Project Dissertation Report

On

Relevance of CAPM for Valuation on Indian Stocks

Submitted By:

Sukhvinder Singh

2K19/DMBA/099

Under the Guidance of:

Prof. Saurabh Aggarwal

Delhi School of Management

DELHI SCHOOL OF MANAGEMENT

Delhi Technological University

Bawana Road Delhi 110042

<u>Certification</u>

This is to certify that the work titled '**Relevance of CAPM for valuation On Indian Stocks**' as part of the final year Major Research Project submitted by Sukhvinder Singh in the 4th Semester of MBA, Delhi School of Management, Delhi Technological University during January-May 2021 is his original work and has not been submitted anywhere else for the award of any credits/ degree whatsoever. The project is submitted to Delhi School of Management, Delhi Technological University in partial fulfilment of the requirement for the award of the degree of Master of Business Administration.

<table>
<tr><td>_____</td><td></td><td>_____</td></tr>
<tr><td>**Prof. Saurabh Aggarwal**</td><td></td><td>**Prof. Archana Singh**</td></tr>
<tr><td>Faculty Advisor</td><td></td><td>Head of Department (DSM, DTU)</td></tr>
</table>

__Declaration__

I hereby declare that the work titled '**Relevance of CAPM for valuation On Indian Stocks**' as part of the final year Major Research Project submitted by me in the 4th Semester of MBA, Delhi School of Management, Delhi Technological University, during January-May 2021 under the guidance of Prof. Saurabh Aggarwal is my original work and has not been submitted anywhere else. The report has been written by me in my own words and not copied from elsewhere. Anything that appears in this report which is not my original work has been duly and appropriately referred/ cited/ acknowledged.

Sukhvinder Singh

(2K19/DMBA/099)

<u>**Acknowledgement**</u>

It is a great pleasure for me to acknowledge the kind of help and guidance received during the research work. I would like to thank my faculty advisor Prof. Saurabh Aggarwal, who helped me to take up the topic '**Relevance of CAPM for valuation On Indian Stocks**' and guided me to complete this project properly. The project provided me with an excellent opportunity to explore the areas of Finance and valuation.

I am highly indebted to Delhi School of Management, Delhi Technological University for giving me an opportunity to work on this project. Lastly, I would like to express my gratitude to all the honourable faculty members for sharing their experience and expertise throughout the course.

I have put all my efforts to ensure that the project is completed in the best possible manner and also ensured that the project is error-free.

Sukhvinder Singh

(2K19/DMBA/099)

Abstract

CAPM (Capital asset pricing model) is one the widely used method for the calculation of cost of equity. CAPM model is established and researched by Sharpe (1964) and Linter (1965) and from then it has got worldwide acceptance all over the world for the calculation of cost of equity and valuation of equity shares of the company. It describes the relationship between Systematic risk and return. Investors wants to be proportionally compensated for taking the risk they were taking. The relationship between risk and return has gone long way and it has been researched by lot of researchers. CAPM is used throughout finance for pricing risky securities and generating expected returns for assets given the risk of those assets and cost of capital. Cost of capital also use Capital assets pricing model on weighted average basis with cost of debt. CAPM is more of a subjective model which is based on the investors to calculate its determinants.

CAPM Model tells us that there is positive relationship between risk and return, but over the years the companies with high market capitalization (they relatively tend to be low risky) has performed better than the low market capitalization company (they relatively are riskier). So, this shows that there are some doubts related to proportional relationship between risk and return. This problem can be arising because of its calculation risk as they take into consideration market risk only, so there are some other ways and models that we can use for the calculation of risk and return so as to make investment decision.

This research will help me know the relevance of CAPM Model in India by testing its property of relationship between risk and return as this method is widely used and widely taught to college students that may leads to wrong pricing and wrong investment decision. The results show that there is negative correlation between systematic risk and return which is important property on which Capital asset pricing model work. The relevance of capital assets pricing model (CAPM) is less in Indian stocks and it can lead to wrong calculation of cost of equity and thus wrong value of assets. So, this should be used with cautious and some other methods can also be used for calculations.

Table of Content

- **Fundamental Beta**
- **Arbitrage Pricing model**
- **Multifactor pricing model for risk and return**
- **Fama – French three factor model**
- **Fama – French five factor model**

<u>Chapter 1: Introduction</u>

Background:

CAPM or Capital Asset Pricing Model is one of the most worldwide used method for the calculation of cost of equity. CAPM model is established and researched by Sharpe (1964) and Linter (1965) and from then it has got worldwide acceptance all over the world for the calculation of Cost of Equity and valuation of equity shares of the company. The establishment of model is of this model started with Markowitz in 1952, who establish the relationship between risk & return. CAPM is a portfolio theory where portfolio is risk is calculated as variance of mean of associated return and investors basically expected to maximize their return on a risk associated or want to reduce the risk on expected return. So, Investors expected to be proportionally compensated for taking the risk they were taking. It has started to pave the wave of modern finance theory and then Sharpe in 1964 and Linter in 1965 and establish Capital Assets Pricing Model. The relationship between risk & its return has gone long way and it has been researched by lot of researchers. The cost of equity is defined as rate of return investors expected to earn for making equity investment in a firm. It describes the relationship between Systematic risk & its return. That means the calculation of cost of equity depends upon the risk. There is positive relationship between Risk and return. That means higher the risk higher will be the return while on the other hand lower the risk lower will the return. So, cost of equity is also known as required rate of return for equity shareholders. So, if the systematic risk is higher than cost of equity will be higher, while if systematic risk is lower than the cost of equity will also be lower. CAPM model is generally used in finance for valuing risky securities and calculating based on expected returns for assets given the risk. Cost of capital is also used in Capital-assets pricing model on weighted average basis with cost of debt. CAPM is more of a subjective model which is based on the investors to calculate its determinants. CAPM use systematic or undiversifiable risk. Systematic sis an undiversifiable risk, the risk that cannot be reduced through diversification. This is the risk of company's share return with respect to the market return. Systematic risk is defined by Beta (b). The beta of an investment is a measurement of how much risk

the investment can be add to a portfolio for investment that looks exactly the market. If a stock has more risk than the benchmark market, it will going to have a beta greater than one and vice versa.
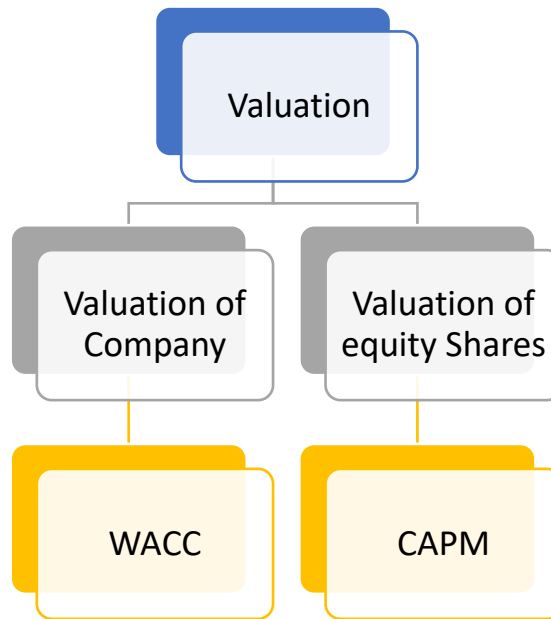
CAPM Assumptions:

- No transection cost and Taxes
- Information is available to all freely and there is no private information
- Borrowing and lending van be done at riskless rate without restriction
- Same expectation of risk and return by all investors
- Maximization of wealth: Portfolio of riskless assets and risky assets that is on the capital market line (CML).

Discounted cash flow model is one the most worldwide used model for the valuation of stock or company by calculating Present-Value of expected future free cash flow over the life span of the firm. Free cash flow to the firm can be categorize into two parts: Forecast-Period and Terminal-Period Value. Forecast Period value is the present value of free-Cash flow of explicitly forecast period. Explicitly forecast period will include all the economic benefit that a firm will get after merger and acquisition deal. The value that is derived after the forecast period is a terminal value. This value is calculated by taking into consideration at constant growth rate of Free Cash Flow after the last year of forecast period.

Present Value of Free Cash flow of the combined firm is measued by discounting it with Cost of Capital. Cost of Capital can be measured through Weighted Average Cost of Capital (WACC). The calculation of this will be discussed later.

Figure 1.1: When to use only CAPM and when WACC

```
                    Valuation
                   /         \
          Valuation of      Valuation of
          Company           equity Shares
              |                  |
            WACC               CAPM
```

So, as you see from above that for the valuation of equity shareholder which does not take into accounts other stakeholders like debtholders, preference shareholder etc. we use capital Assets Pricing Model (CAPM) While to calculate the Valuation of whole Company, which takes into accounts all the stakeholder including debtholders, preference shareholder etc. we use Weighted Average Cost of Capital (WACC). CAPM is known as Cost of Equity as discussed earlier, while WACC is known as Cost of Capital.

CALCULATION OF CAPM:

As said earlier that CAPM is used for the calculation of Expected Rate of Return for the equity shareholders. This calculation of CAPM is given as follows:

CAPM = Rf + b*(Rm – Rf)

Rf = Expected Risk-Free Rate of return

b = Beta of the asset/company/investment

Rm = Market Rate of return (Expected)

(Rm – Rf) = Market Risk Premium

The explanation of all these determinants is given below:

Figure 1.2: Determinants of CAPM Model

Expected Riskless rate of return	Expected Market Rate of Return	Beta	Market Risk Premium

1. **Expected Riskless Rate of Return:**

    To discuss riskless rate of return lets first discuss what is Risk? We generally make investment to get expected rate over a period of time for which we have invested money. But if the Actual Return on the asset invested is different from expected Return Rate, this's where the term risk came. For example, if an Investor makes investment for 1-Year period and expects the rate of return to be 12%, but after 1 year the return comes out to be 10%, so this deviation in expected and actual rate of return shows the risk in making investment in that assets. Another example of riskless assets, an investor invest in 10-years Government bond yield and the bond coupon rate and current yield is same as 6%, and investor invest money for 1 year. After 1-year, investor's actual return will be same as expected return that is 6%.

Figure 1.3: Distribution of return on riskless security

Distribution of Riskless Assets

Expected   Return

4.
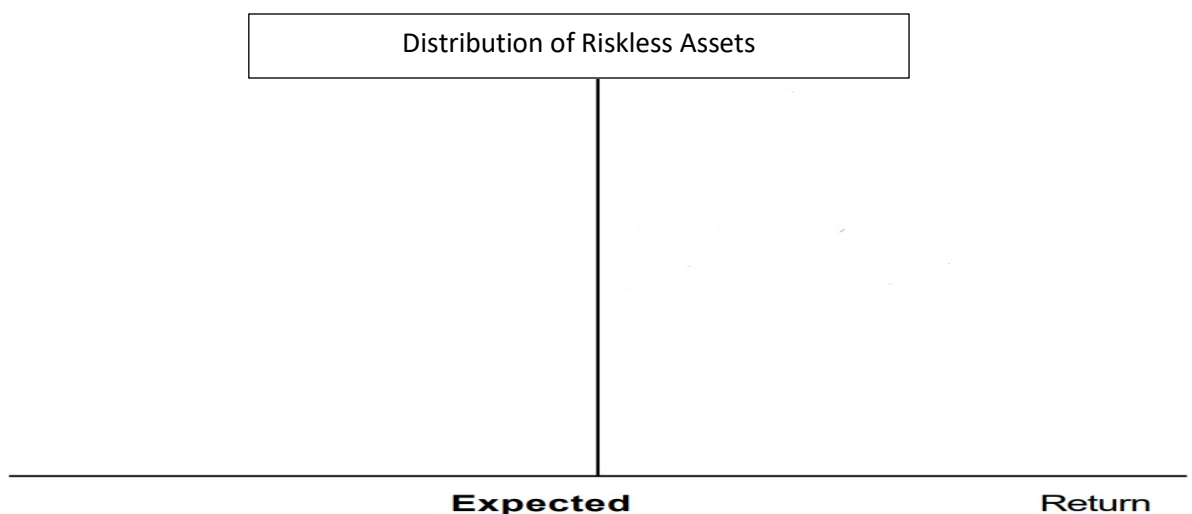
The Expected Returns rate on riskier investments are then calculated relative to the Risk-Free rate, with the risk calculated an expected premium of risk that is added on to the Risk-Free rate.

Determinants of Riskless rate:

Investing in government bonds doesn't always means that it is a riskless investment. There are some other determinants for this. These are as follow:

Figure 1.4: Determinants of Riskless rate

Riskless Rate
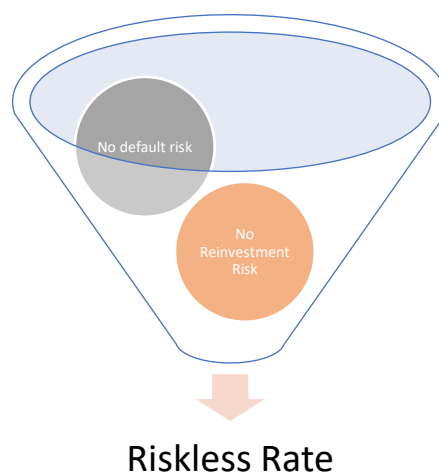
1. **No Default Risk:** It means that investment will default on its payments when it matures and it also ensures no default in periodic payments like interest. Generally, Government bonds and other government securities are default free. It is needed to note that all governments are default free are not Risk-Free and sometime the presence of Government default risk sometime make it very difficult to calculate Risk-free rates for some Economies.

2. **No Reinvestment Risk:** There must not be any uncertainty regarding Reinvestment rates is the investment should be considered as a riskless rate, that means there should be no intermediate cash flows. To illustrate the point with as example, consider that someone try to estimate the Expected Return for over a Six-year period and that you it must be risk-free rate. A 1-Year Treasury bill rate, while Default-free, is not risk free, this is because here we have Reinvestment Risk of not having knowledge regarding what the Market Treasury bill rate will be in next 1-Year. Even a five-year or two-year or three-year etc Treasury bond/security is not risk free, since the risk-free rate for Six-Year time horizon has to be the expected

return on a Default-Free Six-year Zero-coupon bond.

These two determinants are must for calculating riskless return for any investment valuation calculations. Not application of any on these two variables will not make return riskless.

2. **Market Rate of Return (Expected) (Rm):** Expected Market rate of Return is Market Return of benchmark market that we use. For example, Return of Nifty 50 is a market return if we have taken nifty 50 index as a benchmark market index. There are number of ways to calculate expected market rate of return (Rm) such as taking using past data of return of market index and taking average or compound annual growth rate or using recognized investors reports and taking their expected market Rate of Return and some other ways. Expected rate of return is used for calculating Market Risk Premium.

3. **Beta:** Beta is used to measurement of risk that an Investment add with respect to Market risk. It is the risk that it adds to the Market benchmark portfolio as in CAPM it is assumed that all the investors own market portfolio. Assets or investment that shows movement more than the market portfolio tend to be riskier than assets that shows less movement than market, as fluctuation unrelated to benchmark Market portfolio is not going to impact value of Investment.

Risk can be divided into 2 parts:

- **Systematic Risk:** Systematic Risk is a market risk that is inherent. This risk can't be diversified or this risk is "undiversifiable risk", it effects the overall market. This is the risk that we use in the calculation of Beta and Capital asset pricing model's calculation of cost of equity. This risk is unpredictable and impossible to avoid. We cannot mitigate this risk through techniques like diversification, hedging or correct assets allocation. Systematic risk examples can include recessions, interest rate changes, inflation, and wars, among other major changes. Any changes in these can positively or negatively impacts the entire market and cannot be reduced by changing positions in Assets within a portfolio of public Stocks.

- **Unsystematic Risk:** Unsystematic risk is a risk that impacts a particular set of stocks or individual stocks. It can include an event that impacts a particular sector but not an entire market, or an event that impacts an individual stock. This Risk is also known as "Diversifiable Risk" because as we know that it impacts particular set of stocks, so we can reduce the risk by diversifying other set of stocks that are not impacted by the same event. So, this risk can sometime be avoided or sometime can be reduce and mitigated. We don't take into consideration this risk as this risk is diversifiable. Examples can be: Entry of new competitors like Grasim Industries has announced to enter into paint industry this year, so this will be going to negatively impacts existing companies like Asian Paints, Berger Paints, Akzo Nobel, Indigo paints, Kansai Nerolac etc.

Calculation of Beta:

Beta is measure through Regression. It represents the Slope Line of regression equation of data. It is a securities return with the changes in the market.

Beta of Asset X= Covariance of asset X with Market Portfolio / Variance of Market Portfolio

b > 1; the Stock is more volatile than the market, if beta is 1.2 that means it is 20% more Volatile than market

b = 1; Stock is equally volatile than the market, price activity is strongly correlated

b < 1; the stock is lesser volatile than the market

b < 0; the stock is negatively correlated

4. **Market Risk Premium:**

Market risk premium is an important input in the capital assets pricing model (CAPM) cost of equity. Market risk premium is the extra return that an investor can get from investing in risky investment. It is an extra risk that is demanded

7.

by investors for shifting money from riskless investment into risky investment. Risk premium depends upon two things. These are as follows:

- **Risk Aversion of Investors:** If the investors become risk averse then they are going to demand higher risk premium for making investment in risky investment. Some of this risk aversion is inborn, while some comes from particular event. For example; if the economy is going through recession, then they will demand more return from making investment in more of risky investment.

- **Average Risk Investment:** If the Risk on the average risk investment increase, so the premium demanded also be increase. That will depend upon the type of firms that are actually traded in the market, fundamentals of economy, industry & company and how good the management in managing risk. The premium is lower in markets where only the largest, trust worthy and high market cap firms trade in the market.

Calculation of Market Risk Premium:

Market Risk Premium = Market rate of return (Expected) – Expected Riskless Rate of return

As Investor generally has different assessment of Risk of Market and differently accept different Market premium, they likely to have a different assessment of Expected Premium, the premium can be a average of these individual assessment premiums, where the average is based on the wealth an investor can bring to the Market.

Figure 1.5: Equity risk premium
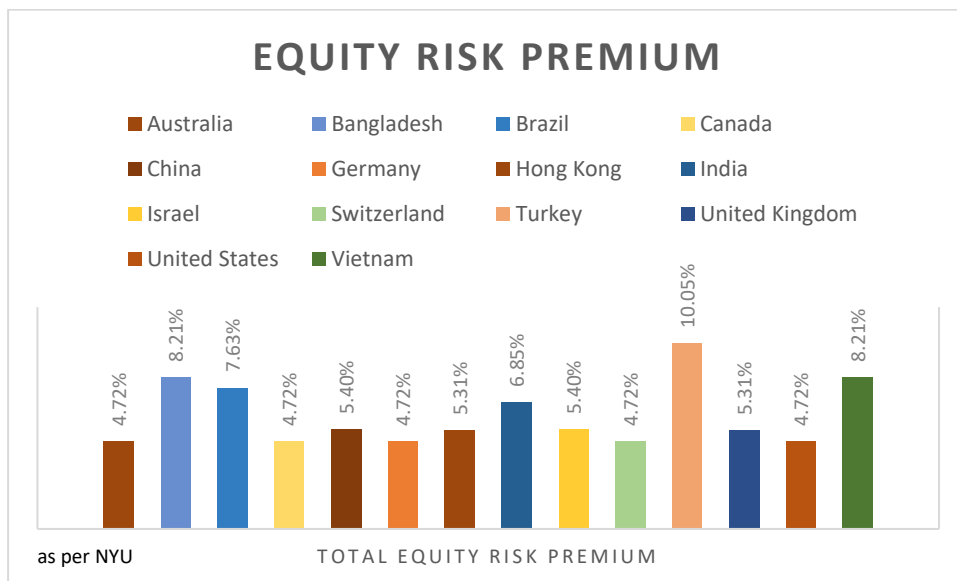
As you can see from the above graph, that the equity risk premium of Turkey is highest due to economic slowdown it is facing even before the pandemic, and the cost of debt and inflation is also high. While for India the equity risk premium, it is 5.31%.

Discounting Cash flow Model: Discounted cash flow model is one the most worldwide used model for the valuation of stock or company by calculating Present-Value of expected future free cash flow over the life span of the firm. Free cash flow to the firm can be categorize into two parts: Forecast-Period and Terminal-Period Value. Forecast Period value is the present value of free-Cash flow of explicitly forecast period. Explicitly forecast period will include all the economic benefit that a firm will get after merger and acquisition deal. The value that is derived after the forecast period is a terminal value. This value is calculated by taking into consideration.

 Present Value of Free Cash flow of the combined firm is measued by discounting it with Cost of Capital. Cost of Capital can be measured through Weighted Average Cost of Capital (WACC). The calculation of this will be discussed later.

Free Cash Flow to the Firm:

For calculating the value of the firm, free cash to the firm is calculated. Free-Cash Flow

to the Firm (FCFF) is the sum of the cash flow available to all the stakeholders like shareholder, debtholders and preference shareholders. This cash flow is discounted at WACC to calculate present value of the firm. The Measurement of Free-Cash flow is as follow:

FCFF = EBIT (1-t) + Depreciation – Capital Expenditure – Change in non-cash working Capital

EBIT = Earnings Before Interest and tax

t = Effective marginal Tax rate

Capital Expenditure = Change in Fixed assets

Discount Rate:

Discount rate is the Expected Rate of return require by that investors demand based on expected systematic risk. It is an opportunity cost on comparable investment. The risk here taken is relative risk. Discount rate is calculated as Weighted average cost of Capital. There is Negative Relationship between Discount Rate & Valuation of firm. Higher the discount rate higher will be the valuation and vice versa.

WACC = We*Ke + Wd*Kd*(1-t)

We and Wd = It is percentage of equity and percentage of debt to the total capital respectively. (Market value can be taken into consideration).

Ke = Cost of Equity

Kd = Cost of debt

Growth Rate:

Growth Rate is an important variable for the calculation of valuation. It shows how much firm will grow and how much market share it can acquire from its competitors. There is Positive Relationship in growth rate and valuation of firm. Higher the growth rate of firm higher will be the valuation and vice versa.

Growth Rate = Reinvestment Rate * ROCE

Reinvestment Rate = It is the investment that firm will reinvest in the business as a % of EBIT*(1-t)

ROCE = Return on Capital employed

This is one of the ways to calculate growth rate, this is also known as sustainable growth rate. Other way can be to calculate growth rate by looking at past growth rate of the firm.

Value of Synergy:

Merger and acquisition deal is happened because of improvement in performance of combined entity. In terms of operational synergy, the combined entity will get strategic and economies of scale advantages. They will get higher Rate of growth, higher Rate of return on capital, , higher Reinvestment, longer growth period, higher profitability margin and operating income. In terms of financial synergy, combined firm will get higher Net present value (NPV) of projects that would have been rejected because of limited cash or cash slack, lower tax expenses because of higher depreciation and amortization and operational loss carry forward and higher debt capacity due to equity, income and cash flow will combined and may improve which will definitely increase debt capacity.

So how this Value of Synergy can be Calculated, the steps for this are given below:

Value of Synergy = Value of Combined firm with synergy – Value of Combined firm without synergy

1. We calculate the value of firm individually and independently by discounted cash flow model. In this value is calculated as if there is no M&A deal happen. This is also known as Status quo valuation.
2. Then we calculate the valuation of combined firm as if there is no synergies and no improvement in performance. This is done by adding the value of each firm as we have calculated in first step.
3. We calculate the combined firm Value by taking into consideration Improvement

in performance due to synergies. This can be in the form of Higher growth rate profitability, return on investment, Higher investment, lower cost of capital and many others.

Deducting Combined firm Value without synergies from the combined firm value with synergy will result in calculation of value of synergy.

Problem Statement:

CAPM model is established and researched by Sharpe (1964) and Linter (1965) and from then it has got worldwide acceptance all over the world for the calculation of cost of equity and valuation of Equity shares of the company. It defines the Relationship in systematic risk and return. But over the years CAPM Model has gone through criticisms because of its unrealistic assumption and generalization of risk and return relationship. CAPM model is basically based on two important assumptions, that the transection cost is nil and there is no private information is available to any investor, everyone has the same information in the public domain so no stock is overvalued and undervalued. It assumes that there are two reasons why investors stop should diversify its investment it then ensures that investors will keep diversify until they hold a single share of every traded asset of what we called "the market portfolio" in CAPM model and it will be different in how much of money they can invest in the market portfolio. So, this tells us that no investor can outperform the market and only way to earn more is by investing more, but this doesn't hold true as lot of investors and investment institutes outperform the market by making portfolio other than market portfolio.

CAPM Model tells us that there is positive relationship between risk and return, but over the years the companies with high market capitalization (they relatively tend to be low risky) has performed better than the low market capitalization company (they relatively are riskier). So, this shows that there are some doubts related to proportional Relationship in risk and return. This problem can be arising because of its calculation risk as they take into consideration market risk only, so there are some other ways and models that we can use for the calculation of risk and return so as to make

12.

investment decision.

Objective of the study:

- To analyse the relevance of Capital asset pricing model on Indian Stock.
- To see whether there is actual Positive Relationship in the Systematic Risk and Return on which premises the CAPM Model works.
- Correlation and regression will be used for the research.
- To recommend other ways and models for the calculation of Risk and return to make investment decisions.

Scope of the Study:

As said earlier that CAPM Model is widely used model for pricing stocks and investments not only in India but around. This method is also used for the calculation of Valuation of whole firm by calculating Cost of capital by taking Weighted Average of both Cost of debt (Interest rate) and cost of equity (CAPM Model). It describes the Relationship in Systematic risk (undiversified risk) and Return of an asset. Investors expected themselves to be proportionally compensated for risk they were taking.

CAPM model has over the year has gone through number of criticisms because of its unrealistic assumption and generalization of risk and return relationship. CAPM model in theories is different from real practice, there is no realty of the assumption on which it operates and over the years the risk of the investment has been broaden and not only includes market risk. CAPM model works only on the assumption that firm can only face market risk and other risk can be avoided, but this is not true in real life as the company face other risk such as accounting risk, top line risk, profitability risk and other types of risk.

So, this research will help me know the relevance of CAPM Model in India by testing its property of Relationship in Risk and Return as this method is widely used and widely taught to college students that may leads to wrong pricing and wrong investment decision.

Chapter 2: Literature Review

CAPM model is established and researched by Sharpe (1964) and Linter (1965) and from then it has got worldwide acceptance all over the world for the calculation of cost of equity and valuation of equity shares of the company. The establishment of model is of this model started with Markowitz in 1952, who establish the relationship between risk & return. CAPM is a portfolio theory where portfolio is risk is calculated as variance of mean of associated return and investors basically expected to maximize their return on a risk associated or want to reduce the risk on expected return. So, Investors expected to be proportionally compensated for taking the risk they were taking. It has started to pave the wave of modern finance theory and then Sharpe in 1964 and Linter in 1965 and establish Capital Assets Pricing Model. The relationship between risk & its return has gone long way and it has been researched by lot of researchers. The cost of equity is defined as rate of return investors expected to earn for making equity investment in a firm. It describes the relationship between Systematic risk & its return. CAPM model is generally used in finance for valuing risky securities and calculating based on expected returns for assets given the risk (Kenton, 2021). Capital Asset Pricing Model or we can say CAPM has its roots on the portfolio theory of made by Markowitz in which portfolio risk is measured by variance of mean of the associated returns of an asset and investors do expect their returns to maximize on the basis of risk or reduce risk given a certain return (Sattar, 2017). Risk–Return trade-off is balance between associated returns of an asset and investors do expect their returns to maximize on the basis of risk or reduce risk given a certain return and higher risk higher return and vice versa (Chawla, 2010). CAPM model is basically based on two important assumptions, that the transection cost is nil and there is no private information is available to any investor, everyone has the same information in the public domain so no stock is overvalued and undervalued. It assumes that there are two reasons why investors stop should diversify its investment it then ensures that investors will keep diversify until they hold a single share of every traded asset of what we called "the market portfolio" in CAPM model and it will be different in how much of money they can invest in the market portfolio (Damodaran, 1994).

In the Capital Asset Pricing Model (CAPM), Beta captures all the market risk it is calculated in relative to a market benchmark portfolio which in theory should include all traded assets in the marketplace hold in proportion to their market value (Damodaran, 1994). A theory CAPM, during the recent years the foundation of this model has been extended and its is moving closure to complete understanding rather of the sufficient assumption and during the recent years its practicality has been negatively impacted and proved less than expected and its variance of mean is not sustainable in today's market scenario (Ross, 2016). CAPM can be consider more of a dead model than alive in today's time as market risk is not only variable that impacts the risk of investment. A negative correlation in beta and returns for 80 per cent of the investment portfolio also raises some doubt on the efficacy of the Indian capital markets (Chawla, 2010). Fama-French model is better and more powerful model than the old and doubtful model CAPM as it takes into consideration more variables/factors for calculating returns (Sattar, 2017).The average rate of return expected from an investment portfolio is dependent on its beta, so if the beta is high than its return will also going to be high but in real time the higher beta does not necessarily provide higher return (chaudhary, 2017). CAPM is not so capable in examining the variations/fluctuation/deviations in returns for the Indian stock market and so therefore CAPM in simple is not that relevant for asset valuing in India (chaudhary, 2017). APM has failed to adequately give explanation that portfolio returns earned that is higher than the expected and for each of its regressions/slope line, and over the years the CAPM model has performed below than the expectation as its explained variable defined by R-squared is very low across 10 sample portfolio tested as its r-squared is very low (Chawla, 2010). For the time being, we must need to research for the new or alternative investment/asset pricing theory which can value the variable and which must be sustainable in Indian Stock market, the one which has been gaining quick attention around the world in recent year is Fama-French 3 factor model. Capital assets pricing model helps us in determining the required of return for the equity shareholders on their risky investments. Efficient capital market is what that is capital asset pricing model assumes in calculation of risk and return. The Capital asset pricing model (CAPM) is a good model and there is significant relationship in Risk and Return, that means that if risk increases then return also increases and investors on the other

hand can conclude that investors can integrate the performance of investment to the market development (Kumar, 2007).

In banking stocks, as tested in research study Higher explanatory power of EBO model and P/B that provides us book value (net asset value) per share is more relevant than other valuation model that influence Banking stocks market price, while on the other hand evidence for Capital Asset Pricing Model (CAPM) shows that CAPM is not the supportive to banking stock valuation as its property (Positive relationship in Risk and Return) is not true in Indian banking share case scenario (E.S., 2014). Liquidity risk is one of the most important systematic risk and any failure to incorporate this risk in capital asset pricing model (CAPM) will definitely leads to erroneous investment decision as liquidity, to incorporating the risk of liquidity (assets that can't be sell easily) can lead to wrong calculation of required rate of return and wrong valuation calculations (Kumar K. G., 2018).

Limitation of Efficient market operation on which CAPM (Capital Assets Pricing Model) model works (Ball, 2017): There is strong data that evident that shows that the prices of stocks generally overreacts/fluctuates more and then shows quick reversal and this led to the negative correlation in risk and return and that create more returns for the contrarians in the stock market (Ball, 2017). The share market fluctuated more genrelallt of the investor's pursuit and other psychological behaviour of investors which forms a major part of stock market daily or short term fluctuations and it seems contradict of the price tendency to overreact to the general information like quarterly/financial results and then making strategies for the earning momentum (Ball, 2017). The CAPM (Capital Asset Pricing Model) is generally used to calculate the return require by the investors to invest and it then use/work as a calculation of discount rate to calculate the present value of cash flow; buy higher-beta stocks doesn't earn higher return and sometime low beta stock earns more return than higher beta which have led to pronounce the horse dead (Ball, 2017).

The Capital asset pricing model is incapable of calculating and not a valid model for small and emerging markets if the beta with market portfolio is insignificant or zero while 5 Factor Fama-French model is one of the good models as it closely related to reality and explaining the results, even this good model explains only 56% ($R^2 = 0.56$)

of the returns variation that means there are also some other factors/variables that can also be included in this variable to increase the accuracy of predictability (MAXIM, 2015). The assumption made by capital assets pricing model is relaxed in Arbitrage pricing model (APM) and it requires that the assets with the same risk exposure to the market will trade at the same price and it allows us to use multiple sources of risk to be consider to calculate overall risk not only risk market risk that we consider in Capital asset pricing model (Damodaran, 1994). CAPM Model is an old model and it should be abandoned and replace by new model in modern finance because it has number of limitations like the calculation of risk take only market risk & not other risk that are equally important, market benchmark index is mostly biased investors do not expect to be compensated for avoidable risk is inconsistent as a risk premium must exist (Walter, 2013).

Conclusion of Literature Review:

The Capital Asset Pricing Model (CAPM) describes as the relationship between systematic risk (described by beta) and expected return for assets, particularly equity stocks. It has started to pave the wave of modern finance theory and then Sharpe in 1964 and Linter in 1965 and establish Capital assets pricing model. The relationship between risk and return has gone long way and it has been researched by lot of researchers. CAPM has been widely used method in finance for pricing risky securities and generating expected returns for assets given the risk of those assets and cost of capital. No investor can outperform the market as CAPM model is basically based on two important assumptions, that the transection cost is nil and there is no private information is available to any investor, everyone has the same information in the public domain so no stock is overvalued and undervalued. It assumes that there are two reasons why investors stop should diversify its investment it then ensures that investors will keep diversify until they hold a single share of every traded asset of what we called "the market portfolio" in CAPM model and it will be different in how much of money they can invest in the market portfolio. According to CAPM model, Market risk captures all the risk that an investor cannot avoid, but various studies tells that this is not true as their other risk that a firm face. There are number of researches which tells that there is no significant relationship between systematic risk and return and there

is need to modify or use different model as CAPM may lead to wrong price calculations and wrong investment decisions.

Chapter 3: Research Methodology

The research is a comprehensive explorative study with an attempt to employ mathematical models and perform statistical modelling to attain the defined objectives. This chapter deals with the research methodology and briefly discusses the tools and techniques adopted for the study.

Data Collection:

For research, I have collected data from number of resources like Moneycontrol, Yahoo finance, and other recognised sources. To explore about the Capital Asset pricing Model and is it relevant for Indian stock value, the data for was collected for daily basis for the 10 years' time period from the end of January 2011 to December 2020. So, the long term 10 years, which almost takes all the economic scenarios including the pandemic scenario which is a kind of once in a century event. So, the data is collected for daily returns, market capitalization, companies' data for top 10 companies and least 10 companies. For choosing Top 10 and least 10 companies I have used Nifty 50 companies. That means that top 10 companies in Nifty 50 by market capitalization at the last date of data collected period and least 10 companies in Nifty 50 Index by market capitalization at the last date of data collection period.

Tools and Techniques:

As said earlier, that top 10 and least 10 companies of nifty 50 companies are being used for the analysis. In this research I am going to regression analysis technique for calculation of alpha (a) and beta (b).

The tool that I am going to use is Microsoft excel.

Standard procedure for calculation of determinants of Capital Asset Pricing Model:

First step, to collect the data for daily price and then used it for calculate daily return data. Data is collected for company as well as market returns.

Second Step, regress the data stock return (Rj) (dependent variable) against the market return (Rm) (independent variable).

After regression we will get regression equation;

$R_j = a + b \cdot R_m$

b is defined as the slope of regression equation and it is defined as the riskiness of the asset.

While a is the intercept of regression equation and it provides us as a performance measurement during the regression period relative to capital assets pricing model.

CAPM Equation comparison with Regression equation

$CAPM (R_j) = R_f + b \cdot (R_m - R_f)$

$\qquad\qquad = R_f \cdot (1 - b) + b \cdot R_m$ ----- Capital Assets Pricing Model

$(Regression) R_j = a + b \cdot R_m$ ----- Regression Equation as discussed earlier

So, when we compare both the first part of Capital asset pricing model equation that is $R_f \cdot (1 - b)$ and a (alpha) of regression equation. It will tell us about stock performance in capital assets pricing model.

$a > R_f \cdot (1 - b)$ …. Actual return is more than expected return – Outperformance

$a = R_f \cdot (1 - b)$ …. Actual return is equal to expected return – Meet the expectation

$a < R_f \cdot (1 - b)$ …. Actual return is less than expected return – Underperformance

Jensen's Alpha (a): Jensen alpha is a performance measurement which is risk adjusted, that shows weather the investment has performed actual performance better than expected return or actual performance is equal to expected return or actual performance is lower than expected return. Expected return is measured through Capital asset pricing model. This is also simply known as alpha. It shows whether the investment outperform, met or underperform the market as you can see from the above discussion.

Alpha = Ri - (Rf + b*(Rm - Rf))

Ri = Actual Rate of Return from investment

Rf = Riskless rate of return

B = beta of investment with respect to market

Rm = Market Rate of Return

So, in this way alpha can be measured. But I have not calculated alpha in this way. As explain earlier alpha can be measured through intercept in regression equation. So, from the regression equation that I will get by comparing company's return with respect to market return. So, for example, if I regress Reliance limited returns (dependent variable) with the Nifty 50 index return (independent variable) then I am going to get regression equation in the form that has been defined above. So, from that I will get both beta as well as alpha.

Beta: Beta is used to measurement of risk that an Investment add with respect to Market risk. It is the risk that it adds to the Market benchmark portfolio as in CAPM it is assumed that all the investors own market portfolio. Assets or investment that shows movement more than the market portfolio tend to be riskier than assets that shows less movement than market, as fluctuation unrelated to benchmark Market portfolio is not going to impact value of Investment. Beta is measure through Regression. It represents the Slope Line of regression equation of data. It is a securities return with the changes in the market.

> **Beta of Asset X= Covariance of asset X with Market Portfolio / Variance of Market Portfolio**

b > 1; the stock is more volatile than the market, if beta is 1.2 that means it is 20% more volatile than market

b = 1; Stock is equally volatile than the market, price activity is strongly correlated

b < 1; the stock is lesser volatile than the market

b < 0; the stock is negatively correlated

As you can see above the formula for the calculation of beta. I am not going to calculate the beta in this way. Like for the case with alpha, I am going to use regression equation for the calculations of beta. So, from the regression equation that I will get by

comparing company's return with respect to market return. So, for example, if I regress Reliance limited returns (dependent variable) with the Nifty 50 index return (independent variable) then I am going to get regression equation in the form that has been defined above. So, from that I will get both beta as well as alpha.

Estimations Issues:

- **Length of period:** As said earlier I am going to use 10 years' time frame which is enough time frame for calculations as it will take all the economic scenarios from growth to slow down including the pandemic period which is a kind of once in a century event also known as black swan. A longer time frame provides us with more data.

- **Return Interval:** Return calculation can be daily, weekly, monthly, quarterly, half-yearly, yearly etc. But for my research u have used daily return data. Use of daily/intra-day returns will increase the number of observations/data points in the regression thus improve the quality of results.

- **Market Index:** Market Index is an important estimation issue, it is on this return our return for investment is compared for analysing whether our investment return outperform or met or underperform the market. It is on the basis of this index we got market return and then use it for the calculation of regression equation. For my analysis I have used Nifty 50 index for calculating market return. Nifty 50 is one of the two main stock indices used in India, the other being the Sensex of BSE. Nifty 50 shares are the most valued and traded shares in Indian Capital market. Almost 90% of the total daily trading in Indian Capital market is done on National stock exchange (NSE).

So, these are the main investment issues that I have taken into consideration and that are important for the quality of the results from this research. These are three decisions a researcher must make in setting up the regression described above.

In research I am going to compare Beta and alpha, to see the relevance of Capital assets pricing model. Capital asset pricing model (CAPM) tells us the relationship between Systematic risk and Return.

There is a <u>Positive-Relationship</u> in systematic Risk and Return. That means

higher the risk higher will be the return while on the other hand lower the risk lower will be the return.

So, for research Beta (b) is consider as a risk (systematic risk), while alpha (a) is a measurement for the return. It tells about whether the investment has performed better than market or lower than the market. So, any company's share alpha should be higher than 0 to tell us that the investment has performed better than market return.

Hypothesis:

H_0 = Higher the Beta higher will be the alpha and vice versa

H_1 = Negative relationship between beta and alpha.

That means that if null hypothesis is rejected than there is negative Relationship in Systematic Risk and Return which is opposite of what this model tells us. So, these reduces the relevance of Capital Asset Pricing Model (CAPM) in Indian Stocks.

Concluding remarks for research methodology:

I have used exploratory research as a method for the research on relevance on Capital Asset Pricing Model. CAPM is based on positive Relationship in Risk and Return. So, we will see if there is actually a Positive Relationship in Risk & Return to analyse the relevance of CAPM model.

Chapter 4: Empirical Results

An empirical analysis is based on the statistical techniques pre-decided as the research methodology. This chapter includes the analysis of the secondary dataset to get insights of relevance of Capital assets pricing model. The results of these models are discussed below.

Calculations of alpha and beta for Top 10 and least 10 nifty 50 companies:

Table of top 10 companies:

Table 4.1: Beta and Alpha of top 10 nifty-50 Companies

Top 10 Companies		
Companies	**Alpha**	**Beta**
Reliance	0.04%	1.11
TCS	0.07%	0.65
HDFC Bank	0.05%	1.04
HUL	0.08%	0.56
Infosys	0.07%	0.74
HDFC	0.03%	1.01
Kotak Mahindra	0.06%	1.08
ICICI Bank	0.02%	1.49
Bharti Airtel	0.01%	0.82
HCL Tech	0.10%	0.17
Average	**0.05%**	**0.87**

Table of least 10 companies:

Table 4.2: Beta and Alpha of Least 10 nifty-50 Companies

Least 10 companies		
Companies	**Alpha**	**Beta**
Cipla	0.03%	0.6
Eicher Motors	0.13%	0.8
Hero Motocorp	0.02%	0.8
Grasim	0.03%	1.0
Tata Steel	-0.02%	1.3
IndusInd Bank	0.02%	1.4
Tata Motors	-0.03%	1.4
Hindalco	-0.02%	1.5
GAIL	0.00%	0.8
UPL	0.05%	1.0
Average	**0.02%**	**1.06**

These are the calculations of alpha and beta in two different table. The top 10 and least 10 companies that has been chosen is based on market capitalization. Market capitalization of last date of data collection period (post pandemic period data is not used) is used to know the top 10 and least 10 companies. So, order of the companies in top 10 and least 10 can be changed as market capitalization of companies is changed on daily basis.

On the basis of Averages as given in last row of tables, the average beta of top 10 companies is 0.87 (less volatile and less risky than market) while the average beta for least 10 companies is 1.06 (more volatile and riskier than market). But on the basis of return or performance measurement which is measured through alpha, the alpha of top 10 companies is 0.05% which is higher than alpha of least 10 companies which is 0.02%. So, these shows that top 10 companies have relatively lower risk or beta but apparently has higher return or alpha on an average basis. While on the other hand, least 10 companies have relatively higher risk or beta but has relatively lower return or alpha on an average basis. So, that means that there is negative relationship between systematic risk and return on an investment.

Further evidence:

Calculation of correlation between Beta (independent variable) and alpha (dependent variable) of top 10 and least 10 companies is giver below:

Table 4.3: Correlation of beta and Alpha

Correlation between Beta (b) and Alpha (b)	
Top 10 Nifty 50 companies	-0.759
Least 10 Nifty 50 companies	-0.528

So, from the above table, it can be concluded that there is negative correlation between systematic risk and return which is important property on which Capital asset pricing model work. We reject the Null hypothesis (H_0) that tells us that there is positive relationship between systematic risk and return. While on the other hand, we accept the alternative hypothesis (H_1) that tells us that there is negative relationship between systematic risk and return.

Empirical results shows that the relevance of capital assets pricing model (CAPM) is less in Indian stocks and it can lead to wrong calculation of cost of equity and thus wrong value of assets. So, this should be used with cautious and some other methods can also be used for calculations.

Chapter 5: Recommendation

I.   Crushing Risk of the Investment

Capital Assets pricing model's main limitation is that it takes only market risk into account which then doesn't give us the accurate Rate of Return that is expected. Though calculating Rate of Return (expected) is impossible, but we can make efforts to go closure to the that. One of the ways to do that is crushing the risks into parts to see what are the risks that our investment can have in future. So, to get high return and minimum risk, we need to minimise four type of risks:

Figure 5.1: Crushing the Risk of Investment
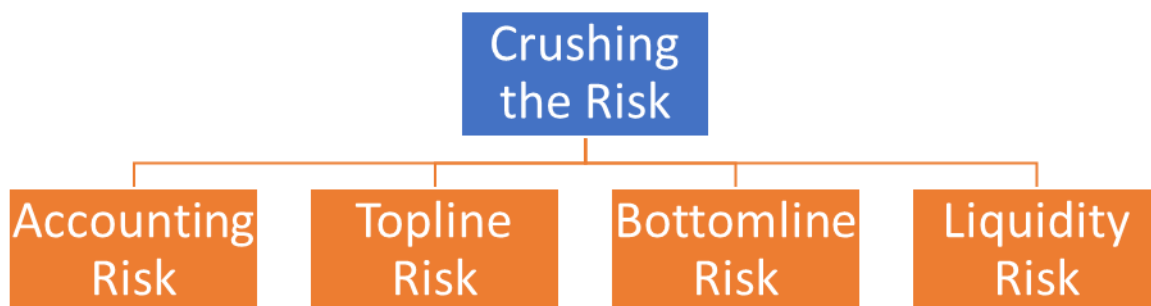
1. **Accounting Risk:** We know from over the years how prominent public and private listed or unlisted companies has over the years has been involved in big scams, presenting inaccurate financial material information, hide information, create bogus revenue and profits using accounting lapses in accounting standards. We also know that how the NPA's of the public and private banks has been increasing due to NPA's of big organisations. The similar problem exists with number of housing finance companies. The accounts of a leading cement manufacturer, pharma companies, petchem companies and other sector companies has some or other kind of accounting problems. There are number of companies in BSE 500 whose annual reports does not past scrutiny. Using financial ratios, financial Shenanigans and models we can easily find the

accounting risk associated with the company.

2. **Top line Risk:** Top line risk is the risk of volatility or uncertainty in terms of revenue growth of the company. India's per capita income over the year has been on a lower side due to huge population. Its per capita is even less than Sri Lanka, Thailand & Malaysia. As a result, except basic goods like FMCG, pharma other items are still considered as a luxury for most of the population of India. For example, Auto sale, even the entry level or low-priced vehicle, faces wide fluctuation over the period of time. Auto sector is considered as a cyclical sector. Its top line growth is widely fluctuating with Indian GDP growth. So, this risk should be taken into consideration for calculating returns. FMCG companies are on the other hand had the stable growth as they are less influenced by the economic growth and people can't postpone its consumption as it is basic good.

3. **Bottomline Risk:** Bottom line growth though influenced by Top line growth, but it is more influenced by the cost especially fixed cost which the firm has to pay even if the firm has zero top line. Fixed cost can include cost of capital (Interest payments), rent payments, lease payments and other such expenses. While on the other hand, Variable cost means the cost which is in proportion to the production/sales level like higher the production higher will be the raw material cost. So, Bottomline growth is heavily influenced by the Fixed cost. To know the variation, we can calculate operating leverage degree, financial leverage degree and degree of overall leverage to know the volatility/uncertainty/risk in bottom line. To reduce such risk, we can look for sectors/industries which over extended periods of time, 2 or 3 companies will cumulatively account for about 80 – 90% of the sector profits. Such monopolies created by these companies will then definitely lower volatility in their profitability.

4. **Liquidity Risk:** Though liquidity has been on increase in the Indian stock market over the years, but Indian Markets are still included in the least 10 liquid market in the world as promoters owns almost half of the share outstanding of the publicly traded companies. Top 50 companies of in Nifty defined by Nifty 50 Index has high liquidity but the subsequently the liquidity reduces substantially

afterwards. Such low liquidity creates stock price high fluctuation as investors generally go through their cycles of bulls and bears. Making the portfolio towards liquid stocks can reduces this risk.

II.   Fundamental Beta:

As the main problem with the CAPM model is its risk calculation as it only takes only market risk and not other risk that are important to be taken into considerations. So, calculating the Beta through fundamentals of company can help us in providing somewhat accurate beta for calculation of cost of equity.

The beta that is determined by the fundamentals of the companies is known as fundamental beta.

Determinants of Fundamental Beta:

The beta of the firm can be divided into three parts: (i) Type of Business (ii) Degree of operating leverage (iii) Degree of financial leverage. Although we will use these determinants to find betas in the calculation of cost of equity in Capital Asset Pricing Model (CAPM), the similar analysis could also be used for the alternative models such as Assets Pricing Model or model which included more than one factors such as Fama-French Model and other models.

Figure 5.2: Determinants of fundamental beta
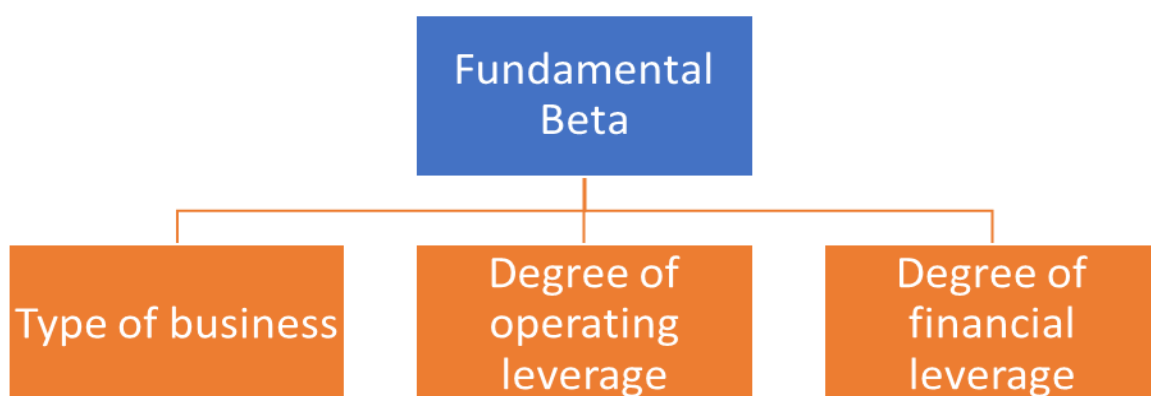
1. **Type of business:** As we know that beta is a measurement of risk or volatility in share price with respect to the market movements. Let consider other thing being constant, the firm which has cyclical business can be expected to have higher beta than the firm which has non-cyclical which can be consider to have lower beta. Auto sector is considered as a cyclical sector. Its top line growth is widely fluctuating with Indian GDP growth. So, this risk should be taken into consideration for calculating returns. FMCG companies are on the other hand had the stable growth as they are less influenced by the economic growth and people can't postpone its consumption as it is basic good. If the product of the company is more of a discretionary whose consumption can be postpone it will definitely going to impact the beta of the firm dealing with that products or having cyclical business. So, if the product of the company is more of discretionary side, so the beta of stock of this company will going to be higher side and opposite is the case with the firm that sells basic goods.

2. **Degree of Operating Leverage:** Operating leverage degree influenced the profitability of the firm. It is based on the cost-structure of the firm and it is measured through the fixed cost of the firm. A firm that has high Fixed cost will going to have higher operating leverage degree. If a firm that has higher degree of operating leverage, then a small fall or rise in sales/revenue of the company will have high impact on its profitability. A rise in sale will increase the profit higher than the growth rate of sales if the operating leverage degree is high, in the same case, if sales fall then profitability will fall at higher rate which will be higher than fall rate in sales.

Do firms change their operational leverage degree? Yes, firm's cost-structure is determined by the type of business (as earlier explained) the firm has (an airlines have to lease expensive planes and energy utility has to build costly power plants).

We know that operating leverage degree impacts the beta of the firm but it is somewhat difficult to calculate the operating leverage degree of a firm, as we look at the financial statements, the fixed and variable costs are not segregated in Profits and Loss Statements. So, we have to look into notes of income statement to know the fixed cost. So, we look at the approximate figures for the

calculation of operational leverage degree by looking at the changes in the operational income of the firm with respect to changes in revenue of the company.

Degree of Operating leverage = % Change in Operating Profit / % Change in Sales

For Companies with relatively higher operating leverage, operating income will fluctuate more than the sales.

3. **Degree of financial leverage:** Like operational leverage, degree of financial leverage also impacts the profitability of the company. The term financial leverage is simply meaning how much debt the company owes. Higher the debt of the company higher will be the mandatory interest payments and higher will be the degree of financial leverage. While if the firm has relatively lower debt, then it will have lower mandatory interest payments thus will have lower degree of financial leverage.

If the overall risk of the firm is born by the shareholders that it means that the beta of debt/preference share instruments is almost nil and tax benefit done, then;

$$\beta_L = \beta_u \left(1 + (1 - t)\left(\frac{D}{E}\right) \right)$$

where

β_L = Levered Beta for equity in the firm

β_u = Unlevered beta of the firm (i.e., the beta of the firm without any debt)

t = Corporate tax rate

D/E = Debt/Equity Ratio

If the degree of financial leverage increase, then this increases the risk in terms of both market and in fundamental terms that will lead to higher beta and vice versa.

The beta of a firm that is unleveraged is determined by determinants the nature of the businesses in which it has its business as defined earlier above and its degree of operating leverage. It is also defined or known by Asset beta since it is determined by the assets which is based on ownership of the asset of company. The beta that is leveraged which is also beta for equity investment in a firm and it is also known as equity beta, is referred both by the how much riskier the business of the firm in which it operates in & by the amount of financial leverage risk measured by degree of financial leverage it has taken on. Since financial leverage degree of company shows the risk of the company so if the firm has taken higher leverage already it will in future will be reluctant to take on the risk. It can also be said that firm that operates in the basic/stable business can take higher leverage to grow their business. Example can be Commodity business for stable firm.

III. Arbitrage Pricing Model:

Arbitrage pricing model (APM) is established after the restrictive assumptions on no transaction costs & no private information (everyone has same information thus means efficient market operations) in the Capital Asset Pricing Model and dependence on the CAPM Mode had long been viewed with doubts and scepticism. It was established as an alternative model of CAPM Model by Ross in 1976 and it is known as Arbitrage Pricing Model (APM).

Premises of Arbitrage pricing model:

It is based on the property that there is arbitrage opportunity available in the market. For example; if someone buy a riskless asset and earned more than riskless rate because of increase interest rate or capital gain, they have arbitrage opportunity. The premise of this APM Model is based on premise that investors takes benefit of arbitrage opportunity in the and as more investors joined to gain advantage, they eliminate that arbitrage opportunity. Another example can include; if two assets have the same risk exposure and one is giving high return and other asset gives relatively low return, then in that case investors will invest in high return asset to get advantage of this arbitrage opportunity. When more investors joined in to get advantage of this

opportunity, the prices of high return asset will be going to increase thus reduce the return on investment to the other relative low return asset. This elimination of arbitrage opportunity will lead to same expected return for both the assets.

Like in the Capital Asset Pricing Model (CAPM), Arbitrage Pricing Model (APM) begins the calculations of risk by diving the risk into two parts: risk specific to firm and other is risk that is related to market. As in the capital asset pricing model (CAPM), firm specific risk includes information that may impacts particularly that firm. Market risk, on the other hand, impacts a group of firms or all & would include unexpected changes in a numbers of economic factors that include Gross Domestic Product (GDP), inflation, IIP, interest rates, and other variables. Incorporating both types of risk into a return model, we get:

R = E(R) + m + e

R = Actual Return

E(R) = Expected return

M = Market - specific risk

e = Firm - specific risk

Source of Market – Specific Risk:

Both CAPM Model and APM Model makes distinction between Market specific risk and firm specific risk. Market risk impacts a group of firms or all & would include unexpected changes in a numbers of economic factors. The Capital asset pricing model assumes Market benchmark Portfolio captures the Market risk that, while, on the other hand, the Arbitrage Pricing Model (APM) define that market risk can come from multiple source not just from one factor and that variable can be known by measuring the sensitivity of the variable with respect to the market risk. In general, the component of market for unexpected changes/returns can be decomposed into economic factors:

$$R = E(R) + (b_1f_1 + b_2f_2 + b_3f_3 + \ldots + b_nf_n) + e$$

Where;

b = Sensitivity of investment to anticipated changes

f = Unanticipated changes

Sensitivity to the macro economic factors takes the form of beta as shown above in the formula. This is known as factor beta. This can be calculated in the same way as the calculation of beta in CAPM model.

Arbitrage Pricing Model in Practice:

Arbitrage pricing model measures the market risk with respect to multiple unidentified macroeconomic variables (any number of variables that impacts market), where variable is chosen based on the sensitivity it had toward calculation of beta in the investment. The number of factors then the calculation of factor betas and factor risk premiums can all be estimated using the factor analysis. But there are two problem: One is the historical data is used as we used in the CAPM Model and second is the APM model doesn't specify the variable that impacts the market as a whole thus sometime it becomes difficult to know which variable impacts the market, especially in emerging markets. Every economy has different variables that impacts more than other economy.

IV. Multi-factor model for risk and return:

As we know the limitations of APM (Arbitrage pricing model) that APM model doesn't specify the variable that impacts the market as a whole thus sometime it becomes difficult to know which variable impacts the market. APM Model failure to provide the specific variable, will lead to development of Multi-factor model for risk and return. There are number of models that can be included in this category.

The solution is quite simple: replace the unspecified variable with the specified variable and it should be on economic basis that impacts the market while still retaining much of the advantages of the Arbitrage Pricing Model.

Deriving Multi-factor model:

Multi-factor models generally are also determining their value from historical data as in the case with CAPM and APM Model, rather than economic modelling. When we know the number of factors or variables that impacts in the APM, their behaviour over time can be known by analysing the past data. The behaviour/sensitivity of the unspecified factors over time can be compared to know its ability to correctly calculate the risk and this can be done by calculating and comparing correlation of different variables with the identifiable variable.

For example, if we take Chen, Roll, and Ross (1986) model, it suggests that the following macroeconomic variables that are highly correlated with the factors that come out of factor analysis:

- changes in default premium,
- shifts in the term structure,
- industrial production,
- unanticipated inflation,
- changes in the real rate of return.

$$E(R) = R_f + \beta_{GNP}\left[E(R_{GNP}) - R_f\right] + \beta_I\left[E(R_I) - R_f\right] + \ldots + \beta_\partial\left[E(R_\partial) - R_f\right]$$

where

β_{GNP} = Beta relative to changes in industrial production

$E(R_{GNP})$ = Expected return on a portfolio with a beta of one on the industrial production factor and zero on all other factors

β_I = Beta relative to changes in inflation

$E(R_I)$ = Expected return on a portfolio with a beta of one on the inflation factor and zero on all other factors

The cost of using multi-factor model instead of arbitrage pricing model is that, this can include the errors that can be made in identifying the factors/variables. The economic factors that impact at point in time may not impact at the same correlation at another

point in time. For example, oil price change was significant economic variable for expected returns in the 1970 but is not as significant now. We can get inferior estimates if we use wrong/miss any variable or factor.

V. Fama-French model (3 factor):

Fama – French model is established by Eugene Fama and Kenneth French that attemts to measure market return through research they have found that small cap stocks generally outperform the market or value stock outperform the market. The fama and French model has three variables. These are as follow:

- Size of firms
- Book to Market value
- Excess return on the market

VI. Fama – French Model (5 factors):

Fama – French model was further updated in 2014 and it was expanded further. They have included "quality", "momentum" and "low volatility". Fama – French model (3 factor) is expanded by including 2 more factors and it becomes Fama – French 5 factors model. These two factors are as follow:

- Profitability
- Investment

So, with the earlier 3 factors, 2 more factors are included and makes it as Fama – French 5 factor model.

Chapter 6: Conclusion

Capital Asset Pricing Model as said earlier is one the most widely used model for the asset pricing and calculation risk and return of security. The main premises of this model are that there is Positive Relationship in systematic risk and return of asset. That means that if the risk is high than do the return, while if the risk is low then then returns will also be low. There is proportional relationship between risk and return. CAPM model's main two assumptions are: no transection cost and all information are known to all the investors and security prices already discounted that information correctly thus leaving no chances to outperform and underperform the market.

In this research, I have tested the relevance of CAPM Model on Indian Stocks. As said earlier, the main premise of CAPM model is Positive Relationship in risk and return. So, we have tested that on Indian stocks to know the relevance of CAPM Model on Indian Stocks. So, for research Beta (b) is consider as a risk (systematic risk), while alpha (a) is a measurement for the return. It tells about whether the investment has performed better than market or lower than the market. So, any company's share has beta (b) higher than alpha should be higher than 0 to tell us that the investment has performed better than market return. Two hypotheses were considered: Null Hypothesis shows that there is positive relationship between Systematic risk and return thus means that CAPM Model is relevant for Indian Stocks while, on the other hand, Alternate hypothesis shows that there is negative relationship between Systematic Risk and return thus means that CAPM Model is not relevant for Indian stocks. We have tested this hypothesis on the top 10 and least 10 companies by market capitalization.

In empirical results, I have calculated alpha and betas of top 10 and least 10 companies and then calculate correlation. In both, top 10 and least 10 companies correlation between beta and alpha comes out to be -0.759 and -0.530 respectively. , the average beta of top 10 companies is 0.87 (less volatile and less risky than market) while the average beta for least 10 companies is 1.06 (more volatile and riskier than market). But on the basis of return or performance measurement which is measured

through alpha, the alpha of top 10 companies is 0.05% which is higher than alpha of least 10 companies which is 0.02%. So, these shows that top 10 companies have relatively lower risk or beta but apparently has higher return or alpha on an average basis. While on the other hand, least 10 companies have relatively higher risk or beta but has relatively lower return or alpha on an average basis. It can be concluded that there is negative correlation between systematic risk and return which is important property on which Capital asset pricing model work. We reject the Null hypothesis (H_0) that tells us that there is positive relationship between systematic risk and return. While on the other hand, we accept the alternative hypothesis (H_1) that tells us that there is negative relationship between systematic risk and return.

So, Capital Asset Pricing Model (CAPM) clearly does not work in India neither in theory nor in practice as in the Indian stock market, risk & return is negatively correlated i.e., Higher risk leads to lower returns and vice versa. There are number of delusional theories and studies are there in Finance like EMH, which means that stock appropriately discount all the information in the market at all the time and there is no private information available to any investor and thus it is almost impossible to beat the market. We can't beat the market benchmark. And the Capital Asset Pricing Model (CAPM) is one more delusional theory, which says that the returns from a stock will be directly dependent on the systematic risk (defined by beta) represented by the stock. CAPM is still taught in classrooms like in MBAs classes around the world, including India, a country where the relevance of CAPM is even less. Following CAPM in India will leads to self-damage to investors. As the investor ends up believing that positive relationship between risk and return.

In this research paper I have recommend some of other ways and methods that we can use which tries to eliminate the limitations of CAPM Model. Capital Assets pricing model's main limitation is that it takes only market risk into account which then doesn't give us the accurate expected rate of return. Though calculating expected rate of return is impossible, but we can make efforts to go closure to the that. One of the ways to do that is **"crushing the risks"** into parts to see what are the risks that our investment can have in future. Other way can be calculating the Beta through **fundamentals** of company can help us in providing somewhat accurate beta for

calculation of cost of equity. **"Arbitrage pricing model"** can also be used as it isbased on the property that there is arbitrage opportunity available in the market. As APM model doesn't specify the variable that impacts the market as a whole thus sometime it becomes difficult to know which variable impacts the market. APM Model failure to provide the specific variable, will lead to development of **"Multi-factor model for risk and return"** which specify that variables. **"Fama – French Model"** can also be used as it also specifies variables that are correlation with risk. These are of two types 3-factors and 5-factors model, these models were suggested by various researchers.

Chapter 7: Limitations

To allow researchers with insight for further analysis, this chapter presents the limitation of study and scope for further work and how further can research can be done to improve these limitations.

This Research focus on the selected stocks of Nifty 50, that is top 10 stocks and least 10 stocks of Nifty 50. This sample data may be biased and this sample data can be increased by focusing on Large cap and small cap stocks classification given by Security and exchange board of India (SEBI). This research can exclude the data of pandemic period as this is one in century event known as black swan to know the results excluding pandemic period high fluctuation. This research takes into consideration daily fluctuation in prices, so the beta and alpha calculations are also based on daily fluctuation. This ignores monthly or quarterly or half-yearly or annually results.

This research results can be improved by taking into consideration more number of companies or increasing the sample data of both top companies by market capitalization and least companies by market capitalization. Instead of taking daily fluctuation in prices, this research can take into consideration increased return interval.

<u>References</u>

References

Ball, R. (2017). The theory of stock market efficiency : accomplishments and limitations . *Bank of America journal of applied corporate finance*.

chaudhary, P. (2017). TESTING OF CAPM IN INDIAN CONTEXT. *srcc.edu*.

Chawla, D. b. (2010). An Empirical Test of CAPM––The Case of Indian Stock Market. *Global Business review - Sage Publication*.

Chen, J. (2020, September). *Jensen's Measure*. Retrieved from Investopedia: https://www.investopedia.com/terms/j/jensensmeasure.asp#:~:text=The%20Jensen's%20m easure%2C%20or%20Jensen's,and%20the%20average%20market%20return.

Chen, J. (2021, April). *Unsystematic Risk*. Retrieved from Investopedia: https://www.investopedia.com/terms/u/unsystematicrisk.asp

Damodaran, A. (1994). Cost of Equity. In A. Damodaran, *Domodaran on Valuation.*

Damodaran, A. (2004). Risk measurement and hurdle rate. In A. Damodaran, *Applied Corporate finance.*

Damodaran, A. (2004). The Basics of Risk. In A. Damodaran, *Applied Corporate Fiance.*

E.S., B. C. (2014). Comparing Stock Valuation Models for Indian Bank Stocks. *International Journal of Accounting and Taxation*.

Fontinelle, A. (2020, November). *Systematic Risk*. Retrieved from Investopedia: https://www.investopedia.com/terms/s/systematicrisk.asp

Kenton, W. (2021, Jan). *Beta*. Retrieved from Investopedia: https://www.investopedia.com/terms/b/beta.asp

Kenton, W. (2021). *Capital Asset pricing Model.* Investopedia.

Kumar, K. G. (2018). LIQUIDITY ADJUSTED CAPM – AN EMPIRICAL ANALYSIS ON INDIAN STOCK MARKET. *Congent economic & Finance*.

Kumar, R. S. (2007). Relevance of CAPM to Indian Stock Market. *ICFAI Journal of Applied Science*.

MAXIM, C.-A. (2015). The evaluation of CAPM, Fama-French and APT models on the Romanian capital market. *Academy of Economic Studies, Bucharest*.

Ross, S. A. (2016). The Current Status of the Capital Asset Pricing Model (CAPM). *The Journal of Finance*.

Sattar, M. (2017). CAPM Vs Fama-French Three-Factor Model: An Evaluation of Effectiveness in Explaining Excess Return in Dhaka Stock Exchange. *International Journal of Business and Management*.

Shah, S. M. (2020). *How CAPM has hurt a Generation of Indian Investors.* Marcellus Investment Managers.

Walter, P. B. (2013). The CAPM: Theor The CAPM: Theoretical Validity, Empirical Interactibility and Practical Applications. *University of Wollongong*.

42.

List of figures and tables

Figures:

Tables:

Annexure

Company Name	Industry	Last Price	Change	%Chg	Mkt Cap (Rs cr)
Reliance	Oil Exploration and Production	2,054.50	27.6	1.36	13,24,139.11
TCS	IT Services & Consulting	2,664.85	32.2	1.22	9,99,954.24
HDFC Bank	Bank - Private	1,183.55	-3.65	-0.31	6,51,573.16
HUL	Household & Personal Products	2,071.30	-50.8	-2.39	4,86,663.59
Infosys	IT Services & Consulting	1,060.60	-14.25	-1.33	4,51,753.23
HDFC	Finance - Housing	1,923.55	-10.75	-0.56	3,45,432.25
Kotak Mahindra	Bank - Private	1,547.40	-23.5	-1.5	3,06,291.50
ICICI Bank	Bank - Private	392.6	-7.3	-1.83	2,70,770.54
Bharti Airtel	Telecommunication - Service Provider	433.75	-17.05	-3.78	2,36,634.80
HCL Tech	IT Services & Consulting	841.95	1.9	0.23	2,28,477.03
Asian Paints	Paints	2,211.50	-13.95	-0.63	2,12,126.59
Maruti Suzuki	Automobile - Passenger Cars	6,965.15	-152.55	-2.14	2,10,403.29
ITC	Cigarettes/Tobacco	165.25	1.4	0.85	2,03,340.73
Bajaj Finance	Finance - NBFC	3,309.00	-71.05	-2.1	1,99,396.15
Wipro	IT Services & Consulting	340.7	3.25	0.96	1,94,711.39
SBI	Bank - Public	189.25	0.55	0.29	1,68,898.27
Nestle	Consumer Food	17,161.60	291	1.72	1,65,464.80
Axis Bank	Bank - Private	492.5	-1.35	-0.27	1,50,713.61
UltraTechCement	Cement	4,574.05	-2.75	-0.06	1,32,020.61
Larsen	Engineering & Construction	929.5	-5	-0.54	1,30,525.66
HDFC Life	Life & Health Insurance	589.75	3.65	0.62	1,19,097.70
Sun Pharma	Pharmaceuticals & Drugs	465.75	9.4	2.06	1,11,749.03
Titan Company	Diamond & Jewellery	1,165.75	-12.45	-1.06	1,03,493.67
Power Grid Corp	Power Generation/Distribution	171	-0.6	-0.35	89,460.18
Bajaj Finserv	Finance - Investment	5,573.50	-50.45	-0.9	88,695.25
NTPC	Power Generation/Distribution	87.6	1.1	1.27	86,676.32
Britannia	Consumer Food	3,473.25	-59.4	-1.68	83,610.03
Bajaj Auto	Automobile - 2 & 3 Wheelers	2,886.90	-38.45	-1.31	83,537.37
Divis Labs	Pharmaceuticals & Drugs	3,142.05	34.45	1.11	83,411.56
ONGC	Oil Exploration and Production	64.9	0.5	0.78	81,646.01
Dr Reddys Labs	Pharmaceuticals & Drugs	4,888.65	-53.3	-1.08	81,290.92
Tech Mahindra	IT Services & Consulting	813.3	9.05	1.13	78,643.13
Shree Cements	Cement	21,694.55	17.55	0.08	78,275.56

SBI Life Insurance	Life & Health Insurance	769.15	7.65	1	76,918.78
BPCL	Refineries	354.45	12.65	3.7	76,889.16
IOC	Refineries	79.55	1.15	1.47	74,889.63
JSW Steel	Iron & Steel	309	2.2	0.72	74,692.11
M&M	Automobile - Auto & Truck Manufacturers	594	2.05	0.35	73,845.64
Adani Ports	Transport Infrastructure	359.85	17.15	5	73,112.59
Coal India	Coal	114.2	3.35	3.02	70,378.36
Cipla	Pharmaceuticals & Drugs	754.5	-7.8	-1.02	60,840.30
Eicher Motors	Automobile - LCVS/ HVCS	2,085.60	-51.25	-2.4	56,984.67
Hero Motocorp	Automobile - 2 & 3 Wheelers	2,799.80	-94.2	-3.26	55,930.94
Grasim	Diversified	778.35	8.15	1.06	51,209.84
Tata Steel	Iron & Steel	410.55	9.15	2.28	46,248.03
IndusInd Bank	Bank - Private	585.7	-3	-0.51	44,305.38
Tata Motors	Automobile - LCVS/ HVCS	132.65	0.75	0.57	40,975.24
Hindalco	Iron & Steel	170.65	2.75	1.64	38,336.15
GAIL	Gas Distribution	84.75	1.3	1.56	38,223.45
UPL	Pesticides & Agrochemicals	453.25	3	0.67	34,630.36

Regresion Analysis	
Company	**Regression equation**
Reliance	0.0004 + 1.11*Rm
TCS	0.0007 + 0.65*Rm
HDFC Bank	0.0005 + 1.04*Rm
HUL	0.0008 + 0.56*Rm
Infosys	0.0007 + 0.74*Rm
HDFC	0.0003 + 1.01*Rm
Kotak Mahindra	0.0006 + 1.08*Rm
ICICI Bank	0.0002 + 1.49*Rm
Bharti Airtel	0.0001 + 0.82*Rm
HCL Tech	0.0009 + 0.17*Rm
Cipla	0.0003 + 0.58*Rm
Eicher Motors	0.0013 + 0.84*Rm
Hero Motocorp	0.0002 + 0.81*Rm
Grasim	0.0003 + 0.98*Rm
Tata Steel	-0.0002 + 1.33*Rm
IndusInd Bank	0.0002 + 1.39*Rm
Tata Motors	-0.0003 + 1.43*Rm
Hindalco	-0.0002 + 1.46*Rm
GAIL	0.0000 + 0.81*Rm
UPL	0.0005 + 0.99*Rm

45.

Plagiarism

turnitin

2K19DMBA099_Sukhvinder Singh.docx
May 17, 2021
13016 words / 66465 characters

Sukhvinder Singh

2K19DMBA099_Sukhvinder Singh.docx

Sources Overview

17%

OVERALL SIMILARITY

1	cdn.preterhuman.net INTERNET	2%
2	www.investopedia.com INTERNET	2%
3	www.coursehero.com INTERNET	1%
4	epdf.pub INTERNET	1%
5	onlinelibrary.wiley.com INTERNET	1%
6	icbm.bracu.ac.bd INTERNET	<1%
7	studylib.net INTERNET	<1%
8	hdl.handle.net INTERNET	<1%
9	"Damodaran on Valuation", Wiley, 2012 CROSSREF	<1%
10	web-proxy.io INTERNET	<1%
11	suhaplanner.files.wordpress.com INTERNET	<1%

46.