A Study on Risk and Return Analysis and Data Envelopment Analysis of Public and Private Sector Banks

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Abstract : *Risk and returns are like two faces of the same coin, if an investor wants to gain higher returns, he must also accept the fact that this would also increase the amount of risk involved. Most of the times, individual decision making process is influenced by risk and return analysis. The study is focused on analyzing the performance of those nationalized banks listed in the NSE with respect to return, risk and beta for the period 1st January 2017 to 31st December 2017. The term risk is a situation in which the possibility of the consequence can be predicted, but uncertainty is the situation where the possibility cannot be predicted. Risk and uncertainty are part and parcel of investment. The possibility of risk is a loss for the investors. The methodology adopted includes analysis of the performance of banking sector considering Bank Nifty Index as benchmark. Risk and return of banking stocks as well as Data Envelopment analysis method is used for analyzing the efficiency of banks. The entire study is based on secondary data collected from the NSE. The data collected was based on the monthly prices of the bank stocks listed in Bank Nifty. The reason for selecting monthly prices is to measure the short term variations in the banking stocks due to various other internal and external factors. The findings of the study revealed that if the investors are ready to take high risk for more returns, the investors are suggested to invest in stocks like Bank of India and Punjab National Bank in which risk and return are high. The investors who prefer low risk and return are suggested to invest in Axis Bank stock.*

Keywords: *Risk, Return, Beta, Data Envelopment Analysis*

Introduction

Banks plays a vital part in building the financial matters of an economy and also individual. In India managing a banking division frames the life saver of financial movement for both rural and urban areas. So the Adjustments in stock value unpredictability of banks will impact the person and also the country.

Every investment is subjected to risk to some extent or the other. The best investment is that increases the return by taking minimum risk into consideration. For the purpose of minimizing the risk the market information is necessary. Expected return is the amount of return predicted by the investors for the future period of time. It may or may not occur. Investors those who are willing to purchase security based on expected return is most adequate but sometimes the return expected may not be the same. The source of risk may be dividends and the securities prices that happened to be expected. The term Risk is a situation in which the possibility of the consequence can be predicted, but Uncertainty is the situation where the possibility cannot be predicted. Further the risk is divided in to Unsystematic and Systematic Risk. Unsystematic risk is the risk which is due to the internal factors of the organization within. These factors are controllable from point of view

of organization. It should be planned in such a way that should be flexible and necessary action can be taken by the organization to control the risk and its effects. The systematic risk are those risk which are external to the firm and cannot be controlled, which effects the entire market. This type of risk arises out of Industry, market and state of economy. The external factors are normally uncontrollable from organization point of view. It is macro in nature and it cannot be planned by the organization.

Data Envelopment Analysis is one of the nonparametric technique which is applied in research operations and economics for the valuation of frontiers in production. It is one of the means to measure the efficiency in the production unit for decision making. This tool is used has benchmarking the service in production and manufacturing operations.

The primary objective of this study was to analyse the bank nifty movements and development towards the equity stocks listed by the public and private banks. The Principle goal of this study was to evaluate the Performance of banks stock, with prime concentration towards identifying the rate of return and the risk involved in the existing market and the various other Internal and external factors. The Study was undertaken for a short period to examine the Performance of the listed stocks with the period of 1 year from January 2017 to December 2017.

Review of Literature

Vikkraman & Varadharajan (2009) - The author has analyzed the risk and returns involved in the stock market of Indian automobile industry from 2004 till 2007 data from NSE. On the basis on risk - return trade - off, the five top companies in automobile industry, Mahindra and Mahindra motors has a risk of 97.33% and return of 7.5% which is best for investment, even though TATA motors and Ashok Leyland has highest risk in the period 2004 - 2007 of 119.9% and 200.17% these companies should produce highest return, but shockingly these two companies yielded a negative return of -8.6% and -13.84%. In the case of Hindustan motors the expected return is of 128.29% at a higher risk of 2092% which is more than the normal level. Author concluded that the investor cannot be induced by such values. An in - depth study about the firm in terms of the capital structure, pattern of share holdings, financial market knowledge are required for decision making for right investment.

Karthika & Karthikeyan (2011) - The author analysis the risk and return of 10 companies (TCS, Maruti, Sun Pharma, SBI, ONFC, ACC, Bharati Airtel Limited, Tata power, L&T and ITC) among Sensex 30 companies for a period starting from Jan 2008 till May 2011. The author finds that the value of beta of pharmaceutical, automobiles and housing related sector are less risky whereas banking, oil and gas, and construction sector are high risky, which tells that these are most aggressive stocks.. The sector which moves the performance of the entire economy and there products are priced highly like Banking and power have high risk. The sector which does not move the performance of the entire economy like Pharmaceutical, FMCG, and Housing related are of low risk. If the investor is planning to buy and sell for a short duration of time beta is one of the good instruments to measure risk.

Nagarajan and Prabhakaran (2013) - The author has conducted analysis on equities of HUL, ITC, Nestle India limited, Dabur India Limited, and GCPL of selected FMCG for 12 months. They have founded that the variance of HUL is 0.76 and ITC is 0.84, which is maximum compared to other companies. This indication shows that these two companies are highly volatile than any other companies which is considered for the study. The Nestle Company has a co-efficient variation of 0.26 which is less volatile. Author concluded that the Dabur India Ltd has the low standard deviation and variance of 0.72 and 0.63, which has greater range of probable return due to the greater standard deviation and much variation, which shows that the prices of stocks are variable. The beta of all the FMCG companies included in the study is less than one, all the companies have moved in positive direction with relation to Nifty Market index. He concluded that the investor before making investment in equity one should measure the price movement of the stocks in the

security market which help them to take a fruitful decision. It was founded that the Dabur India Ltd has moderate risk which yields moderate returns than any other company in FMCG related companies which is considered for this study.

Krishnaprabha and Vijayakumar (2015) - The author believes that risk and return plays a very important role for an investor to make decision, each and every investor who is interested in stock market wants to avoid risk and maximize returns. High risk would yield more return and low risk yields low returns, based on this concept banking and automobile industries gives high risk but yields low returns and in case of Information technology (IT), fast moving consumer goods and pharmaceutical sectors gives low risk and yields more returns, he concludes that investors who wishes to invest for long term tenure they are able to take advantage of the market due to less volatile. When there is not much fluctuations in the stock price when compared to market, investors who are looking for long term investment are able to predict the price movement when they may fall. According to author IT, FMCG and Pharmaceutical sectors yields more returns then the banking and automobile sector.

Dr. Prema Chandran (2016) - In this Paper the author has made an attempt to measure the volatility of the bank index stocks and compare it with that of the Nifty stocks volatility. The investors who are risk averse would not be happy to invest in a highly fluctuating stock, where as those with a thirst for riskiness would happily invest in a highly volatile market. In this study standard deviation and individual beta values have been calculated to get an idea of volatility. The data used for the study is secondary in nature where the daily closing of the NIFTY index and daily closing prices of stock of the 12 banks that are listed in the bank index is considered. The daily closing prices have been collected from the NSE website for a period of one year from April 1st 2015 to 30th March 2016.Volatility is explained using standard deviation and Beta.

From the analysis and interpretation among the bank listed in the Bank index, Kotak bank had the highest standard Deviation of 309.85 reflecting highest fluctuation in price. This could be possible because of merger of Kotak Mahindra bank and ING Vyasa bank in April 2015 among other reasons. Bank of Baroda has the least Standard Deviation of 19.39 reflecting least fluctuation price. HDFC Bank among the 12 banks has the highest correlation (0.79) with the NIFTY index, followed by ICICI bank (0.74), yes bank (0.72), and IndusInd and Axis bank (0.71), SBI ((0.69), Bank of India (0.67), Canara Bank(0.64), PNB (0.61), BOB (0.53). Federal bank and Kotak bank have the least correlations of 0.40 and 0.41 respectively.

Dr. M. Ravichandran and T. Iswarya (2016) - In this paper the author has analyzed the risk and return of selected mutual fund schemes on the basis of Sharpe, Treynor and Jensen's measure. The main objectives of the study was to analyse the five year annual growth return given in their schemes. To help the investors to choose the top mutual fund according to their risk among the selected schemes, to measure the risk return relationship of selected sector fund schemes and also to classify the return and compare the schemes of growth return. For the purpose of analysis secondary data was collected and descriptive research design has been applied. The top five schemes considered for the study are UTI transportation and logistics fund, SBI Pharma fund, Birla sun life MNC fund, Reliance Pharma fund, ICICI prudential banking and financial service fund. The tools used are alpha, Beta, standard deviation, Sharpe ratio and R- squared. From the analysis the Beta (risk) value analyzed for UTI transportation and logistics (1.16), SBI sun Pharma (0.88), Birla sun life fund (0.73), reliance Pharma fund (0.88), and ICICI prudential banking and financial services fund (0.85).In the long run, the private sector companies have performed better than the public sector. From the treynor's results, it has found that 19 out of 29 schemes had performed with the benchmark.

Bilal Ahmad Pandow and Khurshid Ahmad Butt (2017) - The author in the present study looks in to the risk and return analysis of the selected mutual funds in India. The main objective of the study was to analyze the growth and development of Indian mutual fund industry and to identify the

challenges confronting by the industry. To analyze risk and return of select mutual fund in India. The data was collected from the Association of Mutual Funds of India, NSE for s&p CNX Nifty and RBI. For this study the author has used Sharpe Ratio and Treynor ratio which measures the unit of reward received per unit risk. The mutual fund industry which consist of all the three sectors i.e. public sector, private sector and foreign fund houses. The analysis states that the fund houses which were 31 in number have grown to 44 by one year.

Sunil M Rashinkar and Divya U (2017) - The author studies the Market Risk analysis of Five Nationalized Banks in terms of Beta Co-efficient for the period of one year. The analysis of the study shows that the beta of State Bank of India, Industrial Development Bank of India and Syndicate Bank were negative which implies that these stocks moved against the market and less affected by market risk. The Punjab National Bank and Bank of Baroda were more than one, which indicates that these stocks were exposed to high market risk and any small changes in the market will directly impact on these stocks.

Dr. S Poornima and Swathiga P (2017) - The author with reference to this paper investigates the study on relationship between risk and return of stocks from two different sectors on NSE by using Capital Asset Pricing Model. The paper has done by analyzing in the selected stocks from automobile sector and IT sector. Five stocks in individual sector has been considered for the sample. The objective was to compare average return with the standard expected return using CAPM, and to rank the companies on the basis of risk and return. The tools used for this study is average return, standard Deviation and Capital Asset Pricing Model.

From the analysis it shows that all the companies has positive beta value, i.e. Bosch and Maruti Suzuki Ltd. Bosch has high volatile in the market 7.36% and Hero Motocorp Ltd has less volatile in the market is 2.78%. Whereas Bosch and Tata Motors have 7.36 and 5.62 % of variation with respect to expected return respectively. Investors can select Maruti Suzuki Ltd (5.31%), Bosch (3.48%). In case of IT they can select HCL Technologies (1.02) % respectively. We can conclude that the automobile sector has performed better than the IT sector.

Faris Nasif Al Shubiri and Syed Ahsan Jamil (2018) - The authors from Sultanate of Oman in this article have examined the idiosyncratic risk of the six Banking sectors companies that is listed in Muscat Security Market. The variables included in this study was dependent variables, Oil Indicators, Stock Market Indicators and Fiscal Indicators. The Idiosyncratic risk will help the investors the importance and impacts for the investment portfolio decisions. With respect to this study they have employed six numerical financial equations and Ordinary least square regression method is used. The data was collected from the annual reports off all the Banking Company and from central bank reports. The descriptive statistics shows that all banking sectors listed in Muscat Stock Market from the period 2009-2015 the mean was 0.0122 is calculating by representing all the bank population using regression test between the market return and stock return. The standard deviation is 0.00864 and from the analysis the idiosyncratic risk is low. It can be concluded that the banks and the financial markets in sultanate of Oman are different from those of advanced market that effects the oil export revenues which leads to mispricing in the market.

Research Gap

From the above literature review it is quite evident that very few studies have been done on risk and return analysis and data envelopment analysis simultaneously. A triangulation approach of public and private sector banks, risk and return analysis along with data envelopment analysis has been taken up.

Objectives and Scope of the Study

- To analyze the risk and return of private and public sector banks listed on Bank Nifty.
- To rank the stocks on the basis of risk and returns.
- To measure the efficiency of the banks using Data Envelopment analysis.

- The study covers a period of 12 months, i.e. starting from January 1st 2017 to 31st December 2017.
- The study is based on 12 stocks (securities) listed on Bank Nifty in NSE belonging to Banking sector. The twelve bank that were considered for this study was- Bank of Baroda, Bank of India, Canara Bank, Punjab National Bank, State Bank of India, Axis Bank, Federal Bank, HDFC Bank, ICICI Bank, IndusInd Bank, Kotak Mahindra Bank and Yes Bank.

Sources of Data

The data are collected for 12 months (i.e. One Year) prices of the stocks related to banking sector listed in Bank Nifty. The study is based on secondary data collected from NSE website. The additional data were also collected from websites, journals, books and reports by researchers and scholars.

Tools:

Rate of Return: The rate of returns is calculated by using closing price and opening price of each stock for individual return and market opening and closing price for market return. The following formula can be used for calculating rate of returns.

$$R = \frac{\text{Closing Price-Opening Price}}{\text{Opening Price}} \text{ X } 100$$

Beta: It is the slope of characteristic regression line it describes the relationship between the index return and stock return. Beta helps in determining the sensitivity of the share price in relation to the index price. Beta measures the systematic risk which cannot be diversified.Beta can be calculated with the help of the following formula.

$$\beta = \frac{N\sum RxRy - \sum RxRy}{N\sum Rx^2 - \left(\sum Rx\right)^2}$$

Co-efficient of correlation: It is a statistical tool which helps in determining, the fluctuation in two variables i.e. security return and market return. It determines the extent of relationship but it does not always imply cause and effect relation. This helps to understand the market indicator prediction ability. It ranges from +1 and -1. The following formula is used for calculating correlation.

$$r = \frac{N\sum RxRy - \sum Rx\sum Ry}{\sqrt{N\sum (Rx)^2}\sqrt{N\sum Ry^2 - \left(\sum Ry^2\right)}}$$

Standard Deviation: In order to measure risk standard deviation is the most commonly used technique. Standard deviation is also used for measuring the volatility of the share. Standard deviation is used for measuring unsystematic risk which cannot be controlled. Standard deviation is used for measuring the expected risk and also for determining the importance of the certain movement of price. The following formula is used for calculating standard deviation.

$$S.D = \sqrt{\frac{\sum (x-x)^2}{N}}$$

Duration of the study

The study covers for a period of 1 year (i.e.12 Months) of data is used i.e. from January 1st 2017 to December 31st 2017.

Limitations of the study

- The study is limited to data that is collected from a period of one year i.e. from January 2017 to December 2017.
- The study is limited to data collected from 12 banks listed under Bank Nifty.

Analysis:

Standard Deviation: In order to measure risk standard deviation is the most commonly used technique. Standard deviation is also used for measuring the volatility of the share. Standard deviation is used for measuring unsystematic risk which cannot be controlled. Standard deviation is used for measuring the expected risk and also for determining the importance of the certain movement of price. The following formula is used for calculating standard deviation.

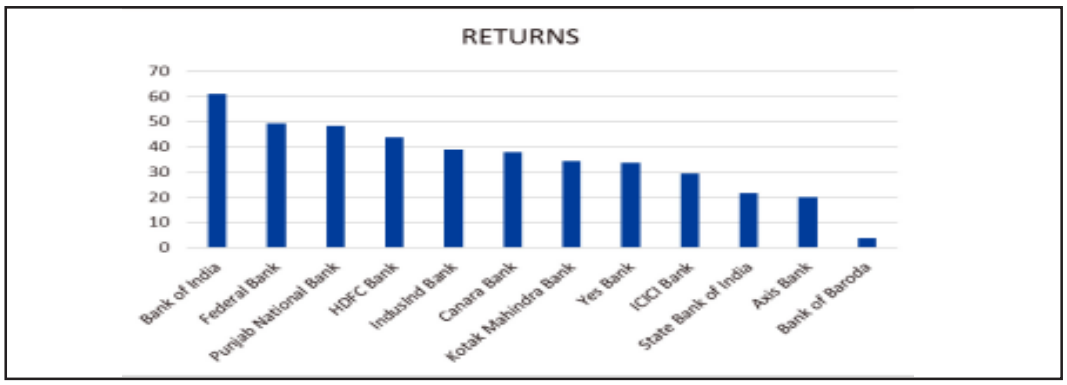
Interpretation:

Figure-1 shows that the Bank of India gave the highest return of 61.04% for the year 2017 whereas the Bank of Baroda has the lowest return

Table 1 - Table showing the list of banks and returns of Stocks listed on Bank Nifty

BANKS	SECTORS	RETURNS	RANK
Bank of India	PUBLIC	61.04	1
Federal Bank	PRIVATE	49.42	2
Punjab National Bank	PUBLIC	48.18	3
HDFC Bank	PRIVATE	43.59	4
IndusInd Bank	PRIVATE	38.90	5
Canara Bank	PUBLIC	37.90	6
Kotak Mahindra Bank	PRIVATE	34.47	7
Yes Bank	PRIVATE	33.52	8
ICICI Bank	PRIVATE	29.37	9
State Bank of India	PUBLIC	21.63	10
Axis Bank	PRIVATE	20.08	11
Bank of Baroda	PUBLIC	3.87	12

Fig. 1 - Graph showing returns of the public and private banks according to their ranks (On the basis of the returns)



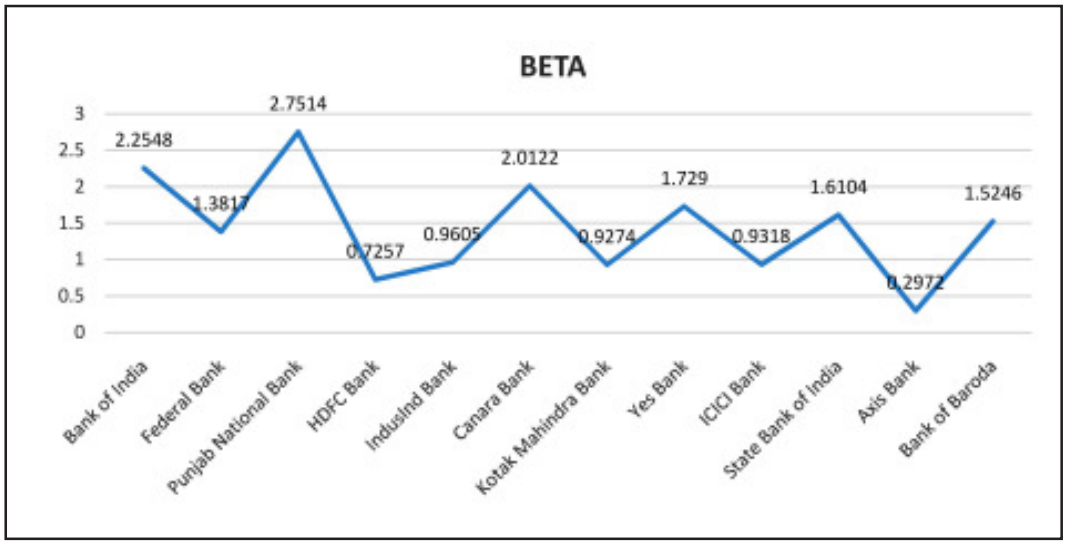
of 3.87% the same year. All the banks listed in the Bank Nifty yield the positive return for the year 2017.

Interpretation: The value of beta of Punjab National Bank (PNB) is highest i.e. 2.75% (1% change in Bank Nifty market returns causes 2.75% change in PNB Scrip returns). The value of beta

Table 2 - Table showing Beta of Stocks Listed on Bank Nifty

BANKS	SECTORS	BETA
Bank of India	PUBLIC	2.2548
Federal Bank	PRIVATE	1.3817
Punjab National Bank	PUBLIC	2.7514
HDFC Bank	PRIVATE	0.7257
IndusInd Bank	PRIVATE	0.9605
Canara Bank	PUBLIC	2.0122
Kotak Mahindra Bank	PRIVATE	0.9274
Yes Bank	PRIVATE	1.7290
ICICI Bank	PRIVATE	0.9318
State Bank of India	PUBLIC	1.6104
Axis Bank	PRIVATE	0.2972
Bank of Baroda	PUBLIC	1.5246

Fig. 2 - Graph Showing Beta of Banking stocks listed on Bank Nifty



of Axis Bank is lowest i.e. 0.29% (1% change in the Bank Nifty returns causes 0.29% change in Bank of India scrip returns)

Interpretation: The data in Table-3 state that Punjab National Bank (PNB) and Bank of India (BOB) have the highest sta ndard deviation of

Table 3 -Standard Deviation, Covariance and Correlation of Stocks listed on Bank Nifty

BANKS	SECTORS	STANDARD DEVIATION	CO-VARIANCE	CO-RRELATION
Bank of India	PUBLIC	18.0201	28.0268	0.4411
Federal Bank	PRIVATE	7.8584	17.1743	0.6198
Punjab National Bank	PUBLIC	18.1854	43.1994	0.5334
HDFC Bank	PRIVATE	3.0573	9.0214	0.8639
IndusInd Bank	PRIVATE	4.6612	11.9397	0.7265
Canara Bank	PUBLIC	12.0966	25.0109	0.5864
Kotak Mahindra Bank	PRIVATE	4.002	11.5282	0.8172
Yes Bank	PRIVATE	10.0650	21.4909	0.5975
ICICI Bank	PRIVATE	5.9344	11.5822	0.5535
State Bank of India	PUBLIC	8.7965	20.0176	0.6454
Axis Bank	PRIVATE	2.52	3.6942	0.3345
Bank of Baroda	PUBLIC	9.7317	18.9503	0.5523

18.18% and 10.02% respectively, which states that the risk is more, and Axis Bank has the lowest standard deviation of 2.52%, which states that the risk is less. The value of correlation of the HDFC Bank is highest, which results that the scrip return and the Bank Nifty are closely correlated i.e. r = 0.83% which moves each other in a positive direction. The value of correlation of Axis Bank stock with the Bank Nifty index is lowest i.e. 0.33%.

Interpretation: The data in Table-3 state that Punjab National Bank (PNB) and Bank of India (BOB) have the highest standard deviation of 18.18% and 10.02% respectively, which states that

the risk is more, and Axis Bank has the lowest standard deviation of 2.52%, which states that the risk is less. The value of correlation of the HDFC Bank is highest, which results that the scrip return and the Bank Nifty are closely correlated i.e. r = 0.83% which moves each other in a positive direction. The value of correlation of Axis Bank stock with the Bank Nifty index is lowest i.e. 0.33%.

Interpretation: The performance ratio of "Total Deposits Processed per number of employee" suggests that IndusInd Bank is the most efficient

BANKS	INPUT (Number of Employees)	OUTPUT(Total Deposits)	OUTPUT/INPUT (Deposits)	RANK
Bank of Baroda	52420	601675.17	11.47	3
State Bank of India	209567	2044751.39	9.75	5
ICICI	83058	490039.06	5.89	11
Punjab National Bank	70801	621704.02	8.78	6
Bank of India	45613	540032.01	11.83	2
Axis Bank	56086	414378.79	7.38	10
HDFC	84325	643639.66	7.63	9
IndusInd Bank	10100	126572.22	12.53	1
Kotak Mahindra Bank	46500	157425.86	3.38	12
Federal Bank	9300	97644.56	10.50	4
Canara Bank	59413	495275.24	8.3	7
Yes Bank	18531	142873.86	7.7	8

bank at the Number of Total Deposits. This is because it has the highest number of total deposits i.e. 1253 deposits for each member of staff employed. In contrast, the least efficient bank is Kotak Mahindra Bank since it has only 338 deposits per staff employed.

Findings:

- During the period of study, Bank of India (BOI) has the highest return of 61.04% and Bank of Baroda (BOB) has the lowest return of 3.87%.
- On the basis of Average Returns, Bank of India (BOI) has the highest return of 5.08% and Bank of Baroda (BOB) has the lowest return of 0.322%.
- During this period of the study, Punjab National Bank (PNB) and Bank of India (BOB) has the highest standard deviation of 18.18% and 10.02% respectively, which states that the risk is more.
- Axis Bank has the lowest standard deviation of 2.52%, which states that the risk is less.
- The study shows the value of Beta of 12 stocks in Bank Nifty, all the 12 stocks has a positive value. And there is no company stock which has a negative value
- Beta value of 5 stocks i.e. (Axis Bank, HDFC, Canara Bank, ICICI Bank, IndusInd Bank, Kotak Mahindra Bank) out of 12 stocks listed in Bank Nifty is in the range of 0.2 to 1.0%. This indications shows that the stock price of the company increases or decreases depending on the movement in the Bank Nifty Index. If the index increases by 10% scrip returns also increases on an average by 1 to 10% and vice versa.
- Beta value of 7 stocks i.e. (Bank of India, State Bank of India, Bank of Baroda, Punjab National Bank, Federal Bank, Canara Bank, and Yes bank) out of 12 stocks listed in Bank Nifty is in the range of 1.0% to 3%. This indications shows that the stock price of the company increases or decreases depending

on the movement in the Bank Nifty Index. If the index increases by 10% scrip returns also increases on an average of 10 to 30% and vice versa.

- In this study there are no negative correlation found among the stocks listed in Bank Nifty with the Bank Nifty Market Index.
- IndusInd Bank is the most efficient bank when compared to other banks which has highest number of total deposits for each member of staff employed.
- Kotak Mahindra Bank is the least efficient bank when compared to other banks which has less number of total deposits for each member of staff employed.

Conclusion:

The entire study is based on the analysis of the stocks listed in Bank Nifty. This provides an idea for the investors to decide whether the investor is required to purchase stocks on the basis of their expected returns and risk. A positive correlation indicates scrip stock is moving in the same direction as the benchmark index and vice versa. A stock with more beta value is not suggested has it is subjected to high market risk in which it cannot be diversified like systematic and unsystematic risk. Hence it is better to avoid such stocks. The study will not suggest the investors which is best stocks to invest and the worst stock not to invest, because the stocks rating are done on the basis of investment and type of investors. If the investors are ready to take high risk for more returns the investors are suggested to invest in stocks like Bank of India and Punjab National Bank in which risk and return is high. The investors who prefer low risk and return are suggested to invest in Axis Bank stock.

Finally, from the study it is seen that many a time market has collapsed which was not happened earlier, which creates a fear in the investors to enter in to the market. By this analysis the investors will get an idea that the scrip returns will definitely get recovered if the market bounce back.

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