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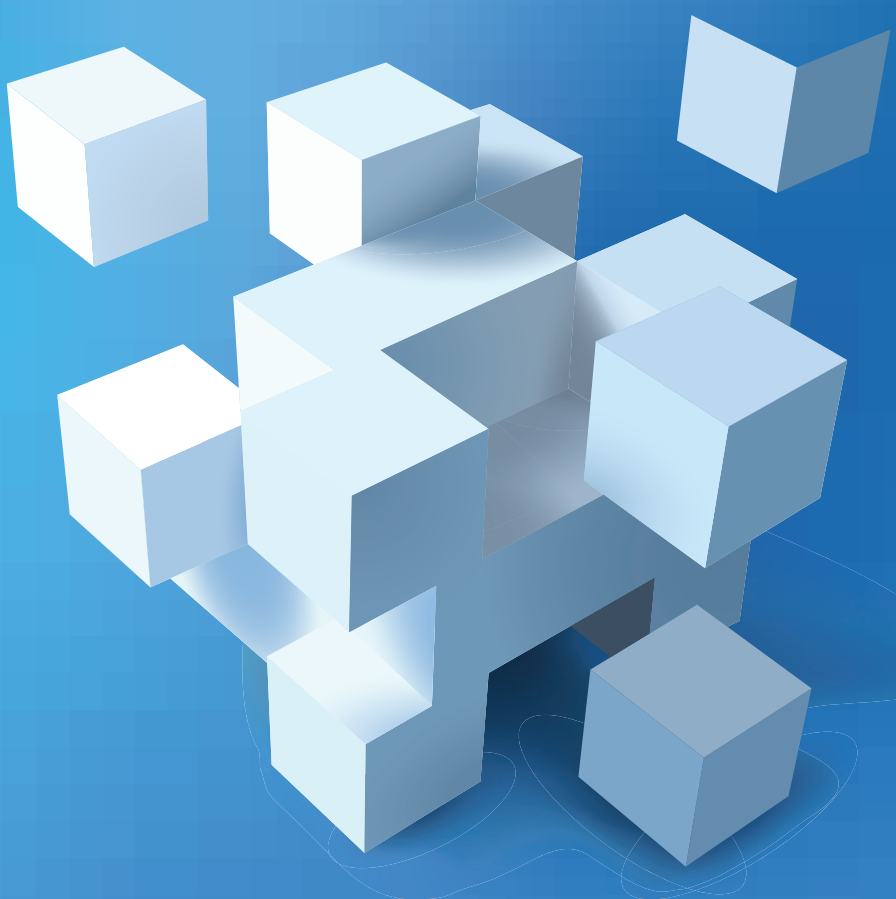

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About the Journal

Recognizing the need for research for exploring new business models in the changing business scenario as well as developing new pedagogy in management, and for creating an influence on the academics as well as corporate thinkers, the institute embarked upon publication of its journal, *Review of Professional Management: A Journal of Management*, way back in 2003 and has been published regularly ever since. The Editorial Advisory Board of the journal comprises of eminent academics from universities and business schools of the USA, Germany, Canada, Malaysia, Mexico, Brazil, besides India. It is a biannual peer-reviewed journal. It is an open access journal and all the publications of the journal are licensed under Creative Commons. The journal follows guidelines on publication ethics in accordance with The Committee on Publication Ethics (COPE).

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Aims and Scope

Review of Professional Management: A Journal of Management, a bi-annual peer-reviewed journal of New Delhi Institute of Management, provides a platform to academics, researchers, practitioners, and professionals from public, private and government sectors to share their original research, innovative practices and articles with Indian and international perspective that shape policy or governance or functioning of an organisation. The journal publishes conceptual, analytical, empirical, and perspective articles that significantly contribute to theory, practice or policymaking in all the functional areas of management and allied subjects.

The journal contains articles in the following functional areas of management:

- General Management
- Financial Management and Banking
- Organizational Behaviour and Human Resource Management
- Macroeconomic Issues and Business Environment
- International Business Management
- Marketing and e-commerce
- Operations Management
- Innovation and Entrepreneurship
- Socio-economic Issues: Health and Education

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Review of Professional Management: A Journal of Management

Contents

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From Crises to Transformative Change

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The past two years have witnessed unprecedented disruption impacting the world economies. While pandemic affected supply chain and trade of goods, the lockdown and severe waves of the pandemic in some countries had spillover effect on imports from their trading partners. While trade in goods bounced back quite rapidly, tourism, hospitality and other firms in the service sector were adversely affected and are still sluggish. This combined with the recent war has led to multiple challenges, such as price rise and fiscal deficit, and thereby slowing down of GDP of the economies across the globe, including India which was projected as the fastest growing economy in 2021. According to IMF, 'Global growth is projected to slow from an estimated 6.1 percent in 2021 to 3.6 percent in 2022 and 2023'.[1] However, governments of various countries have been taking a variety of measures, and those with stronger fundamentals are expected to gradually bounce back.

Another issue that deserves urgent attention is climate action for ambitious climate goals along with other Sustainable Development Goals (SDGs). Climate change is pivotal as it affects weather conditions causing heat waves, droughts, floods and tropical cyclones, affecting life and livelihood, economy, health and well-being of communities. 'Climate change presents a grave threat to macroeconomic and financial stability', posits IMF.[2] India had introduced a National Action Plan on Climate Change in 2008 with eight National Missions to focus on the country's climate priorities. With a view to assessing India's performance towards the Goal of Climate Action, five indicators have been identified at the national level which cover two out of the five SDG targets for 2030 set under SDG 13 on climate action.

NITI Aayog, India's nodal body, has been overseeing the movement of states and union territories towards 2030 agenda. Ministry of Statistics and Programme Implementation has developed the National Indicator Framework, comprising 306 statistical indicators, for monitoring of SDGs at the national level. A dashboard has been prepared which presents the performance of each state/union territory on each SDG along with a composite SDG score. The index helps in identifying critical gaps and facilitates adoption of appropriate actions to accelerate progress towards achieving the SDGs. Budget allocations have been done, and NITI Aayog has released a medium term 7-year strategy document in the form of 'Strategy for New India @ 75'.

Another change in this direction is that Securities and Exchange Board of India requires firms to submit Business Responsibility and Sustainability Report with effect from 2023 to bring in greater transparency through disclosure of environmental, social, and governance-related information.

The pandemic has given rise to transformative changes and innovations at work level: cutting-edge tech solutions involving AI, ML, VR, e-commerce and business models, COVID vaccine, unicorn entrepreneurship, online working, work from home, hybrid working, webinars, global video conferencing; as well as at individual level such as agility, self-reflection and self-reliance [*atmanirbharta*] which intertwine for organisational and individual effectiveness.

Notes

1. https://www.imf.org/en/Publications/WEO/Issues/2022/04/19/world-economic-outlook-april-2022
2. Kristalina Georgieva, https://blogs.imf.org/2021/10/31/not-yet-on-track-for-net-zero-climate-threats-demands-more-ambitious-global-action/

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Circular Economy-driven Sustainability Adoption Practices in the Food Supply Chain: An Analysis of Managerial Perceptions

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Tribhuvan Nath[1], Shrestha[2] and Priya Sharma[3]

Abstract

The circular economy has emerged as a new paradigm for sustainability. The 'take-make-reutilise' concept of the circular model is considered to be far more superior to the traditional 'take-make-dispose' linear model. The concepts of circular economy and sustainability are closely related; the circular economy is considered a driver to more sustainable business. Our existing global food system is highly unsustainable. Roughly, one-third of the total food produced gets lost or waste at different stages of food supply chain. Further, the agriculture sector is also a victim of and a major contributor to climate change. Hence, our food system is in urgent need of transformation from the existing unsustainable to be made more sustainable and healthier. So, it is critically important to adopt circular economy-driven sustainability practices in the food industry and its supply chain. While there have been many studies in the past which built conceptual knowledge on the circular economy and sustainable food business practices, rarely any study attempts to investigate the perception of food business managers/executives by integrating both concepts.

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The article analyses the circular-economy driven sustainability adoption practices in the food supply chain. Based on the survey of managers and business executives of 26 selected food companies in India, the study investigates the managerial perception on sustainability adoption practices in food supply chain. The findings indicate that food business managers and executives believe that adoption of sustainable practices is extremely important for food business sustainability. However, their sustainability adoption practices were found to be on moderate level across the food supply chain. The major recommendation is that the government should take the proactive approach to educate the agri-food industry particularly the traditional food enterprises including SMEs about the benefits of the adoption of circular economy and sustainability approaches. Policy-based initiatives are required to develop the enabling conditions in terms of provision of necessary infrastructure, delivering technical-know, promoting innovations and extending the financial support for successful adoption of circular economy-driven sustainability practices by agri-food sector and its supply chain.

Keywords

Food production, sustainable production, food supply chain, circular economy, managerial perceptions, sustainability in emerging markets

Introduction

The world has made spectacular progress in every aspect of human wellbeing; unfortunately, the fundamental problem of hunger still exists in the scientific-driven world of today. Agricultural science has made tremendous progress in terms of increasing productivity and overall food production as the world currently producing 4 billion metric tonne of food per year yet some 690 million people regularly go to bed hungry (FAO, 2011, 2020). Of the total global food production, about one-third i.e., 1.3 billion tonne of food worth about $750 billion gets lost or wasted each year (FAO, 2013). Clearly, hunger is not a production issue rather it is a logistics issue. Food distribution is different from the distribution of other consumer goods due to perishable nature of food. Unlike other goods, foods undergo quality deterioration caused by spoilage throughout the food supply chain, until the final consumption (Akkerman et al., 2010). Shorter shelf lives of food products, high customer expectations and low-profit margins are some important challenges which characterise the food supply chain. Due to these characteristics, the topic of food supply chain has received a lot of attention from academia and the industry alike in the areas of food quality and safety. But research on food supply chain sustainability has gained momentum only in the last few decades (Ahi & Searcy, 2013). Sustainability commonly refers to how needs of the current generation could be met without compromising the needs of the future generation. It has three dimensions—economic, environmental and social. Environmental sustainability is one of the major challenges the supply chains face today. The role of environmental sustainability is more prominent in the food distribution systems as the food and agricultural commodities are perishable in

nature due to which there are heavy food losses or wastages. The food wastage occurring in the supply chain is particularly high in developing economies like India where almost 40% of the food is wasted in comparison to the developed economies where about 33% of the food is lost in the supply chain (Bordoloi, 2016; FAO, 2011; Kaza et al., 2018). This food wastage can be accounted to the limited and inefficient use of the resources, poor business operations management and lack of knowledge on environmental sustainability (Birthal et al., 2005; Parwez, 2013). Therefore, minimisation of food wastage is an important step which food industries can take in order to make their supply chain sustainable and also profitable. Sustainable supply chains also have the potential to improve products, processes, meet customer demands in a better way and thus adding more value to the business (Camilleri, 2017). A sustainable business operation involves green practices that aim to reduce their environmental footprint, efficient use of resources and cut down on waste (Ahmad, 2015).

In order to fully utilise resources and minimise the waste, food industries are transforming from linear supply chain model to a circular one (Genovese et al., 2017). A circular economy is modern economic system of closed loops in which materials and resources retain their maximum value over multiple product life cycles (Han et al., 2020; Reikea et al., 2018). The circular economy has long existed in the books of environmental sciences. Many researchers have attempted to describe it but there is a lack of scientific consensus to define the term 'circular economy' (Kirchherr et al., 2017; Korsunova et al., 2021). The World Economic Forum defined the circular economy as an industrial system that is restorative or regenerative by intention and design. The circular economy refers to economic model that aimed to produce long-lasting goods in a sustainable manner. Unfortunately, most businesses in today's world use a linear economy model which is based on 'take-make-waste' approach to landfill. Instead, material and resources are reused, repaired and recycled that lead to reduction in consumption of materials and waste. Our existing food system is unsustainable and under increasing pressure from a rising global population and in urgent need of transformation to be made sustainable and healthier (Hawkes & Voegele, 2018; Huntjens, 2021; WBCSD, 2018). The adoption of circular-economy driven sustainability practices can greatly help the sector deliver social, economic and environmental benefits.

Sustainability Adoption by Businesses: Emerging Source of Competitive Advantage

'Forget how business is affecting sustainability; ask how sustainability is impacting business?' When managers and executives refer to sustainability, what do they exactly mean? Companies all over the world define the term sustainability in myriad ways. There is no single established definition of the term, however, research and regulatory bodies define sustainability as the ways in which needs of the current generation could be met without compromising the needs of the future generation. Although there seems to be no consensus on the definition of

sustainability between businesses yet they do believe that business sustainability will have a great impact on the way businesses think, act and manage themselves (Hopkins et al., 2009). However, there is general understanding of businesses that sustainability is about doing business without harming the environment and lives on the planet (Srivastava, 2006). Nowadays, sustainability is also seen as a business strategy to gain competitive advantage over its rivals (Ojo et al., 2015). The importance of sustainability being clear, the measurement of sustainability in the business poses itself as a hassle to the executives and the managers alike. Previous researches have argued that sustainability is an internally focused concept for businesses and it is measured by the financial benefits to the firm. Sustainable initiatives are often evaluated by the company in the form of waste reduction, cost-saving, product differentiation, risk mitigation and overall improvement in process and product quality (Banerjee, 2001; de Visser-Amundson & Kleijnen, 2020). This is why the concept of circular economy is seen as a crucial element to promote sustainability in the businesses.

Circular Food Supply Chain: Rationale for Circular Solutions to the Linear Problems of Agri-food Sector

The food supply chain that follows a 'farm to fork' structure connects three main sectors: the agricultural sector (cultivation, livestock, fishing and aquaculture), the food industry (firms dealing in processing of fruits, vegetables, spices, poultry & meat, beverages, etc.) and the distribution sectors (logistics including wholesale and retail) (Handayati et al., 2015; Zhong et al., 2017). Agriculture as the primary sector is the most resource-intensive stage of the agri-food supply chain (Wunderlich & Martinez, 2018). Primary agriculture aims at providing healthy and nutritious food to feed the population often places intense pressure on natural resources and the environment (Tengberg & Torheim, 2007). Historically, in India, the Green Revolution phase during the 1960s–1980s has catalysed agricultural production and transformed the country's image from the begging bowl to food basket for the world (Chand & Raju, 2008). However, even after the passing five decades of the green revolution phase, Indian agriculture continues to adopt the linear economy approach (i.e., take-make-use-dispose) causing several issues and environmental concerns (Nath, 2013). The existing linear system of food production is unsustainable (Borrello et al., 2017). The Economic Survey 2015–2016 claims Indian agriculture to be 'a victim of its past success—especially the green revolution'. Criticism of the green revolution includes land degradation, diminishing water resources, pollution of underground water and the decline in productivity which are putting serious challenges to food security. The immense pressure on agriculture to address increasing food demands will continue in near future, particularly in developing and emerging economies which agri-food sector needs to address on urgent basis.

Today, more than one third of all the food produced in the world is discarded as waste. In other words, 16% of all calories currently produced for human consumption as food is lost or wasted due to the linear economy which is based on

the concept of take-make-and-dispose (Silva, Ex-DG FAO, 2016). The food losses and waste occurs in the entire food supply chain including logistics, distribution and also at the household level (Dora, 2019). Agri-food sector is also known for the inefficient utilisation of vested resources. Apart from that, more than 13% of the world's greenhouse gas emissions have resulted from food and agriculture (Russell, 2014). Agriculture and food industry faced with the dual challenges of food security and climate change needs to be addressed in a sustainable manner (Baker et al., 2017). Therefore, the existing linear model of wasteful 'take-make-dispose' pattern of agri-food sector and its supply chain needs action in transition towards circularity in the food system (Zanten et al., 2019).

The adoption of circular economy by agri-food sector and its supply chain can offer sustainable solutions by the reduction in food loss/waste and minimise resource inputs (or maximise resource efficiency) through reducing, reusing, recycling and recovering materials in the supply chain stages of production, processing, distribution and consumption processes (Figure 1). This will be resulting terms of more healthy food for all, less emission of greenhouse gases, mitigation of climate change, increased productivity, competitive advantage for business and sustained economic growth.

In principle, the concept of circular economy sounds great considering the benefit it offers to businesses, society and the environment. But, its adoption particularly in developing countries is very challenging and complex due to poor enabling conditions and Infrastructure bottlenecks (Sousa-Zomer et al., 2018). For instance, in India, a majority of traditional food processing enterprises are lacking knowledge and technical know-how about circular economy including sustainability practices, which are some of the major challenges for the adoption of circular economy.

This study aims at analysing the managerial perception of the adoption of circular economy-driven sustainability practices at the stages of procurement, processing, packaging, logistics, distribution and warehousing management of food supply chain. This work has been structured into six sections. After the introduction, the literature review as the second section built the theoretical foundation of the study on circular-economy driven sustainable strategies & practices in supply chain. The third section provides a framework for circular-

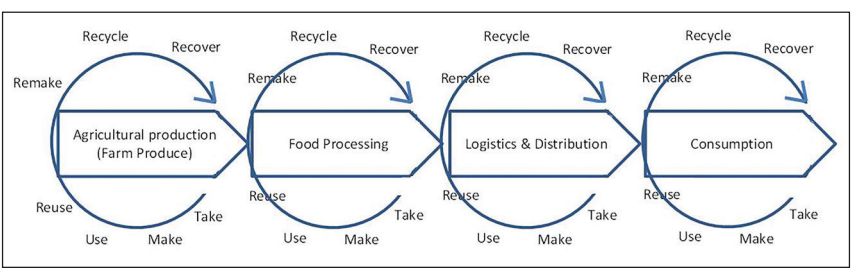

Figure 1. Circular Food Supply Chain

economy driven sustainability practices. In the fourth section, the methodology adopted in the research work has been described. In the next fifth section, the results obtained are discussed in detail along with relevant findings. Finally, in the last section, the most relevant conclusions and policy implications were discussed. The limitations of the study were also stated.

Literature Review: Circular Economy-driven Sustainable Strategies and Practices in Supply Chain

The concept of circular economy is trending as a different and sustainable way to do business and fix climate change. It is forcing companies to rethink everything, starting from the product design through manufacturing to the distribution and consumption process. This transformative approach redefines the traditional linear (end-of-life concept) based industrial production system with circular 'restoration' and 'regeneration' approach in the entire supply chain (Kirchherr et al., 2017). Circular economy is considered a driver that influences more sustainable businesses (Barros et al., 2021). The agri-food sector in developing countries is facing difficulty to feed the growing population due to the emerging challenges of climate change, environmental degradation, desertification & land degradation and huge food losses and waste in the food supply chain (Malorgio & Marangon, 2021). Therefore, the agri-food sector needs immediate action to adopt the circular-economy driven sustainability practices that can lead to a food-secure and a healthier economy. The adoption of circular economy by the agri-food sector has the potential to minimise food losses & waste and ensure food & nutritional security while saving the environment and resources. Accordingly, food companies across the world are pushing to adopt circular economy-driven social, economic and environmental sustainability practices along the food supply chains (Sharma et al., 2019).

The growing environmental consciousness among consumers drives their purchasing decision that has increased demand for more environmental friendly food products that pressurise food industry (Sudeeptha & Galahitiyawe, 2020; Tetra Pak, 2019). Further, there are increased government initiatives to address the climate change issues forcing companies to adopt sustainable strategies and practices to contribute to build a cleaner, healthier and prosperous world (Berrone et al., 2013; Huang, Hu, et al., 2016). According to Elkington (1994), a company is to be considered as sustainable if it performs on all three dimensions of sustainability framework to meet the triple objectives, that is, (a) being economically viable, (b) being socially beneficial and (c) being environmentally responsible. This condition reflects the win-win situation for business, society and the environment. Creating a truly circular food economy requires adoption of sustainable practices by businesses and their supply chain.

A transition from linear to circular economy can lower the resource use (or increase resource use efficiency) and lessen environmental impacts through the adoption of 3R's strategies of reduce-reuse-recycle and sometimes expanded to 7R's (rethink-reduce-reuse-repair-refurbish-recover-recycle) or even more

R's-strategies (Geissdoerfer et al., 2017). Adoption of the circular economy model as an economic system of closed loops keeps materials, parts and products at their highest utility and value while reducing the pressure and impact on natural resources and the environment (Fogarassy & Finger, 2020). Considering the scope of the circularity concept, the food supply chain is the area where adaptation to circular economy strategies can provide a great solution particularly in dealing with food losses or waste. The gain for food supply chain stakeholders and businesses adopting circular economy strategies and practices as reported by many studies include greater efficiency and profitability, less cost, better innovation and stronger relationships with customers (Antoniou et al., 2019; Boon & Anuga, 2020).

A circular economy path in supply chain starts from sustainable sourcing and procurement (Nath, 2013). Switching to a circular procurement path not just focuses on what materials we buy and the way we buy but looks beyond that and considers whole life of materials in terms of their reusability or recyclability (Molin et al., 2021). Sustainable procurement involves close collaboration with green suppliers for efficient utilisation of materials and reducing wastages & thereby minimising environmental impacts (Arora et al., 2020; Difrancesco et al., 2022). A successful sustainable procurement operation enables the firm to adopt sustainable manufacturing practices to accelerate the transition to a circular-economy driven supply chain (Moktadir et al., 2019). Circular manufacturing essentially considers the environmental, social and economic objectives of sustainability while making a high-quality product. Apart from that, manufacturing activities also integrate sustainable product design and eco-packaging aspects (Ekanayake et al., 2012). The firm extends the sustainable practices beyond manufacturing and integrates logistics activities that involve storage and transportation to move products through the supply chain (Ahmed & Monem,

Table 1. Major Studies on Circular-economy Driven Sustainability Practices in Supply Chain

S. No.	Supply Chain Stage-wise Sustainability Practices	Description	References
1.	Sustainable sourcing & procurement	• Sustainable sourcing is the act of obtaining required materials, products and services from suppliers that adhere to social, ethical and environmental standards. • Circularity based procurement is strategic in nature that is based on cooperation, coordination and long term relationship building with suppliers.	Feng & Huatuco (2022); Handfield et al. (2002); Jia & Jiang (2018); Jones et al. (2007); Khodaverdi & Jafarian (2013); Mattas et al. (2022); Miemczyk et al. (2012); Migliore et al. (2020); Roehrich et al. (2017); Thiebault & Tonda (2018); Tikkanen (2014); Walker et al. (2012); Zsidisin & Siferd (2001).

(Table 1 continued)

(Table 1 continued)

S. No.	Supply Chain Stage-wise Sustainability Practices	Description	References
2.	Sustainable product designing, manufacturing & packaging	• Sustainable product design is the approach to creating long-lasting products that are easy to reuse and recycle, unlike the buy-use-throw away approach of 'linear' economy. • Sustainable manufacturing is the creation of products through economically and environmentally sound processes/eco-efficient practices that reduces waste and increases business performance. • Sustainable packaging refers to the use of eco-friendly packaging material to wrap/ protect/preserve the product that is safe for individuals and easy to recyclable (or reusable, compostable); and minimises environmental impact & footprint.	Ačkar (2021); Accorsi et al. (2020); Albuquerque et al. (2019); Casarejos et al. (2018); Delabre et al. (2021); Ekanayake et al. (2012); Gonzalez-Boubeta et al. (2018); Huang, Tu, et al. (2016); Knorr et al. (2020); Lazaridesa (2011); Mahmoudi & Parviziomran (2020); Martindale et al. (2013); Miah et al. (2015); Molina-Besch et al. (2019); Sartal et al. (2020); Silva & Pålsson (2022); Wang & Yang (2008).
3.	Sustainable logistics, warehousing & distribution	• Sustainable logistics refers to the efforts to measure & reduce the environmental impact of logistics activities and minimise resource consumption. • Sustainable warehouse is about going green and adopting energy-efficient practices such as automated warehouse, lean warehousing and green building that reduce the carbon footprint/ environmental impact & improve operations. • Sustainable distribution refers to the economically viable logistics practices that minimise environmental impact.	Bank & Murphy (2013); Curioso & Brooke (2018); Drejeris & Samuolaitis (2020); Fichtinger et al. (2015); Gong & Kong (2013); Limoubpratum et al. (2015); Perotti et al. (2022); Qaiser et al. (2017); Saada (2020); Saroha (2014); Sbihi & Eglese (2007); Schönhart et al. (2008); Vasiliauskas et al. (2013); Xiang Li (2014).

2020; Vienazindiene et al., 2021). Table 1 summarises the supply chain stage-wise major studies on circular-economy driven sustainability practices.

The previous studies on adoption of circular economy and sustainability practices were largely conducted in developed countries' contexts; further, both the concepts were attempted in disintegrated manner. This research study addresses this gap and integrates both the concepts and investigates the adoption of circular-economy driven sustainability practices by food industry and its food supply chain based on managerial perception.

Framework for Circular-economy Driven Sustainability Practices in Supply Chain

There is a direct connection between the concept of circular economy and sustainability (Coste-Maniere et al., 2019; Rathinamoorthy, 2019). The circular economy model fits directly into the sustainability adoption framework and application to the food supply chain context. The adoption of circular economy-driven sustainability practices along the agri-food supply chain, namely agricultural production, food processing, logistics & distribution and consumption can address the issues of significant food losses or wastages including inefficient utilisation of resources (Dora, 2019). Figure 2 presents a framework for the adoption of the circular-economy driven sustainability practices in the food supply chain used in the study.

Data and Methodology

The study has adopted exploratory research design which is suitable when the objective is to gain insight into an emerging concept such as circular economy and

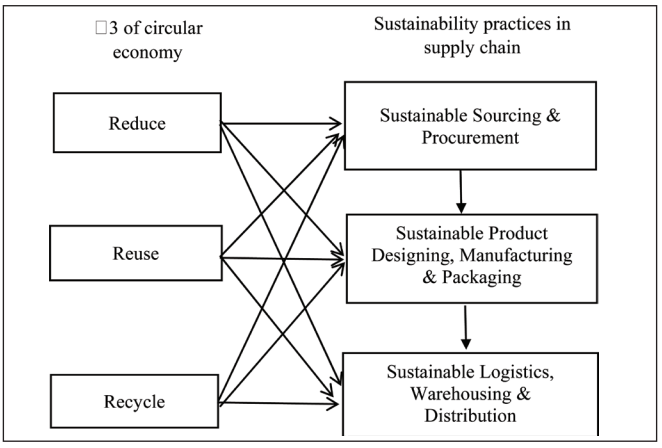

Figure 2. Framework for Circular-economy Driven Sustainability Practices in Food Supply Chain

sustainability for its better understanding and measurements (Filippini, 1997; Forza, 2002; Malhotra & Grover, 1998).

Sampling Procedure

Despite circular economy and sustainability concepts have become increasingly popular and interest in companies, the number of firms adopting circular economy approach with sustainability practices is limited particularly in developing countries. Hence, the study focused the sample on food companies in India which were engaged with circular-economy driven sustainability practices (to the extent of low or high). To identify such food companies, a purposive sampling method was employed (Hibberts et al., 2012; Walker et al., 2021). Although the food processing industry in India is still at a nascent stage of development with limited firms having circular economy and sustainability orientation, this purposive sampling method reduces the potential target population for sampling. However, it serves the purpose of the study, that is, all samples possess the intended characteristics of the adoption of circular-economy driven sustainability practices. The identification of such circular food firms with sustainability orientation was done through various sources such as sustainability/CSR reports of companies, media reports, social media, etc. On the basis of available information, a total of 45 food companies with circular-economy driven sustainability practices were identified for the survey.

From each selected food firm, only one managerial response was collected. The respondents were typically senior managers or executives who possess a higher level of awareness and knowledge about circular economy and sustainability practices and were also involved in the implementation of such practices in their organisation. Their responses were collected through the telephonic survey using a structured questionnaire. Out of a total of 45 selected food companies, a total of 26 companies' managers/executives have responded with valid responses. This represents a survey response rate of 58%, which is considerable for business surveys (Dillman, 2011).

Survey Instrument

A survey questionnaire was developed considering the study objectives. The survey questions covered circular-economy driven sustainability practices at different stages of food supply chain. The major stages and activities covered under the study are procurement, product design, manufacturing & packaging, distribution, logistics and warehouse management. A five-point Likert scale was used that offers five different options for the respondents to express how much they agree or disagree with a particular statement (representing a circular-economy driven sustainability practice). The questionnaire was shared and discussed with three academic experts and equal number of food industry experts for their feedback (Piyathanavong et al., 2019). Their

suggestions were incorporated to improve the ease of questions, structure and logical flow of the questionnaire. A pilot test was performed to ensure both reliability and validity of the questionnaire (Johanson & Brooks, 2010; Piyathanavong et al., 2019).

Data Analysis

The data collected was examined using the SPSS 20.0. A descriptive analysis was carried out (mean and standard deviation) to analyse the perception of managers and executives on the adoption of circular-economy driven sustainability practices at the different stages of the food supply chain.

Results and Discussion

Circular economy is gaining considerable attention from all industry professionals including food industry (Malik et al., 2022). The business community believe that a circular economy approach offers solutions to the problems of the existing industrial 'linear' model which assumes that resources are infinite. A circular economy offers solutions for sustainability challenges through re-introducing the discarded materials into the economic system and thus brings operational efficiency and minimises the use of resource inputs (Donner et al., 2020; Rizos et al., 2016; Velenturf et al., 2019). The circular economy approach can simultaneously achieve several goals of increasing recourse use efficiency, generate new business opportunities, reducing costs & price volatility, food security and reducing greenhouse gas emissions (Kalmykova et al., 2018; Malik et al., 2022). Although circular economy and sustainability are different concepts, both are closely connected. The adoption of circular economy is considered a pathway to achieve sustainability (Walker et al., 2021).

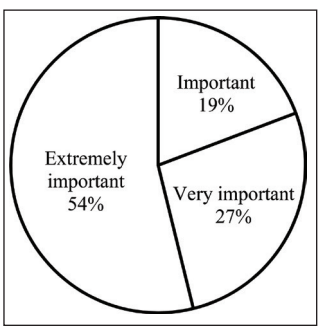

Figure 3. How Much Important Is the Adoption of Circular-economy Driven Sustainability Practices for Food Business Sustainability?

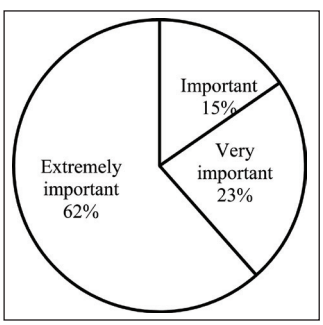

Figure 4. How Much Important Is the Adoption of Circular-economy Driven Sustainability Practices in Food Supply Chain for Sustainable Food System?

Figures 3 and 4 illustrate the percentage response of managers and executives on the respective questions on (a) how much important is the adoption of circular-economy driven sustainability practices for food business sustainability? and (b) how much important is the adoption of circular-economy driven sustainability practices in food supply chain for sustainable food system? Result indicates that a majority (>80%) of the food industry managers/executive believe that adoption of circular-economy driven sustainability practices are 'very important' to 'extremely important' for their business and its supply chain.

Towards a Circular Economy for Sustainable Food System

A circular economy is more sustainable production and consumption model that is based on principles, strategies and practices that aim to reduce, reuse and recycle materials and other resources that enter the supply chain. Table 2 presents the descriptive statistics for the response to adoption of circular-economy based principles and strategies by the surveyed food companies. Result indicates that there were favourable responses toward the adoption of circularity principles and strategies in terms of 7R's (i.e., rethinking business models, redesigning the product, reusing materials/by-products, reducing wastage, repairing components/parts and recovering embedded energy). Result suggests that food companies are rejecting the linear take-make-waste economy and moving towards the circular path that is a restorative or regenerative. The adoption of circular economy by food businesses can be clarified in terms of tangible and intangible benefits such as new business opportunities, reduction in food loss/waste, minimise use of input resources, reducing cost, access to market and innovation of products. Some companies adopt the circular economy as a strategic approach to take the long term economic and environmental benefits, apart from meeting out the regulatory requirements.

Circular-economy Driven Sustainable Practices in Procurement

Circularity starts from the procurement. As compared to 'traditional' procurement, the circular economy procurement is strategic in nature that focuses on more

Table 2. Circular-economy Principles and Strategies for Sustainable Food System

	Mean*	Std Dev.
Re-thinking business models & sharing economy practices	4.1	1.093
Redesign of product/package	3.9	1.093
Reuse of materials/by-products	4.3	1.018
Reduce wastage of resources/energy consumption/carbon footprint	4.3	1.116
Recycle of materials/waste/parts	4.0	1.280
Repair components/parts for durability	4.3	0.892
Recover embedded energy from non-recyclable waste (waste-to-energy)	3.8	1.234

Note: *Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly agree: 5.

Table 3. Circular-economy Driven Sustainable Practices in Procurement

	Mean*	Std Dev.
Implementing green procurement policy	4.0	1.095
Selecting eco-minded suppliers with high-quality raw materials supply	3.9	1.243
Consider suppliers as sustainable business partner	3.2	1.120
Training manpower for green purchase practices	2.5	1.303
Minimise delivery times by removing unnecessary deliveries	3.1	1.230
Regular audit for suppliers in compliance with sustainability targets	4.2	1.059
Reduce inventory level on non-critical supply for lowering carrying cost, waste minimisation & material obsolescence	3.1	1.211
Improve overall transaction efficiency through best inventory management & control practices	3.8	1.297

Note: *Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly agree: 5.

collaborative, cooperative, innovative and green mindset suppliers (Schmid & Kutzner, 2021). Procuring for circular business takes a different approach that reduces, prevents or reverses obsolescence of materials/waste/by-products or resources leading to develop a sustainable value chain (Seb, 2021). Simply put, the circular economy promotes procurement that controls cost, secures value and meets environmental, social and economic performance goals.

The analysis of managerial responses revealed that there is moderate to high degree of favourable response towards the adoption of circular-economy driven sustainable sourcing and procurement practices (Table 3). The most favourable sustainability practices were observed in terms of implementing green procurement policy, selection of eco-friendly suppliers, regular audits for suppliers (in compliance with sustainability targets) and improving overall transaction efficiency through best inventory management & control practices. The motivation for adoption of circular-economy driven procurement practices suggests advantage of high productivity, cost reduction, competitiveness and green company reputation in the market. Sustainable sourcing is also linked with social, ethical and environmental performance factors.

Circular-economy Driven Sustainable Practices in Product Design, Manufacturing & Packaging

Circular economy begins with the idea of a product and product design (Hollander et al., 2017). Circular product design creates long-lasting products that are easy to reuse and recycle. Further, manufacturing in a circular economy is the crucial step that involves switching from the 'take-make-dispose' linear economy to a regenerative business model. Circularity provides the opportunity to incorporate green attributes into a product including its packaging. Circular packaging incorporates the circular economy strategies of recyclable and renewable packaging materials that also integrate with sustainability efforts.

Table 4. Circular-economy Driven Sustainable Practices in Product Design, Manufacturing & Packaging

	Mean*	Std Dev.
Reduced consumption of material and energy through efficient product design	3.8	1.084
Minimise the use of hazardous materials through redesigned/ efficient product/process designing	4.3	0.928
Use of clean energy sources for energy saving	3.0	1.483
Use of green technologies for water saving	2.5	1.503
Use of green technologies for waste reduction	3.2	1.156
Use of green technology to reduce GHGs emission	3.2	1.266
Implementation of good manufacturing practices (GMP)	3.0	1.637
Process optimisation through lean manufacturing operations	3.1	1.440
Quality standards certification	4.6	0.804
Application of risk management practices	3.8	1.142
Use of non-toxic packaging material	4.0	1.183
Reusability of package /packaging materials	3.9	1.306
Use of eco-labelling	3.2	1.347

Note: *Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly agree: 5.

Table 4 depicts the results of perception analysis on the adoption of circular-economy driven sustainable practices in product design, manufacturing & packaging. Results indicate that there were moderate-level favourable responses observed in terms of—reduced consumption of material/energy, minimise the use of hazardous materials, quality standards certification, risk management practices and use of non-toxic packaging material. Moderate-level positive response was also recorded towards the reusability of packaging materials. While the responses on adoption of remaining sustainability practices were average.

Circular-economy Driven Sustainable Practices in Logistics and Distribution

The circular economy is directly linked to logistics. As the circular economy reduces the resources consumption including basic raw materials, this will result in less procurement transport requirements (Neuhold, 2022). Regarding the distribution, it involves the movement of vehicles and products across the territory and boundaries, the circular-economy driven sustainability practices can greatly help logistics and warehousing to be greener and benefit all stakeholders with less environmental footprints. The survey results presented in Table 5 reveal that there was a moderate level of adoption of sustainable practices in logistics and warehouse operations management by the food industry. However, much favourable response was recorded for optimising truckloads as it accounts for a significant proportion of logistics costs.

Table 5. Circular-economy Driven Sustainable Practices in Distribution, Logistics & Warehouse Management

	Mean*	Std Dev.
Optimised truck loads in transportation process	4.2	0.895
Proper vehicle route mapping to minimise unnecessary distance travel	3.3	1.129
Reverse logistics practices	3.4	1.391
Improve warehouse layout	3.7	1.002
Regular service of trucks and other vehicles	3.3	1.192
Switching to more efficient transportation systems (LPG etc.)	3.2	1.541
Optimising location of distribution hubs	3.2	1.713
Strategic placing of warehouses & distribution centres	3.0	1.399
Wholesalers/retailers & 3PLs are considered business partners	3.3	1.538

Note: *Strongly disagree: 1, Disagree: 2, Neutral: 3, Agree: 4, Strongly agree: 5.

Conclusion and Policy Implication

As the world population inching towards a projected figure of 8.5 billion in 2030 (and 10 billion by 2050); the traditional 'take-make-consume-throw away' approach of the linear economy would no longer make any sense. The above population growth will give unprecedented upsurge in global middle class (mostly Asians) from some 4 billion (in 2021) to 5.5 billion by 2030 (European Union). Importantly, the emerging economies particularly China and India will represent over 40% of the global middle class by 2030. This will lead to increase in food demand by approx. 35% by 2030 (as compared to 2012); the adoption of circular economy by food industry and its supply chains can reduce the food waste and losses & provide a sustainable food supply system. Importantly, the circular economy and sustainability concepts are different but both are closely connected. The adoption of circular economy is considered a pathway to achieve sustainability. A circular-economy driven sustainability practice offers many opportunities and benefits for the business, simultaneously it also achieves the goal of social, economic and environmental performance. Considering the multiple benefits it offers for all, the food industry in the developed world is leading in the adoption of circular economy approach. However, despite the popularity of the concepts of circular economy and sustainability, the developing countries are slow to take the advantage of its adoption.

The study was undertaken with the purpose to analyse the managerial perceptions of circular-economy driven sustainability adoption practices by Indian food industry and its supply chain. The review of various studies on circular economy and sustainability has provided an understanding of linearity, circularity and sustainability concepts and their application in the context of food supply chain management. Although circular economy is an emerging concept, there is a lack of consensus on a common definition and theoretical framework for the adoption by industry. The 'circularity' feature of food supply chains relates to an

increase in the rate of reuse, recovery and recycling processes which ultimately benefits the environment and communities. The adoption of circular-economy driven sustainability practices in supply chain keeps the materials, parts and products at their highest utility and value and also extending their useful life.

The study has resulted that adoption of circular-economy driven sustainability practices both for food business sustainability and sustainable food system were 'very important' to 'extremely important'. This is very positive and encouraging sign from food industry in the country on their step-up on sustainability path. The food industry responses were also favourable on the adoption of circular-economy principles/strategies in terms of 7R's strategies (rethink-reduce-reuse-repair-refurbish-recover-recycle). The analysis of circular-economy driven sustainability adoption practices in different stages of the agri-food supply chain observed a varying responses. At the sourcing and procurement stages, the favourable managerial response was recorded on the adoption of green procurement policy, selection of eco-friendly suppliers and regular audit of suppliers including inventory management & control practices. At the manufacturing stage, a moderate-level responses were recorded towards the integration of sustainability measures in various operations such as reduced consumption of material/energy, reduced use of hazardous materials, quality standards certification, use of non-toxic packaging material and risk management practices. At the distribution & logistics stage of the food chain, the analysis revealed moderate-level adoption, particularly in activities of optimising truckloads and improving warehouse layout. The remaining responses on sustainability adoption practices in the food supply chain were neutral or average.

Conclusively, the study has resulted that there was moderate to high-level adoption of circular-economy driven sustainability practices at different stages of the food supply chain. However, the degree of adoption of various sustainability practices may vary from firm to firm. This indicates that Indian food industry is moving towards the circular-economy driven sustainability path attracted by new business opportunities, minimise resource inputs (or maximise resource efficiency), reduce food wastage, less costs, low price volatility, green company image and reduce greenhouse gas emissions. Simultaneously, the food business will achieve the goals of social, economic and environmental performance. This will help the agri-food sector to develop a sustainable food system in the country in order to address the emerging concern for food security for growing population. Now, it is the government's turn to extend all possible support for food industry in their successful move from traditional linear (take-make-use-dispose) approach to circular-economy driven sustainability model of regenerative that offers social, economic and environmental benefits.

Policy Implications

This study has shown a moderate to high-level adoption of circular-economy driven sustainability adoption practices by managers/executives of the food companies. The food industry is very different from other industries and therefore, the nature of the industry should always be kept in mind while devising any policies

on addressing the environmental concerns. Food companies deal with intermediate to finished goods, which belong to the fast-moving consumer goods category. The product is highly perishable which in turn increases the risk and the importance of having a smooth and agile supply chain. The food industry is largely monopolistic in nature with each company delivering the same kind of product with a little variation to the consumer. Therefore, there is a cut-throat competition in the market. In such a scenario, it is obvious that the basic objective of a food company is to cut the costs, increase the production and sales and have efficient supply network in order to earn economic profits.

If the government and policymakers encourage the food industry to adopt sustainable practices, they must focus on the cost reduction, risk reduction and increase in operational profit characteristics of the sustainable food business practices rather than relying on the environmental aspects alone. After all, increasing the shareholder's value is one of the main reasons for existence of any business.

Limitations

While this study has generated interesting results, there have been some limitations that should be addressed by future researchers working on the theme. The first and foremost limitation is the small sample size and limited geographical scope to a few states in India. Secondly, the study was based on managerial perception analysis. The interested researchers can do actual observation at the firm level practices and in-depth quantitative analysis for more realistic figures. The third limitation is that the study was conducted in the food sector context; future researchers may look into the non-food sector supply chain and analyse the circular-economy driven sustainability adoption practices.

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Article

Investigating the Impact of Non-Performing Assets on Efficiency of Public Sector Banks in India

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Abstract

Financial system plays an important role in an economy. The banking sector in India has been undergoing reforms for a long time with the aim to develop competitiveness, increase inclusiveness, create big-sized banks and improve operational efficiency. The present investigation looks at the efficiency of the public sector banks for the period 2012–2018, using data envelopment analysis under the assumption of constant returns to scale. The two-input, two-output model is used to determine the efficiency levels on the basis of Minimum Distance to Strong Efficient Frontier as proposed by Aparicio et al. (2007). In order to capture the effect of non-performing assets (NPAs), efficiency is computed under the restricted (with NPAs not included) and unrestricted model (with NPAs considered as an undesirable output). The study finds that majority of the banks have been consistently performing quite well compared to their peers and overall industry. The correlation in the ranking of banks under the two models shows high and significant value in all the years.

Keywords

Banking, DEA, technical efficiency, constant returns to scale

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Introduction

The countries across the globe have been going through reforms which aim to make the economy stronger and shock-resilient. In this era of turbulent environment, stagnancy is bound to lead to failure and hence there is a need to change and bring about continuous reforms. The aim of reforms is to bring about a positive development in the economy. With banking being a key sector of an economy, it cannot remain unscathed from the change. Due to the rippling effect of such reform measures, the different sectors get affected of which banking is one of them. The key reason is the systemic importance of the sector that has wide repercussions for the economy. In the words of Stiglitz and Squire (1998), the financial sector is considered to be the brain of an economy. An efficient and sound banking system leads to improvement in the condition of the economy (Kim et al., 2012; Peltonen et al., 2011) by helping to reduce the cost of funds/credit, best allocation of loanable funds to the needy sectors of the society and also transmitting the effect of policies framed by the central bankers (Jonas & King, 2008). Banks in an economy play a vital role in promoting economic growth and development. Thus, the prominence of the banking sector is undoubtedly paramount. With the growing importance of the sector, there is always a discussion among researchers, academicians and policymakers to understand the performance of this sector. Among the parameters that are generally considered, profitability, productivity, efficiency and fragility form the key areas of focus. However, with the changing landscape of the banking sector and increase in industry competition, the issues of efficiency and productivity have been gaining increasing importance. It is of paramount importance to study the impact of reforms on the banking sector as the experience worldwide has been mixed. The way this sector has been undergoing reforms makes it very coherent for researchers to explore into its effect on banking. This study looks deeply into the impact of such reforms on the efficiency level of public sector banks that still hold a share of 60% in the business of the banking industry.

There are research evidences that show that, with the banking sector reforms and entry of private sector banks, the public sector banks have been feeling the competitive pressure. Several measures have brought about a massive change in the functioning of banks (Uppal, 2011) due to which banks have been expanding their network all across the country either in brick-and-mortar form or through non-physical branches. The sector has transformed itself by bringing change with regard to its focus and institutional governance (Laxman et al., 2008). In a recent study by Spierdijk et al. (2017), the effect of regulatory changes on banks of the United States has been studied by looking at the low level of substitutability of important inputs. Following the sub-prime crisis, the banks in order to boost the development of the economy and to escalate the growth of different industries had followed a practice of indiscriminate loan disbursement that led to an accumulation of huge non-performing loans in the books of the banks. This ‘crazy’ banking led to a deteriorating effect on the financial health of the banks, thereby affecting their stability. This attitude for a significant time resulted in a burgeoning effect on poor loans (Hafsal, 2020). The same

finding has been pointed by the Financial Survey 2017 with public sector banks. As per the Reserve Bank of India (RBI) reports, the gross non-performing assets (NPAs) as a percentage of total loans stood at 14.6% for the public sector banks compared to 11.2% for private banks. With the sub-prime mortgage crisis affecting the global financial system, there was a severe impact on the banks due to the sudden slump in business across sectors which led to an increase in quantum of NPAs. Consequently, the RBI had to resort to several measures in order to put a brake on the burgeoning bad loans that got accumulated in the books of the banks. Not only did the rise in NPAs result in increased credit risk for the banks but it also impacted the profitability of banks negatively. This investigation finds the effect of NPAs on the efficiency of banks.

Literature Review

The summary of different studies made with regard to efficiency in banking is given below. There are several studies that employed efficiency measurement to assess the performance of banks (Arjomandi et al., 2011, 2008). Some employed data envelopment analysis (DEA) to measure efficiency (Dhanapal, 2012; Gulati, 2011) and many others employed it to study productivity (Daley & Matthews, 2009; Matthews et al., 2007). Wanke et al. (2016) observed DEA to be the key tool for undertaking efficiency studies. The application of DEA as a tool to study the banking industry has been done in various countries such as Iran (Arjomandi et al., 2011), India (Khan & Sinha, 2015; Mukta, 2016; Sinha & Khan, 2015), Jamaica (Daley & Matthews, 2009), European Union (Svitalkova, 2014), Pakistan (Ahmad et al., 2015), Thailand, Taiwan (Chang et al., 2011) and many others.

Although the story of financial sector reforms has been experienced in various countries, the results are varied. The study of Iranian banks showed deteriorating effect on productivity due to regulatory changes (Arjomandi et al., 2011). The Polish-based study by Balcombe et al. (2006) showed divergence in the effect of reforms on productivity. The study on Thai banking during the reform period showed positive impact of change with inefficiency in the range of 3%–10%. The study by Daley and Matthews (2009) on the effect of changes on the productivity of Jamaican Banks found an inconsistent and fluctuating pattern in terms of growth. Dhanapal (2012) in the study of banks in India found the importance of poor-quality loans on the profitability of these institutions. In India, the application of efficiency analysis on public sector banks found an inefficiency to the extent of almost 13%, with the best performing banks being IDBI Bank, Corporation Bank and Indian Bank (Bala & Kumar, 2011). Gupta et al. (2008) found the State Bank group to be the most efficient one. Gulati (2011), in a similar study on private sector banks, not only found inefficiency to the extent of almost 20% but also identified that ICICI Bank, Yes Bank and HDFC Bank to be the dominant banks. Recent study by Mukta (2016) found Indian public sector banks to be less efficient than their private counterparts. The recent study by Hafsal et al. (2020) lamented the role of NPAs plaguing the banking industry. The study by Sharma and Gupta (2010) found the dominance of nationalised banks in respect of

scale efficiency and that of private banks in technical efficiency. In a recent cross-sectional study by Rakshit (2019) on commercial banks in India, larger-sized banks were found to be more efficient in respect of profitability. The research by Martinez-Campillo et al. (2020) used network slack DEA to study efficiency of public sector banks and found the close relationship between social performance and operational performance.

To discuss further, it is seen that there are numerous studies that explored the effect of poor-quality loans on banking profitability (Balasubramaniam, 2012; Ganesan & Santhanakrishnan, 2013). Gitto and Mancuso (2012) in the study on Italian financial institutions found that reforms had a varied effect on productivity with only six institutions showing an improvement and remaining fifteen showing decline. Chang et al. (2011) applied the Nerlovian profit indicator to study the performance of Taiwanese banks. The study showed that allocative efficiency played a more important role compared to technical efficiency. Moreover, the older banks outperformed the new generation banks. The findings by Matthews et al. (2007) on the productivity growth of banks in China due to the reforms showed negative growth for the state-owned banks when poor-quality loans were included in the study. The study by Kamau (2011) on Kenyan banks showed an overall reduction in the productivity growth with the passage of time as a result of reforms. In this backdrop, the researchers in this study look at the effect of NPAs on the performance of public sector banks in the Indian context. There is no study to the knowledge of researchers in Indian respect that looked into the change in relative position of public sector banks based on efficiency derived with the inclusion of NPAs in the DEA linear programming model. This gap has been accordingly addressed by the researchers in this contribution.

Objectives and Hypotheses of the Study

The key objectives of this empirical study are as follows:

- To determine the relative efficiency of the Indian public sector banks under the non-consideration of NPAs as an output and find the relative position (ranks) of the sample banks.
- To determine the relative efficiency of selected Indian public sector banks with NPAs duly considered as an undesirable output and find the rank of banks.
- To identify the relationship in the ranks obtained under the above two considerations (with NPAs excluded and NPAs included).

Accordingly, the hypotheses of the study are as follows:

H_0: There is no significant difference in the ranks obtained under the two models.

H_1: There is significant difference in the ranks obtained under the two models.

Research Design

The research is adopted to determine the efficiency of Indian public sector banks. For the investigation, sample comprises 20 banks (which covers more than 80% of the business of public sector banks in the country). The remaining banks were not considered as they were merged with some bigger sized banks towards the end of the last decade. The period 2012–2018 is considered, as this phase experienced a sudden escalation of NPAs in the industry and more noticeably in the books of public sector banks. The investigation is based on secondary data collected from the Capitaline database. The research considers the application of DEA, a non-parametric statistical method for efficiency analysis under the assumption of constant returns to scale. This technique has been popularly applied in efficiency studies (Harimaya & Kondo, 2016; Jaouadi, 2014; Novickyte & Drozdz, 2018) because of its ability to consider multiple inputs and outputs. Since the output maximisation method is followed, it implies the extent by which output needs to be escalated, keeping the inputs unchanged that will make the bank efficient.

In this study, the best practice frontier is the Minimum Distance to Strong Efficient Frontier as proposed by Aparicio et al. (2007). For determining efficiency results, the model proposed by Banker et al. (1984) has been applied under the consideration of two inputs (deposits and advances) and two outputs (investments and loanable funds). The present exploration considers cues from the research contribution of Guo and Wu (2013) where the outputs are categorised into two namely desirable and undesirable outputs. Accordingly, the investigators consider two models simultaneously: (a) the restricted/basic model (excluding net NPAs) and (b) the unrestricted/non-traditional model (with net NPAs included as an undesirable output). Thus, this study applies the extended form of the original concept given by Dong and Jie.

Analysis and Findings

The discussion below highlights the position of selected public sector banks in respect of efficiency. The results focus on efficiency score under two separate considerations which are: (a) under the non-consideration of NPAs and (b) under the consideration of NPAs.

Results of the Restricted Model

Table 1 presents the findings of technical efficiency score under the non-consideration of NPA. The results show that out of the total sample, around one-third of the banks attain a relative efficiency score of 1 in all years of the study period. The banks include Canara Bank, Indian Bank, Punjab & Sind Bank, State Bank of India, Syndicate Bank, UCO Bank, United Bank and Vijaya Bank. About 55% of the banks have an efficiency score that falls in the range of 90% to less than 100% efficiency level, which make them inefficient. Only two banks, namely, Bank of India and Indian Overseas Bank (IOB), have efficiency score of 88.5%

Table 1. Technical Efficiency in Case of Restricted Model

Bank	2012	2013	2014	2015	2016	2017	2018	Mean	*SD*	CoV
Allahabad Bank	1.000	0.979	0.933	0.979	0.981	0.972	0.967	0.925	0.053	0.058
Andhra Bank	0.943	0.978	0.837	0.916	0.992	0.984	0.967	0.952	0.026	0.028
Bank of Baroda	0.843	1.000	0.838	0.792	0.843	1.000	0.889	0.986	0.037	0.037
Bank of India	0.905	0.913	0.875	0.875	0.890	0.892	0.899	0.885	0.025	0.028
Bank of Maharashtra	1.000	1.000	1.000	1.000	1.000	0.943	0.970	0.966	0.069	0.071
Canara Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
Central Bank	0.991	1.000	1.000	1.000	1.000	1.000	1.000	0.982	0.049	0.050
Corporation Bank	0.948	1.000	0.991	0.968	0.966	1.000	1.000	0.987	0.023	0.023
Dena Bank	0.964	1.000	0.427	1.000	0.964	0.955	1.000	0.905	0.168	0.186
IOB	0.875	0.978	0.887	0.974	0.992	0.937	0.981	0.871	0.053	0.061
Indian Bank	0.997	1.000	1.000	1.000	1.000	1.000	0.995	1.000	0.000	0.000
Oriental Bank	1.000	1.000	1.000	1.000	0.990	0.944	1.000	0.973	0.060	0.061
Punjab & Sind Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
Punjab National Bank	1.000	1.000	1.000	0.982	0.937	1.000	0.923	0.937	0.079	0.084
State Bank of India	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
Syndicate Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
UCO Bank	0.944	0.977	0.797	0.961	1.000	0.998	1.000	0.960	0.045	0.047
Union Bank	0.953	0.969	0.963	0.958	0.966	0.957	0.933	0.939	0.041	0.044
United Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
Vijaya Bank	1.000	0.972	0.956	0.977	1.000	1.000	1.000	1.000	0.000	0.000
Mean	0.970	0.978	0.964	0.961	0.960	0.945	0.965			
SD	0.053	0.036	0.101	0.052	0.058	0.072	0.050			
CoV	0.054	0.037	0.104	0.054	0.061	0.076	0.052			

Note: Restricted model implies NPAs are not considered.

and 87.1%, respectively. Hence, for these two banks, there is a need to improve their performance by almost 12% in order to reach the efficient frontier. The mean score of efficiency during the period remains in the range of 94.5% and 97.8%. The coefficient of variation score shows low variability around the mean thereby pointing to consistency in performance. However, Dena Bank looks to be an exception with the coefficient of variation of 0.186 which is quite high.

Results of the Unrestricted Model

In the second model, net NPAs are additionally considered as an undesirable output for computing the efficiency score. Table 2 shows that the number of banks that remained efficient throughout the study period came down to five from seven because of the effect of poor-quality loans. The standard deviation of the efficiency scores remains at a low level for the majority of the banks, except for Andhra Bank (5.5%), Bank of Baroda (8.2%) and UCO Bank (7.2%). Furthermore, the banks which were found to be 'efficient' with a score of 100% included Canara Bank, Punjab & Sind Bank, State Bank of India, Syndicate Bank, UCO Bank, United Bank and Vijaya Bank. Although majority of the banks attained a score of more than 90%, Bank of Baroda had an inefficiency of 11.3%. The overall average efficiency during the period exceeded 90%.

Ranking of Banks Based on the Restricted Model

In this section of the study, the investigators determine the relative position of the sample banks with the poor loans excluded from the model. This analysis does not only give us an idea about the ranks but also relative change in ranks during the period.

For ranking purpose, the banks that have efficiency score of 1 are allotted a rank of 1 and then the following banks are ranked accordingly. Table 3 shows that Canara Bank, Central Bank, Indian Bank, Punjab & Sind Bank, State Bank of India, Syndicate Bank, United Bank and Vijaya Bank hold the first rank in all the years, thereby pointing to a commendable performance. Although Bank of Baroda, Punjab National Bank and UCO Bank show deterioration in the rank among the sample banks, Bank of Maharashtra shows a substantial decline in its rank during the later years of the study period.

Results of the Unrestricted Model

The discussion in this sub-section finds the relative position of the sample public sector banks when poor quality loans are included as a negative output in the DEA linear programming formulation. It is important to know this, as it will give an idea about significant change in the ranks, if any, under the two different methods.

Table 4 shows wide fluctuation in the relative position of different banks during the study period. A glance through the table shows consistency in performance of Canara Bank, Central Bank, Punjab & Sind Bank, State Bank of India, Syndicate

Table 2. Technical Efficiency in Case of Unrestricted Model

Bank	2012	2013	2014	2015	2016	2017	2018	Avg.	*SD*	CoV
Allahabad Bank	1.000	0.920	0.960	0.892	0.887	0.849	0.967	0.973	0.020	0.021
Andhra Bank	0.958	0.930	0.948	0.917	0.999	0.950	0.964	0.945	0.055	0.058
Bank of Baroda	1.000	1.000	1.000	1.000	1.000	1.000	0.903	0.887	0.082	0.093
Bank of India	0.883	0.908	0.899	0.869	0.837	0.906	0.891	0.893	0.014	0.016
Bank of Maharashtra	1.000	1.000	1.000	1.000	1.000	0.818	0.944	0.988	0.023	0.023
Canara Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
Central Bank	0.871	1.000	1.000	1.000	1.000	1.000	1.000	0.999	0.004	0.004
Corporation Bank	1.000	1.000	1.000	0.949	0.957	1.000	1.000	0.982	0.021	0.021
Dena Bank	1.000	1.000	0.541	1.000	0.920	0.873	1.000	0.901	0.210	0.233
IOB	0.818	0.931	0.941	0.865	0.842	0.806	0.891	0.946	0.048	0.050
Indian Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.999	0.002	0.002
Oriental Bank	1.000	1.000	1.000	1.000	0.970	0.840	1.000	0.991	0.021	0.021
Punjab & Sind Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
Punjab National Bank	1.000	1.000	1.000	0.873	0.850	1.000	0.839	0.977	0.033	0.034
State Bank of India	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
Syndicate Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
UCO Bank	0.929	0.896	1.000	0.917	1.000	0.981	1.000	0.954	0.072	0.076
Union Bank	0.947	0.980	0.988	0.932	0.949	0.873	0.902	0.957	0.012	0.013
United Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000
Vijaya Bank	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.986	0.018	0.018
Avg.	0.968	0.988	0.925	0.969	0.976	0.979	0.976			
SD	0.046	0.021	0.132	0.051	0.041	0.030	0.035			
CoV	0.047	0.021	0.142	0.053	0.042	0.031	0.036			

Note: Under unrestricted model, NPAs are included as an undesirable output.

Table 3. Ranking of Banks, Excluding NPAs

Bank	2012	2013	2014	2015	2016	2017	2018
Allahabad Bank	1	18	16	17	17	17	13
Andhra Bank	15	17	17	15	12	13	14
Bank of Baroda	1	1	1	1	1	1	16
Bank of India	18	19	19	19	20	14	19
Bank of Maharashtra	1	1	1	1	1	19	15
Canara Bank	1	1	1	1	1	1	1
Central Bank	19	1	1	1	1	1	1
Corporation Bank	1	1	1	13	14	1	1
Dena Bank	1	1	20	1	16	15	1
IOB	20	16	18	20	19	20	18
Indian Bank	1	1	1	1	1	1	1
Oriental Bank	1	1	1	1	13	18	1
Punjab & Sind Bank	1	1	1	1	1	1	1
Punjab National Bank	1	1	1	18	18	1	20
State Bank of India	1	1	1	1	1	1	1
Syndicate Bank	1	1	1	1	1	1	1
UCO Bank	17	20	1	16	1	12	1
Union Bank	16	15	15	14	15	16	17
United Bank	1	1	1	1	1	1	1
Vijaya Bank	1	1	1	1	1	1	1

Table 4. Ranking of Banks with NPAs

Bank	2012	2013	2014	2015	2016	2017	2018
Allahabad Bank	1	14	14	12	14	14	15
Andhra Bank	17	16	18	18	12	13	16
Bank of Baroda	20	1	17	20	20	1	20
Bank of India	18	20	16	19	19	20	19
Bank of Maharashtra	1	1	1	1	1	18	14
Canara Bank	1	1	1	1	1	1	1
Central Bank	12	1	1	1	1	1	1
Corporation Bank	15	1	11	15	15	1	1
Dena Bank	13	1	20	1	17	16	1
IOB	19	15	15	14	11	19	13
Indian Bank	11	1	1	1	1	1	12
Oriental Bank	1	1	1	1	13	17	1
Punjab & Sind Bank	1	1	1	1	1	1	1
Punjab National Bank	1	1	1	11	18	1	18
State Bank of India	1	1	1	1	1	1	1
Syndicate Bank	1	1	1	1	1	1	1
UCO Bank	16	17	19	16	1	12	1
Union Bank	14	19	12	17	16	15	17
United Bank	1	1	1	1	1	1	1
Vijaya Bank	1	18	13	13	1	1	1

Table 5. Spearman's Rank Correlation

Year	2012	2013	2014	2015
Correlation	0.659***	0.829***	0.676***	0.669***
Year	2016	2017	2018	–
Correlation	0.758***	0.954***	0.919***	–

Note: *** indicates significant at 1% level.

Bank and United Bank. The consistency is visible from their ranking of 1 for the majority of the years. The banks that show little improvement in respect of their relative position include Corporation Bank, UCO Bank and Vijaya Bank. However, there were certain banks that showed a drastic fall in their performance, as evident from the rank over the period. The names include Allahabad Bank, Andhra Bank, Bank of India, IOB, Indian Bank, Punjab National Bank and Union Bank. The financial institutions that show an improvement in respect of their ranking in the industry is due to the low NPAs because of certain measures as an outcome of stricter regulations and operational restrictions imposed on operations by the RBI under the prompt corrective mechanism because of the rise in the NPA levels in the middle years of the study.

Relationship in the Ranks Based on the Two Models

This analysis is important as it gives the result about the degree of similarity in ranks obtained under the two methods. A higher rank correlation score implies high similarity, which means that the relative position of the banks did not show wide difference under the two methods. The rank correlation value in the different years is presented in Table 5.

The value of Spearman's rank correlation coefficient shows that the association is not only high in all the years but also significant at 1% level with the highest and lowest values being 0.919 and 0.659, respectively. Thus, there is a close parity in the ranks following the two methods. Hence, there has not been much change in the ranking of the banks under the two methods which points that the impact of NPAs has been felt across the banking space. The ones that held the first rank were able to hold on to similar ranks because of effective NPA management. This was evident from the different restrictive practices that the banks had started following the surge in NPA levels which included 'safe' banking and not 'crazy' banking that was responsible for the rise in the NPA levels to unsafe levels during the last decade.

Conclusions

The banking sector is among the key sectors of an economy. The strength of an economy is very much dependent upon the resilience of the financial system. There is a positive connection between banking sector stability and economic growth. Thus, with the sector playing such a vital role, this arena has been in the

limelight of reforms process. In fact, it is seen that with economic sector reforms taking place, there have been several changes that the banking sector has experienced. With the Indian economy growing at close to double digits in the first decade of the present century, the credit–deposit ratio was at a commendable level, as the industries experienced a rising phase which boosted the demand for industrial loans. However, the sub-prime mortgage crisis in 2008 changed the overall scenario across the globe, including India. Though the environment became subdued, banks continued with their practice of 'crazy' banking that got reflected with the rise in NPA levels in the financial books of public sector banks. There was an escalation in the level of NPAs during the second decade and, accordingly, the RBI, the banking regulator, had to resort to several measures in order to control the rise in poor loans in the books of the banks.

In this backdrop, the researchers in this study look at the performance of banks from the viewpoint of efficiency. In contrast to the previous contributions in banking, the researchers consider two models simultaneously—restricted and unrestricted—to understand how the efficiency and relative position of banks has changed due to the impact of NPAs. The main intention is to see whether there is a significant impact of poor-quality loans on the position of banks. The study finds that the sector shows good efficiency level in all years of the study period, and the level of variation is on the lower side which shows consistency in the performance. One possible reason is the application of the approach proposed by Aparicio et al. (2007). Our findings support the findings of Dhar (2012), which found the public sector banks to be superior. However, it contradicts the results of Jayaraman and Sharma (2018) who found public sector banks to be poor performing in comparison to private and foreign banks. On the contrary, foreign banks were found to be better performing than the public sector banks, as noted in Mazumdar (2019). The ranking of different banks shows that the most consistently performing banks are the large-sized banks that include Canara Bank, Central Bank, Indian Bank, Punjab & Sind Bank, State Bank of India, Syndicate Bank, United Bank and Vijaya Bank. However, the position of Bank of Baroda, Punjab National Bank and UCO Bank shows deterioration on the basis of evaluation under the non-consideration of NPAs. The mean efficiency score lies in the range of 94.5% and 97.8%. On the other hand, while considering poor loans as an undesirable output, it is observed that the standard deviation of the score of the banks remained at a low level for the majority of the banks, except Andhra Bank, Bank of Baroda and UCO Bank. The banks that are found to be 'efficient' include Canara Bank, Punjab & Sind Bank, State Bank of India, Syndicate Bank, United Bank and Vijaya Bank. Although majority of the banks attained a score of more than 90%, Bank of Baroda had the maximum inefficiency score of more than 10%. The average efficiency result for all years of the study period exceeded 90%. The last part of the analysis looked at the association between the ranks obtained by the banks under the two methods, which showed that there was a significantly high positive correlation. This can be interpreted as there being not much change in the relative position of the banks. The result shows that the better placed banks had been able to manage the NPAs better in comparison to others because of which the majority of the leading banks could maintain their prominent position.

Managerial Implications

The banking industry plays a vital role in any economy. The stability of the financial system in India has repercussions on the stability of the overall financial system in this region of the world. The findings of this study are vital and have implication for managers. It shows that the consideration of poor-quality loans has least influence on the relative efficiency of public sector banks. However, it is of no doubt that NPAs are a burden for the banking industry and have severe impact on the profitability and financial strength of the banks and, thereby, the overall banking system. Thus, it can be opined that in order to understand the real effect of poor loans on banks' performance, it is better to consider other operational measures to capture the impact of NPAs on the financial stability of the banks and their operational riskiness. Moreover, for tightening the ropes of control by the regulator, it is necessary to take measures on the basis of gross NPAs instead of net NPAs. The adjustment of provisions to arrive at net NPAs negates the true non-performance to some extent. Thus, the findings can definitely guide managers and policymakers in regulating the industry and take commensurate strategies based on the performance with regard to quality of banking assets.

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Article

Relationship Between Emotional Intelligence and Organizational Citizenship Behaviour Among the Teachers Working in Various Arts and Science Colleges in the Kanchipuram District

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Abstract

The behaviour of employees in an organisation can be of two types, namely defined role behaviour and extra role behaviour. Defined role behaviour means performing as per their official duties and rights, whereas extra role behaviour means doing something beyond their official work, out of their own interest without expecting any benefit in return. This means they will neither get recognition nor any monetary benefit for such behaviour. This kind of extra role behaviour is called organisational citizenship behaviour. Many of the researches have proved that this kind of behaviour of employees help the organisation achieve its objectives and maintain healthy organisational climate. Much research has been done on the determinants of organisational citizenship behaviour. This study is being carried out with the aim of finding out the relationship of emotional intelligence and the organisational citizenship behaviour among the college teachers working in arts and science stream. A total of 288 teachers working in various aided colleges, government colleges, self-financing colleges and deemed-to-be universities offering arts and science stream at Kancheepuram district

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have been chosen for the study. Self-assessment report of emotional intelligence based on Daniel Goleman's mixed model and organisational citizenship behaviour based on the concept of Podsakoff have been adapted in this study. Statistical tools used in this study are correlation, one-way ANOVA and multiple linear regression. This study has divulged a moderate positive relationship among the various dimensions of emotional intelligence and the organisational citizenship behaviour. It is also perceived that emotional intelligence dictates 41% variance of organisational citizenship behaviour among the college teachers.

Keywords

Organisational citizenship behaviour, emotional intelligence, college teachers

Prologue

Teachers are the real sculptors of the younger generation. Education sector's efficiency and effectiveness are being influenced by the behaviour of the teachers at their institutions. Their level of emotional intelligence and their attitude to discretionary behaviour determines their level of performance and their success in the teaching profession. This empirical analysis is being conducted to explore the relationship between organisational citizenship behaviour and emotional intelligence of college teachers working in the arts and science stream.

Organisational Citizenship Behavior

Dennis Organ is considered the father of organisational citizenship behaviour, who coined this concept in the 1980s. Katz had laid the foundation for this concept in the year 1964 and identified three types of behaviour of workers for the efficient functioning of an organisation. One among them is the innovative and spontaneous activity of employees in realising the objectives of an organisation which go beyond the role specifications (Katz, 1964). Organ's concept of organisational citizenship behaviour was emanated from Katz's thought.

A formative definition was given by Organ in the year 1988. He elucidated the organisational citizenship behaviour as 'individual behaviour that is discretionary, not explicitly recognized by the formal reward system, and that in the aggregate promotes the effective functioning of the organization' (1988, p. 4). However, over the period, the definition took subtle revisions as conceived by different authors. The five dimensions of organisational citizenship behaviour—altruism, courtesy, civic virtue, conscientiousness and sportsmanship—as it is formulated by Organ (1988), are the most used classifications in the research.

Altruism indicates the helping behaviour of employees in the workplace (Smith et al., 1983). Courtesy is being defined as a kind of discretionary behaviour that aims to avoid conflict in the workplace (Law et al., 2005). Civic virtue is comprised of a set of behaviour that explains the concern and interest of employees towards their organisation (Law et al., 2005). Conscientiousness

is characterised by the behaviour of employees which goes well beyond their official requirements (Law et al., 2005). According to Organ et al. (2006) sportsmanship is the ability of an employee to tolerate changes that take place in their organisation whether they like or agrees with it or not. Organisational citizenship behaviour is proved to be serving for betterment of an organisation and its employees as well (Hazzi, 2018). Professional and organisational commitment are found to be significantly related with organisational citizenship behaviour (ÖZDEM, 2012).

Emotional Intelligence

The cognitive intelligence of an individual alone will not help achieve success in their profession. There are multiple intelligences, as it is discussed by Gardner (1983), each of which determines success on a personal and professional front. John D. Mayer and Peter Salovey (1997) have conceived an idea of emotional intelligence. Emotional intelligence is a set of skills that help the accurate appraisal and expression of emotion in oneself and others, the effective regulation of emotion in self and others, and the use of feelings to motivate, plan and achieve in one's life (Salovey & Mayer, 1990).

However, the term got popularised by internationally reputed psychologist Daniel Goleman in the year 1995 after the publication of his book titled *Emotional Intelligence; Why It Can Matter More Than IQ*. Emotional intelligence is being considered and defined as the ability to perceive emotions accurately, generate feelings when they facilitate thought, the ability to understand emotions, and the ability to regulate emotions to promote emotional and intellectual growth (Mayer & Salovey, 1997).

According to Goleman (1995), emotional intelligence is comprised of social and personal competencies that lead to effective leadership performance. Goleman's emotional intelligence is considered a mixed model, that is, emotional intelligence is both an ability and a trait. Emotional intelligence is conceptualised as a trait of an individual which relates to self-perception of their emotional abilities (Petrides & Furnham, 2000).

Emotional intelligence dimensions, as conceptualised by Goleman, are self-awareness, social awareness, self-management and relationship management (Goleman et al., 2002, p. 39). Self-awareness and self-management are considered personal competencies, whereas social awareness and relationship management are considered social competencies. Self-awareness is related to the competencies of awareness of their own emotions, assessing their emotions and self-confidence. Self-management is a personal competence to regulate one's own emotions and acts flexibly to achieve the desired result (Goleman et al., 2002). Social awareness is one of the social competencies to understand the emotional state of others and understand what others are going through and listen to them (Goleman et al., 2002). Relationship management is a social competence of an individual which helps them get along well with others and handle any conflicts, sharing of his ideas and show empathy towards others (Goleman et al., 2002).

Relationship Between Emotional Intelligence and Organisational Citizenship Behaviour

The aim of this study is to find out how emotional intelligence determines the level of organisational citizenship behaviour among college teachers. When a high level of organisational citizenship behaviour is put together with a high level of emotional intelligence at the workplace by the employees, it enhances their productivity which, in turn, leads to enhanced organisational performance (Sharma & Mahajan, 2017). Emotional intelligence has the strongest relationship with organisational citizenship behaviour (Turnipseed & Vandewaa, 2012). The two dimensions of organisational citizenship behaviour, namely altruism and conscientiousness of subordinates, are being predicted by the emotional intelligence level of leaders (Yaghoubi et al., 2011). The demographic profile such as age and gender were found to have a strong relationship with various dimensions of organisational citizenship behaviour (Narayanan, 2016).

Although some of the studies had focused on the relationship between organisational citizenship behaviour and emotional intelligence, only very a few studies had been found in education literature. Therefore, this study focuses on the organisational citizenship behaviour among the college teachers, and their level of emotional intelligence.

Aim of the Research

Exploring the relationship between organisational citizenship behaviour and emotional intelligence among college teachers working in the arts and science stream in the Kanchipuram district is the main aim of the research. This study has been carried out keeping in mind the following objectives:

1. To find out whether the type of the institution makes any the difference in the level of emotional intelligence among the respondents.
2. To assess the relationship between the dimensions of emotional intelligence and organisational citizenship behaviour.
3. To scrutinise the predictive power of emotional intelligence on organisational citizenship behaviour.

Method

This study is to scrutinize the relationship between organisational citizenship behaviour and the emotional intelligence of college teachers working in the arts and science stream in the Kanchipuram district.

Population and Sample

College teachers working in arts and science streams in the Kanchipuram district are the population for this study. Data has been collected from 288 college teachers: 29 teachers are from government colleges, 130 teachers are from self-financing colleges, 99 teachers are from aided colleges and 30 teachers are from deemed-to-be universities. The demographic profile of the respondents has been presented in Table 1.

Table 1. Profile of the College Teachers Who Participated in the Study

Personal profile			
Variable	Sub-Category	*n*	%
Gender	Male	65	22.60
	Female	223	77.40
Age	Less than 25 years	11	3.8
	25 years–35 years	45	15.6
	36 years–45 years	134	46.5
	46 years–55 years	69	24.0
	56 and above	29	10.1
Marital status	Married	256	88.90
	Unmarried	32	11.10
Level of education	Post-graduation only	13	4.50
	Post-graduation with MPhil	125	43.40
	PhD	150	52.10
Reason for choosing this profession	Passion	190	66.0
	By chance	33	11.5
	By choice	65	22.6
Place of higher education	Semi-urban	83	28.8
	Urban	108	37.5
	Metropolitan city	97	33.7
Work profile			
Nature of employment	Permanent	141	49.0
	Temporary	139	48.3
	Contract	8	2.8
Designation	Lecturer	14	4.9
	Assistant professor	237	82.3
	Associate professor	33	11.5
	Principal	4	1.4
Type of the institution	Government college	29	10.1
	Self-financing college	130	45.1
	Aided college	99	34.4
	Deemed-to-be university	30	10.4
Teaching experience	Less than 5 Years	52	18.10
	5 years–10 years	54	18.80
	11 years–15 years	77	26.70
	16 years–20 years	40	13.90
	21 years–25 years	26	9.00
	26 years–30 years	16	5.60
	31 and above	23	8.00
Income level	Less than ₹25,000	131	45.5
	₹25,000–₹50,000	51	17.7
	₹50,001–₹75,000	46	16.0
	₹75,001–₹100,000	35	12.2
	₹100,001 and above	25	8.7

Notes: $N = 288$; n = frequency for each category.

It is being divulged by Table 1 that 77.40% of the respondents are female and 65% are male; 46.5% of the respondents belong to the age group of 35–45 years whereas only 3.8% respondents are below the age group of 25 years. Out of the

total respondents, 88.90% are married and 11.10% are unmarried. As far as the educational level is concerned, 4.50% are post-graduates, 43.40% are post-graduates with MPhil and 52.10% are PhD holders. Of the total respondents, 66% have chosen this profession out of their passion while 11.5% of the respondents alone have chosen this profession by chance. About 37.50% of the respondents have completed their higher studies in urban area followed by 33.70% at metropolitan cities and 28.80% in semi-urban area.

As far as work profile is concerned, 49% of the respondents have been placed in permanent positions and 48.3% in temporary positions. The respondents' group is comprised of associate professors (11.50%), assistant professors (82.30%), principal (1.40%) and lecturers (4.90%). Out of total respondents, 45.10% are working in self-financing colleges and 34.40% in aided colleges; 10.10% of the respondents are government college teachers while 10.40% are from deemed to be universities. About 18.10% of the respondents are with less than 5 years of experience while 8% are with above 30 years of experience. Of all the respondents, 26.70% are having professional experience between 10 years and 15 years; 18.80% are having 5–10 years of experience. Only 5.60% have experience of about 25–30 years. About 45.50% of the respondents are drawing less than ₹25,000 per month whereas, 8.7% are drawing more than ₹100,000 per month.

Tools Applied for Data Collection

Emotional intelligence scale, as formulated by Goleman (2000), and organisational citizenship behaviour measuring scale, formulated by Farh et al. (1990) based on Organ's five dimensions of organisational citizenship behaviour, have been adapted in this study. Five points Likert scale has been used to assess the self-report questionnaire. The Cronbach's alpha coefficient has been calculated as 0.83 for the scale of organisational citizenship behaviour and 0.79 for the emotional intelligence scale.

Data Analysis

The analysis of data is done by using the statistical analysis software SPSS 23. The first objective is to perceive whether type of institution makes any notable difference in the level of organisational citizenship behaviour. To analyse the variances among the four types of the institutions, one-way ANOVA has been conducted.

The second objective is to find out the relationship between emotional intelligence quadrants and organisational citizenship behaviour. For this, the Pearson correlation analysis has been done. Correlation coefficients values between 0.70 and 1.00 are considered as 'high', between 0.69 and 0.30 are considered as 'medium' and 0.29 and below are as 'low'. The values closer to 0.00 were considered to be irrelevant (Büyüköztürk, 2005).

The third objective is to scrutinise the predictive power of the dimensions of emotional intelligence. The multiple linear regression analysis has been done for this scrutiny.

Difference in the Level of Organisational Citizenship Behaviour Across Types of Institutions

The ANOVA test reveals that organisational citizenship behaviour of the faculty members differ significantly based on their institution type ($F3,284 = 5.034$, $p < .001$).

The test of homogeneity variance explains that the equal variance is not assumed, that is, the Levene's statistics is found to be significant. Therefore, Dunnett's T3 post-hoc test has been selected to check the individual difference between the institutions. The post-hoc result reveals that the mean score of self-financing colleges ($M = 4.42$, $SD = 0.610$) differs significantly with from that of deemed-to-be universities ($M = 4.80$, $SD = 0.407$).

Likewise, the mean score of aided colleges ($M = 4.46$, $SD = 0.570$) differs significantly from that of deemed-to-be universities ($M = 4.80$, $SD = 0.407$). The level of significance for such mean differences is at 0.05 level.

However, no significant differences were found between the mean score of government colleges with the remaining institutions of aided colleges, self-financing colleges and deemed-to-be universities. Table 2 portrays the outcome of one-way ANOVA.

Correlation Between Various Dimensions of Emotional Intelligence with Organisational Citizenship Behaviour

To determine the relationship between various dimensions of emotional intelligence and organisational citizenship behaviour, the Pearson correlation coefficient has been computed.

Table 2. Results: One-Way ANOVA

			Test of Homogeneity of Variances		ANOVA	
Type of the Institution	Mean	*SD*	Levene's Statistic	Sig.	*F*	Sig.
Government colleges	4.69	0.471	7.636	0.000	5.034	0.002
Self-financing colleges	4.42	0.610				
Aided colleges	4.46	0.570				
Deemed-to-be university	0.80	0.407				
	Group differences					
Type of the Institution	Mean Difference	Sig.	95% Confidence Interval			
		[LL	-	UL]		
Self-financing colleges – deemed-to-be university	–0.385*	0.001	–0.63	–0.14		
Aided colleges – deemed-to-be university	–0.340*	0.003	–0.59	–0.09		

Correlation is a statistical tool which is applied to measure the relationship of two continuous variables. The coefficient of correlation explains not only the relationship between the variables taken for study but also indicates the strength of such a relationship along with its direction. If the correlation coefficient is closer to +1 or −1, the relationship between the variables will be considered as strong and, at the same time, the sign will indicate whether such a relationship is positive or negative.

Table 3 shows the correlation among the quadrants of emotional intelligence with organisational citizenship behaviour. All the dimensions of emotional intelligence are showing a positive moderate correlation with organisational citizenship behaviour.

A moderate positive statistically significant correlation ($r = .61$, $p < .001$) is found between relationship management and organisational citizenship behaviour. A positive moderate correlation exists between self-awareness and organisational citizenship behaviour ($r = .43$, $p < .001$). The correlation between self-management is found to be moderate positive with organisational citizenship behaviour ($r = .48$, $p < .001$) and moderate positive with social awareness and organisational citizenship behaviour ($r = .48$, $p < .001$).

Prediction of the Level of Organisational Citizenship Behaviour by Emotional Intelligence

Multiple regression analysis has been done to determine the predictive power of various dimensions of emotional intelligence. Table 4 depicts the results of multiple regression analysis.

Table 3. Mean, *SD* and Correlation Matrix

	Mean	*SD*	1	2	3	4
Self-awareness	4.24	0.48				
Self-management	3.96	0.53	0.539*			
Social awareness	4.03	0.59	0.484*	0.591*		
Relationship management	4.00	0.60	0.464*	0.544*	0.714*	
Organizational citizenship behaviour	24.94	2.32	0.430*	0.480*	0.477*	0.613*

Note: *Correlation is significant at the 0.01 level (2-tailed).

Table 4. Results of Multiple Regression Analysis

	B	*SE*	Beta	*t*	Sig.
Constant	61.898	5.141		12.040	0.000
Self-awareness	0.320	0.137	0.132	2.335	0.020
Self-management	0.361	0.136	0.163	2.655	0.008
Social awareness	–0.058	0.138	–0.030	–0.422	0.674
Relationship management	0.931	0.130	0.484	7.187	0.000

The analysis reveals a statistically significant moderate correlation between various dimensions of emotional intelligence with organisational citizenship behaviour ($r = .647$, $p < .001$). The four dimensions of emotional intelligence explain 41% variance in organisational citizenship behaviour.

Based on the value of the standardised coefficient (beta), it is ascertained that relationship management is found to be the most important predictor of organisational citizenship behaviour, followed by social awareness. This can also be interpreted as higher the social competence among the faculty members, the more will be the organisational citizenship behaviour. The *t*-test result also proves that relationship management along with social awareness were found to be sound predictors of organisational citizenship behaviour of the faculty members. Regression equation can be formulated based on the value of unstandardised coefficient value as follows:

$$OCB = 0.320\ SA + 0.361\ SM - 0.058\ SOA + 0.931\ RM + 61.898.$$

Where, OCB means organisational citizenship behaviour, SA indicates self-awareness, SM indicates self-management, SOA indicates social awareness, and RM indicates relationship management.

The regression model is found to be good with $R = 0.647$, $R^2 = 0.418$ and $F(4,279) = 50.104$ $p = .000$.

Conclusion

A correlation study has been conducted to find out the relationship between various dimensions of emotional intelligence and organisational citizenship behaviour. One such dimension of emotional intelligence, called relationship management, is statistically and significantly related with organisational citizenship behaviour and, at the same time, the remaining sub-dimensions are also found to have moderate positive relationship with organisational citizenship behaviour. In a study conducted among the bank employees (Rezaei et al., 2014), all the four dimensions of emotional intelligence were found to be positively and significantly correlated with organisational citizenship behaviour. On the contrary, no significant relationship was found between emotional intelligence and organisational citizenship behaviour among executives of small enterprise sector (Chin et al., 2009).

Multiple regression analysis was done to discern the sound predictor of organisational citizenship behaviour which revealed relationship management as a strong predictor, and all the four dimensions of emotional intelligence were found to be contributing 41% to the level of organisational citizenship behaviour. The social competencies were found to be high among the faculty members who possessed high level of organisational citizenship behaviour.

The findings of the present study reveal that faculty members who are highly emotionally intelligent are also having a high level of organisational citizenship behaviour. Emotional intelligence helps an individual perform better organisational citizenship behaviour (Hasidim, 1998). Their social competency skill helps them to be good at their level of organisational citizenship behaviour.

To improve organisational citizenship behaviour in educational institutions, the level of emotional intelligence among the faculty members is to be increased, for which the institutions can arrange for training and development.

Limitations of the Study

The faculty members of arts and science colleges were chosen for the study. So, this study is limited to their opinions only. The location of the study was also confined to arts and science colleges in Kancheepuram district only. So, the outcomes of this study are ought to be assessed and generalised accordingly. The emotional intelligence dimensions as specified in mixed model were used for measuring emotional intelligence.

Future Study

Future studies can be done with larger sample size either by choosing respondents from various streams in higher education sector or by expanding the geographical coverage of institutions. The other models of emotional intelligence such as ability model and trait model can be applied in the study. A comparative study between government college teachers and self-financing college teachers can also be done. The role of socio-demographic variables in determining emotional intelligence and organisational citizenship behaviour can be done. Apart from education sector, any other service sector can also be considered for the study.

Declaration of Conflicting Interests

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Global Investing Sentiment and Social Interaction During COVID Outbreak

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Abstract

The outbreak of COVID-19 was an extreme event that created panic among the people, disrupted normal functioning and adversely affected the economy. The stock market fell due to the uncertainty that ensued, and it continues to do so as new variants are being discovered. The study explores the impact of the outbreak of a new variant of COVID-19 on the stock market and analyses investor sentiment towards investing and global investing through sentiment analysis using QSR NVivo software. The results contribute to the extant literature that the investors' sentiment is positive towards global investing despite the adverse conditions. Investors need to choose those stocks that are internationally diversified with sound fundamentals. The study reveals that markets bounce after a significant cooling period, and investment managers should encourage the investors to hold their portfolios. The study also identifies the important themes and social networking of investors from India with the world through the NodeXL. The study identified major themes such as alerts, timing, investors and investing, which shows that the people mainly focus on stocks, its alert and timing for making investment decisions.

Keywords

Stock market crash, COVID-19 pandemic, sentiment analysis, social network analysis, thematic analysis

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Introduction

The COVID-19 outbreak, which originated in December 2019 in Wuhan (China), impacted the entire world severely, has infected more than 280 million people and caused 5.41 million deaths worldwide as of December 2021 (data from, as on 14 October 2021, https://COVID19.who.int/). It resulted in changes in policies and regulations for trade, governance for foreign trade and ultimate lockdown, leading to a mandatory closure of the economy. The continuous injection of pandemic-related news resulted in the stock market crash (Baig et al., 2021). A stock market crash is defined as a significant decrease in stock prices in a minimal time, which is extreme in the given condition (Huang et al., 2020). The sentiments have caused fear among the investors as social media plays a prominent role in disseminating information and decides the market's mood (Hatefi Ghahfarrokhi & Shamsfard, 2020).

Recent studies reveal that the fluctuations caused by the COVID-19 outbreak in the stock market, oil prices, cryptos and gold were evident and caused a disruption like never before (Bai et al., 2020; Huang et al., 2020; Salisu et al., 2020; Selmi et al., 2021). The world has faced several waves; however, India has witnessed two waves of COVID-19 already, and the outbreak of the new variant 'Omicron' has aroused apprehensions among Indians for a third wave and ensuing lockdown. The reaction of investors is visible in the stock market as well. These events provide a chance to learn about investor psychology and human behaviour. Individual investors seem to have started speculating on the stock market's movement on specific dates or on what others would anticipate on the market's attention on particular days, events and so on (Wagner, 2020). The fear of lockdown and stock market crash in history gripped the investors for the shortfall in prices once again. COVID-19 is a terrifying and novel threat that sparked a frenzy among investors. Fair economic assumptions underpinned individual company stock price fluctuations despite the volatility and panic. Consequently, investors developed a greater understanding of the nature of the challenge they were dealing with in these difficult times. To avert future adverse outcomes and amplification of the COVID-19 shock, broad efforts, including fiscal policy interventions, are needed, according to stock price reactions (Okorie & Lin, 2021).

Presently, social media platforms reflect people's opinion and public sentiment about current events (Pagolu et al., 2017). Microblogging websites such as Twitter and Facebook have become a valuable source for people's sentiments because of the ease of use and accessibility, as they use these platforms to express their views on current events (Pak & Paroubek, 2010). Twitter is considered one of the major social media networks for expressing opinions and disseminating information (Pak & Paroubek, 2010). The study aims to explore the impact of the outbreak of a new variant of COVID-19 on the stock market and analyse the significant themes of investor sentiment towards investing and global investing, considering the social networking of Indian investors with the world.

The following sections of the paper deal with the literature review and the research framework, followed by data analysis and discussion of results, conclusions, implications and future scope for research.

Literature Review

The COVID-19 pandemic caused a nationwide lockdown leading to economic and social disruption. There onwards, many variants of the virus were detected. Since people had already survived two waves, getting the news of a new variant, 'Omicron', a fear of third wave engulfed them. Stock markets across the globe saw a rapid decline, resulting in a crash. Many studies have been conducted to capture the effect of virus and lockdown over the stock market and on the economy (Alam et al., 2020), the spread of the virus and the contagion effect (Okorie & Lin, 2021), the impact of COVID-19 on oil prices, gold and other commodities (Salisu et al., 2020) and also on the stock market prediction (Salisu & Vo, 2020). Studies also try to compare COVID-19 with other pandemics (Bai et al., 2020) in terms of volatility in the stock market.

Stock market volatility is a random, dynamic and non-linear function which makes it very difficult to forecast, and mainly the studies are concerned with the quantitative methods primarily based on random walk theory or efficient market hypothesis (Huang & Liu, 2020). Forecasting and volatility have been captured through GARCH and ARIMA modelling (Almasarweh & Wadi, 2018; Gaire, 2017; Katoch & Sidhu, 2021; Mustapa & Ismail, 2019; Pandey & Bajpai, 2019; Sunarya, 2019; Susruth, 2017). Investing decisions are the result of news and the sentiment of people, which sets the mood for investing (Sun et al., 2020). Study of public sentiment has been an extended area of research, and various developments happened over time for predicting stock market movement (Anand et al., 2021; Goel & Mittal, 2012; Hatefi Ghahfarrokhi & Shamsfard, 2020; Sun et al., 2020; Zhang et al., 2021), effect of pandemic news over the stock market (Ahmed & Lugovic, 2019; Baig et al., 2021; Shaikh, 2021), and conducted over the other major topics such as policies of the government, for political parties, #Metoo movement, and new educational policy (Bai et al., 2020; Nguyen & Shirai, 2015; Schmidt et al., 2020; Sharma & Gupta, 2021). These social media platforms influence investment decisions and people's opinions during such pandemic, which creates a havoc in the market; hence sentiment analysis for this period becomes critical to evaluate and understand the gravity of the situation.

Thematic study is another critical approach for identifying, analysing, organising and reporting the significant themes, which helps understand the people's overall mood (Sharma & Gupta, 2021). Thematic study can assist with trustworthy and helpful insights (Nowell et al., 2017). Thematic studies were conducted to interview Twitter data (Jugder, 2016), which is used to identify themes during pandemics such as H1N1, SARs, COVID (Ahmed et al., 2019).

Social network analysis (SNA) is a research method that involves a pattern of human-to-human and group-to-group interactions, such as organisations and individuals. In general, SNA examines individual behaviour at the micro-level and relationship patterns and networks at the macro level, and interactions between the two (Ahmed & Lugovic, 2019). The SNA in investing exhibits similar feelings of one individual to another and shows the association (Bozkurt, 2020).

The analysis might be focused on differences in centrality, the exploration of closely connected clusters, structurally equivalent places in networks or unique positions, depending on what creates variations in opportunity structures. The large datasets of Twitter aid in forming connections among users is in a way shown in SNA, which aids in discovering and obtaining clusters of people with the same opinion.

Anand et al. (2021), in their study, show that investor sentiment has a significant influence over the stock market returns, and positive and negative views have a strong correlation for the stock price determination (Smailović et al., 2013). In their study, Thelwall and Thelwall (2020) show the thematic analysis for Twitter data to identify the major themes during the earlier period of COVID-19 for dissemination of information. The research focuses on examining investor sentiment towards investing and global investing during this period, based on existing literature that shows that social media sentiment information affects stock market movement, and that thematic analysis is used to identify the major themes of the tweets data. There has been no study done to the best of the researchers' knowledge on the relationship between global investment and sentiment analysis, theme analysis for tweets and SNA of Indian investors concerning the rest of the globe.

Objectives

Following are some of the research objectives:

1. Exploring the impact of the outbreak of the new variants of COVID-19 on the stock market.
2. Analysing the investor sentiment towards investing and global investing.
3. Identifying significant themes and social networking of Indian investors with the world.

Research Framework

The study first collects the data 'to explore the impact of the outbreak of the new variant of COVID-19 on stock exchange'. The information collected from www.yahoofinance.com, and the period of 24 November 2021–24 December 2021, is taken for the study, and significant stock exchanges across the world (India, USA, China, South Africa and Japan) have been considered.

To analyse the investor sentiment towards investing and global investing, the data was taken from Twitter threads using hashtags #investing and #globalinvesting. Tweets were collected with the help of NCapture, a Google Chrome extension of NVivo. The captured database is imported to the NVivo software through the supported format *.ncvx. Total 17,957 tweets were collected after applying the below filters through advanced search. Before sentiment analysis, text analysis was performed through word frequency analysis (WFA), which showcases the most frequent words in tweets. Cluster analysis was performed for major

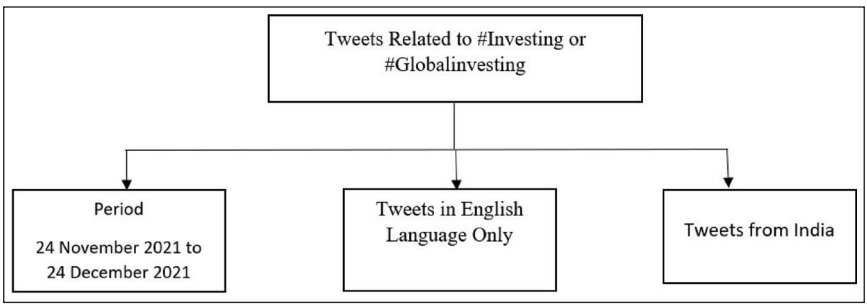

Figure 1. Steps for Filtering the Tweets

inter-related hashtags and forms a cluster show the importance of these hashtags. Sentiment analysis was performed through auto coding of the NVivo software. In this, the software looks for the person's opinion with the help of expressions in the tweets. To identify major themes of the study, automatic coding feature of NVivo has been used, which showcases/highlights major theme around which the tweets are coming.

NodeXL software works as an add-in for Microsoft Excel 2007 and provides an extendible toolkit for network overview, discovery and exploration. Microsoft Edge lists or pairs of vertices, also referred to as nodes, are used by NodeXL to depict a network. Each vertex represents one of the network's entities. Each edge or link that connects two vertices represents the relationship between them. A live or non-living entity can be a node. Ties are defined by the interactions, relationships or links between these nodes. Every network is essentially the sum of its nodes and the relationships that connect them (Bozkurt, 2020). This relationship may or may not have a direction. Some relationships are bi-directional, whereas others are one way (Hansen et al., 2011). For the social interaction mapping of Indian investors with the world, data is downloaded from Twitter using the same hashtags, that is, #inveting or #globalinvesting. This includes tweets all across the globe. Network analysis is performed with the help of the software NodeXL through which Indian investors interact with the world.

Data Analysis and Findings

Impact of Omicron Variant on Major Stock Markets

The Omicron variant of COVID was reported in South Africa in November 2021; the rest of the world has been waiting to see how the extensively mutated version affects case rates, hospitalisations and vaccination effectiveness. According to the WHO's weekly data issued on 7 December 2021, South Africa's COVID infection rate has surged, with 62,021 new cases recorded between 29 November and 5 December, up by 111% from the previous week. The detection of new variants

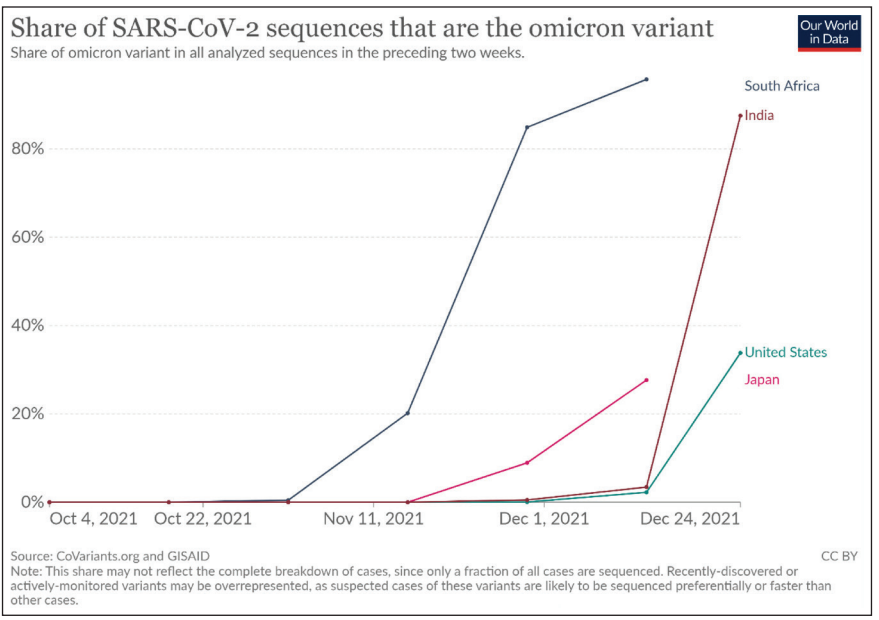

Figure 2. Omicron Variant Cases During October–December 2021

and the sudden surge in cases and hospitalisation rates created chaos among the investors. Within a few weeks after the first case was detected in South Africa, the variant seems to have spread widely throughout the world. Figure 2 presents increase in cases internationally due to the Omicron variant.

The effect of this variant was visible on the stock market as well because of the spreading rate. Major stock indices worldwide saw a sudden decline due to fear in the investors owing to their previous experiences. Figure 3 shows the decline of the primary index of China, India, the USA, Japan and South Africa. All the indices are falling due to the fear of lockdown and disbalance created by the detection of the new variant. Only the index of South Africa shows some upward trend because of the cooling period.

Figure 4 shows the return graph of these stock indices, representing the mixed return for the period and mainly showing the negative return for the definite period. In India, the significant decline is visible on 26 November 2021, 6 December 2021 and 20 December 2021 because of the first detection and rapid increase in Omicron cases.

Figure 5 shows the location from where the tweets have been posted. Figure 6 shows the cluster of the most frequently used hashtags during these tweets in the dataset. The core cluster is formed with the hashtags of the stock market, investing and other indices. The following significant collection is related to the cryptos investment, which shows that the investors consider the stock market as their first avenue and are inclined to invest in the crypto market.

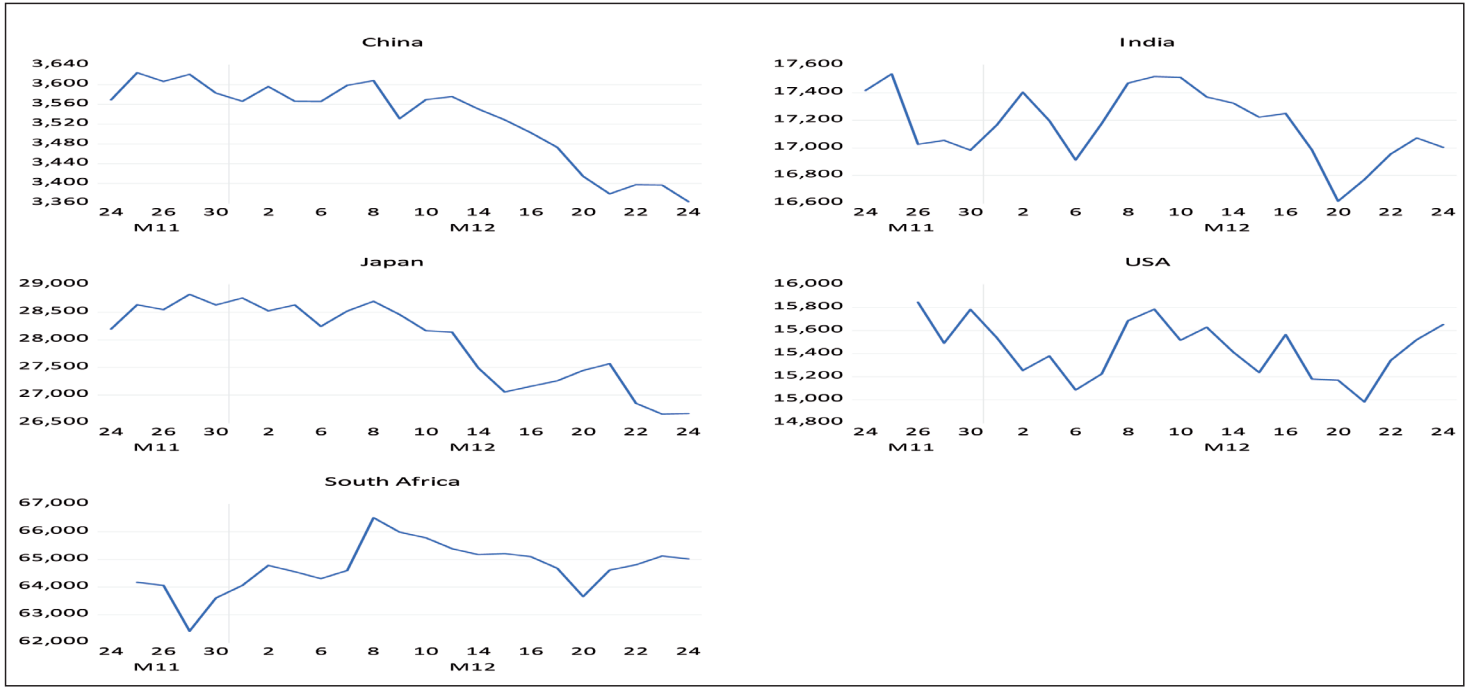

Figure 3. Stock Market Price Movement

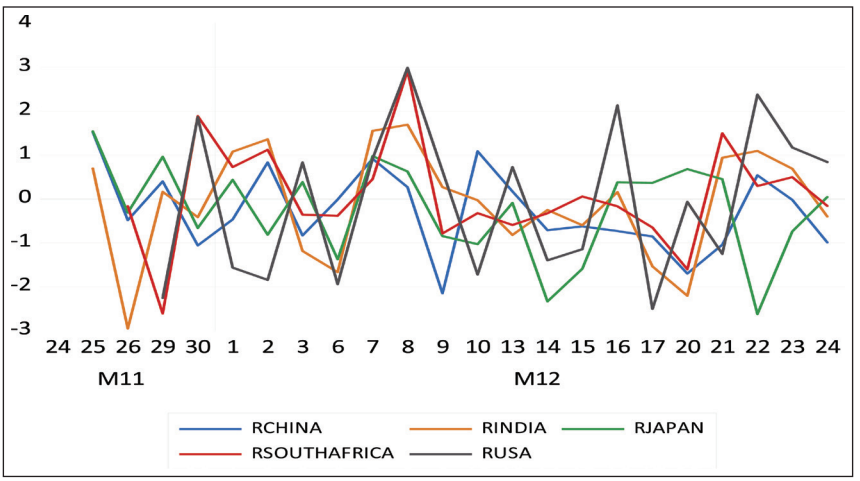

Figure 4. Performance of Stock Market

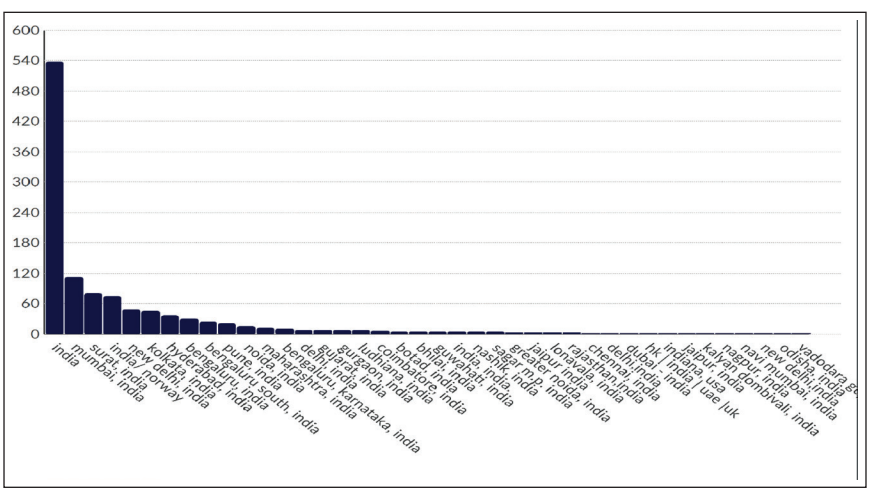

Figure 5. Tweets Posted from Different Locations of India

Textual Analysis

Word frequency analysis is performed through NVivo to check the dataset's most frequently used words. WFA gives the word cloud as an output in decreasing order of usage, which is depicted in Figure 7. For word cloud, 100 stemming words of a minimum of 5 letters were taken for the study.

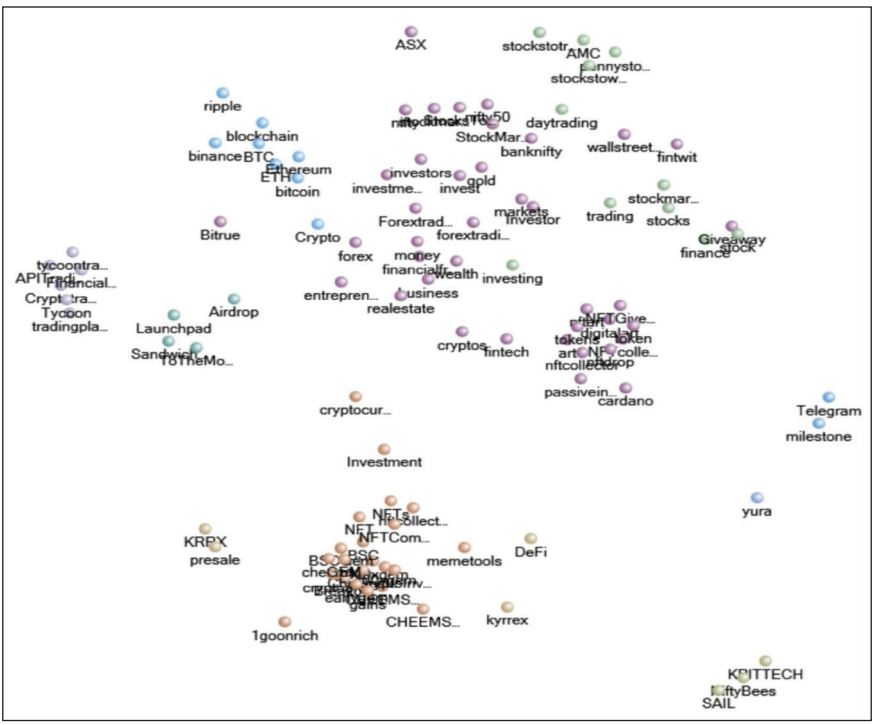

Figure 6. Most Frequently Used Words

Figure 7. Word Cloud

Sentiment Analysis

Sentiment Analysis is a field that aims to understand users' opinions through texts and categorise them as positive, negative or neutral sentiments. The majority of sentiment work has been done on review sites so far (Kamyab et al., 2018). Analysis of Twitter posts is the next important step in the field of sentiment analysis, as tweets provide a more prosperous and diverse repository of opinions and sentiments on topics ranging from the most recent phone they purchased to the most recent movie they watched, from political issues to religious beliefs, and the individual's state of mind towards investing. As a result, using Twitter as a corpus allows us to explore multiple dimensions and applications. Out of 6,804 data, 611 were very negative, 2,303 were moderately negative, 2,607 were relatively positive and 1,283 were very positive. Data that did not fall in the above category were considered neutral. Table 1 shows the percentage of these sentiments. The sentiment of 42.83% of the dataset was negative, and 57.17% was positive. This indicates that while the investors fear and negativity for selling the stock because of an outbreak, people's positive sentiment is stronger.

Table 1. Percentage of Sentiment from Sentiment Analysis

Percentage	Sentiment
8.98	Very negative
33.85	Moderately negative
38.31	Moderately positive
18.86	Very positive

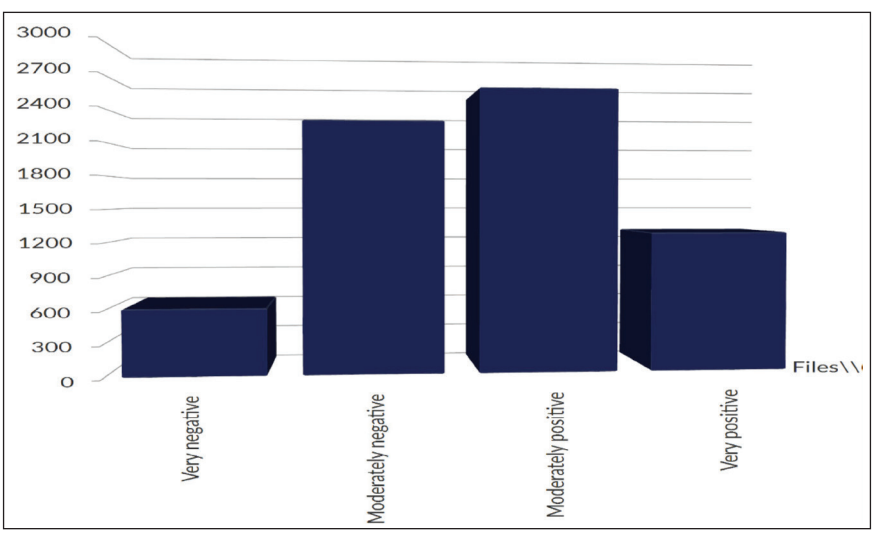

Figure 8. Summary of Results of Automatic Coding

Table 2. Excerpts from Tweets

References	Emotions
When you think you've bought the bottom, you see some profit and then your stop loss gets hit!	Very negative
Looking ominous into 2022.	Very negative
If you want high expected returns, you need to be patient and volatility tolerant.	Moderately negative
Don't get too emotional over something you can't control.	Moderately positive
My trade from Friday. 230% profit in less than 30 minutes.	Very positive

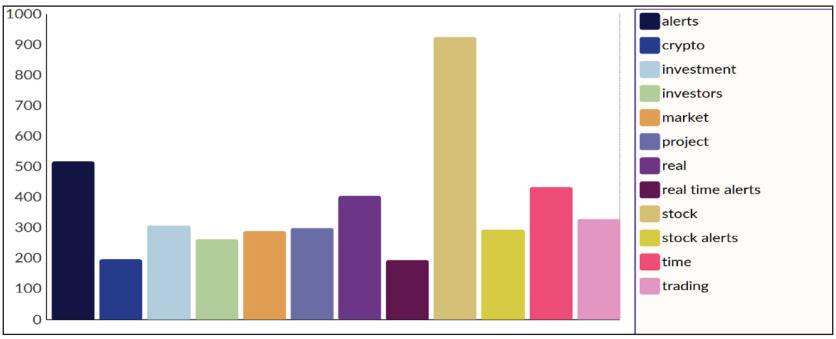

Figure 9. Analysis of the Major Themes of Tweets

Thematic Analysis

Thematic analysis of the employed data presents an effective method for diversifying and comparing the perspectives of the people employed in the Twitter posts. It highlights the parallel view and the differences among the users and reveals unexpected discoveries. Thematic analysis is really useful for summarising the large data into essential aspects. It pushes the researcher to organise the data properly, resulting in a clear and orderly final report (Ahmed et al., 2019; Jain & Singh, 2022). Figure 9 shows the major themes identified from the datasets. The themes related to stock and stock market are primarily followed by alerts and timings, which shows that the people mainly focus on stocks, its alert and timing for taking decisions related to investing.

Social Network Analysis

SNA is the scientific examination of social relationships between social actors who are either implicitly or overtly related. According to social network researchers, the world comprises entities (people, organisations, artefacts, nodes

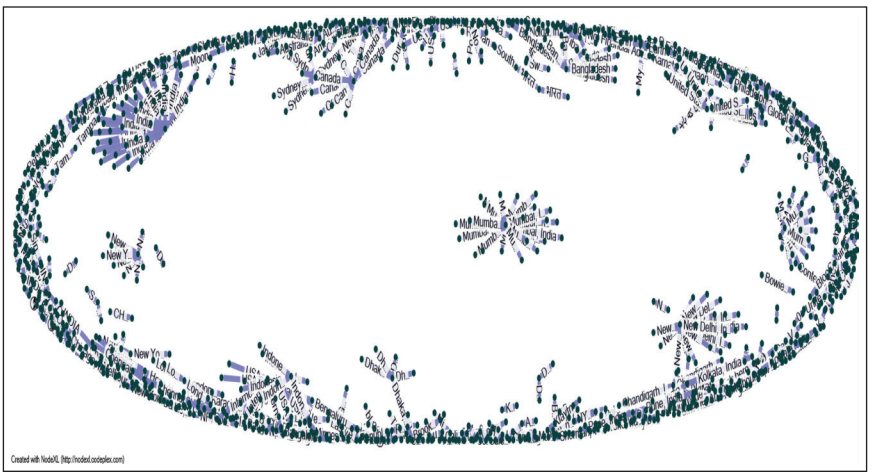

Figure 10. The Network Analysis of Tweets

and vertices) linked through relationships. In contrast to attribute data about individuals, SNA focuses on relational data about what happens between entities. Network analysts are interested in the patterns that emerge from large groups of connections. SNA is more about 'who you know' than 'what you know' or 'who you are' for individuals. In Figure 10, there are 11 clusters; the significant clusters are Mumbai, New Delhi, Canada and the United States. The dense outer portion of the cluster shows interaction, showing the same emotions between the countries.

Discussion

The study explores the impact of the outbreak of a new variant of COVID-19 on the stock market. The effect of the variant was significant on the stock market as well because of its spillover effect. Major stock indices worldwide see a sudden decline due to the fear among the investors, and it is evident that when the major crisis occurs, the stock market falls severely (Huang et al., 2020; Phan & Narayan, 2020); however, as it is seen in the cases of South African stock market, after the cooling period, the stock markets become stable and try to bounce back.

People's sentiment regarding global investing and social interaction within the network was further analysed. For this, the sentiment analysis using Twitter data was conducted to identify people's sentiment, and SNA was done to check the social interaction among the investors. It demonstrated that apart from the negative news and fall of stock markets, there was positive sentiment between the people, which aligns with the previous studies (Jain, 2021; Selmi et al., 2021; Srivastava et al., 2019). The study also identified some significant themes emerged from the thematic analysis of tweets, supporting the major themes during the outbreak related to stock and stock market are maximum followed by alerts and timing,

which shows that the people mainly focus on stocks, its alert and timing for taking decisions related to investing. Further, it was found that 11 clusters were formed among the people who share the common sentiments with the people across different geographies; the significant places identified in the study were Mumbai, New Delhi, Canada and the United States.

Implications of the Study

Investors' sentiment is one of the prominent factors in making investment decisions during the crisis period, and social media platforms, especially Twitter, direct people's moods. The study contributes to the existing portfolio theory as diversification provides an opportunity to investors for reducing losses and encourages the investors to hold the securities during the period, as the study demonstrates the positive sentiment during crises, implying that investors should avoid panicking during these times and instead strive to hold their portfolios. Investment advisors are also encouraged to help their clients to keep their nerves during a stock market collapse as the study shows that markets rebound back after a cooling period. During such a period, an institutional mechanism should be developed that should control the free float of tweets to avoid causing investors to panic about selling stocks.

Conclusions

The significant decline in index prices is visible across the major stock markets worldwide, and the volatility impact has been captured. All the indices included in the study showed declines, explaining the fear among the investors except the index of South Africa, where the first case of Omicron was found, which recovered, highlighting that after the cooling effect, the indexes will start bouncing back, which happened in the earlier period as well.

The results highlight that the investors show mixed sentiments (positive and negative) towards investing. Of the dataset, 42.83% was negative and 57.17% was positive, which shows that apart from the fall of the major indexes, the positive sentiment is positive of investors prevails out. The negative sentiment in people arose due to the fear of the third wave, lockdown 3.0 and many other factors. But the positive sentiment is more than the negative, which shows that the investors are preparing for this and hoping for the correction soon.

The study emphasises identifying the significant themes and social interaction of Indian investors with the world. The primary identified themes around the tweets are related to stock, and the stock market is primarily followed by alerts and timing, which shows that the people are mainly focusing on stocks, its alert and timing for taking decisions related to investing. The SNA revealed that the Indian investor's sentiment aligns with that of the world, forming connections with Canada, Australia, Bangladesh and the United States. In India, the primary identified clusters based on the findings of the study are Mumbai, Delhi, Tamil Naidu and Indore.

Suggestions for Future Research

The study is focused on investor sentiment and social interaction for which the qualitative data has been used. For future research, the mixed method approach using qualitative and quantitative data can be adopted to give a broader perspective of the global markets and investor's sentiment. It could be further expanded to predict the stock market volatility and spillover effect on the domestic market from the foreign market.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Article

Cognitive Dissonance Bias Among Stock Market Investors

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Abstract

The cognitive dissonance theory, formulated by Psychologist Leon Festinger, revealed that inconsistency in beliefs or behaviour among individuals causes psychological tension or dissonance due to exposure to new information. Investor behaviour is prone to several biases that refrains them from making rational decisions. They often reluctantly stick to their original decision even though it is costly. An online and offline survey using a structured questionnaire was used and data was collected from 250 stock market investors of Visakhapatnam, India. With the use of mean and one-way ANOVA—the relationship between independent variable (income, investment amount, education qualification, age, gender and investor experience) and dependent variables (cognitive dissonance)—it was revealed that investors were prone to cognitive dissonance bias. The research shows that cognitive dissonance bias causes investors to make sub-optimal choices. Based on the findings, recommendations were put forth to help investors mitigate their susceptibility to cognitive dissonance bias.

Keywords

Behavioural finance, irrational, cognitive dissonance, bias, financial literacy

JEL Classification: G4, G53, G11

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Introduction

Anomalies are the abnormalities that occur in the financial markets. The explanation for this anomaly was not covered in the ambit of traditional finance, as investors were assumed to be rational. This drawback led to the emergence of behavioural finance. This field integrates traditional finance theories with behavioural aspects to understand the irrational behaviour of investors. The evolution of traditional theories of finance were unable to explain anomalies (speculative bubbles, overreaction, underreaction to new information) that existed in the stock market. The evolution of behavioural finance provided behavioural explanations for these anomalies (Kapoor & Prosad, 2017). Instances of irrational behaviour were observed among investors during the Global Crisis of 2008, demonetisation, and even during the ongoing COVID-19 pandemic. The 2008 Financial Crisis instigated the necessity to understand irrational human behaviour and, for this reason, emphasised the need to study behavioural finance (Nair & Antony, 2015).

The Securities and Exchange Board of India (SEBI) revealed a surge in new investors entering the stock market amid the pandemic. The new Demat accounts opened in the fiscal year 2020 were recorded at 4.9 million, which is the highest in at least a decade, leading to a 22.5% hike from 4 million accounts opened last year (Agarwal, 2020). This increase makes it pertinent to understand the influence of behavioural biases in investment decisions. A bias is a tendency to believe something or to be inclined towards something in an unreasonable manner. In this study, the cognitive dissonance bias has been selected to examine its presence and influence among the investors of Visakhapatnam city, India.

Review of Literature

Cognitive dissonance is a state of imbalance when opposing cognitions intersect (Pompian, 2006). Psychologist Leon Festinger formulated the theory of cognitive dissonance. The results of his experiment revealed inconsistency in beliefs or behaviour among individuals, which causes psychological tension (i.e., cognitive dissonance) due to exposure to new information. The new information tends to make people, who often prefer to change the inconsistent elements to lessen the dissonance or add consistent elements to reinforce consonance, review their decision (Suls, 2020).

The author mentioned that individuals tend to show resistance when they are confronted with contradictory information to their current beliefs. Furthermore, when the time, money and effort involved to accept the new belief is high, the resistance level also remains high (Olsen, 2008). Due to this dissonance, the investors do not like to repurchase the assets that have increased in price because it would unwillingly make them admit that their earlier decision to sell the asset was a mistake (Chang et al., 2016). Investors believe the data collected by them to be useful and are inclined to trade. Individuals tend to understand one thing at a time and, in this process, miss other vital information (Barber & Odean, 2001; Wood & Zaichkowsky, 2004). They often remain serious about their original decision and stick reluctantly even though it is a costly affair (Singh & Bahl,

2016). Antoniou et al. (2013) found that bad news causes cognitive dissonance among small investors when they have positive beliefs and take time to let go of the loser stocks. On the other hand, large investors quickly respond to negative information and sell off loser stocks. This bias showed its influence on the psyche of Indian investors (Shahani & Gupta, 2019). Interestingly, Bernard et al. (2018) found that stock ownership creates a feeling of cognitive dissonance. Investor tends to take action even when they do not benefit the invested-in company.

Statement of the Problem

After the review, it was found that there were limited studies that examined the influence of cognitive dissonance bias on investors' decisions. The influence of this bias leads to poor or sub-optimal decision-making. Furthermore, there is a dearth of such studies in Andhra Pradesh and particularly in Visakhapatnam city. There exists a research gap, and this article is an attempt to address it.

Need for the Study

Despite many investors entering the markets, they are not able to earn good returns and feel disappointed. This study is needed to understand cognitive dissonance bias and its influence on the investors' behaviour. During the pandemic, the majority of Demat accounts were opened by millennials aged between 24 and 39 years (Gilchrist, 2020). Also, the sample for the study includes a majority of respondents (40%) from the age group below 35 years. Since the research was conducted during the pandemic time, it is relevant to understand the detrimental effects of this bias on investors' return from the market.

Objectives of the Study

1. To examine the influence of cognitive dissonance bias on behaviour of stock market investors.
2. To put forth recommendations to help investors recognise and mitigate the effect of cognitive dissonance bias on their investment decisions.

Research Hypothesis

H_0: There is no significant relationship between demographic variables and cognitive dissonance bias.

The demographic variables considered here are age, gender, marital status, occupation, educational qualification, income, investment amount, Demat account value and investor experience. The demographic variables are the independent variables while cognitive dissonance bias is the dependent variable.

Methodology of the Study

The questionnaire consists of two parts: The first part focused on the demographic and investment profile, while the second part included a set of five questions regarding cognitive dissonance bias among investors and their stock market investment knowledge.

Sample Selection

Snowball and convenience sampling method was used to collect primary data.

Source of Data

The primary source of data was collected using an online and offline questionnaire from investors in Visakhapatnam city and received 250 responses. Secondary data was taken from various articles, books and websites.

Period of the Study

The data was collected from July to September in the year 2020.

Tools Used in the Study

SPSS 20.0 software was used for one-way ANOVA and mean analysis.

Data Analysis

The reliability of the questionnaire was tested using Cronbach's alpha, and the results showed the alpha value as 0.7. As a general rule of thumb, this value is acceptable and good which makes the questionnaire reliable and consistent.

Table 1 presents the classification of respondents based on their educational qualifications. It shows that the respondents with doctorate degrees (3.6800) were most prone to cognitive dissonance bias, followed by undergraduates (3.5429) and then the individuals who were qualified chartered accountants, cost accountants, company secretaries and advocates (3.2500). The postgraduates (2.9920) showed the least susceptibility to this bias. The *f*-value was found to be 11.674 with a *p*-value of 0.000, that is, less than 0.05, thus, the null hypothesis is not accepted. There exists a significant relationship between the educational qualification of the respondent and cognitive dissonance bias.

The occupation of an individual plays a key role in determining the amount of investment made by an investor. Table 2 shows the mean values of investors, that is, students (3.6800) and homemakers (3.8) were the most influenced by cognitive dissonance bias. This behaviour can be ascribed to the fact that their source of income is dependent on the monetary assistance received from the earning

Table 1. Result of Mean Values and ANOVA: Educational Qualification and Cognitive Dissonance

Highest Education	Mean	*N*
UG	3.5429	35
PG	2.9920	125
PhD	3.6800	50
Professional education	3.2500	40
Total	3.2480	250

ANOVA Table

		Sum of Squares	*Df*	Mean Square	*F*	Sig.
CD mean Highest education	Between (combined) groups	20.566	3	6.855	11.674	0.000*
	Within groups	144.458	246	0.587		
	Total	165.024	249			

Source: Primary data processed using SPSS 20.
Note: *Significant at 5% level.

Table 2. Result of Mean Values and ANOVA: Occupation and Cognitive Dissonance

CD Mean

Occupation/Profession	Mean	*N*
Government employee	2.9000	20
Private employee	3.2800	100
CA, CS, CMA, advocate	3.0000	30
Business or self employed	3.1800	50
Student	3.6800	25
Homemaker	3.8000	10
Others	3.1333	15
Total	3.2480	250

ANOVA Table

			Sum of Squares	*Df*	Mean Square	*F*	Sig.
CD mean Occupation/profession	Between groups	(combined)	12.511	6	2.085	3.322	0.004*
	Within groups		152.513	243	0.528		
	Total		165.024	249			

Source: Primary data processed using SPSS 20.
Note: *Significant at 5% level.

members of their household, which creates an innate need to be accountable for any loss that may occur. Thus, they prefer low-risk investments and often show herd behaviour. The least susceptibility to this bias was observed from the

government employees (2.9). The ANOVA results show the significant *p*-value at 0.004, which is less than 0.05; thus, the null hypothesis is rejected.

It can be observed from Table 3 that the mean value of investors with no source of income (4.0667) shows the highest susceptibility to cognitive dissonance bias. This was followed by investors who fall in the income slab between ₹750,000 and ₹1,000,000, that is, mean value 3.65. The *f*-value was found to be 7.93 with a *p*-value of .000, that is, less than 0.05; thus, we do not accept the null hypothesis. It shows that there is a significant relationship between individual average annual income and cognitive dissonance bias. About 46% of the respondents fall into the non-taxable income slab rate, that is, below ₹5 lakhs; their combined mean value was 3.205, which showed that they are also influenced by the cognitive dissonance bias. It is interesting to note that the investors whose average annual income was above ₹15 lakhs (mean value 2.6857) exhibited less influence of this bias on investment behaviour. It can be inferred that when an individual falls into a higher income slab, they have extra income for disposal which makes them financially confident to make independent investment choices.

In Table 4, the mean values for the average Demat holding value per month of below ₹25,000 and between ₹25,000 and ₹100,000 are 3.3167 and 3.7, respectively. Approximately 72% of the respondents have their average Demat holding value below ₹100,000. It was observed that with an increase in Demat holding value, the

Table 3. Result of Mean Values and ANOVA: Individual Average Annual Income and Cognitive Dissonance

CD Mean		
Individual Average Annual Income	Mean	*N*
Less than 250,000	3.0800	25
250,000–500,000	3.3333	90
500,001–750,000	3.4333	30
750,001–1,000,000	3.6500	20
1,000,001–1,250,000	2.8000	20
1,250,001–1,500,000	3.2000	15
Above 1,500,000	2.6857	35
Nil	4.0667	15
Total	3.2480	250

ANOVA Table

			Sum of Squares	*Df*	Mean Square	*F*	Sig.
CD mean Individual average annual income	Between groups	(combined)	30.791	7	4.399	7.930	0.000*
	Within groups		134.233	242	0.555		
	Total		165.024	249			

Source: Primary data processed using SPSS 20.
Note: *Significant at 5% level.

Table 4. Result of Mean Values and ANOVA: Average Demat Value Per Month and Cognitive Dissonance

CD Mean		
Average Demat Value Per Month	Mean	*N*
Less than 25,000	3.3167	120
25,001–100,000	3.7000	60
100,001–200,000	1.4000	10
Above 300,000	2.9273	55
Total	3.2449	245

ANOVA Table							
			Sum of Squares	*Df*	Mean Square	*F*	Sig.
CD mean Average Demat value per month	Between groups	(combined)	52.630	3	17.543	37.657	0.000*
	Within groups		112.276	241	0.466		
	Total		165.024	249			

Source: Primary data processed using SPSS 20.
Note: *Significant at 5% level.

susceptibility to cognitive dissonance bias reduced and vice-versa. Since the *p*-value was .000, that is, less than 0.05, thus the null hypothesis is not accepted as there exists a significant relationship.

Interestingly, it can be observed in Table 5 that there exists a significant relationship between experience and cognitive dissonance bias. The *f*-value was 2.775 with a *p*-value of .028, that is, less than 0.05, thus the null hypothesis is not accepted. Investors with greater experience (above 15 years of age) in investment in stock markets had the least influence of cognitive dissonance bias (mean value of 2.9). They were able to mitigate the effect of this bias.

Findings of the Study

Following are the findings of the study:

1. Respondents with the highest education background, that is, PhD and professional education, were more predisposed to this bias. Individuals with high education find it difficult to make the right choices when compared to others. Thus, there is a need for these investors to be able to identify their biases.
2. Investors with lesser Demat holding value, that is, below ₹25,000 and between ₹25,000 and ₹100,000, had more effect of this bias on their investment decisions, that is, an experienced investor was better at mitigating this bias when compared to a less experienced investor.

Table 5. Result of Mean Values and ANOVA: Experience and Cognitive Dissonance

CD Mean							
Experience			Mean		*N*		
Less than one year			3.3875		80		
1–5 years			3.1529		85		
6–10 years			3.4286		35		
11–15 years			3.3000		20		
Above 15 years			2.9000		30		
Total			3.2480		250		
ANOVA Table							
			Sum of Squares	*Df*	Mean Square	*F*	Sig.
CD mean Experience	Between groups	(combined)	7.153	4	1.788	2.775	0.028*
	Within groups		157.871	245	0.644		
	Total		165.024	249			

Source: Primary data processed using SPSS 20.
Note: *Significant at 5% level.

3. Investors prone to cognitive dissonance bias stick to losing stocks that they would otherwise sell because they want to avoid the mental pain linked to accepting their prior poor decision.
4. Cognitive dissonance bias also makes the investors susceptible to herd behaviour. They get influenced by the opinions of their co-investors and analysts rather than independent decisions.
5. Out of 250 respondents, 52% have an average level of knowledge in stock markets, about 26% of them stated poor knowledge, 16% stated above average/good knowledge in markets and only 6% rated themselves to have excellent knowledge in markets. Lack of proper knowledge in stock markets and training and orientation from advisors or depository participants before investing discourage investors from making independent decisions.

Recommendations

To overcome this bias, an investor must have an open mind and be ready to reflect on his/her mistakes. Investors must carefully analyse the market patterns using charts and follow authentic sources of news. The use of paper trading can be done simultaneously to keep a check on decisions which they impulsively make and compare that decision with those taken in reality. This comparison will help the investor to know the deviation in returns and will help them control this bias. With experience and adequate knowledge, one can learn to make independent decisions and avoid being prone to herd mentality.

Further, it is suggested that investors should also be provided with a booklet by their depository participant in vernacular languages to help them understand the basics of financial markets as many investors randomly begin investing without proper knowledge. Thus, financial literacy and self-control are the key aspects that will help an individual make rational choices and reduce their susceptibility towards biases.

Limitations of the Study

This sample size is limited to 250 investors only and cannot be generalised to all stock market investors. The majority of the respondents were men, so the behaviour of women investors could not be captured well. Due to the pandemic norms, the researcher's interest to personally interview the respondents was constrained. Despite the limitations, care and effort have been taken to ensure the accuracy of the results.

Conclusion

Behavioural finance acts as a guide in making viable decisions by suggesting ways to avoid these mistakes, which are known as defensive behavioural finance applications in investment decision-making. This study further revalidates the influence of this bias on stock market investors, which leads to investors making sub-optimal investment choices. The factors such as education, occupation, income, Demat holding value, investor experience and cognitive dissonance bias have a significant relationship.

Scope for Further Research

This study can be extended to brokers and investment advisors to understand their susceptibility to cognitive dissonance bias. A specific study on women investors would give a better understanding of their behaviour.

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Stock Price Forecasting of Maruti Suzuki using Auto Regressive Integrated Moving Average (ARIMA) Model

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Abstract

Forecasting of stock prices is a very important subject in the financial world and economics. For many years, investors have been interested in making better forecasting models. The autoregressive integrated moving average (ARIMA) model was used previously for time series forecasting. This article shows the process of stock price forecasting using an ARIMA model. Historical stock data for analysis is obtained from the National Stock Exchange (NSE) and is used along with the stock price for forecasting using an ARIMA model. The result obtained from an ARIMA model is better for short-term forecasting and can be proven with existing methods for stock price prediction.

Keywords

ARIMA model, stock price prediction, stock market, short-term prediction

Introduction

Forecasting is a very important field of study. Researchers in this field always have the desire to perform better than the previously used forecasting techniques. One reason for this is that the investment choices that institutes and individual investors are willing to make require a plan to build an effective model for making

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future decisions. Forecasting stock prices is regarded as a very complex task to complete in financial forecasting owing to the complex nature of the stock market. Many investors want to create a forecasting model that could enhance their profit as well as minimise the risk of investing in the stock market. For researchers, this is an important factor to consider when changing and developing any required predictive models. For the past few years, many models and processes have been developed for predicting stock market prices. Artificial neural network (ANN) is one among them that is very popular owing to its ability to predict patterns using historical data. Much work has been done using ANNs model for stock price prediction; for example, a hybrid approach was developed to enhance stock price forecasting models by using the desired advantage from each of them.

In the literature, there are two perspectives of prediction: statistical perspective and artificial intelligence perspective. The autoregressive integrated moving average (ARIMA) model is a statistical model perspective. ARIMA model is said to be more powerful in financial time series data forecasting for short-term forecasting as compared to the very popular ANNs model and it is used widely in economics and financial fields.

The ARIMA model was introduced by Box and Jenkins in 1970. It is also referred to as Box-Jenkins's methodology. It is a set of processes to identify, estimate and diagnose ARIMA technique for time series data. ARIMA models are efficient for short-term forecasting. It also performs better than most complex structural models for short-time prediction. Future value in ARIMA is the value of a variable, and it is the linear summation of past values and past errors, which is expressed as follows:

$$Y_t = \varphi_0 + \varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + .. + \varphi_p Y_{t-2} + \varepsilon_t - \theta_1 \varepsilon_{t-1} - \theta_2 \varepsilon_{t-2} - ... - \theta 1_q \varepsilon_{t-q}$$

Here, Y_t is the actual value and t ε is the random error at *t*; φ_i and θ_j are the coefficients, and p and q are integers, which are often referred to as autoregressive and moving average, respectively.

Building an ARIMA predictive model consists of many steps, which are identification of model, estimation of parameter and checking of diagnostic.

Objective

In the present scenario, investment in financial markets is very important for the growth of the economy. Limited analysis of an investment can result in loss. Currently, investors mainly focus on the fundamental data of the company for making an investment. So the objective of this study is to forecast stock prices for the Indian market in order to make better investment decisions.

Literature Review

Nayak et al. (2016) in the paper titled 'Prediction models for Indian stock market' stated that, for the past few years, many people have been showing interest in

investing in the stock market. When investing, the investor may lose all the money they invested. For this reason, an efficient predictive model is required to understand the future behaviour of the stock market. Many forecasting models have been developed about the market trend but very few give good results.

Babai et al. (2011) in the paper titled 'Forecasting and inventory performance in a two-stages supply chain with ARIMA (0,1,1) demand' stated that the demand model for ARIMA (0,1,1) was analysed extensively by researchers. Forecasting practitioners use ARIMA widely, as it has promising theoretical features. They analyse the correlation between the accuracy of forecasting and the performance of the inventory in order to investigate if there are any benefits of sharing the forecast data with retailers and manufacturers.

Ertekin and Büyükşahin (2019) in the paper titled 'Improving forecasting accuracy of time series data using a new ARIMA-ANN hybrid method' stated that it is important to forecast time series data as it is also a very challenging task. It is used in a lot of other fields of application. Studies have been done on linear data individually or in a combination with non-linear data. To forecast stationary time series data, a linear model like ARIMA has a good forecasting accuracy.

The past studies also classify forecasting models according to their perspective: statistical approach and artificial intelligence approaches. An ARIMA model relates to the statistical perspective (Wang et al., 2012). It is considered as being efficient as well as predominant for time series forecasting. Many researchers showed that the short-term predictions of ARIMA technique perform better than those of ANNs models (Lee et al., 2007; Merh et al., 2010; Sterba & Hilovska, 2010).

Adebiyi et al. (2014) in their study demonstrated the ability of an ARIMA model to provide relatively accurate short-term predictions about stock prices. Among the works that applied ARIMA for forecasting purposes are Contreras et al. (2002), Khashei et al. (2012), Wang (2011), and Lee and Ko (2011).

The time series methods can be divided into two types. The first, that is, the univariate method, is applied using only a time series of the examined variable, in contrast to the second, the multivariate method, which in addition requires time series of related variables. The main advantage of an ARIMA model being a univariate method is that it requires less data than a multivariable approach. This feature makes an ARIMA model convenient for forecasting the stock prices of many stocks. One time series also allows avoiding inconsistent data, which is a problem that multivariate models may suffer if the available time lengths of time series are not matched or have missing observations. The main disadvantage of an ARIMA model is that it is based on historical information; therefore, it is not capable of predicting shocks or big, unexpected changes in the stock price (Meyler et al., 1998).

Methodology

The detailed process for an ARIMA model is explained further. The tool used for implementation of model is Python. Historical daily stock data collected from the National Stock Exchange (NSE) is used in this research work. The stock data has

four constituents, which are open, low, high and close price. Closing price is used in this research. It was selected because it shows all the events that happened on that particular trading day. Several experiments were performed to examine the best ARIMA model, and the following methodology was used.

Research Framework

The study is based on the stock price of the company and the forecasting of the stock price.

Research Design

The research design shows the methods and procedures for conducting any particular study. The objective of the analytical research design applied here is to analyse and forecast the stock price of Maruti Suzuki.

Method of Data Collection

Secondary data is used to reach the aims and objectives of this project. The secondary data for the analysis, which is the stock data for the past 4 years, was collected in digital form from the NSE website. I had chosen these sources because of the reliability and suitability of these sources, and I was also sure about the accuracy of the data.

Research Instrument

The research instrument used for the study is the daily closing price of the stock price of Maruti Suzuki.

Data Analysis

ARIMA is a tool that is used to forecast stationary time series data.

An ARIMA (p, d, q) model requires three input parameters:

- p is used for autoregressive.
- d is used for to make the time series data stationary.
- q is used for moving average.

ARIMA is able forecast stationary time series data.

What does stationarity mean?

A time series data is considered to be stationary when the mean and standard deviation remain constant over time. In order to check the stationarity of data, the rolling mean and standard deviation are computed and plotted on the original time series data.

It is evident from the graph in Figure 2 that the mean and standard deviation in not constant over time. So the data needs to be made stationary. To do that, the first-order difference of the data was taken. In simple words, subtract today's price from yesterday's price and plot it again (Figure 3).

From the graph in Figure 3, it is evident that mean and standard deviation remain constant. Since stationarity is achieved by differencing once, the d term for ARIMA will be 1.

Autocorrelation (ACF) and stands for partial autocorrelation (PACF) plots are usually used for stock price analysis and forecasting.

They show how strong or weak the relationship of an observation in a time series is with the observations at prior time steps.

Autocorrelation is the relation between points at time t (P_t) and the point at (P_{t-1}). Partial autocorrelation is the relation between point at time t (P_t) and the point (P_{t-k}) where k is any number of lags. Partial autocorrelation ignores all of the data in between both these points.

In simple words, autocorrelation is the relationship between today's stock price and yesterday's stock price. Partial autocorrelation shows the relationship between

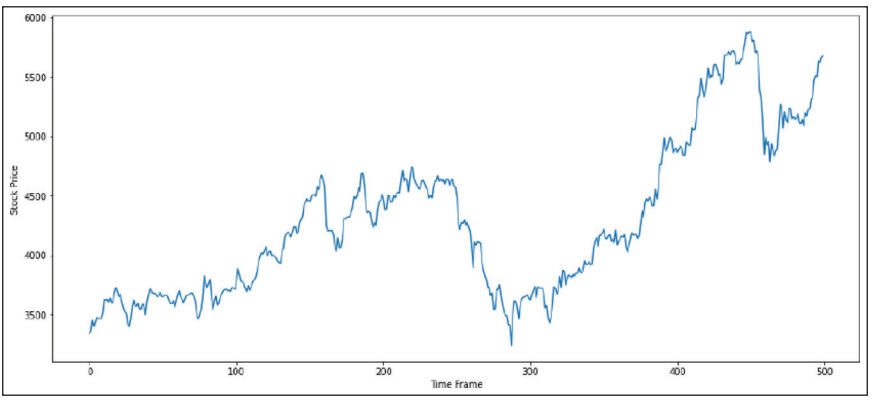

Figure 1. Graph of Collected Data

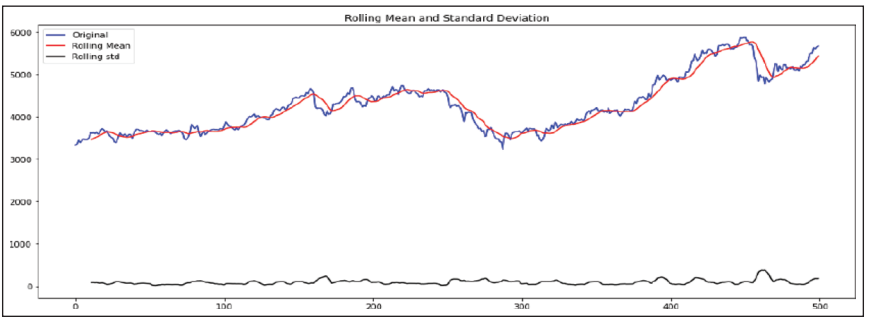

Figure 2. Mean, Standard Deviation and Original Data

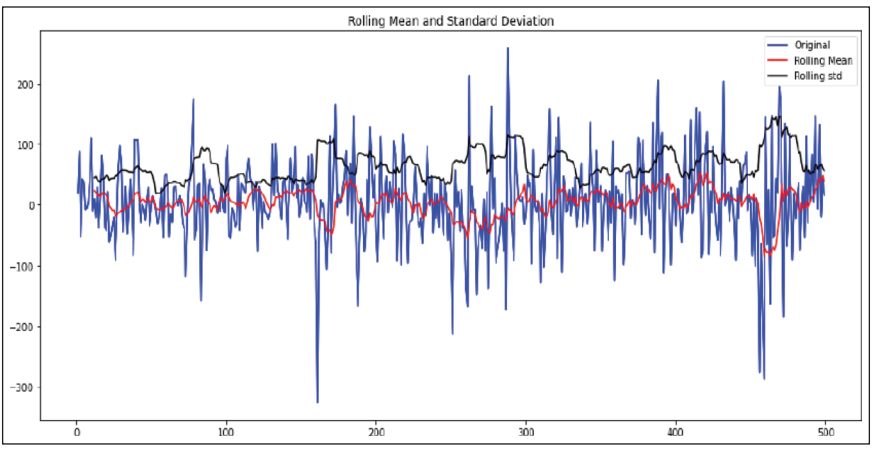

Figure 3. Mean, Standard Deviation and Differenced Data

today's stock price and the price it was a week before. Let's obtain the plots for autocorrelation and partial autocorrelation.

The p term for ARIMA is computed from the autocorrelation plot (Figure 4). The p term is taken as that which crosses the significance zone. So the p term is 8.

The q term for ARIMA is computed from the partial autocorrelation plot (Figure 5). The q term is taken as that which crosses the significance zone. So the q term is 8.

Result and Conclusion

For ARIMA (p,d,q) model, the values obtained are p = 8, d = 1 and q = 8. So the model is fitted for ARIMA (8,1,8). The result obtained is shown in Table 1 and plotted in Figure 6.

The original time series data is decomposed and plotted in Figure 7. It contains trend, seasonality and the residual part of the original time series data. By comparing them with the forecasted result, it is evident that the forecasted result contains the trend and seasonality part of the time series data, but it does not contain mush of the residual part of the original time series data.

To check the statistical accuracy of the forecasted result, the Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE) are computed. The value of RMSE is 492.4 and of MAPE is 8.92%, which is pretty good. A MAPE of 8.92% indicates that our model is 91.08% accurate.

An analysis of Maruti Suzuki stock price for the previous 5 years daily traded value on the NSE gives us an ARIMA (8,1,8) model. ARIMA (8,1,8) is used in predicting the future values of Maruti Suzuki stock price. An ARIMA (8,1,8) model was selected as it satisfies all criteria of the statistics fit.

This article explored the wide process of making an ARIMA model to forecast the stock price of Maruti Suzuki. The obtained experimental results show the

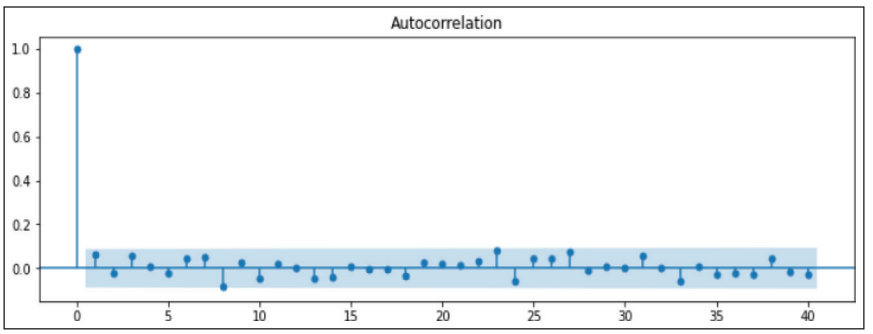

Figure 4. Auto Correlation Plot

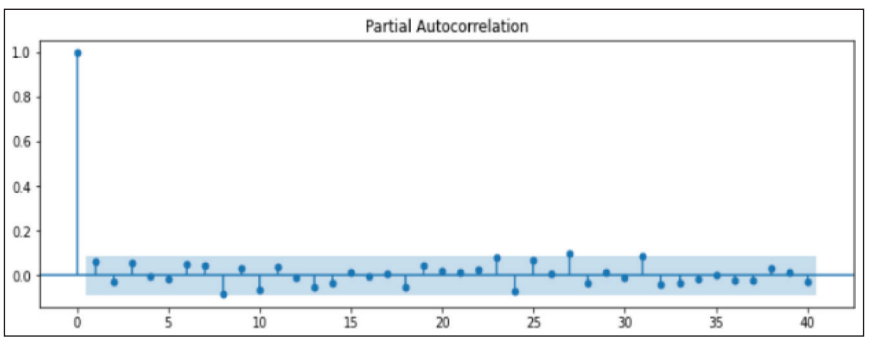

Figure 5. Partial Auto Correlation Plot

Table 1. Original and Forecasted Data

Date	Original	Forecasted
1 January 2015	3,340.75	3,340.75
2 January 2015	3,359.6	3,345.3
5 January 2015	3,447.8	3,350.69
6 January 2015	3,395.25	3,360.12
7 January 2015	3,437.5	3,360.9
8 January 2015	3,475.5	3,370.02
9 January 2015	3,648.2	3,373.65
12 January 2015	3,462.9	3,379.47
13 January 2015	3,468.25	3,387.75
14 January 2015	3,516	3,388.72
15 January 2015	3,625.8	3,393.22
16 January 2015	3,616.6	3,410.62
19 January 2015	3,626.25	3,406.13
20 January 2015	3,605.55	3,419.07

Figure 6. Original Data and Forecasted Data

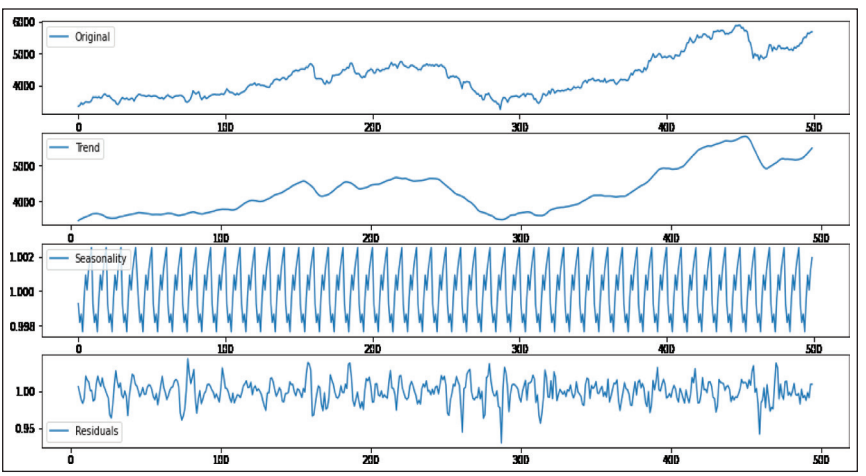

Figure 7. Decomposition of Original Time Series Data

potential of ARIMA model—that it could be helpful for making profitable investment decisions.

Limitation

There are some limitations in using an ARIMA model to forecast time series data. This technique produces the desired results only for a short time period. When a

sudden change in the data happens, such as when a government changes its policy or there is economic instability (a structural break), in that case, it is hard for the model to capture the change; so this model is not good to forecast for longer periods of time. Forecasting with this model assumes that the time series data is linear.

Future Scope

Forecasting of stock price was done using an ARIMA model. The assumption for using ARIMA is that time series data is linear, and so implementing non-linear forecasting techniques using soft computing techniques can be considered with a lesser white noise term.

Declaration of Conflicting Interests

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Book Review

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Carrie A. Picardi, *Leadership Essentials You Always Wanted to Know*. Vibrant Publishers, 2021, 198 pp. ₹1,985. ISBN 978-1-63651-033-0.

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This book is spread over 10 chapters detailing the essentials of leadership for different organisations in terms of developing future leaders. The first chapter is about the meaning and purpose of leadership where the complex subject of leadership is discussed keeping in mind the different elements of leadership such as effectiveness, ethics, efficiency, influence, accountability and so on. The chapter also details the difference in informal and formal leadership and the ways and means that make them these types of leadership successful in their respective domains. It highlights the importance of a leader who leads by example and thus sets the tone for the followers. The author highlights this by giving the specific example of how a college professor is an informal leader inside the classroom for students and outside the classroom has a number of responsibilities as a formal leader, depending on the role allocation. The next chapter elaborates on the multifaceted role of a leader with reference to the different attributes, skills competencies and knowledge s/he ought to have in order to succeed as an impactful leader. Further, the chapter discusses the different takes with respect to the leadership traits; leaders ought to have as elaborated through researches on leadership trait research—universal leadership traits as well as skill-based leadership model. The common traits that emerged from all these perspectives include being a motivator, problem solver, role model, communicator, team builder and a visionary who is assertive, compassionate, patient, creative and insightful in not only dealing with problems but also in dealing with diverse people. In a nutshell, it can be concluded that leadership traits can be developed through the proper development of skills and competencies in those who are to don leadership roles. The third chapter details the importance of leadership behaviours that translate the vision and mission of the organisation into the much-sought outcomes in terms of tangible results. The chapter has examples from best

practices based on the studies in Ohio State University and the University of Michigan Studies. Behavioural best practices for effective leaders includes understanding the milestones to be achieved in a given time frame with the focus on the vision. It is important to understand the needs and concerns of the followers with respect to the challenges they face in the execution of the plans set out for them by maintaining a two-way communication with respect to listening to their concerns as well as sharing information from time to time. Chapter four of the book details the different leadership styles that have been recommended by different theorists from time to time such that it is understood that, apart from the leadership traits, it is important that the leader understands the needs as per the circumstances presented and adapts his/her leadership behaviour according to the change perceived in the expectations and needs on ground zero. The author builds a case for looking into Fiedler's contingency theory, House's path goal theory, Hershey and Blanchard's situational leadership model and leader–member exchange theory in order to understand the demands exerted on leaders in different situations and the ways and means needed to understand them. The next chapter helps the reader to differentiate between power and influence. The intricate relationship between power and influence with respect to leadership is described along with understanding the key differences between personal power and position power. It also clarifies the four common outcomes of power that are seen in terms of the behaviours of the followers which include, namely, compliance, identification, internalisation and resistance. It is important for every leader to exercise power in such a way that it translates into exerting influence such that the followers are able to understand as well as share the vision of the leader in order to act in a particular way to achieve the desired objectives. This can be done easily if the leader is able to empower the followers by sharing a considerable amount of power and influence such that it increases their commitment as well as engagement in achieving the goals. Chapter six is about different leadership styles that may be adopted by leaders to be successful in their respective domains of responsibility. The two recent leadership styles that support positive outcomes are charismatic leadership and transformational leadership. Although the strength of charismatic leadership is well documented, it is important to understand that charismatic leadership can be disastrous in case of negative or destructive agendas which may be pursued by any such leader in terms of influencing the followers. On the other hand, transformational leadership is a style where the leader is able to transform the organisation or institution not only by his/her leadership behaviours and personal traits but also by giving the followers clear directions, positive motivation, road map of action and incentives for exemplary performance. However, it is important to understand that the strength of charismatic leadership cannot be undermined in comparison to transformational leadership as both have their own strengths and weaknesses. It is also possible that a leader adopts a combination of both charismatic and transformational leadership to lead an organisation successfully. There is no doubt that the success of an organisation is contingent upon the teams that work towards it. Chapter seven of the book details the different types of team leadership such as self-managed or informal team leadership and formal team leadership, that is, a structured team leadership. The author also

focuses on the need for understanding the fine balance between task facilitation and interpersonal relationship building in order to have a high performing team in place such that conflicts are minimised and productivity is maximised. The success of a team is dependent upon the strategic thinking of the team leader with respect to achieving the short-term and long-term goals by taking the team along in terms of demonstrating empathy towards their needs, challenges and interests such that they are able to perceive the leader as a compassionate and caring individual who leads by example. The important aspects that need to be remembered with respect to supporting responsible teams are mutual respect, trust, open communication channels, meaningful engagement, cooperation and dependability as a whole. The next chapter conceptualises the need for leadership development in terms of having a strategy in place to facilitate the development of knowledge, skills and abilities that prepare individuals for leadership roles. It is important that organisations look at the different models that are in place with respect to development of the needed leadership competencies. Competencies are the desirable behaviours that are needed to achieve the outcomes. There are different ways through which leadership competencies may be developed which include enrolling oneself in formal degree programmes, certificate programmes, mentoring and coaching institutes and workshops and classes such that the future leaders are provided with hands on experiences to thus understand the nuances of leadership development. Any organisation that invests in the development of leaders for their future keeping in mind the evolving roles and responsibilities over a period of time shall be able to achieve the organisational outcomes better by planning ahead. Chapter nine focuses on a very important dimension of leadership, that is, ethics. It is indisputable that the critical responsibility of a leader is to not only achieve the organisational outcomes but also do it by simultaneously upholding the moral fabric of integrity and justice high. In order to uphold the principles of ethical leadership, it is important that leaders work towards the best interests of the organisation rather than self-interests. It is important to be confident, secure and competent such that fear of failure or insecurity does not lead to any kind of unethical decision or behaviour which tarnishes not only the image of the leader but also of the organisation in the long run through the abuse of power and influence. It is important that leaders are taught the ethical use of power such that they are mindful of their actions in terms of understanding the relevance of leading by example, demonstrating high integrity, focus, communicating with honesty and transparency and having a value-driven agenda in place to achieve organisational goals positively and ethically. The last chapter of the book elaborates on the importance of three important areas that need to be focused upon in order to lead a thriving organisation which includes managing continuous change, leading through crisis situations and the ability to demonstrate global competency in terms of leadership. The author details the different factors that may contribute to resistance to change which can be overcome by facilitating change through open communication about the benefits of the change, supporting and validating the best interests of all the stakeholders and empowering the teams by communicating the factual information in terms of the necessity of change as well as their role as change agents.

This book is a must for all practitioners in leadership roles looking at the intricacies with which different dimensions of leadership are explained. The book is coloured and is written in a language that is easily comprehensible and jargon free. The paper used and the print quality, both are excellent. Every chapter gives a brief introduction along with the learning objectives it is supposed to achieve. At the end of each chapter is the point-wise summary of the contents of the chapter. The author has used examples from research in the field of leadership wherever necessary to substantiate a claim with respect to leadership styles or models of leadership development which makes it an evidence-based work. The chapters are not lengthy; this makes the readers focus easily through all the 10 of them. This book is a contribution that shall prove to be valuable for all the stakeholders working in the area of leadership at different levels in times to come.

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