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3 authors:

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Christ University, Bangalore
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Sandeep Thakur
Christ University, Bangalore
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Medha Dhingra
Christ University, Bangalore
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RESEARCH ARTICLE

Finding Efficient Stocks in BSE100: Implementation of Buffet Approach

Sherin Varghese*, Sandeep Kumar Thakur, Medha Dhingra
Research Scholar, Christ Institute of Management, Christ (Deemed to be University), Bangalore
*Corresponding Author E-mail: **sherinmelby@gmail.com**

ABSTRACT:
With an ever-increasing and expanding economy, the Indian stock market is seen as a very lucrative investment option for many investors. One of the most important factors that any investor would look into before investing in a particular stock is the financial health and stability of the company. Investment in present-day has become a new way of making money, but not all know how and where to invest. How much to invest and for how long to stay in for one particular stock is again a question and changes based on different perceptions. Tools available to analyze the best stock from an exchange trading market are enormous, but how efficient is the tool is totally a different ball game. Many investors have developed several ways of finding their efficient stock for investment and have been successful in different ways and parameters. Warren Buffer, the best-known investor in modern-day maintained his portfolios even in the time of global crisis as he has his own ways of finding the best investment options and knowing how long to be invested in the same stock and for how long. The paper aims to present a combination of stocks from the BSE100 that are highly stable with the least probability of default. Based on different parameters, the stocks are evaluated and curtailed down to investment grading stocks. The paper uses an Artificial Neural Network (ANNs) along with the help of Principal Component Analysis (PCA). The Principal Component Analyzer was used to obtain a portfolio of effective stocks from BSE 100 with the help of the Warren Buffet approach.

KEYWORDS: Warren Buffet Universe, Principal Component Analysis (PCA), Artificial Neural Network (ANN), Eigen Values, Eigenvectors.

INTRODUCTION:
"We simply attempt to be fearful when others are greedy and to be greedy only when others are fearful."
-Warren Buffett

Warren Buffet, the greatest investors the world has ever seen has made most of his fortune through careful investments and strategic investment decisions. He began his investment career with the firm Graham-Newman Corporation in New York in the year 1954. He took the charge of Berkshire Hathaway in the year 1965. An investment of $10000 with any of the original partnerships of Buffet in the year 1956 would have fetched around $270 million if reinvested in Berkshire Hathaway nine years laters (Price and Kelly, 2004). According to Warren Buffet, one must use a sensible mindset while investing and not gamble and be frivolous. According to him if a business performs well

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the stock will also perform well. Buffet examines the businesses which are expected to perform well in the long run. According to Warren Buffett the financial statements are not the proper depiction of the financial health of any business, according to him the while investing the investor must look into the true financial condition of the company (Banchuenvijit, 2008). It is observed that Buffett has developed unique access to leverage that he has invested in safe, high-quality, cheap stocks and that these key characteristics can largely explain his impressive performance (Frazzini et al., 2005). One of the most important strategies followed by Buffet is to not follow the herding behaviour rather the investor should use his rationale and also invest in the long term. Warren Buffet's strategy is to invest for the long term (Banchuenvijit, 2008). According to Warren Buffet, investors must have full knowledge about the company in which they wish to invest. He urges the investors no to blindly invest in the companies without any information. He suggests that excessive diversification may also not be very profitable and may result in an investor losing money due to a lack of knowledge. He suggests that the investor should gain knowledge about the business. According to him the investors must have full knowledge about the value of their investment holdings (Banchuenvijit, 2008). This paper is an attempt to emulate the Warren Buffet Universe stock for the Indian market taking into account BSE100 stocks. Warren Buffet universe is a collection of the most efficient stocks of American stock market.

Started in 1875 the Indian stock market is one of the oldest and well-established stock markets in Asia and has been growing since. From local traders to international investment firms many are eyeing the Indian stock market for investment opportunities.

From its inception the Indian stock market has gone through major reforms, making it more desirable for the investors to invest in the market. The Indian stock market went through major transformations due to the financial and economic reforms carried out by the Government of India since 1991 (Mukherjee and Mishra, 2005). Improving macroeconomic conditions and India's global competitiveness has placed Indian into the world radar for investing(Muthumani and Prabhakaran, 2011). Due to this, it becomes important for the investors to have a clear knowledge about the index constituents. Prediction of stock performance in this scenario becomes one of the most important deciding factors when an investor is willing to invest in the Indian stock market. Analysis of the financial data disclosed by the company is one of the most common pieces of information used by investors. For new investors, a proper understanding of ways to invest can help them maximize the returns (P. Singh and Thankral, 2018). Generally, the investors look at the ratios and other projections offered by the companies. The work takes into account 15 variables based on which the efficient stocks are identified with the help of ANNs and PCA.

LITERATURE REVIEW:

An efficient stock market is believed to highly impact the demand side of any economy. It facilitates the investors to invest in various assets with varying degrees of liquidity and risk-return profile (Pal.P, 1998). The stock prices depend on various factors ranging from the type of industry the company belongs to, the company-specific details and also the environment where the company is functioning (Singh.D, 2010). Investors can get to know the financial conditions of a company based on stock prices. If the stock prices fall over a relatively long period then it suggests that the company might be in a distressed financial condition (Wulandari and Iradianty, 2015). One of the most popular and old strategies applied by many investors is the value investment strategy which minimizes the risk and maximizes the returns (J. Singh and Kaur, 2013). With the help of new and advanced statistical tools the investors now have the option of looking at more sophisticated models to analyze data. It is observed that tremendous research works are being undertaken in order to predict the financial soundness of the company (Sanobar, 2012). The benefits emerging due to international diversification would lead to an inflow of foreign investments into the domestic equity market (Ahmed, 2008).

Researchers are constantly analysing the data in order to come up with better prediction models for crashes and events such as bankruptcy. Financial distress modelling can be used to predict the oncoming of any financial crisis. These models can then be used to predict the bankruptcy of any company (Husein and Pambekti, 2014). Debt plays a major role while leading any firm into bankruptcy. Bankruptcy generally occurs when the company's debt increases as compared to its assets or if the company is unable to pay its debt (Pongsatat et al., 2004). While measuring the liquidity of any firm the higher the total assets current liabilities, the company said more liquid or the higher the company's ability to pay all liabilities (Husein and Pambekti, 2014). It is observed that the stocks having high dividend yield and low leverage underperform the market due to the fact that such stocks have low or no future opportunities and thus have lesser chances of growing in the future (J. Singh and Kaur, 2014).

Companies become insolvent when they are unable to acquire funds for their operations. (Sanobar, 2012). One of the other methods to predict the bankruptcy of any company is using the Z score (Mohammed, 2016). The efficient market hypothesis also known as random walk theory states that the current stock price reflects the

value of the firm based on the available information about the firm, and the probability of earning excess profit by using public or private information is extremely low (Clarke et al., 2005). A market is called efficient if abnormal and anomalous interest is not gained by means of the data existent in the market (Jandaghi et al., 2010). It is observed that stock prices tend to follow a pattern and these patterns contain useful information about future prices (Gebka, 2008). Stock prices tend to decline when the investors' expectation on the future income of their holdings decreases (Pal.P, 1998).

The financial indicators given in the company's annual report are the best indicator of their stock performance. These reports have a large amount of information, so in order to make this information interpretable the financial data are converted into various ratios (Upadhyay.A, Bandyopadhyay.G, 2012). Another observation that emerges is that the intrinsic value of a stock may not align with the current market price of the firm's stock (Fama, 1965). Companies acquire other firms or them takeover other entities in order to expand. The best value-creation takeovers are those where a high Tobin Q company buys off a low Tobin's O company (Toudas and Nikolaos, 2007). Researches identify risks in terms of various aspects but there is no agreement on how to show these risks(VakilAlroaia et al., 2012).

Advances in the field of Artificial Intelligence has been unremitting. It is very prolific to use ANN for financial and economic problems. Artificial neural networks (ANNs) are calculation based and data processing models inspired by the functioning of a human brain and it is used to estimate functions that can depend on a substantially large number of inputs and are partially known or completely unknown (Ghosh, 2015). ANNs can be used for classifying, optimizing and forecasting depending on their architecture and type (Caride et al., 2018). The use of neural networks becomes more important when market efficiency is small since investors follow feelings rather than a technological or fundamental approach (Ghosh, 2016). ANN's are good function approximates, so the input and output relationship can be examined by them even if the data set is very complex (Hiransha et al., 2018). Artificial Neural Network (ANN) is the theory based on machine learning which captures the regular patterns hidden behind the complex and high-dimension data through its machine learning. The connection among various layers of the neural network has a huge significance (Perwej and Perwej, 2012). Despite ANN performing better than traditional method but still, the difficulty in determining network diagram structures, problems with local minimum points and over-fitting are some of the defects which are there in this method. (Yu et al., 2014).

METHODOLOGY:

BSE100 stocks have been taken into consideration for this work. The data set has been chosen for the period of 2018-19. The values for the 15 control variables (Ghosh, 2017) given in Table1 have been calculated using the data disclosed in the annual report of the selected companies and fed into the neural network. The work employs PCA in order to generate efficient stocks. The collected data, compiled for all the 100 companies has been fed into the PCA using XLSTAT add-in for Microsoft Excel. The results of PCA are shown in Figure 2 which generates efficient stocks from BSE100.

Table 1: Control Variables

Variable	Description
Price to Book Value	This ratio computes the share price of a company by comparing the current market price of the company's stock with the Book Value of the same.
Operating PE Ratio	Similar to a normal PE ratio, however, the earnings per share exclude tax effect, non- operating income and expenses, preferred stock dividends etc.
Dividend	Partial or complete share of profit, either biannually or annually as per the management discretion.
Dividend Yield	The ratio of the annual dividend per share to the price per share.
Return on Invested Capital	This measures a company's profitability relative to the amount of capital invested by shareholders and other debtholders
Altman Z Score	Measurement of bankruptcy with the help of credit strength.
Debt to Equity Ratio	This ratio computes the amount of financing done by debt over equity. This is computed by dividing the company's total liability with shareholder's equity.
Book Value per share	Used to calculate a company's share value on the basis of its common shareholders ' equity
Graham's Number	Benjamin Graham has given this calculation that is based on EPS and Book Value per share. According to him, the EPS should not cross 15 and the Book value per share should not cross 1.5, so multiplying both he has arrived at a figure of 22.5. Therefore, the formula becomes
Ohlson Score	This is an accurate measurement over the traditional Z score. It is a multifactor financial formula for bankruptcy prediction.
Tobin's Q	It is used for measuring the replacement cost of a firm.
Zmijewski Score	An efficient bankruptcy prediction model, using Profit Regression which employs liabilities and assets of the firm.
Beta	A measure of the sensitivity of the company's returns to the market return.

RESULTS AND DISCUSSION:

Factor Analysis interpretation:

The factors from F1 to F9 have higher significance and thus are taken into consideration as given in Table 2, Eigenvalues. The factors having Eigenvalue above 0.5 are taken into consideration for further analysis. Using the method of elimination, the analysis has been restricted to F1, F2 and F3. This is due to the inference from Eigenvectors in Table 3. It can be noted that book value per share has the highest value of 0.654. Further observations can be drawn from the factor analysis graph in which the Zmijewski score, return on investment capital and debt to equity ratio emerge as the most significant factors as they appear in the first quadrant of the PCA graph as shown in Figure 1. The efficient stocks are those stocks that appear in the first quadrant of the PCA result as shown in Figure 2.

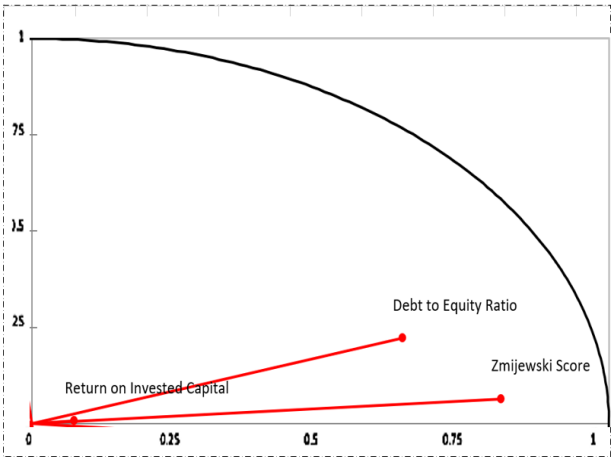

Figure 1: Active Variables

The Three line represented which comes out as the active variables are: Debt to Equity Ratio and Zmijewski Score and Return on Invested Capital

Table 2: Eigen Values

	F1	F2	F3	F4	F5	F6	F7	F8	F9
Eigenvalue	2.660	2.120	1.862	1.257	1.030	0.892	0.799	0.711	0.571
Variability (%)	20.465	16.308	14.322	9.666	7.921	6.861	6.147	5.466	4.390
Cumulative %	20.465	36.774	51.096	60.761	68.682	75.543	81.691	87.156	91.547

Table 3: Eigenvectors

	F1	F2	F3	F4	F5	F6	F7	F8	F9
Price to Book Value	-0.431	-0.047	-0.237	-0.285	0.178	0.127	0.053	0.345	0.083
Operating PE Ratio	-0.190	-0.026	-0.389	-0.129	-0.084	0.170	0.750	-0.357	-0.080
Dividend	-0.049	-0.130	0.504	-0.357	0.115	-0.123	0.378	0.053	0.089
Dividend Yield	0.013	-0.164	0.575	-0.060	0.046	-0.117	0.252	0.176	-0.287
Return on Invested Capital	0.045	0.005	-0.057	0.097	0.939	-0.026	-0.042	-0.262	-0.179
Altman Z Score	-0.229	0.248	0.181	-0.270	0.106	0.706	-0.179	0.166	0.073
Debt to Equity Ratio	0.393	0.152	-0.209	-0.391	0.033	0.024	-0.012	0.320	-0.335
Book Value per share	-0.059	0.654	0.088	0.059	0.010	-0.164	0.154	0.045	0.014
Graham's Number	-0.067	0.652	0.072	0.083	0.006	-0.206	0.111	-0.002	0.006
Ohlson Score	-0.146	-0.049	0.059	0.692	-0.007	0.315	0.222	0.356	-0.341
Tobin's Q	-0.359	-0.101	-0.280	-0.056	0.078	-0.488	-0.034	0.464	-0.140
Zmijewski Score	0.498	0.044	-0.155	-0.113	-0.044	0.136	0.121	0.133	-0.377
Sensitivity (Beta)	0.401	-0.040	-0.093	0.174	0.211	0.039	0.305	0.398	0.685

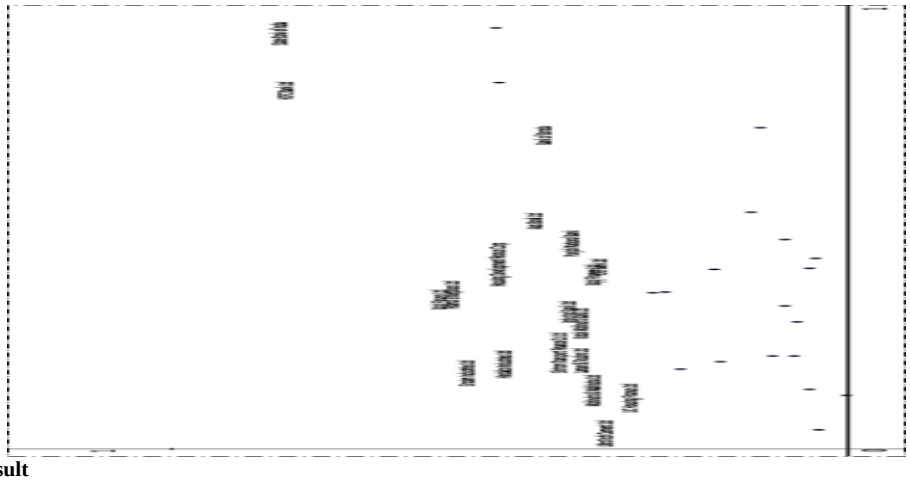

Figure 2: PCA Result

Stocks that show efficiency after the PCA analysis are (in distance from zero): Ultratech Cements Ltd, LIC Housing Finance Ltd, Mahindra and Mahindra, Grasim Industries Ltd, Hindalco Industries, Shriram Transport Finance Co. Ltd, Larson and Toubro Ltd, Kotak Mahindra, Indusind Bank Ltd, Bajaj Finserve Ltd, Parimal Enterprise Ltd, Housing Development Finance Corp, Bajaj Finance Ltd, Punjab National Bank, Axis Bank, Bank of Baroda, HDFC Bank and State Bank of India.

CONCLUSION:

The Indian stock market has seen a jump in the number of investors investing in the market. Efficient stock information plays an important role in their investment decisions. This paper is an attempt towards finding the most efficient stocks from BSE100 based on the Warren Buffet approach. Looking at factors like PE Ratio alone is now an old way of finding investment-grade stocks. Even though many investors believe that over a long period any company will grow in valuation and in turn its stock will be valued higher, finding one for investment today looking at their financials is imperative. Given below is a list of stocks that have emerged as the most efficient stocks in the BSE100. UltraTech Cement Ltd., LIC Housing Finance Ltd., Mahindra and Mahindra Ltd. Grasim Industries Ltd., Hindalco Industries Ltd., Shriram Transport Finance Co. Ltd., Larsen and Toubro Ltd., Kotak Mahindra Bank Ltd., Induslnd Bank Ltd., Bajaj Finserv Ltd., Bajaj Finance Ltd., Piramal Enterprises Ltd., Housing Development Finance Corp., ICICI Bank Ltd., Punjab National Bank, Axis Bank Ltd., Bank of Baroda., HDFC Bank Ltd. and State Bank of India. An interesting observation that emerges from the study is the dominance of financial services industries in the first quadrant.

Active Variables	Point	F1	F2
Zmijewski Score	0.812688	0.812688	0.063940515
Debt to Equity	0.64183201	0.64183201	0.22197597
Return on Invested Capital	0.7331422	0.7331422	0.007063256

Active Variables	Point	X-axis	Y-axis
UltraTech Cement ltd.	0.201949085	0.201949085	0.0826756
LIC Housing Finance Ltd.	0563909937	0563909937	0.001429688
Mahindra and Mahindra	0.627407634	0.627407634	0.627407634
Grasim Industries Ltd	0.841810673	0.841810673	0.489445326
Hindalco Industrial Ltd.	0.922810283	0.922810283	0.377100319
Shriram Transport finance Co. Ltd	0.979867102	0.979867102	0.219018293
Larensen and Toubro Ltd.	0.979628872	0.979628872	0.155747573
Kotak Mahindra Bank Ltd.	1.341048083	1.341048083	0.147296286
Indusind India Bank	1.509826066	1.509826066	0.186761086
Bajaj Finserv Ltd.	1.654967358	1.654967358	0.53518385
Piramal Enterprise Ltd.	1.654967358	1.654967358	0.53518385
Housing Development Finance Corp	1.894560354	1.894560354	0.393757092
Bajaj Finance Ltd.	1.894560654	1.894560654	0.3939757092
ICICI Bank Ltd.	2.00848098	2.00848098	0.094628193
Punjab National Bank	2.20656687	2.20656687	0.179981216
Axis Bank Ltd.	2.495246456	2.495246456	0.288779049
Bank of Baroda	3.385323197	3.385323197	0.260837957
HDFC Bank	3.859708831	3.859708831	1.29000432
State Bank of India	4.436069264	4.436069264	1.041252567

It is worth noticing that the Zmijewski score, return on investment capital and debt to equity ratio emerge as the most significant factors that can be used to measure the profitability of the stocks. Zmijewski score comes out to be an important parameter as it is a bankruptcy prediction model and takes into consideration factors like Net Income, Total Assets, Total debt, and both current liabilities and current assets. The prediction of stock has been improved. These factors can be inflated by a company but when the Zmijewski score is combined with measuring parameters and machine learning method of eliminating error it seems to give the best results in stock prediction. It is observed that debt plays a major role in the bankruptcy prediction for any company. The extent to which a company is leveraged becomes a key decisive factor for investors to invest in a particular company. (72% are in BFSI AND NBFC all six are banks)

FURTHER SCOPE OF RESEARCH:

The data was obtained from the annual reports and various other sources which may not give precise information about the values and it may affect the analysis. So, to make the work more concrete close data points or high frequency data could be used relating to each stock and probably for various other stock markets such as NSE and can also be performed for specific industries.

SHORTCOMMINGS:

A certain time period is selected and if the time period would have been more, we could have achieved a more accurate and reliable result. The same can be said about the index selected.

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