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SOCIAL MEDIA AND THE STOCK MARKETS: AN EMERGING MARKET PERSPECTIVE

Diya Patel[1], Dr.P.Suvarchala Devi[2]

MBA2nd Year,Malla Reddy Engineering College for Women,
diyapatel0855@gmail.com-9491392855

HOD,Associate Professor,Malla Reddy Engineering College for Women,

suvvimrecw@gmail.com,8099439922

Abstract: Therearenumerousstudiesthathaveexploredtheimpactofsocialmediaonstockmarketperformance,butthereislittlesuchevidencefromemergingmarkets.Manymultinationalbanksandotherfinancialconglomeratesfromdevelopedcountriesarenowexpandingtheiroperationsintoemergingmarketsknownfortheirrapidgrowth.Companiesfromdevelopedcountriesprefertousesocialmediatoconnectwiththeirstakeholders.Thiscanbechallengingasemergingmarketsareverydifferentfromdevelopedmarketsintermsofinfrastructureandstockmarketdevelopment.Thestudyconductssentimentanalysisoftweetsabout IndiancompaniesincludedintheNifty50orindustryindicesoveraperiodof15months.GrangercausalitytestresultsshowthatTwittersentimenthasasignificantrelationshipwithindicesrelatedtobankingandfinancialsectorofIndianstockmarket.Impulseresponsefunctionresultsshowthattheimpactofnegativesentimentonindexreturnslastslongerthantheimpactofpositivesentiment.Thisstudywillhelpcompaniestoeffectivelyutilizesocialmediaforinformationsharinganddisseminationinnewenvironments.

Keywords:Emergingmarkets,Sentimentanalysis,Socialmedia,Twitter,Indianstockmarket,Marketefficiency,Impulseresponse.

Introduction

Nowadays, more and more people use various online news channels, blogs, virtual communities, social media networking websites such as Facebook and Twitter to stay updated on important events around the world and share their feelings and opinions on various expressive themes (Kapoor et al., 2017). The vast amount of data available on the Internet is used by companies to understand their stakeholders better and manage risks (Lahey, 2016). These vast amounts of information available on the Internet have attracted the attention of researchers in various ways, such as: B.: Researchers have analyzed the use of social media data by start-ups (Kim & Choi, 2019), investigated the role of social media in promoting joint initiatives in temporary project organizations (Rimkuninee & Zinkeviciute, 2014), investigated the application of social media in formulating marketing strategies (Ahmed et al., 2017; Klepek & Starjična, 2018), etc. Due to the ease of sharing information through social media, social media has now become a very popular communication channel. Researchers have studied various social media platforms such as Facebook (Siganos et al., 2014), Yahoo Messenger (Antweiler & Frank, 2004), and StockTwits (Oliveira et al., 2016) to determine their impact on stock market research. Twitter was chosen for this study because it is a popular social media platform for sharing financial information and trading systems based on Twitter are also popular among investors (Sprenger et al., 2014). There is ample evidence that public opinion expressed on Twitter has significant predictive power for the development of stock market indicators (e.g., He et al., 2016; Liu et al., 2015; Risius et al., 2015). However, researchers in this field have mainly studied developed markets, and developing markets have yet to be fully explored, given the spread of information through social media (Agarwal et al., 2019). Studies on developing countries have mainly focused on testing only weak forms of market efficiency (e.g., Mobarek & Fiorante, 2014). Since the degree of irrationality of investor behavior and stock market inefficiency varies across countries (Chui et al., 2010), it is essential to investigate stock market behavior in emerging markets in light of information available through social media. Stock markets in developing countries are still not fully developed compared to developed countries (Claessens & Yurtoglu, 2013). Twitter is a popular social media platform with 330 million active users worldwide (Clement, 2019). Information on Twitter has proven to have a significant impact on financial markets. For example, in 2013, the US market fell by almost 1% within three minutes of a hoax report of a White House bombing from a hacked Associated Press Twitter account, resulting in huge losses (Selyukh, 2013). Twitter is an important social media platform for India. While Twitter does not release official figures, Taranjit Sinha (Head of India Operations at Twitter) revealed in an interview that India was Twitter’s fastest growing market (in terms of daily active users) in 2017. India as a market on Twitter has grown almost five times the global average (Chaturvedi, 2017). Moreover, there is some evidence to suggest that information on Twitter can affect Indian investors and markets. For example, the Securities and Exchange Board of India [SEBI] has warned investment advisors not to use Twitter to give stock market advice to investors to protect their interests (SEBI, 2018). Recently, Singapore Exchange's Nifty futures fell 200 points following Iran's missile attack on US military, but recovered 100 points after the US President's tweet curbed the possibility of escalating tensions between the US and Iran (ETMarkets.com, 2020). Moreover, India's Nifty stocks closed 1.58% higher following the US President's Twitter response (George, 2020).

The following are the main contributions of this article to the existing literature: a. We provide a comprehensive overview of how Twitter information impacts stock markets in developing countries using evidence from India. b. To the best of our knowledge, this is the first time to investigate the impact of Twitter sentiment on broad market indexes and indices of different sectors of a country's economy. c. We study the impact of positive and negative sentiments on stock markets (broad market index and sectoral indexes) of developing countries. In this study, sentiment analysis was conducted using VADER on tweets about Indian companies that are part of the Nifty50 national broad market index and 11 other industry indexes of the Indian economy. This tool is specifically designed to capture sentiment (expressed through emoticons, acronyms, and abbreviations) in a

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microblogging-like context. Further, each tweet is classified as positive or negative. Stock market data was used for the same indexes. Various statistical tests are then performed to determine the relationship between Twitter sentiment and stock market indices. The results were confirmed using a vocabulary-based sentiment analysis approach. This paper is divided into six sections. Section 1 describes the literature available in the field and highlights gaps in the existing literature. Section 2 describes the data and methodology used for the sentiment analysis and stock market indices calculations used in this paper. Section 3 presents the results of contemporaneous correlation and Granger causality between Indian stock market index and Twitter sentiment. Section 4 details the impact of the impulse response function on Twitter used in the empirical analysis and explains how this affects the results obtained. Section 5 tests the robustness of the sentiment analysis process and results. Section 6 discusses the results of the paper with practical implications and suggestions for future research. The last section concludes the study.

1. Literaturereview

The efficient market hypothesis states that stock prices cannot be predicted because they already fully reflect all relevant market information (Fama, 1965). However, this theory has been modified to introduce three levels of market efficiency based on the "relevant information" that should be reflected in the market price of a stock: moderate efficiency (all public information) and strong efficiency (all relevant public and private information) (Malkiel and Fama, 1970).

In the era of big data, using social media information to predict stock prices has been widely studied. Many researchers have investigated the role of Twitter information in financial markets (e.g., Bollen et al., 2011; Tetlock, 2007). Zherdev et al. (2014) showed that positive and negative sentiments can be extracted from Twitter and significantly predict the future price of the S&P500 index. Studies have shown that negative sentiments expressed on Twitter have a significant impact on company-specific stock prices (He et al., 2016; Risius et al., 2015). Liu et al. (2015) Identify homogeneous groups Analyze stock prices of companies whose stock prices fluctuate based on Twitter-based metrics such as number of tweets and number of followers. The Daily Happiness Index (created by sentiment analysis of 10% of all Twitter messages) is widely used to examine the impact of social media on financial markets. Zhang et al. (2016) find that online sentiment derived from the Twitter Happiness Index has significant predictive power for stock market performance metrics (index returns and range-based volatility) across 11 developed countries. (2017) investigated the relationship between stock markets and the Twitter Happiness Index in 10 developed countries. The authors found that high-returning stocks were more affected by investor sentiment than low-returning stocks. Recently, Zhang et al. (2018) investigated the impact of Twitter sentiment on index returns in 40 countries across four regions: the Americas, Europe, Asia Pacific, and the Middle East and North Africa. They observed the interaction between online activity on Twitter and stock market trends. Leitch and Sherif (2017) developed a Twitter

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sentiment score to predict corporate stock returns, and many recent studies have also found that user-generated content on social media has a significant impact on stock market movements (Fan et al., 2020a, 2020b; van Dieijen et al., 2020).

According to the World Federation of Exchanges (WFE), the National Stock Exchange of India (NSE) was the second-largest stock exchange in the world by stock trading volume in 2018 (National Stock Exchange [NSE], 2019). (2015) demonstrated techniques that can be used for sentiment analysis of live server data from Indian stock exchanges; however, none of these techniques were implemented in the study. An event study collected tweets about demonetization, a major event in the Indian economy, and investigated whether public sentiment expressed on Twitter influenced the movement of the Indian stock market (Mohan & Kar, 2017), but found no significant relationship. Nayak et al. (2016) attempted to predict the Indian stock market based on Twitter sentiment using the machine learning technique Support Vector Machine. However, they did not discuss the statistical significance of the results. No previous studies have compared the impact of negative and positive public opinion expressed on Twitter on the Indian stock market. Several other studies have shown that information from the Internet does not have significant predictive power for investor sentiment. b. Kim and Kim (2014), who used messages posted on the Yahoo Finance message board. The sentiment of the messages used in this study was classified into one of five categories that the message board explicitly offered to retail investors: “strong buy”, “buy”, “hold”, “strong sell”, and “sell”.

This study seeks to answer the research question: How does the information over Twit-ter influence the Indian stock markets? For this, the following hypothesis are proposed asshowninTable1.

Table1.Tableofhypotheses

H_1	There is norelation between returnsof NIFTY50 and positiveTwitter Sentiment.
H_2	There is norelation betweenreturns of indexNifty Autoand positiveTwitter Sentiment.
H_3	ThereisnorelationbetweenreturnsofindexNiftyPharmaandpositiveTwitterSenti ment.
H_4	There is no relationbetween returns of indexNifty Bank andpositive Twitter Sentiment.
H_5	There is no relation between returns of index Nifty PSU Bank and positive TwitterSentiment.
H_6	There is no relation between returns of index Nifty Private Bank and positive TwitterSentiment.
H_7	Thereisno relationbetweenreturns ofindexNifty Realtyandpositive TwitterSentiment.
H_8	There is norelation between returnsof index NiftyFMCG and positiveTwitter Sentiment.

H_9	There isnorelationbetweenthereturnsofindexNiftyMediaandpositiveTwitterSentiment.
H_{10}	There is norelation betweenthe returnsof indexNifty Metals andpositive TwitterSentiment.
H_{11}	ThereisnorelationbetweenthereturnsofindexNiftyITandpositiveTwitterSentiment.
H_{12}	There is no relationbetween the returnsof index NiftyFinancial Services andpositiveTwitterSentiment.
H_{13}	There isnorelationbetween returnsofNIFTY50 andthenegative TwitterSentiment.
H_{14}	There is no relation between returns of index Nifty Auto and negative TwitterSentiment.
H_{15}	ThereisnorelationbetweenreturnsofindexNiftyPharmaandnegativeTwitterSenti ment.
H_{16}	Thereis no relation between returns of index Nifty Bank and negative Twitter Sentiment.
H_{17}	There is no relation between returns of index Nifty PSU Bank and negative TwitterSentiment.
H_{18}	There is no relation between returns of index Nifty Private Bank and negative TwitterSentiment.
H_{19}	ThereisnorelationbetweenreturnsofindexNiftyRealtyandnegativeTwitterSentiment.
H_{20}	There is no relation between returns of index Nifty FMCG and negative TwitterSentiment.
H_{21}	There is no relation between returns of indexNifty Media and negative Twitter Sentiment.
H_{22}	Thereis norelation between returnsof index NiftyMetals and negativeTwitter Sentiment.
H_{23}	ThereisnorelationbetweenthereturnsofindexNiftyITandnegativeTwitterSentiment.
H_{24}	here isnorelationbetweenthereturnsofindexNiftyFinancialServicesandnegativeTwitterSent iment.

Data andmethodology

This paper investigates relationship between the information on the Twitter and the Indianstock markets. This study extracts two different kind of information

Collectionofsocial mediadata

The daily stock market data is collected from the NSE website (NSE, 2019). All the marketindices are rebalanced semi-annually and additional reconstitution of the indices also takesplace in case any of

from the twitter: a)optimistic public sentiments, b) pessimistic public sentiments. The daily Twitter data andthe stock market data has been collected for the period of 15 months (i.e. 1, Aug 2017 to 10,Nov2018).

the constituent companies undergoes a scheme of arrangement for cor-porateeventssuchasmerger,suspension,spin-off,etc.TheTwitterdataaswellasthestockmarket data has been collected carefully, taking care of all the

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inclusions/exclusions done intheindicesduringthesampleperiod.

Collectionofstockmarketdata

The NSE website provides daily stock market statistics (NSE, 2019). Half-yearly rebalancing of all market indices takes place, and extra reconstitutions of the index also happen if any of the covered firms go through an adjustment program for corporate events like spin-offs, suspensions, or mergers. With careful consideration to all inclusions and exclusions in the indexes produced throughout the sample period, data from Twitter and the stock market were gathered. Other well-known online sources of social media information, such Facebook, Instagram, and Snapchat, are excluded from this analysis for three reasons, whereas the Twitter platform was especially chosen for it. As a result of limitations put in place after the Cambridge Analytica controversy early in 2018, data cannot be downloaded from Facebook (Gonzalez, 2018). Furthermore, prior research has indicated that viewpoints shared on Facebook, Twitter, and stock discussion boards

Analysisandresults

Contemporaneouscorrelation

This section explores the contemporaneous effect of public sentiments as expressed on theTwitter on the Indian equity market indicators. The results of the same have been depictedinTables2and3

.

Table2.KendallcorrelationcoefficientsbetweenAvg_PosandIndianStockmarketindicators

Index	StockMarketIndicators	
	Ret	Rv
NiftyAuto	.043	–.002
NIFTYBank	–.021	–.006
NIFTYFinancialService s	–.021	.192* *
NIFTYFMCG	.002	.048
NIFTYIT	–.031	.015
NIFTYMedia	.026	.028
NIFTYMetals	–.013	–.013
NIFTYPharma	–.064	.036
NIFTYPSUBANK	–.038	–.019
NIFTYPvtBank	.002	.228* *
NIFTYRealty	–.076	.028
NIFTY50	.050	.166* *

Table3.KendallcorrelationcoefficientsbetweenAvg_NegandIndianStockmarketindicators

International Journal For Advanced Research In Science & Technology
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IJARST
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Index	StockMarketIndicators	
	Ret	Rv
NiftyAuto	–.058	.023
NIFTYBank	–.001	.193**
NIFTYFinancialServices	–.043	–.024
NIFTYFMCG	–.042	–.013
NIFTYIT	.037	.051
NIFTYMedia	–.059	–.033
NIFTYMetals	–.112*	–.008
NIFTYPharma	.047	–.114*
NIFTYPSUBANK	.060	–.037
NIFTYPvtBank	.110*	.017
NIFTYRealty	.082	–.007
NIFTY50	–.011	.026

Table2andTable3clearlyshowthatthe correlationbetweenthereturnsfromtheNifty50and the Twitter sentiments is insignificant. The returns for the Metals and the Private Bankssector are also found to be correlated to the negative sentiments derived from the Twittermessages.Hencewefailtoacceptthe hypothesisH_{18}andH_{22}.

Table4.TabledepictstheoutcomeoftheGranger-causalitytestbetweenthe*Open-to-closereturns*andthesentimentindicators *Avg_Neg*and*Avg_Pos*.Thetabledisplays theF-statisticsandthecriticalvaluesareputintheparenthesis.*representsthestatisticalsignificanceat5%level

Index	Null: Avg_Posdoes notcauseRet	Null: Ret does notcauseAvg_Pos	Null: Avg_Negdoes notcauseRet	Null: Ret does notcauseAvg_Neg
NIFTYAuto	(3.095)3.906	(2.0252)3.906	(0.290)3.906	(1.2216)3.906
NIFTYBank	(4.645)*3.906	(2.0007)3.906	(5.628)*3.906	(2.1253)3.906
NIFTY FinancialServices	(4.303)*3.906	(0.1333)3.906	(6.233)*3.906	(3.534)3.906
NIFTYFMCG	(3.011)3.90	(0.4527)3.90	(1.017)3.90	(2.1504)3.90

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	6	6	6	6
NIFTYIT	(0.1807)3.906	(0.6324)3.906	(0.192)3.906	(1.1083)3.906
NIFTYMedia	(5.538)*3.906	(1.27)3.906	(2.316)3.906	(2.6826)3.906
NIFTYMetal	(2.998)3.906	(1.6235)3.906	(2.201)3.906	(1.1670)3.906
NIFTYPharma	(1.9424)3.906	(0.1088)3.906	(1.665)3.906	(0.3402)3.906
NIFTYPSUBank	(2.112)3.906	(0.0948)3.906	(2.253)3.906	(5.2236)*3.906
NIFTYPrivate Bank	(4.721)*3.906	(0.9989)3.906	(4.838)*3.906	(1.786)3.906
NIFTYRealty	(0.787)3.906	(1.6672)3.906	(0.880)3.906	(0.2265)3.906
NIFTY50	(2.931)3.906	(0.6998)3.906	(1.0680)3.906	(0.7180)3.906

Table 5. The table depicts the outcome from the Granger-causality test between the volatility (Range-based) and the positive and negative sentiment indicators. The tables shows the F-statistics and valuesin theparanthesisare thecritical.**represents thestatisticalsignificanceat 1%level

Index	Null: Avg_Posdoes not causeRange_v	Null: Range_vdoes not causeAvg_Pos	Null: Avg_Negdoesnotcause Range_v	Null: Range_vdoes not causeAvg_Neg
NIFTYAuto	(1.544)3.906	(7.2785)** 6.803	(0.303)3.906	(1.4133)3.906
NIFTYBank	(0.572)3.906	(0.3952)3.906	(0.0614)3.906	(1.9452)3.906
NIFTY FinancialServices	(0.0085)3.906	(0.0162)3.906	(0.00502)3.906	(3.664)3.906
NIFTYFMCG	(0.258)3.906	(1.5992)3.906	(0.283)3.906	(1.0615)3.906
NIFTY IT	(6.949)3.906	(0.4421)3.906	(1.168)3.906	(0.001)3.906
NIFTYMedia	(1.4404)3.906	(1.3720)3.906	(0.491)3.906	(1.6385)3.906

NIFTYMetal	(1.842)3.906	(1.6222)3.906	(1.555)3.906	(2.3322)3.906
NIFTYPharma	(0.5576)3.906	(0.1501)3.906	(2.763)3.906	(0.4744)3.906
NIFTYPSUBank	(1.712)3.906	(0.1833)3.906	(0.779)3.906	(2.4894)3.906
NIFTYPrivate Bank	(0.444)3.906	(2.6658)3.906	(0.492)3.906	(1.852)3.906
NIFTYRealty	(2.172)3.906	(6.7960)3.906	(1.629)3.906	(2.6142)3.906
NIFTY50	(0.215)3.906	(0.0106)3.906	(0.0910)3.906	(1.8157)3.906

2. Impulseresponse

TheImpulseResponseFunction(IRF)isusedtoexaminetheresponseofavariableto aunit shock (one standard deviation) in another variable. To assess the influence of the Twit-ter information on the returns from the Indian equity markets, IRFs are computed on thebasisoftheVAR(VectorAutoRegression)systemparameters.FollowingDengetal.(2018)IRFs have been used in this study, to perform a detailed sector analysis and look deeper intostudying the influence of twitter on the equity markets over time. Following (Trusov et al.,2008), the IRFs are shown graphically so as to get a visual impression of the dynamic inter-relationships among the stock market returns and the public sentiment indicators derivedfromtheTwitterforthesectorialindicesNIFTYPrivateBank,NIFTYFinancialservicesandNIFTY Bank. These sectors are specifically chosen as it is evident from the Table 5 that theoptimistic and the pessimistic public sentiments can granger-cause the returns of the secto-rial indices related to the banking and financial services industry i.e. NIFTY Bank, NIFTYFinancialServices,andtheNIFTY PrivateBank.Othersectorscannotbeanalyzedusing IRFsbecause there is no evidence of causalty between their returns and the Twitter information.TheresultsaredisplayedinTable6(Figure1toFigure6).Othersectorscannotbeanalyzed Table6.ThistableshowsthegraphicalrepresentationoftheIRFsappliedtodynamicinterrelationshipsamong the stock market returns and the public sentiment indicators derived from the Twitter for thesectorialindicesNIFTYPrivateBank, NIFTYFinancialservicesandNIFTYBank

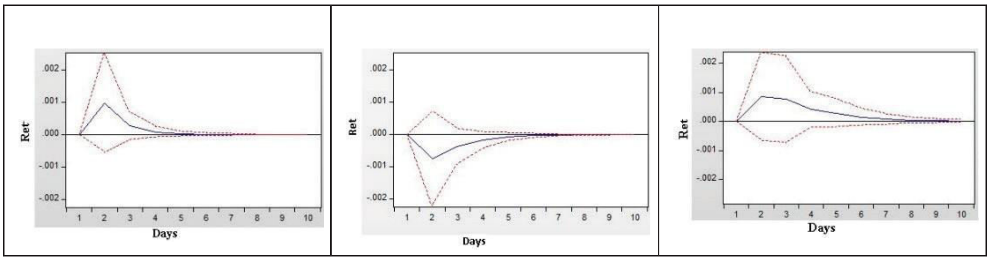

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Figure1.DepictstheresponseofRet to a unit shock in Avg_Pos,computed for the index NIFTYPrivateBank	Figure2.DepictstheresponseofRet to a unit shock in Avg_Neg,computed for the index NIFTYPrivateBank	Figure3.DepictstheresponseofRet to a unit shock in Avg_Pos,computed for the index NIFTYFinancialservices
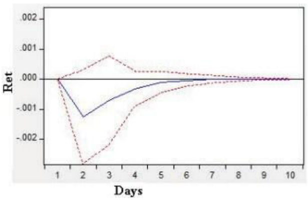	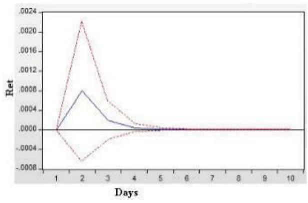	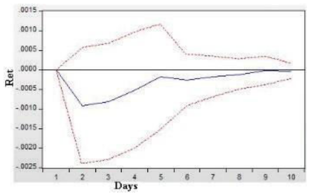
Figure4.DepictstheresponseofRet to a unit shock in Avg_Neg,computed for the index NIFTYFinancialServices	Figure5.DepictstheresponseofRet to a unit shock in Avg_Pos,computed for the index NIFTYBank	Figure6.DepictstheresponseofRet to a unit shock in Avg_Neg,computed for the index NIFTYBank

using IRFs because there is no evidence of causalty between their returns and the Twitterinformation.

Itisobservedinsection4.b.thatthemovementoftheindicesrelatedtothebankingand financial services sectors is significantly influenced by the public sentiments (either theoptimisticorthepessimistic)expressedontheTwitter.TheIRFshelpinproviding adetailedsector analysis. A comparison based on the influence of the positive and the negative senti-ments on the returns, is provided in Figure 1 to Figure 6. The sectors NIFTY Private Bank,NIFTY Financial services and NIFTY Bank are chosen for making the comparisons. Thestock market returns (Ret) for the sectors and the sentiment indicators (both positive andnegative) have been confirmed for the stationarity properties (through the ADF and KPSStest).

Figure 1 and Figure 2 show that the impact of the positive and the negative sentimentson the returns of the NIFTY Private Bank is significantly different from zero only for a pe-riod of 3 days and 4 days, respectively. The Figure 3 and Figure 4 suggest that the impact ofthe positive and the negative sentiments on the returns of the NIFTY Financial services issignificantforaperiodof6daysand4days,respectively.Theimpactofthepositiveandthenegative sentiments on the returns of the NIFTY Bank is observed for a period of 3 and 8daysrespectively,asshownintheFigure 5andFigure6.

Kendall correlations, which quantify the contemporaneous effect of the polarity scoresonthestockmarketindicatorsarecalculatedforNifty50andeachofthe11sectorialindices.Table7providestheresults.TheresultsconfirmourpreviousresultS(usingVADER)thatthesentimentsextractedusingthefinancialcontextdictionarydonotexhibitanysignificantcor-

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relationwiththestockmarketindicators.ButthesectorialindexofNIFTYFinancialServicesexhibits asmallbutsignificantcorrelationwiththe publicsentiments expressedonTwitter.

Table7.Kendallcorrelationcoefficients.*representsthestatisticalsignificanceat5%level

Index	Ret	Range _v
NIFTYAuto	0.119	0.065
NIFTYBank	–0.084	0.119
NIFTYFMCG	–0.067	–0.012
NIFTYFinancialServices	–0.133*	0.041
NIFTYIT	0.072	–0.050
NIFTYMedia	–0.066	–0.093
NIFTYMetal	–0.019	0.068
NIFTYPharma	–0.092	0.129
NIFTYPSUBank	–0.075	0.108
NIFTYPrivateBank	–0.058	0.032
NIFTYRealty	–0.021	0.065
NIFTY50	–0.081	0.008

Discussion

The present paper investigates in detail how the Twitter information influences the perfor-manceoftheequitymarketsofadevelopingeconomy,withtheevidencesfromIndian stockmarkets. VADER sentiment Analyzer has been used to extract the optimistic and the pes-simisticpublicsentimentsfromtheTwitterdata.

The findings of this paper reveal that the impact of the Twitter information on the per-formanceofthebroadindicesoftheIndian equitymarketsisnotsignificant.Therobus tnessoftheresultshasbeenconfirmedbyusinganotheralgorithm(Loughran&Mcdonald,2011)for the sentiment analysis. This suggests that the results are indifferent towards the use ofdifferent sentiment analysis techniques and there exists no significant correlation betweenthe Twitter sentiments and the broad market indices (Nifty 50) of the Indian stock markets.Thismightbeattributedtothefact thatinthedevelopingcountries,theuseofInforma-tion and Communication Technologies, especially the social media platforms is still in theemergingstateascomparedtothedevelopedcountries(Ilavarasanetal.,2018).Someofthereasons attributed to it are the affordability of devices, differential penetration rates, regula-toryframework,etc.

This paper also explores the influence of Twitter information on the various economicsectorialindicesoftheIndianeconomy.Theresultsshowthatthesectorialindicesrelatedto the bank and financial sector (NIFTY Private Bank, NIFTY Financial services, and NIFTYBank) show a small but significant relationship with the Twitter information. A small butsignificantcorrelationbetweentheNIFTYFinancialservicesandtheTwittersentimentsis also confirmed using the financial context lexicon (Loughran & Mcdonald, 2011). TheGrangercausalitytestsalsorevealthe bi-directionalcausalitybetweenthereturnsfromthesesectorial indices and the positive and negative sentiments on the Twitter. The impulse re-sponse function indicates that the influence of the negative information on the stock marketreturns,persistsforalongerperiod ascomparedtotheinfluenceofthepositive information.Theresultsobtainedareinterestingsinceonly Bankingandfinancialindustrystockshavea significant relationship with Twitter sentiment, unlike other markets where all sectors areinfluenced by social networks' sentiment. The emerging economies offer attractive marketsto the businesses in the developed economies, but they are still in the developing stage. Thebusiness strategies that work in the developed countries (such as using social media for in-formation dissemination) might not be as successful in the developing countries (Ilavarasanetal.,2018).

Thisstudyprovidesanswerstotheresearchquestionraisedinthisstudy.Thecorrelationcoefficients in Table 2 and Table 3 clearly show that the Twitter information has no signifi-cant influence on the NIFTY50. However, the Metals and the Private Banks sectors' returnsare found to be significantly correlated to the negative sentiments derived from the Twitterinformation. Similarly, the results from the granger causalty tests suggest that the positiveandnegativepublicopinionsonTwittercancausethereturnsofthesectorialindicesNIFTYBank,NIFTYFinancialServices,andtheNIFTYPrivateBankonly.Hencewefailtoacceptthe hypotheses H_4, H_6, H_{12}, H_{16}, H_{18}, H_{22}, and H_{24}. On the basis of these results, the answerto the research question would be that the Twitter information influences Indian stock mar-ket to some degree and the impact of positive and negative sentiments differs in lag as wellastheparticularindexesitinfluences.

SincetheresultsfromtheBankingandFinancialservicessectorshowthatthereexistsa significant relationship between the social media information and their stock market per-formance, indices related to these sectors are analyzed further for quantifying such effects.ThereforeIRFshavebeenusedfor furtheranalysis.TheresultsdepictedbytheIRFsanswerthe research question raised by the hypothesis H_3 in detail. It is clearly suggested (as shownin the Figure 1 to Figure 6) that in the sectors NIFTY Private Bank and NIFTY Bank, theinfluence of the pessimistic sentiments on the stock market performance lingers for a longerperiod of time as compared to the influence of the optimistic sentiments. So, the paper isinteresting because of its results and also because it is the first paper that analyses the im-pact of Twitter on the various economic sectors of Indian markets. This study also providesfurtherevidencestosuggestthattherateofadoptionofsocialmediainformationisdifferentfordifferenteconomicsectors.

Researchimplications

Thisresearchhasbothpracticalandtheoreticalimplications.Mostoftheresearchthat inves-tigatestheassociationbetweentheInternetinformationandstockmarketsisconcentrated on the developed countries (Agarwal et al., 2019). This may be attributed to the fact that thedeveloping economies pose an entirely different set of challenges e.g. stock markets of theemergingeconomiesarenotfullydeveloped(Claessens&Yurtoglu,2013).Thisstudyshowsthat the Indian stock markets are not efficient with regards to the information available ontwitter. It shows that the information on the internet does not get automatically reflected inthe stock prices. Some possible reasons for this might be that the accessibility/affordabilityof the devices is still an issue. It also shows that the informational efficiency with respect totheinformationoverthesocialmedia,is quitedifferentforthedifferenteconomicsectors.It also provides information as to how the positive and negative information impacts thevarioussectorsofacountry.

This study also has some managerial implications. The business managers can focus onspecialized media channels to reach out to various stakeholders as the mass communica-tion channels (popular social media) do not seem to have any significant influence on thebroadmarketindices.ThispaperalsosuggeststhatthesocialmediaadoptionrateforNIFTYPrivate Bank and NIFTY Bank is higher than other sectors. Therefore, the business manag-ers or the social media mangers might consider using Twitter to disseminate more positiveinformation and limit the negative content to build a positive image and thus use Twitter asan effective channel to reach out to their potential investors in two sectors (NIFTY PrivateBankandNIFTYBank).

Conclusions

The paper concludes that the Twitter information has an exceedingly small but significantrelationshipwiththestockmark

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etperformanceofthesectorialindicesrelatedtotheBankingand Financial services, in the developing countries. This also reveals that the social mediacanbeusedasaneffectivetoolfordisseminatingusefulinformationtotheinvestorsinthesesectors. These new mass media channels might also be considered for retail marketing andrelationship building with the retail customers. However, this relationship is not present inthe other economic sectors as well as the over market index (Nifty50). This study empha-sizes a need to investigate and collect concrete evidences to understand the reasons behindthis. The results indicate that the negative twitter content has a long-lasting effect on thestockmarketsthanthepositivecontent. Thissuggeststhatthesocialmediamanagersshouldcarefully monitor their social media content for any negative content. Also, future researchshould focus on examining the reasons for the insignificant correlation between the overallperformance of the market and the social media content through a detailed analysis of thetradingbehavioroftheretailinvestorsinthedevelopingcountries.Thebehavioralaspectsof using social media information by the investors still need to be explored. Future studiescan also explore whether there is any inclination towards the country-specific informationchannelsontheinternet.Forthis,thefinancialmarketsoftheotherdevelopingcountriesandtheinformationavailableontheirhomegrownsocialmediaplatformscanbestudied.

The findings of this research have a few limitations too. Firstly, it is limited to the studyof the Indian stock markets. The stock markets of the other emerging economies might alsobeexplored.Secondly,itonlyexplorest hesubjectthroughamacrolevelstudyandadetailed

study at the micro level might help to understand the behavior of the stock markets of theemerging economies in light of the information available on the social media. Finally, thisstudyislimitedtotheinformationavailableontheTwitterwhileothermediachannelscouldalsobeexploredinfuturestudies.
Further research could attempt to enlighten us on the underlying reasons to understandwhythestockmarketsoftheemergingeconomiesbehavedifferentlyfromthestockmarketsof the developed countries. A study gathering the viewpoints of the investors regarding theinformation available through the social media might also help in furthering the knowledgeinthisfield.FuturestudiescanalsoexplorewhetherthereisapreferenceforthehomegrownsocialmediaplatformsovertheglobalIypopularsocialmediaplatformsamongthe investors.This study focuses only on the equity markets, while other financial markets such as deriva-tivesmarketscanalsobeincludedinfurtherstudies.Astudycomprisingofacomparisonof the influence of information from different social media platforms on different financialmarketscanbedoneinfutureresearch

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