

DO NEWS HEADLINES HAVE ENOUGH SENTIMENTS? ANALYSIS ON FOREX, EQUITY AND BOND MARKETS OF INDIA

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Abstract

Study of Financial market is very riveting topic for investors and researchers. Financial markets are very important for the growth of country, it will help company to raise money from people, it helps savers to become an investor. People are very risk averse in nature so they started adapting analytics and machine learning and over the years they have seen that amalgamation of data analytics and finance has created wonders for investors. This study involves the sentiment analysis of the News headlines of Indian newspaper Time of India, which is the most read English newspaper in India. For the sentiment analysis Python programming language has been used, in Python Natural Language Tool kit (NLTK) has been used to know the polarity of each news headlines of the dataset. NLTK is a one of the platforms in Python, this platform go hand in hand with human language data for implementing statistical natural language processing (NLP). This study considers to do analysis on three dominated markets of India. (i.e. Forex market, Equity market and Bond market). Three different indicators have been chosen from each market; USD/INR from Forex market, Sensex From Equity Market and S&P BSE India Agency Bond Index from Bond market. If sentiment of the day and movement of particular index are in same direction it means predicted direction is correct otherwise not by this rule final received accuracy for USD/INR, Sensex and Bond Index are 71%, 53% and 58% respectively. Therefore, it can be concluded that yes news headlines have the sentiments, if retail investors or traders even ignore the technical analysis and focus only on fundamental analysis by using this algorithm they will be in Profit in each market..

Key words: News Headlines, Sentiment Analysis, Natural Language Processing, USD/INR Currency pair, Sensex, S&P BSE India Agency Bond Index, Indian Financial Markets.

Introduction

Study of the financial market and prediction of the same is very interesting topic for many investors and researches. Interest has always been there for people because everyone wants certainty when they invest their money. There are many different kinds of markets across the globe. Capital Market, Bond Market, Stock Market, Foreign Exchange Market, Money Market, Spot Market, Derivatives market, Over the counter Market, Commodity Market etc. This Study will Focus on Forex Market, Equity Market and Bond Market of India.

The Forex market is open for 6 days a week around the clock, it is undoubtedly the largest financial market in the world. This is the market which known as a market that never sleeps. Many technological advancements have led millions of traders across the globe to trade in this most uncertain market of the world. (What Is Forex? | FOREX.Com, n.d.) The daily volume of the FOREX market is more than \$5 trillion dollars per day, which is 10-15 times daily trading volume of the world's stock market combined. (Market Capitalization by Country, 2018 - Knoema.Com, n.d.) Equity market is open for 5 days a week around the clock, total market capitalisation of equity market is around 67 trillion USD as of 31st December 2019. NYSE is the world's biggest stock exchange in terms of volume traded. BSE is the biggest stock exchange in the world in terms of number of companies listed. Bond market is one of the most important market of the world, its size is larger than Equity market. (SIFMA Capital Markets Fact Book, 2019, n.d.) As of 31st December 2018, market capitalization of this market was 105 trillion USD. USA dominate this market. In this market there are many instruments other than bonds for example notes, bills and so on.

There are many things happening across the globe, there are many sources for information. But does everything is relatable to take trading decision for any financial markets? Here there is need to focus on just related

information which can help investor to take trading decision. Sometimes market doesn't move as per the news in the market, so that's one need to know about market efficiency. An efficient market reduces the possibility of beating the market, because any information available to trader of investor is already incorporated into the market price. So, it totally depends quality and amount of relevant information. It will make market more efficient.

Our objective in this study is to determine do the news headlines have enough sentiments to take trading decisions? As our area of focus is just Indian Financial market, this Study involves sentiment analysis of the India news headlines from 01-01-2012 to 31-12-2018. News headlines includes all the economic indicators, business trends, results of one of the biggest business of the country, government initiatives or schemes, monetary policy announcements, geopolitical news etc. This research mainly focused on sentiment analysis; it is powered by smart language algorithms. It identifies and quantifies positive and negative feelings behind the texts, there are many applications for sentiment analysis like training chatbots, adaptive customer service, detect change in customer opinion etc.

This is the case of USD/INR (Forex Market), Sensex (Equity Market) and S&P BSE India Agency Bond Index (Bond Market). In this study we have chosen the most important Index or currency pair for India, this can signify investment sentiment in India not only to particular firm or sector but also to the government. American dollar is an international currency, many of the foreign transaction of government or firms involves USD. Government maintain their forex currency mostly on USD, so that's why to choose USD/INR currency pair was the best option. Sensex is an index of Bombay stock exchange representing 30 leading companies of respective sector. Base year of Sensex is 1979-1980, this is the oldest trading exchange of India. That's why Sensex is chosen for this study. S&P BSE India Agency bond index which gives generic idea about bond market of India, this is the reason this Index has been chosen.

Review of Literature and Objective

. Related Works

There are many researchers who are focusing on sentiment analysis for the opinion mining. Microblogging was very popular communication tool among internet users, researchers has performed sentiment analysis on those data for the opinion mining (Pak & Paroubek, 2010). Researchers used a supervised approach for running the sentiment analysis on the twitter data (Kouloumpis et al., 2011).

Now coming to the applications of sentiment analysis in the financial world, one of the papers talks about to know the popularity of event by using sentiment analysis of tweets published by financial community (Daniel et al., 2017). Next application is to predict the movement of the stock by applying the sentiment analysis on the twitter data (Pagolu et al., 2016). Last application want to highlight is perform sentiment analysis on twitter and some liquidity measures have been in consideration for the linkage between liquidity and investor's opinion (Guijarro et al., 2019).

From the review of above-mentioned paper, one can come to know how sentiment analysis can be helpful for the researchers to contribute into the Financial world. Apart from that some paper was very specific and relevant for this study which are explained as shown below.

Mr. Nassirtoussi talked about the prediction of the intraday movement of currency pair from the financial news headlines. (Nassirtoussi et al., 2015) In interest of achieving this objective author had used multilayer algorithm. First layer is there for Semantic abstraction layer to deal with the problem of co-referencing. Second layer is for the sentiment analysis on the data of news headlines and there is last layer of consist of dynamic model creation algorithm. This is a great work by author however in this particular research target is specifically on the Indian news headlines, and we will not just target the forex market, In addition of it this study also includes Equity market and Bond market of India.

This paper shows usage Word Sense Disambiguation (WSD) to predict the movement of the FOREX market. (Seifollahi & Shajari, 2019) This study also involves using the news headlines. WSD helps to get the proper

sentiment of the text. This study involves many novel concepts like Relevant Gross Retrieval, Similarity Threshold, Verb normalisation etc. Second focus in this study was to determine proper sense of the significant words, which can improve determination of sentiment, conveyed by the text. Inclusion of WSD helped to achieve this. This test outperformed one of the best systems proposed for the market prediction and improves accuracy from 83.33% to 91.67%.

Next paper includes the model which calculates the emotion score of the news headlines, and after this author founded correlation between sentiment and stock price curve of 2 companies for 10 years. (Kirange & Deshmukh, 2016) Proposed system is as follows...

There is one more study on Forex-Foreteller to mine news articles and from that it will predict the movement in the currency market. (Jin et al., 2013) This study uses an amalgamation of language models, topic clustering, sentiment analysis to find the relevant news articles. Some of the articles were there regarding historical stock index and currency exchange values that are used in liner regression for prediction. The system had an interactive visualizer which depicts forecast with historical news and financial data. However, this study is not in the context of India and Indian news headlines.

There is another study, which conducted on 2 million tweets and search volume index from June 2010 to September 2011. (Rao & Srivastava, 2012) This study is for various market securities equity like DIJA and NASDAQ-100, commodity markets and Euro Forex rates. This study investigates the lagged and statistically causative relations of twitter sentiments developed during active trading days and market inactive days in combination with search behaviour of people before any changes in prices or indices.

Research Gap

Above papers are just references that there have been many experts who have studied to predict the movement of the different stocks, commodities, currencies etc. However, there is no study by using the Indian News headlines to predict the movement of the Indian Financial Market. So to Fill the gap this study focusses on most important currency pair for India (USD/INR), the most important stock market index of India (Sensex) and the most important bond Index of India (S&P BSE India Agency Bond Index) by analysing the news headlines of 7 consecutive years (2012-2018).

Objective

To determine do the News headlines have the enough sentiments to take the trading decisions in the three dominated markets of India? (i.e. Forex Market, Equity Market, Bond Market)

Data and Research Methodology

This study involves secondary data of the News headlines, Sensex, USD/INR currency pair and S&P BSE India Agency Bond Index. News headlines are the headlines of the Times of India from the beginning of the 2012 to the End of the 2018. So, in total seven years of Financial and economic news headlines. For the same duration USD/INR data, Sensex data and Bond Index data have also been collected. After the collection of data we applied sentiment analysis on our dataset by using NLTK (Natural Language Toolkit) in Python Programming language. Flowchart of the methodology is shown below.



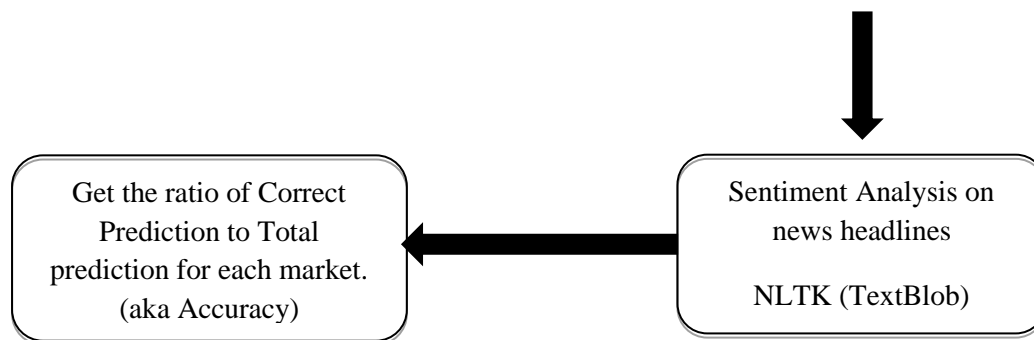


Figure 1: Research Methodology

In this study all the data needed for the research is the secondary data. For the news headlines this study demanded headlines from one of the most authenticated newspapers of India. There are many newspapers in India, but to match research standard I have chosen the headlines from the Times of India. This newspaper is the most read newspaper in English for the India. There is free database Kaggle, from that data of News headlines have been extracted. There were around 29 lakh news headlines but all of there were not necessary for our study. So Financial and Economic news have been filtered out from it and Current data set is around 1,90,000 news headlines across the Seven Years.

For the collection of data of (*Investing.Com India - Financial News, Shares & Quotes*, n.d.) USD/INR currency pair, Sensex index and S&P BSE India Agency bond Index were extracted from free available and reliable sources.

After collection of the data we have conducted a sentiment analysis on each news headlines. For the analysis of the news headlines we have used Python programming language. For the analysis cleaning of data is also very necessary so need to remove all the digits and punctuations from the dataset, converted whole data set into lower case. It is necessary because it is not possible to read digits and punctuations in the case of sentiment analysis (Text Mining). In this study sentiment analysis has been done with the help of NLTK (Natural Language Tool Kit). NLTK is a one of the platforms in Python, this platform go hand in hand with human language data for implementing statistical natural language processing (NLP). There are many libraries in this platform for classification, tagging, stemming, semantic reasoning etc. This is open source library written by Steven Bird, Edward Loper and Ewan Klein for use in development and Education. This contain around fifty corpora and lexical sources like Penn Treebank Corpus, Open Multilingual Wordnet etc.

In the NLTK, here TextBlob has been used to know the sentiment of each line items, which is news headlines in this case. Sentiment analysis is nothing but to know the opinion of the person with 3 classifications (i.e Positive, Negative and Neutral). Text blob will can give is two things polarity and subjectivity, Polarity will tell statement is positive or negative and subjectivity can give people's opinion. Generally, subjectivity differs from people to people so in our analysis we will use polarity to get the sentiment of each news headlines.

After getting a sentiment of each line, a sentiment of day can be calculated by doing a simple summation of sentiments of all news headlines of that particular day. If the Sentiment of the day comes greater than zero then it will be classified as positive day and if sentiment of that particular day comes less than zero then that day will be classified as Negative day. Example for the same is shown below.

After this sentiment analysis now, we need to compare with the movement of the three markets. Statistical Summary of USD/INR (Forex Market), Sensex (Stock Market) and S&P BSE India Agency Bond Index (Bond market) are as follows.

Table 1: USD/INR Descriptive Summary

<i>USD/INR (1st Jan 2012- 31st Dec 2018)</i>	
Mean	62.54001
Standard Error	0.126146
Median	63.7095
Mode	64.86
Standard Deviation	5.39043
Sample Variance	29.05673
Kurtosis	-0.25911
Skewness	-0.56977
Range	25.73
Minimum	48.61
Maximum	74.34
Count	1826
<i>Sensex (1st Jan 2012- 31st Dec 2018)</i>	
Mean	25653.56
Standard Error	141.1438
Median	26311.13
Standard Deviation	5733.288
Sample Variance	32870591
Kurtosis	-0.87917
Skewness	0.145901
Range	23378.71
Minimum	15517.92
Maximum	38896.63

Count 1650

Table 2: Descriptive Statistics of Sensex

Table 3: Descriptive Statistics of S&P BSE India Agency Bond Index

S&P BSE India Agency Bond Index (1st Jan 2012- 31st Dec 2018)

Mean	118.705521
Standard Error	0.51984232
Median	117.935
Mode	146.87
Standard Deviation	22.1894134
Sample Variance	492.370069
Kurtosis	-1.41952275
Skewness	0.03004755
Range	73.01
Minimum	84.01
Maximum	157.02
Count	1822

Results / Findings

After running a code of sentiment analysis, will get the sentiment for each News headlines. Some of the news headlines will get positive output, it means sentiment of that particular news headlines is positive, if the output is negative then sentiment of the news headlines is negative and if output is zero then sentiment of the news headlines is neutral. Table for the same is shown below.

Table 4: Sentiment of Each News Headlines

Date	News	Sentiment
02-01-2012	India; Pak to start power; petro trade	0
02-01-2012	Vetting pharma M&As out of ambit; says CCI	0
02-01-2012	Jet cuts trainee co-pilots' pay from Rs 1.3L to Rs 50k	0
02-01-2012	Fresh row over airport development fee	0.3
02-01-2012	QFIs unlikely to enter bearish market	-0.5
02-01-2012	FDI inflows up 36% in Jan-Oct	0

02-01-2012	QFIs need to meet KYC norms	0
02-01-2012	Bonds; equities better bet in the New Year	0.318182
02-01-2012	NRIs may pump in over \$10bn as rates rise	0
02-01-2012	A foreign individual can hold up to 5% in Indian co	-0.0625
02-01-2012	Foreigners can now invest directly in Indian stocks	0.1
02-01-2012	Happy new year for hiring: 5 lakh jobs likely in 2012	0.312121

There are many news headlines for one particular day, so after the summation of the sentiment score of all headlines for that particular day, we will get the sentiment of that day accordingly. Table for the same is shown below.

Table 5: Sentiment analysis according to date

Date	Sentiment score of day	Sentiment of day
02-01-2012	0.845887	Positive
03-01-2012	-0.77311	Negative
04-01-2012	2.475437	Positive
05-01-2012	-0.24156	Negative
06-01-2012	-0.65611	Negative
09-01-2012	1.274015	Positive
10-01-2012	2.338203	Positive
11-01-2012	-1.25833	Negative
12-01-2012	0.45796	Positive
13-01-2012	1.035227	Positive
16-01-2012	0.490902	Positive

After getting a sentiment of each line we are going to compare the sentiment of the particular day to the movement of the Index of respective market. If sentiment is positive and the market index has gone up on that day it means we have predicted correctly otherwise not.

Data of all the three indicators can be merged with the dataset of the news headlines, and after that accuracy can be calculated for each market indicators. If the market indicator is positive movement and sentiment of the day is also positive, we can give that score 1 and if the movement of both is in opposite direction, we can give score 0. Then we can calculate the number of 1 and it can be divided by total no. of days. Thus, we can get the accuracy.

By following this method accuracy for three of the markets can be determined, which are as follows.

Table 6: Accuracy of the analysis for three different markets

Sensex		S&P BSE India Agency Bond Index
USD/INR		
71%	53%	58%

Meaning of the above results are 71% of our time our decision in the Forex market will be supported by Sentiment of the day, 53% of time our decision in the Equity market will be supported by sentiment of the day and 58% of time our decision in the Bond market will be supported by sentiment of the day. By trusting this algorithm If one will trust to invest in any one market from above mentioned three markets, he/she won't suffer any loss. In trading of currency pair USD/INR one will find maximum amount of profit by trusting this algorithm and results.

Conclusion and Limitations

Conclusion

Do the news headlines have enough sentiments? Are they enough to make trading decisions? Results are showing that yes if one is trading USD/INR currency pair chances are that they will make correct decision 71 times out of 100 by using NLTK in python. Sor Sensex and Bond Index accuracy is around 53% and 58% respectively. For any trader if Win to loss ratio is more than 1 that trader is considered successful. As per the results Win to loss ratio can be achieved 2.44, 1.13, 1.38 for the USD/INR, Sensex and S&P BSE India Bond Index respectively.

So yes, News headlines have the sentiments for sure, do they affect the sentiments of people? yes, it is affecting and people are also reacting to news headlines that's why different market also moves according to sentiment of the day. Clearly this above statement can be justified by the results of accuracy of three different markets, which is clearly more than 50% in every case. This results sows how important fundamental analysis is for the traders, most of the retail investors act according to news headlines and fundamental analysis, they generally don't do technical analysis. Therefore, for this kind of analysis can help retail investors or part time investors. Retail investor will start reacting and supply and demand can be affected by that only. So, it is very evident that how important news headlines for the professional traders and retail investors also.

Limitations

In this study analysis has been done for three markets. In the Forex market USD/INR currency pair has been used. This currency can be affected Indian factors as well as American factors or indicators. However, here we have just used Indian News headlines from Times of India.

In this study our objective was to determine news headlines have sentiments or not, However, if one wants to do trading with their valuable money, one can also collect the data of whole news articles to get the better results than this. Whole articles contain way more information about that particular news headline and sometimes news headlines are sarcastic, this can be avoided in the case of full news articles.

Many investors focus more on some particular news, which is the right thing also. Some news headlines are important for the movement of the particular market. Other than sentiment some news headlines should also be given more weightage according to market. However, in this study we have given all the news headlines equal weightage.

Acknowledgements: Want to thank **Mr. Pratik J. Gandhi** for contributing in data analysis of this research paper.

Conflict of Interest: There is no conflict of interest.

Funding: NA

Ethical Approval: NA

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Appendix 1

Code in Python programming language to get Sentiments of each news headlines.

```
import csv  
  
import string  
  
import nltk
```

```
from nltk.corpus import stopwords

from nltk import word_tokenize

from textblob import TextBlob

from textblob.sentiments import NaiveBayesAnalyzer

nltk.download('punkt')

def write_to_file(data):

    with open('result.txt', 'a') as resfile:

        for row in data:

            resfile.write(str(row.sentiment.polarity) + "\n")

def main():

# open the news file in read mode

    with open('only.news.csv', 'r') as news_file:

        reader = csv.DictReader(news_file)

        data=[]

        for row in reader:

            news=row['News']

# remove stopwords and punctuations

    stop = stopwords.words('english') + list(string.punctuation)

    news = [i for i in word_tokenize(news.lower()) if i not in stop]

# combine everything back to string

    news = " ".join(news)

# using TextBlob for sentiment analysis

    res = TextBlob(news)

    data.append(res)

# Write it to the result file

    write_to_file(data)

if __name__ == '__main__':

    main()
```