Conceptual Analysis of India-VIX to Determine the Buying Opportunities and Risk Management.

Dr. Anilkumar J. kadam[1], Ravina Karmankar[2]

[1]Proffessor, Department of Computer Engineering, AISSMS COE, Pune, Maharashtra, India.
[2]M.E. Student, (Artificial Intelligence and Data science) Department of Computer Engineering, AISSMS COE, Pune, Maharashtra, India.

Abstract

Various studies have been done proving the effectiveness of volatility index in stock market. In this paper we will look into the predictive capabilities of the India Volatility Index (VIX) in forecasting the behaviour of Nifty 50 stocks over a 12-month period. Originating in 1993, the VIX has evolved into a crucial benchmark for risk management and decision-making in the stock market. The motivation behind this research is to help fellow researchers design a model that offers a range for developing investment strategies, minimizing losses, and maximizing profits. Here categorization of Nifty50 stocks into range of prices have been done based on certain VIX value to check if the stocks follow the price given by VIX for 12-month period. This study challenges the perception of fear associated with the VIX and outliers, using real-time Nifty50 stock data which suggest possible profitable predictions can be made based on India VIX. Contrary to conventional beliefs, outliers serve as indicators for strategic entry and profit-taking. In this paper we are going to discuss the incorporation of the VIX in investment decisions refines analyses, anticipates market movements, and equips investors with insights for prudent decision-making in the dynamic landscape of Nifty stocks.

Keywords: India VIX, Stock market analysis, Volatility, Machine learning, Classification algorithms.

Introduction

While predicting a future of stock listed in stock market requires a lot of knowledge but still the market maintains its reputation of uncertainty is a way. We can also say that the change is constant in the stock market. This phenomenon is the reason why the stock trading gives equal opportunities to all of us. It's been observed that there are some tools which can give you a little peek in the future of the current market. In this research we are working with index known as volatility index. Volatility index was first introduced by 'Cboe Global Markets', Incorporated (Cboe) in 1993 [1]. Originally it was used to the predict the future of the stock market for at-the-money option prices for not more than 30 days. Ten year later in the year 2003 the Cboe collaborated with Goldman sacks to develop a new methodology for volatility index which became a benchmark for many stock trades, financial theorist, portfolio managers, fundamental traders, volatility traders, etc. The same methodology has been adopted by the National Stock exchange in India to develop a volatility index which was introduced in the year 2008 [2][3]. The India VIX has become a benchmark for the portfolio managers in India. India VIX is also known for its sentimental property to broadcast the fear in the stock market. The India VIX shows the annualized percentage of

volatility. It is highly used by the option traders to predict the future of option near 30 days expiry. In general, we can say the option trader has to convert the annualized percentage given by the VIX to month rate so as to get the

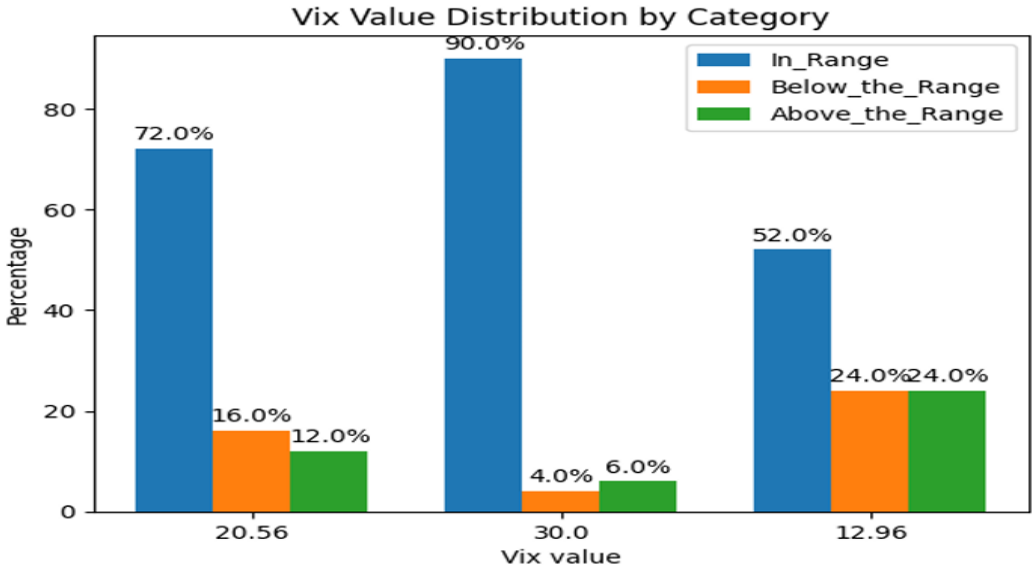

Figure 1.. Representation of Stocks Based on Different VIX Value.

exact figure. The India VIX in general shows value by which the nifty index will increase or decrease in the coming 12 months. Which means it gives a range for the nifty index. This helps the portfolio manager to manage the risk and take long position in the market and also helps the value traders to bottom fish the undervalued stocks.

It's been portrayed that the volatility index is mainly used by the option traders and that its inversely co-related with the stock market or we can also say nifty index. It's been observed that on some crucial times like the corona effects or the 2007 financial crises the volatility index was very high and similarly the nifty index was down but that too gave a buying opportunity for many value traders like warren buffet, Munger etc. Hence in this paper I proposed that, if we understand the volatility index properly, we can peak into the future of stock which holds the key to high profitability and proper risk management. In this paper we are going to further analyse the behaviour of stocks listed on nifty 50 based on India VIX for a term of 12 months. The paper will also analyse the outliers through the range given by the India VIX and use them to take profitable position and manage risk.

Motivation

Stock market investments have always come with a disclaimer which says, 'stock market investments are subject to market risk'. It never goes without saying that, we should make our investments only after getting all the facts checked as past performance is not solely an indicator of future returns. Delving into the stock market studies I found that with the help of available data we could design a model which can give us a range for the developing our investment strategy and with the help of which we can minimize our loses and maximize our profit percentage. Taking this motivation at heart, I find India VIX most appropriate for deciding that range for investments in the nifty50 stocks. Though VIX is mostly referred as 'fear index' and anomalies/outliers in data are considered bad for the data analysis, my idea suggests contradictory aspect about the both. There is ample amount of real time stock data available for developing such model for deciding the range. In my study, I have used only Nifty50 stocks one year apart data values for simplification. My motivation leads to help research communities and data scientist

who work in the financial sector to devise a system and build an effective machine learning model on larger scale with humungous amount of data.

Literature review

We can get the reference for calculations of India VIX on official websites of National Stock Exchange of India Ltd and know more about the VIX indices on both CBOE as well as NSE (Cboe Global Markets. (n.d.)) (National Stock Exchange of India Ltd. (n.d.))**.** These articles provide in depth knowledge on VIX indices and its working. As per one of the studies, stock price and volatility are inversely proportional however, The VIX doesn't always move opposite to the stock market in India, making its predictive power weaker than in some other markets. The study shows the VIX has limited ability to predict future stock market movements in India. However, it highlights the influence of volatility on short-term investment decisions and suggests areas for further research (Acharya, Seet, & Salvi, (n.d.)).

The study by D. Bagchi explores the relationship between the India Volatility Index (VIX) and stock index returns, focusing on stock beta, market-to-book value, and market capitalization. Using multiple regression analysis, the study finds a positive and significant connection between India VIX and returns for portfolios sorted by these parameters. The study suggests that India VIX serves as a distinct risk factor, predicting market dynamics and aiding regulators in managing market risks. It also highlights the relevance of volatility indices, particularly in emerging markets like India, emphasizing the distinct and significant role of India VIX in predicting portfolio returns in the Indian stock market (Bagchi, 2012). There are so many articles which shows the significance of machine learning algorithms in stock market analysis. In this paper, I am proposing the use of machine learning algorithm to build a tool for better investment using India VIX for nifty50 stocks.

Methodology

The idea behind conducting this analysis to derive meaningful conclusion for more profit booking and less losses in nifty fifty stocks exchange using individual stock prices and VIX index relationship. To understand bigger population of stock information, I have manually selected sample of the stock data required for the calculation purpose and conduction of the analysis. Here I have gathered nifty50 stocks closing value for 31st march 2022 as well as closing value of these stocks on 31st March 2023. Along with these historical stock price details, I have gathered India VIX value for 31st march 2022 for first experimental analysis. All these historical stock information was gathered from yahoo finance and calculation are done using python. Based on these three details I have calculated the range for expected stock price on 31st march 2023. Taking these values as base, I have distributed nifty50 stocks in three sections: **In range, above the range and below the range** based on their actual price on 31st march 2023. The exploratory analysis indicates that stock prices on 31st march 2023 and the expected high and low stock prices calculated based on VIX value are highly correlated showing linear relationship among them. The expected low stock price of almost 56% nifty50 stocks are closer to the actual price whereas it is lesser percentage in case of expected high stock price. The distribution of nifty50 stocks price gives more deeper idea about correlation between stock prices and India VIX. Based on VIX value: 20.56, I manged to identify that almost 72% stocks fall in range of expected range calculated based on VIX. There are 12% stocks who have overperformed and fall in above the range category. Whereas, 16% stocks show underperformance and hence named below the range category. This clearly shows that if someone would build their investment strategies which

are range bound just based on India VIX then there are almost 70-75% stocks in Nifty50 which will go as per strategy and 10-12% stocks will definitely provide highest profit if long term investments are made considering at least 12 months period. There are 14-18% chances of failure however these percentage are totally reduceable by doing more market research and using supporting information and tools along with India VIX.

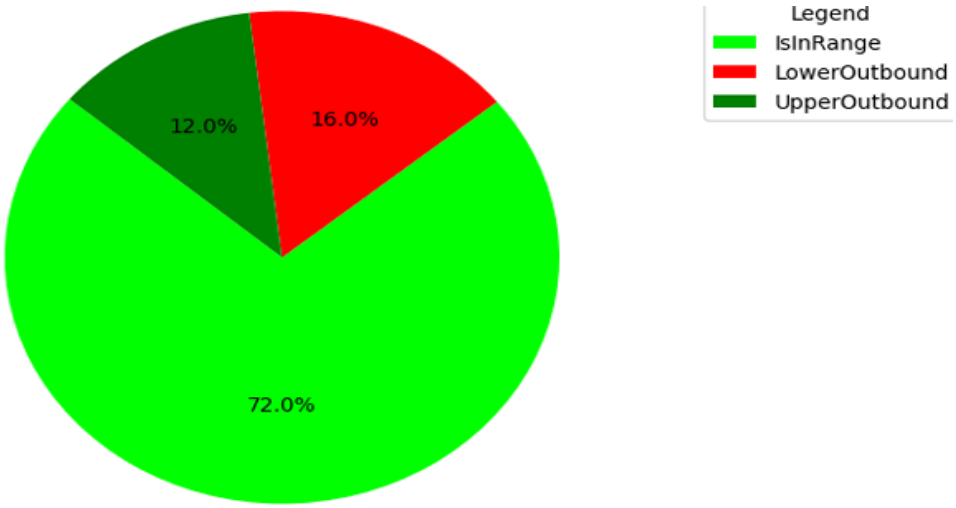

Figure 2. Distribution of Stocks Based on VIX: 20.56

I have conducted another experiment which adds more specifics to the above experiment and can help us build more profitable investments. Here I have followed the same procedure mentioned above however I have used two different VIX values which are approximately 10 points bigger and lesser than previous value. The result came out of this experiment tells that in case of higher VIX value, 90% stocks fall in range whereas only 52% stocks fall in range for lower value of VIX. From this I have concluded that higher value of VIX will provide bigger range for strategy building and hence profit-making percentage are going to increase with higher VIX value and vice versa. This will totally help in minimising the risk and in turn reduce the losses. Stocks have highest and lowest value daily, monthly and yearly, I have taken yearly lowest and highest values of stocks for my next experiment and done calculations based on new values. This experiment shows that when prices are lowest for any stocks, only

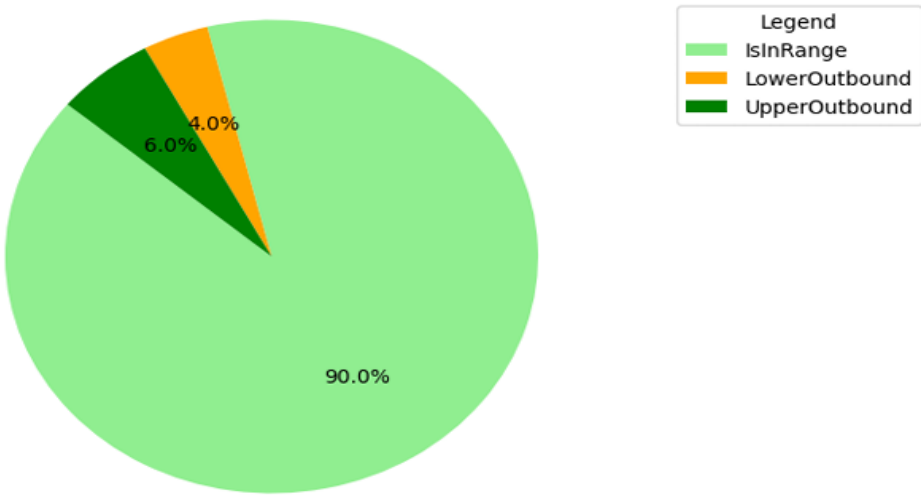

Figure 3. Distribution of Stocks Based on VIX: 30.

24% stocks fall below the range and when prices are highest almost 60% stocks are above the range. This information certainly helps us conclude that VIX is definitely an important index to consider while building an investment strategy for individual nifty50 stocks.

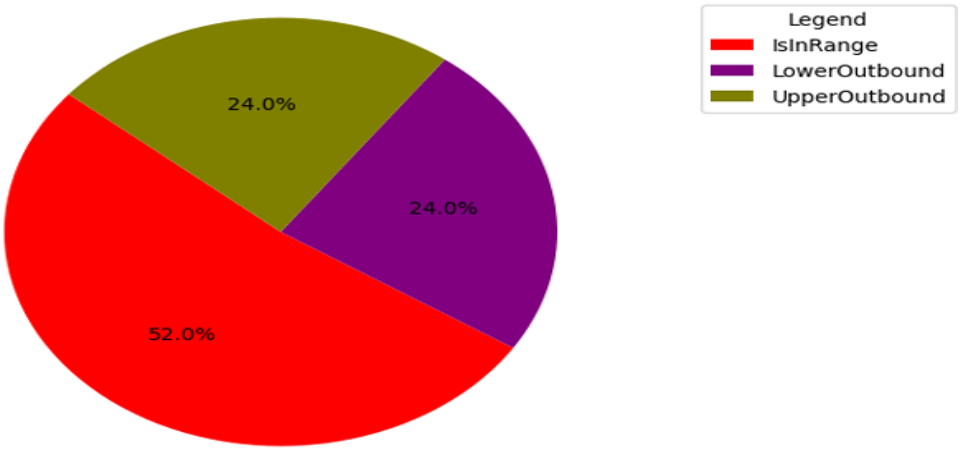

Figure 4. Distribution of Stocks Based on VIX: 12.9

All the distribution plays an importance role in investment decisions. The in-range stocks will help investors build stability-based strategies. Wherein, the outliers (above the range and below the range stocks) has specific significance in their places. The above the range stocks are perfect for profit-booking. On the other hand, below the range stocks gives an opportunity to make an investment.

Proposed Model

From various literature review it is found that supervised learning commonly used by researchers in stock market analysis. The traditional machine learning algorithms such as SVM, KNN, naïve-bayes, logistic-regression and decision tree models are conveniently used by researchers for classification purposes. Sometimes hybrid approach is also used if it provides the better performance than single algorithm/classifier. From various experiments that are performed in this study shows that classification of historical stock data to get a range for strategy building is

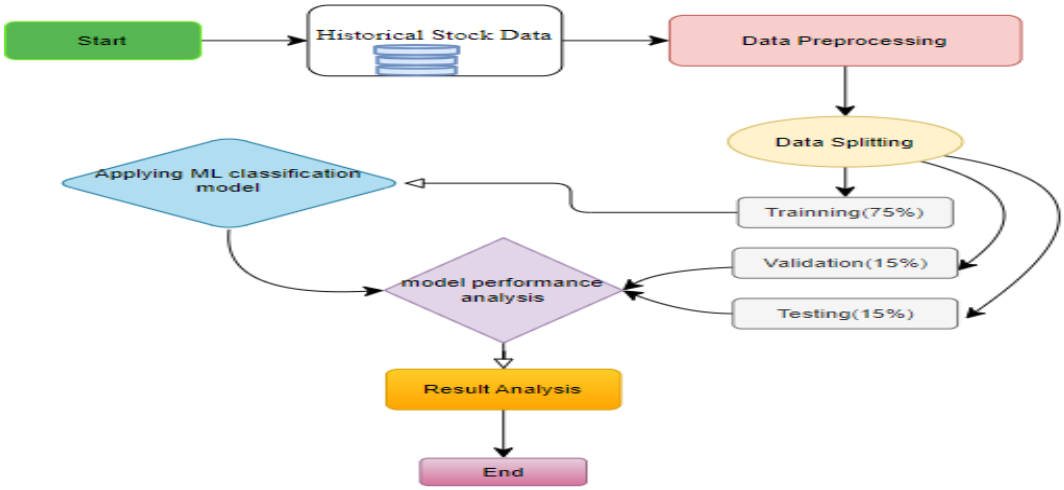

Figure 5. Proposed Model

essential. Once the distribution of data is done, we can utilize that data to build a tool to develop investment strategies by considering other essential factors for more effective investments. Hence here I would like to proposed a model which will used the most efficient ML classification algorithm on training data set as shown in the flowchart above. Once the model is trained, it can be evaluated for performance analysis by testing and validating data. This is work in progress and hopefully this paper will become an opportunity for fellow researchers to work on the proposed model.

Data used for analysis (Sample)

Nifty50 stocks historical data is used for this study along with India VIX values. VixHigh and VixLow represent the calculated stock price based on India VIX value and stock prices on the 31st March 2022.

	StockSymbol	StockPriceMarch22	StockPriceMarch23	VixOn31March22	VixValue(20.56)	VixHigh1	VixLow1	VixValueHigh(30)	VixHigh2	VixLow2
0	ADANIENT	2014.75	1750.45	20.56	414.23260	2428.98260	1600.51740	604.425	2619.175	1410.325
1	ADANI PORTS	774.20	631.90	20.56	159.17552	933.37552	615.02448	232.260	1006.460	541.940
2	APOLLOHOSP	4516.10	4310.90	20.56	928.51016	5444.61016	3587.58984	1354.830	5870.930	3161.270
3	ASIAN PAINTS	2761.65	2761.65	20.56	567.79524	3329.44524	2193.85476	828.495	3590.145	1933.155
4	AXIS BANK	761.15	858.50	20.56	156.49244	917.64244	604.65756	228.345	989.495	532.805

Figure 6. Sample of Data Used for Analysis table 1

VixValueLow(12.9)	VixHigh3	VixLow3	YearlyLowestValue(22-23)	YearlyHighestValue(22-23)
259.90275	2274.65275	1754.84725	1017.45	4190.0
99.87180	874.07180	674.32820	395.10	916.0
582.57690	5098.67690	3933.52310	4123.00	5364.0
356.25285	3117.90285	2405.39715	2685.85	3568.0
98.18835	859.33835	662.96165	814.30	1047.5

Figure 7. Sample of Data Used for Analysis table 2

Results

Below are the results from conducted analysis which clearly shows the distribution of stocks in range, above the range and below the range for different VIX values. The graphs show the distribution based on annually highest closing price and lowest closing price for all nifty50 stocks.

	for vix:20.56	for vix:30	for vix 12.56
In a range	['ADANIENT', 'ADANI PORTS', 'APOLLOHOSP', 'ASIAN PAINTS', 'AXIS BANK', 'BAJAJ AUTO', 'BPCL', 'BHARTI AIRTEL', 'CIPLA', 'COAL INDIA', 'DRREDDY', 'EICHER MOTORS', 'GRASIM', 'HCLTECH', 'HEROMOTOCO', 'HDFC LIFE', 'HDFCBANK', 'ICICIBANK', 'INDUSINDBK', 'JSWSTEEL', 'KOTAKBANK', 'MARUTI', 'NESTLEIND', 'ONGC', 'POWERGRID', 'RELIANCE', 'SBI LIFE', 'SBIN', 'SUNPHARMA', 'TCS', 'TATAMOTORS', 'TATASTEEL', 'TITAN', 'ULTRACEMCO', 'UPL', 'TATACONSUM']	['ADANIENT', 'ADANIPORTS', 'APOLLOHOSP', 'ASIAN PAINTS', 'AXISBANK', 'BAJAJAUTO', 'BAJAJFINANCE', 'BAJAJ FINSERV', 'BPCL', 'BHARTIAIRTEL', 'CIPLA', 'COALINDIA', 'DRREDDY', 'EICHER MOTORS', 'GRASIM', 'HCLTECH', 'HEROMOTOCO', 'HINDALCO', 'HINDUNILVR', 'HDFCLIFE', 'HDFCBANK', 'ICICIBANK', 'INDUSINDBK', 'INFY', 'JSWSTEEL', 'KOTAKBANK', 'LTIMINDTREE LTD', 'LT', 'MARUTI', 'NESTLEIND', 'NTPC', 'ONGC', 'POWERGRID', 'RELIANCE', 'SBI LIFE', 'SBIN', 'SUNPHA RMA', 'TCS', 'TATAMOTORS', 'TATASTEEL', 'TECHM', 'TITAN', 'ULTRACEMCO', 'UPL', 'TATACONSUM']	['APOLLOHOSP', 'ASIAN PAINTS', 'AXIS BANK', 'BAJAJ AUTO', 'BPCL', 'BHARTI AIRTEL', 'CIPLA', 'DRREDDY', 'GRASIM', 'HCLTECH', 'HEROMOTOCO', 'HDFC LIFE', 'HDFCBANK', 'JSWSTEEL', 'KOTAKBA NK', 'MARUTI', 'ONGC', 'POWERGRID', 'RELIANCE', 'SBI LIFE', 'SBIN', 'SUNPHARMA', 'TATAMOTOR S', 'TITAN', 'UPL', 'TATACONSUM']
below the range	['BAJAJ FINANCE', 'BAJAJ FINSERV', 'DIVISLAB', 'HINDALCO', 'INFY', 'LTIMINDTREE LTD', 'TECHM', 'WIPRO']	['DIVISLAB', 'WIPRO']	['ADANIENT', 'ADANI PORTS', 'BAJAJ FINANCE', 'BAJAJ FINSERV', 'DIVISLAB', 'HINDALCO', 'INF Y', 'LTIMINDTREE LTD', 'TCS', 'TATASTEEL', 'TECHM', 'WIPRO']
above the range	['BRITANIA', 'HINDUNILVR', 'ITC', 'LT', 'M&M', 'NTPC']	['BRITANIA', 'ITC', 'M&M']	['BRITANIA', 'COAL INDIA', 'EICHER MOTORS', 'HINDUNILVR', 'ITC', 'ICICIBANK', 'INDUSINDBK', 'LT', 'M&M', 'NESTLEIND', 'NTPC', 'ULTRACEMCO']

Figure 8. Different Stock Category

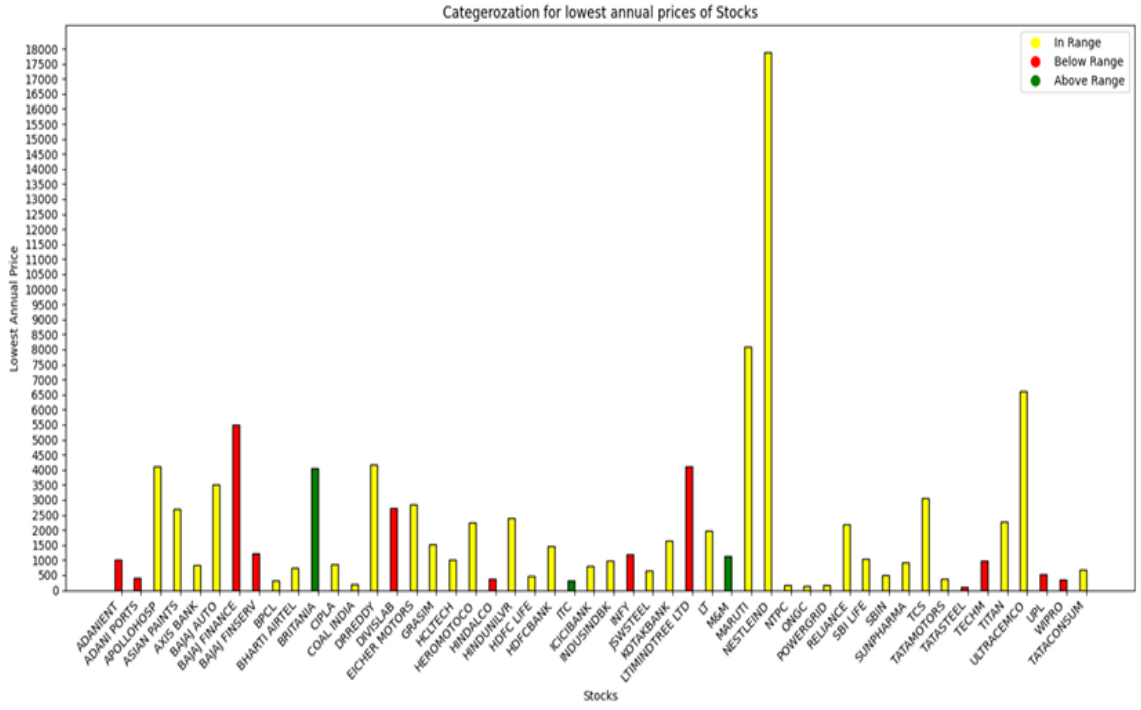

Figure 9. Distribution Based on Lowest Annual Stock Price

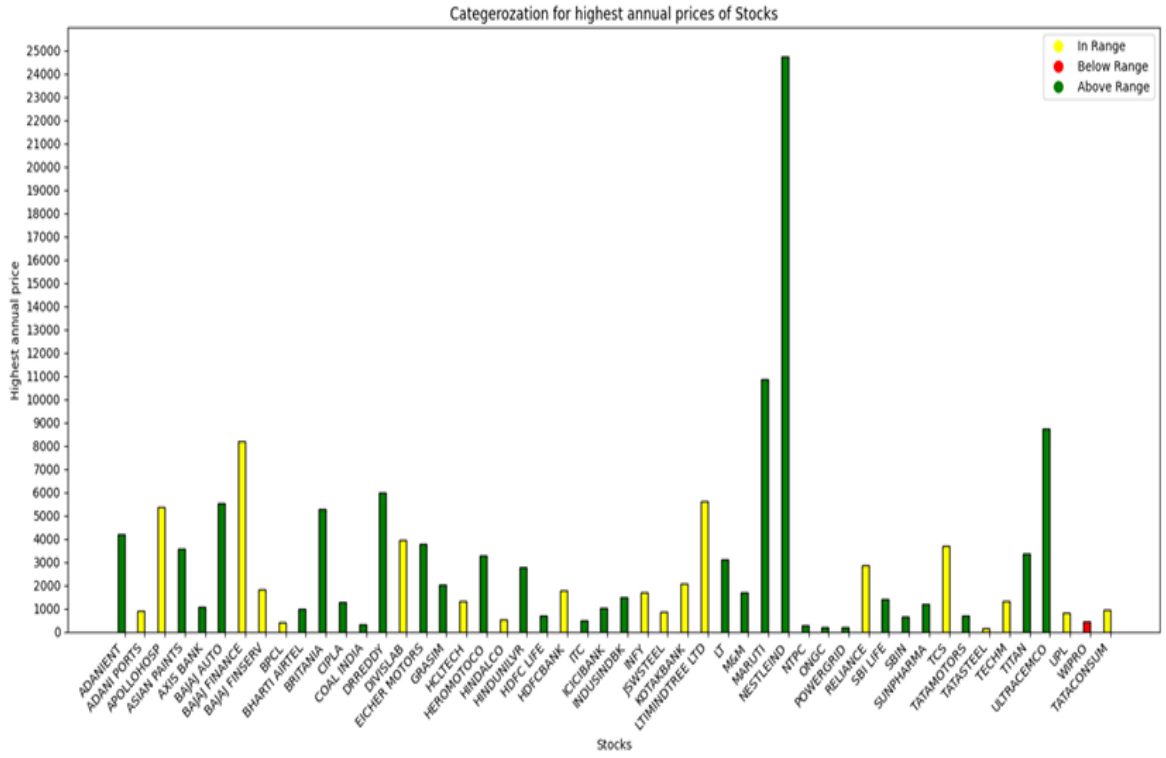

Figure 10. Distribution Based on Highest Annual Stock Price

Interpretation

Stocks In Range, which include industry leaders such as 'ADANIENT', 'ADANI PORTS', 'APOLLOHOSP', 'ASIAN PAINTS', 'AXIS BANK', 'BAJAJ AUTO', 'BPCL', 'BHARTI AIRTEL', 'CIPLA', 'COAL INDIA', 'DRREDDY', 'EICHER MOTORS', 'GRASIM', 'HCLTECH', 'HEROMOTOCO', 'HDFC LIFE', 'HDFCBANK', 'ICICIBANK', 'INDUSINDBK', 'JSWSTEEL', 'KOTAKBANK', 'MARUTI', 'NESTLEIND', 'ONGC', 'POWERGRID', 'RELIANCE', 'SBI LIFE', 'SBIN', 'SUNPHARMA', 'TCS', 'TATAMOTORS', 'TATASTEEL', 'TITAN', 'ULTRACEMCO', 'UPL', and 'TATACONSUM', signify stability within the expected price range. This category offers a foundation for investors seeking consistent performance and reliability.

Stocks Below Range, featuring 'BAJAJ FINANCE', 'BAJAJ FINSERV', 'DIVISLAB', 'HINDALCO', 'INFY', 'LTIMINDTREE LTD', 'TECHM', and 'WIPRO', present opportunities for scrutiny and strategic entry. These outliers indicate deviations from the anticipated price range, suggesting the potential for in-depth analysis and careful consideration for entry point.

Stocks Above Range, encompassing 'BRITANIA', 'HINDUNILVR', 'ITC', 'LT', 'M&M', and 'NTPC', highlight potential outliers indicating overperformance. Investors are advised to approach this category judiciously, considering profit-taking strategies and risk management. Above images shows the similar reference to the interpretation made.

Conclusion

In conclusion, the delineation of Nifty stocks into In Range, Below Range, and Above Range categories, predicated on the VIX value of 20.56, unveils a nuanced understanding of outliers within the market dynamics. Recognizing the significance of outliers is paramount in this comprehensive study of Nifty stocks, as they serve as vital indicators of potential opportunities and risks. Stocks Below Range, identified as outliers, signify deviations from the expected price range, presenting opportunities for in-depth scrutiny and strategic entry.

Conversely, stocks Above Range highlight potential outliers of overperformance, urging a judicious approach for profit-taking. The categorization within the VIX framework underscores the importance of volatility in shaping market behaviour and identifies stocks that deviate from expected trends. This nuanced analysis, considering outliers, enhances the precision of investment strategies by providing a robust framework for discerning potential buying opportunities and profit-taking scenarios within the dynamic landscape of Nifty stocks.

Looking ahead, the VIX range can offer valuable insights into potential future market conditions. A higher VIX might suggest heightened volatility and the possibility of larger price swings, guiding investors to adjust their risk tolerance and portfolio allocation accordingly and make strategies based on the VIX range for option and future trading for getting higher profit and lowest and informed risk. Conversely, a lower VIX could indicate a more stable market, prompting a reassessment of risk management strategies. Therefore, incorporating the VIX into investment decisions not only refines the current analysis but also lays the groundwork for anticipating future market movements. Investors, armed with this comprehensive insight, are better equipped to navigate the complexities of the market with prudence and foresight and make mindful decision and build strategies for optimal profit and minimal loses. There is wide range of future scope in this research conducted by me. Professional and fellow researchers who are willing to build an application using suitable classification algorithms is one of the area of further studies.

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