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Contents

Editorial

Orissa Commerce Association is working consistently with a pious mission to serve the research community of India by publishing '*Orissa Journal of Commerce*', a quarterly peer-reviewed research journal for over four decades. The current Issue of the Journal contains thirteen research papers and articles from diverse fields of commerce, management and public policy.

Agile leadership strategies/competency roadmap is the need of hour for organizational success and sustainability which has been epitomized in the *first article*. The 3W (work, workspaces and workforce) are transforming, thereby changing the landscape of how organizations build work structures, people management systems and drive the business models & productivity parameters. This study presents various competency frameworks/models for agile leaders. Subsequently, the paper concludes with agile leadership strategies for ensuring business continuity plans by mentioning the 'AGILE' and 'HAVE' models of agile leaders in industry 5.0 era. The *second paper* critically analyses the major inefficiencies and issues in the existing international financing and way forward. Empirical findings and projections indicate that climate change threatens the stability of the entire financial system; and developing and least-developed economies are most vulnerable to adverse impact of climate change.

To study the impact of lockdown announcements due to Covid-19 on banking sector in various phases of lockdown, the *third paper* uses event study methodology. The event day has been taken as announcement day of lockdown in various phases. It was concluded that investors were able to earn abnormal returns during event window period. The aim of the *next paper* is to develop a model showing that the connection of the numerous magnitudes of perceived risk and the online purchase intention of consumers. The findings are helpful to understand the complex relationships between various dimensions of risk and online purchase intention. The *fifth paper* attempts to explore the factors affecting the criterion-wise score and also overall scoring pattern of accredited higher education institutions of Chhattisgarh. Findings indicate that HEIs with post-graduation program positively and that in rural areas negatively impact the accreditation scores.

The *sixth paper* examines the effect of currency futures on foreign exchange rate volatility in India focusing on USD-INR, EUR-INR, GBP-INR and JPY-INR. The findings clearly depict that presence of volatility persistence is there for USD-INR, GBP-INR, EUR-INR, and JPY-INR. The main objective of the *next paper* is to provide comprehensive overview of previous studies related with the topic 'dividend policy' in context of statistical analysis of published articles/documents around the world. And it is found that there was great increment in number of publications and from 2018 the publications are continuously increasing.

The *eighth paper* investigates the influence of firm characteristics on cash holdings in Indian Iron & Steel industry over 2007-2019. The result documents that firm characteristics viz. cash flow, dividend,

assets tangibility, and profitability positively influence the cash holdings while firm size, leverage, net working capital, and R&D expenditure negatively influence cash holdings. The *next paper* examines the effectiveness of direct and indirect tax revenue on gross domestic product (GDP) in the Indian economy. The study finds a positive and significant impact of direct and indirect tax on the country's GDP both in long-run and in short-run.

The *tenth paper* is based on exploring one such bias, herding behaviour. Herding behaviour involves an investor mimicking the behaviour of other investors in the market for investment decision making irrespective of fundamentals. Findings of study reveal that herding behaviour is a phenomenon which has occurrences in the short-run and not in the medium and long-run. The *eleventh paper* focuses on the forecasting capability of Auto Regressive Integrated Moving Average model for the nifty 50 index. It is concluded that ARIMA is not capable of forecasting data for a long period of time as time progresses it tends to forecast inaccurately.

The *twelfth paper* examines the behavior of stock prices outperforming pharmaceutical industries of India during the Covid-19 pandemic period. The results suggest the weak-form efficiency of the Indian pharmaceutical industry during the selected period. The *last paper* is based on the socio-economic status of female entrepreneurs in north-east India. The basic objective of the paper is to figure out the level of women empowerment through entrepreneurship in the north-eastern region of India.

The readers will find this Issue with superior quality and high intellectual diversity. Hope the readers will enjoy reading this Issue and encourage us to stride forward.

Dr. Malay Kumar Mohanty

(Managing Editor)

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Dynamics of Competency Roadmap for Agile Leaders in Industry 5.0 Era

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Keywords
Competency, Agile leaders, Organisational development, Culture, Mapping

JEL Classification
J24, J81, M12, M54

Abstract: The world has grown more volatile, unpredictable, complex, and ambiguous (VUCA) and leading by example has been encouraging transformation in organizations. The 3W (Work, Workspaces and Workforce) are transforming, thereby changing the landscape of how organizations build work structures, people management systems and drive the business models & productivity parameters. The key leadership competency profile have to be developed and practiced, which are enumerated with competency models of three categories of competencies of OECD competency framework, ARC competency framework, Korn Ferry's 38 competency framework, and Finning values & competency framework. Subsequently the practical application of the competencies in various organizations like Bosch, Microlabs, Manjushree, Mercedes Benz, along with digital learning & development competencies in 10 corporates, have been explained and illustrated. Subsequently, the paper concludes with agile leadership strategies for ensuring business continuity plans (BCPs) by mentioning the 'AGILE' and 'HAVE' models of agile leaders, ultimately culminating with 'LEIRA Mindset' and 'LUR Mantra' models, to make organisations viable, profitable and sustainable in competitive global business context today in industry 5.0 era.

1. Introduction and Context to the Competency Building

The organizations go through five (5) stages of growth viz., establishment, stabilization, consolidation, expansion and diversification. The development of competencies of people who manage the business is an ongoing phenomenon. However, it is known fact that extreme difficulties are faced by businesses everywhere in the world in order to compete, endure, and expand in the modern business environment. The organizations have been pushed to alter how they run their operations as a result of the technology revolution, market volatility, economic uncertainty, and the entry of millennials into the workforce. During and after Covid-19, the world has grown more volatile, unpredictable, complex, and ambiguous (VUCA). Leading by example encourages digital transformation. Organizational development processes

are mostly driven and led by the values, abilities, and behaviours of leaders. The responsiveness and creativity seem to be crucial components for the long-term development and success of any firm in the critical managerial function of agile leadership. As a foremost illustration, the '*key leadership competency profile'* for federal public service executives and senior leaders was revised in March 2015 by Government of Canada (Figure 1), which illustrates the competencies the leaders should possess.

Figure 1: The Key Leadership Competency Profile

Source: https://www.canada.ca/

As it is known to the business world today in 2022, *the 3W (Work, Workspaces and Workforce) are transforming, thereby changing the landscape of how organizations build work structures, people management systems and drive the business models & productivity parameters.* Simply stated the organizations and business enterprises are fast-migrating from '*Industry 4.0 into Industry 5.0'*, almost in a seamless manner.

The most effective transitions to organisational agility combine both structural and cultural improvements at the same time. Among these two, generally, it is '*culture first*' i.e., the agility is a mind-set for the people, wherein the transformation will remain skin-deep if the transformation is not changed at the levels of minds and hearts of the employees and leaders. Simply stated, building an enabling culture for people to perform with some semi-flexible structures produces great results. At the same time, agility is about achieving results, which may not become a reality unless some serious '*structural changes*' are embraced. Thus, the true potential of individuals and leaders can be better harnessed, when we adopt the change and/or transformation in both at cultural and structural levels (cutter.com, 2017).

2. Concept and Framework of Competencies

The recent studies by Mckinsey (2018) and Accenture (2022) have found that there are 5 key characteristics of building and nurturing a '*winning organizational culture*' include enabling the growth-oriented mind-set at all levels, agility in thinking and doing to pivot towards outcome, purposeful-

driven processes and systems to connect people with organizations, openness to experimentation, collaboration and innovation, and inclusive people-centric and customer-driven focused strategies.

Similarly, one of the IBM study (2019) with CEO Perspectives 19th Edition – Global C Suite Study – 2019 has found that there are four key takeaways, viz., (a) dancing with disruption, meaning on-going disruption is the order of the day; (b) Trust in the journey, with the path to personalization to employees and customers to be ensured by leaders; (c) Orchestrating the future, by leveraging the pull of platforms to break conventional & traditional approaches thus harnessing innovation; and (d) embracing and building innovation in motion or '*agility across the enterprise*' by both entrepreneurial and intrapreneurial cultural transformation.

In addition to the above findings, many researchers have found that competency building is of the people by leaders is one of the most critical aspects for ensuring the survival, growth and sustainability of the organizations and business enterprises. This can be illustrated through a '*Competency Framework*' in 3 categories viz., *leading self, leading teams and leading business* (Figure 2). The sub-components in each of these categories play a pivotal role to march seamlessly into industry 5.0 era.

This is also illustrated by one of the studies by dCode Economic & Financial Consulting (2020) that the '*potential winning business sectors'* were medical supply & services, followed by food processing & retail, personal & healthcare, ICT, e-commerce and agriculture; while the '*potential losing business sectors'* included tourism & leisure followed by aviation & maritime, automotive, construction and real estate, manufacturing (especially of non-essential products); whereas the financial services, education and oil & natural gas sectors had mixed impact. It is amply clear from this study that continuous and sustainable nurturing of competencies at all 3-levels viz., self, team and business level are critically important to ensure the success of organizations and business continuity plans (BCPs).

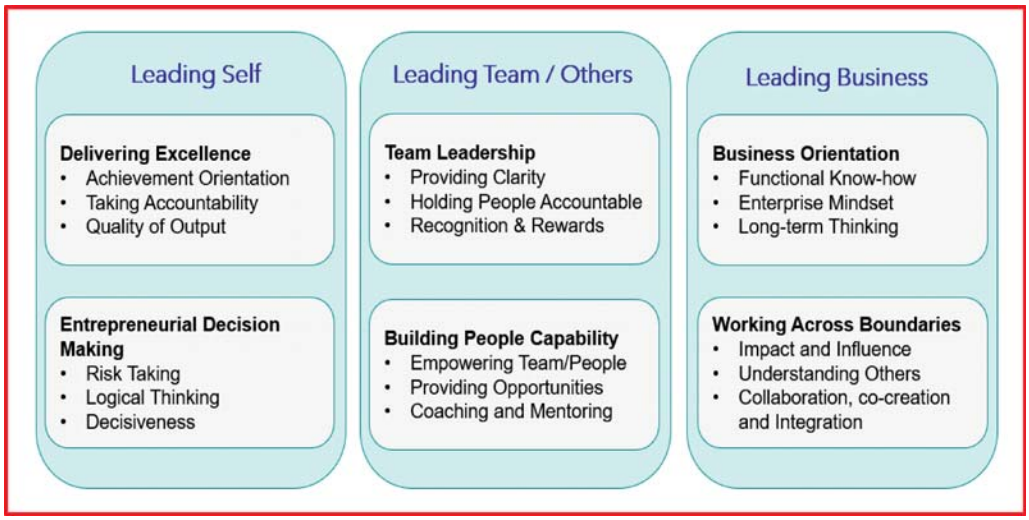

Figure 2: Framework of Competencies under 3 Categories

Source: Compiled by Prof. Subhash Khare, Leadership Coach, Bangalore.

3. Competency Building Models and their Significance

The competency is a combination of knowledge, skill and attitude (KSA) in action for producing results in organizations. This KSA framework has transformed into 'ASK (attitude, skill and knowledge) model' thus emphasizing the significance of attitude and skill in real-time action by almost 80%, when compared to knowledge (20%) among the employees, managers & leaders etc.

There are various types of competency frameworks given by various researchers and the leading consulting agencies. Few of the important competency frameworks are being enumerated herein below:

3.1. OECD Competency Framework

The '*OECD Competency Framework'* lists three groups of fifteen (15) core competencies, which are broadly classified & grouped in 3 categories:

a) Delivery-related competencies (6): *for achieving results*
   - Analytical thinking, achievement focus, drafting skills, flexible thinking, managing resources, teamwork & team leadership.

b) Interpersonal related competencies (5): *for building relationships*
   - Client focus, diplomatic sensitivity, influencing, negotiating & organizational knowledge.

c) Strategic competences (4): *for planning the future*
   - Developing talent, organizational alignment, strategic networking & strategic thinking.

3.2. ARC of the Modern Leadership

The recent competency framework by Accenture (2022) under caption '*ARC of the modern leadership*' includes and predominantly focuses upon *'A'gile, 'R'esponsible and 'C'onnected leaders, who create the 'winning cultures' for a sustainable growth, expansion and diversification of the organizations*. It has been found that modern leaders should embrace and adopt the new skill-sets and behaviours by being authentic, empowering, visionary & collaborative, creating a human-centered, growth-oriented, innovative and purposeful cultures. And in doing so, they live up to their promises and bring out the best in their teams, for the good of the business as such.

This ARC of the modern leadership further emphasizes upon 6 key approaches viz., (a) *Leading with agility*, from top-down & by leading with example; (b) *Leading with empathy* for employees, teams & customers; (c) *Leading with innovation* by leveraging technology, AI, ML, Automation etc. which strengthen the leadership competencies; (d) *Leading with sense of purpose*, in long-term connectedness and short-term motivational drivers; (e) *Leading with energy*, to harness the collaborative partnerships with a shared conviction of purpose & identity, while negating energy burnouts; and (f) *Leading with edge*, in decision-making at all levels with adoptive learning, so that everyone in organization gains edge to deliver the results.

3.3. Leadership Architect Legacy Competency Mapping

Competencies are more about cluster of related behaviours and based on certain skillsets, and especially imperative for agile and strategic leaders (Ferry, 2014). The broader scope yields more flexibility and adaptability because competencies can easily translate across roles. The Korn Ferry

Leadership Architect Legacy Competency Mapping has enlisted 38 competencies, which are presented in Table 1.

Table 1: Korn Ferry's 38 Competencies

1. Ensures accountability	14. Values differences	27. Resourcefulness
2. Action oriented	15. Directs work	28. Drives results
3. Manages ambiguity	16. Drives engagement	29. Demonstrates self-awareness
4. Attracts top talent	17. Financial acumen	30. Self-development
5. Business insight	18. Global perspective	31. Situational adaptability
6. Collaborates	19. Cultivates innovation	32. Balances stakeholders
7. Communicates effectively	20. Interpersonal savvy	33. Strategic mindset
8. Manages complexity	21. Builds networks	34. Builds effective teams
9. Manages conflict	22. Nimble learning	35. Tech savvy
10. Courage	23. Organizational savvy	36. Instils trust
11. Customer focus	24. Persuades	37. Drives vision and purpose
12. Decision quality	25. Plans and aligns	38. Optimizes work processes
13. Develops talent	26. Being resilient	

Source: Korn Ferry, 2014

3.4. Finning: Transforming Culture to Nurture the Competencies

The Finning case of Korn Ferry, 2014, indicated that with right values in action, the *competency framework gave 3 times of higher performance*; the challenges could be easily dealt with teams & leaders; effective implementation of competency framework enabled to meet company vision for 3-5 years; which was to be realized with training development & competency enrichment calendars at all the levels of employees/leaders across the organization.

The *'values'* involved in Finning's competencies are: *trusted, collaborative, innovative and passionate*. These are further connected and closely interlinked to eight (8) competencies, which contribute for the success of business, which include: i) commercial mind-set; ii) decision quality; iii) situational adaptability; iv) developing talent; v) being courageous; vi) driving the results; vii) cultivates innovation, and viii) customer focus. In other words, when the competencies are embedded with values of individuals, leaders and organizations it is much easier to imbibe the transformation in competencies.

4. Practical Applications of Competencies in Organizational Growth

To drive the utility of competencies in real-time business context, the authors have used few illustrative cases of different industry sectors. (Note: These are practically implemented as most successful Management Development Programs for leaders in organizations, front-ended by the 2nd author of this paper, as the advisor of the Management Development Centre, working closely with many corporates).

In Bosch Home Appliances, lower level to mid-level team were imparted training on leading self, leading people and managing tasks/outcomes across the domains for Hi-potential leaders for over 3-months. These interventions could enable the outcome mindset, with science of execution, having growth mindset and skills for collaborating with people.

In Microlabs Ltd., one of the leading pharma companies, the middle level managers were imparted 6-month training with 4 days/month and coupled with mentoring support. This training focussed upon strategic & result orientation, optimising resources/stakeholders, understanding the customers & markets, thereby leading & developing people.

The senior level executives at *Manjushree Technopack Ltd.* were given Executive Development Program (EDP) over 9 months, with 5 days/month coupled with mentorship. The competencies in focus were result-driven, customer-orientation, people-orientation, managing the change, and leadership (having accountability, delegation & strategic thinking)

Similarly, the *HR Team of Mercedes Benz R&D* were put through 2-days rigorous domain knowledge to acquire skills on 'HR Analytics & their usage'. This enabled and equipped HR team to realize the need for connecting people & technology. It also drew insights from data, measuring employee attitude, creating dashboards, encouraging self-based training and embracing the future-ready L&D skills to the trainees.

In addition, Hiremath et al. (2021) have studied the application of competencies related to digital learning and development in 10 different corporates viz., Genpact, Nexval, Airbus, Siemens, AstraZeneca Pharma, HPCL, HGS (BPM), HP, Flipkart and IBM. Further, Bhaduri (2019) has illustrated the massive competency building in Airbus, across 90+ countries. In summary, the above examples and illustrations clearly indicate that the comprehensive and structured competency development for employees &/or leaders will make significant positive contributions to the development, growth, expansion and diversification of the organizations and business enterprises.

5. Agile Leadership Strategies for Ensuring Business Continuity Plans

Joiner & Josephs (2008) have proposed five levels of agile leadership, after evaluating the maturity of the agile leaders: *'expert, achiever, catalyst, co-creator and synergist'* which are the focus of leadership competency. Further, it can be noted that agile leaders are:

a) Humble: They are able to accept criticism and admit that others are more knowledgeable than they are.

b) Resilient: They recognise that change is a constant and that having the flexibility to modify one's viewpoint in response to new facts is a strength rather than a weakness.

c) Visionary: Despite uncertainty in the short term, they have a strong sense of long-term direction.

d) Engaged: They have a great sense of interest in and curiosity about new trends, as well as a willingness to listen to and connect with various stakeholder.

Horney *et al.* (2010) have analysed and illustrated the need for leadership agility, especially in the VUCA World, in which the *'AGILE' Model (Anticipate change, Generate confidence, Initiate actions, Liberate thinking, & Evaluate results*) has been explained with leadership agility skills (15 skillsets) required, along with the leaders being embodied with *3Fs (Flexible, Fast & Focussed).* In another perspective, the *HAVE (Humility, Adaptibility, Visionary and Engagement)* comptencies of agile leaders makes them what they are suceessful for andd these *'4 HAVEs'* inform the business-focused actions or behaviours, which translate directly into 'what they do' – somathing that is worthy for self, teams & business.

Further, the agile leaders practice the fast execution i.e., they are willing to move quickly often valuing speed over perfection. The speed is relevant in the current context of disruption, volatile and evolving business systems &/or organizational cultures. The employees and leaders in organizations

should choose to change their mindset and behaviours through different methods like (a) role modelling of the best leaders in or across the industry, locally / regionally/nationally or globally; (b) fostering understanding and conviction across the various layers of organizations and with all stakeholders; (c) developing the talent and skills on continuous basis, based on the relevanence and need of the sitaution and (d) ensuring and installing the reinforcement mechanisms to avoid barriers and to inbulit the enabling systems/ process/culture.

In other words, the '*competency development as a strategy for designing the competency roadmap - the way forward for leaders* – shall broadly consist of: (a) *leading the self*, with enhanced resilience, self-trust and continuous development; (b) *leading teams* with motivation/ inspiration, setting right expectations along with constructive feedback, and enabling collaboration with all stakeholders; (c) *having deep domain expertise* to understand the industry, market, customers, employees, technology usage & emerging trends; and (d) *facilitating the 1st order and 2nd order learning* among all the people in organizations at all the levels with *LUR (Learning, Unlearning & Relearning)* principle. Hiremath *et al.* (2020) have illustrated the necessity of business continuity plans, which are mission critical for the today's organizations in VUCA world.

Figure 3: Models of 'LEIRA Mindset' & 'LUR Mantra' for Competency Culture

Source: Compiled and Designed by the Authors.

Keeping the above discussion in context, the authors have proposed 'LEIRA Mindset' and 'LUR Mantra' in Figure 3 as frameworks to stay relevant, viable, profitable and sustainable.

In summary, it can be summarized that competency development is the key in evolving organizations today on one hand, while developing & nurturing the agility among leaders to drive self, teams & business are most essential, so that growth is perennial and can be sustained, despite the globally competitive business context.

6. Summary and Conclusions

From the foregoing discussion, it is amply clear that the competency building is core basis of organization's existence or growth or sustainability. This can be better enhanced by adopting *Golden*

Circle Principle of Simon Serek: where the leaders should start & work with WHY i.e., they ask 7 times 'WHY', then go ahead to ask 'HOW', then go ahead to implement the plans, strategies and policies with 'WHAT' to be done.

When the various competency frameworks, as discussed in this article, are aptly designed, carefully implemented with needed customization, it is almost sure to embrace, enroll and engage the teams to drive the business for the planned output or results or outcomes, the leader's desire, dream and aspire. In short, in today's, agile leadership is one of the most feasible approaches of style that can be adopted to ensure the required change and transformation occurs in building organization culture, through a defined structure, already illustrated in the foregoing discussion.

In brief, it can summarised that agile leadership strategies should be able to adopt and practice the models or frameworks of 'AGILE', 'HAVE', practicing the fast execution with 'LEIRA Mindset' and 'LUR Mantra' to inculcate the competency culture in organizations, thereby accomplishing the desired business outcomes by leading the change at 3 levels viz., leading self, leading teams and leading the business.

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Climate Change Risk and Climate Finance in India: A Critical Analysis and Policy Recommendations

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Keywords

Climate change, Climate finance, Green house gas, IPCC, Mitigation, Adaptation.

JEL Classification

Q50, Q54, Q58, Q56

Abstract: Climate change and its impacts are more evident today than they ever were. Empirical findings and projections indicate that climate change threatens the stability of the entire financial system. And developing and least developed economies are most vulnerable to adverse impact of climate change. A direct government financial support is not adequate in these countries. Hence, several multinational climate funds have been set up to enable them to mitigate and/or adapt the adverse effects of climate change. The present study critically analyse the major inefficiencies and issues in the existing international financing and way forward. In India, strong GDP growth projection adds up to the risk of climate change due to increased energy consumption, such as increased frequency of droughts, variability in rainfall, and rise in temperature. Hence, achieving economic growth bounded by the commitment to reduce emissions is a major challenge as well as an opportunity for India. This requires several policy initiatives as suggested in the present study.

1. Introduction

The change in climate and its impact on various aspects of life does not need any introduction because these impacts are more evident today than they ever were. Financing these efforts to mitigate and/or adapt the climate changes involves several types of policies, such as target lending, issuance of green bonds, weather-indexed insurance, feed-in-tariffs, tax credits, and national climate funds. Each of these policy initiatives converges on a common goal of mobilizing the funds to tackle the challenges arising due to climate change. Mainly, countries with low and lower middle-income group require crucial financial and technical support from other developed and industrialised nations as they are more vulnerable to climate change.

Just like discussion and debate on climate change is going on for decades, research in the area of policy effectiveness and the impact of climate change is not new. Plenty of research is available that collectively investigates into a broad area of climate finance, climate change, approaches to incorporating climate risk in macro-finance models, pricing of climate risk, and the impact of climate change on different sectors of economies. According to a report by Commodity Futures Trading Commission (USA) Gillers, Litterman, Martinez-Diaz, Keenan, & Moch (2020) reported a systemic risk of climate change on the U.S. financial system that threatens its ability to sustain the American economy. This, however, is not limited to only one nation. Countries all over the globe are facing the adverse impact of climate change on agriculture, public health, finances, housing, production, and other sectors of the economy. Later in this paper, we discuss the impact of climate change on the Indian economy and its policy implications.

In a global effort to help mitigate and/or adapt the climate change, under the Kyoto Protocol and the Paris Agreement, countries having greater financial resources committed themselves to financially assisting the less endowed and vulnerable countries. The argument is that these developed nations have already utilised far more than their fair share of the global carbon budget to achieve industrialization, and the environmental cost have been shared by all countries. And now it's the ethical and moral duty of these developed nations to help the emerging economies and least developed countries (LDC) to tackle the challenges of climate change rather than just expecting them to reduce their greenhouse gas (GHG) emission and consumption of energy and fossil fuel. Therefore, climate finance is needed for mitigation, because large-scale investments are required to significantly reduce emissions. Climate financing has two main focus areas, i.e., mitigation and adaptation. The present study focuses on the sources and impact of climate change in the Indian context. Followed by this, we discuss the financial mechanisms available to address climate change and India's current and needed investment status. Finally, we present the policy recommendations for future direction.

2. Literature Review

The present study contributes to the existing literature on climate finance and the effect of climate change. The study focuses the discussion on a critical analysis of the present state of climate finance, existing issues related to climate finance mechanisms, the ever-evolving challenges of climate change, and the policy implications for India. Mitigation and/or adaptation of climate change and its effects has become a major concern for nations around the world. However, developing nations such as India, and LDC are most vulnerable to these effects. The principle of Differentiated Responsibilities and Respective Capabilities (CBDR-RC) requires developed nations to take responsibility for combating climate change and its adverse effect thereof.

2.1. Need for Climate Finance

Climate finance is "local, national, or transnational financing drawn from public, private, and alternative sources of financing that seek to support mitigation and adaptation actions that will address climate change" (United Nations Environment Programme, 2022). Reducing emissions is the key focus area

of addressing climate change, however, this requires a large-scale investment to develop technology that is environment friendly. Therefore, climate finance is needed for the mitigation and adaptation of adverse impacts of it if they have already taken place. And since less developed nations are not financially sound enough, the developed nations contribute to various international funds and grants that provide financial support to developing and LDC. As per the World Economic Forum's year 2020 latest projections, a humongous amount of USD 5.7 trillion is required every year for green infrastructure, compared to this the existing commitment of USD 100 billion is still inadequate (Barua, 2020). Direct government financial support is not adequate in poor and vulnerable nations. Therefore, several multinational climate funds have been formed which are discussed in the following section.

2.2. Rationale and Argument for Climate Finance

Let's take the example of the most recent case of a global pandemic which hit almost all nations around the globe. Although a pandemic-like crisis which is sudden and whose impacts remain over quite many years is very different from climate change which plays out over decades and potentially has permanent consequences. They still have a similarity and that is the 'cost of delayed actions and appropriate policy implementation. According to a study, delayed social distancing by one week caused the death rate to double in the United States (Pei *et al.*, 2020). Similarly, delayed policy actions by one year can cause higher average global temperature leading to irreversible and catastrophic damages. Hence, appropriate timely actions to mitigate and/or adapt to the adverse impact of climate change are of utmost importance.

However, this brings us to the question that how the cost of dealing with climate change should be shared among nations. Should the wealthy nations bear the entire burden or the burden be shared by all? The emerging economies have just begun to grow, and the growth obviously requires energy consumption leading to emissions. Whereas developed nations have already consumed far more than their fair share of the global carbon budget. The argument is, this would be unjust to ask developing nations to compromise their economic development while they shared the environmental cost of the developed nation's growth. Therefore, it's the moral duty of these developed nations to provide the financial and technical support needed to achieve sustainable economic development.

2.3. Financial Mechanism

Presently there are several financial mechanisms available to address climate change and the risk arising from it. Figure 1 and the following discussion present the scope of these financial mechanisms.

The *Global Environment Facility (GEF)* which is also the largest multilateral trust fund, was established 30 years ago at Rio Earth Summit to enable developing countries to invest in nature and support the implementation of major international environmental conventions. The corpus of GEF replenishes every four years. Under its ambit, GEF has a small grant programme which is focused on including biodiversity, climate change, chemicals, and desertification (Global Environment Facility, 2022).

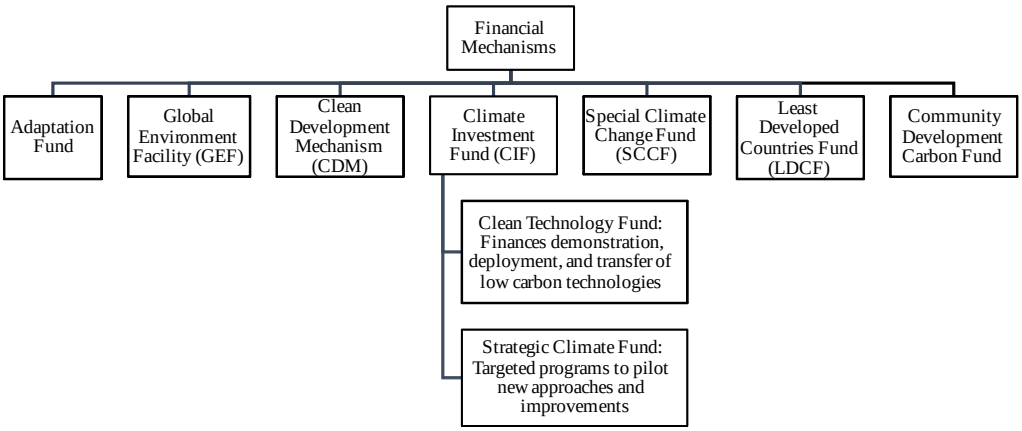

Figure 1: Financial Mechanism of Climate Financing

Source: Compiled by Authors

The focus of the *Special Climate Change Fund (SCCF)* is to help vulnerable nations to address the negative impacts of climate change and supports a wide spectrum of adaptation activities. It is one of the world's first multilateral climate adaptation finance instruments (The Special Climate Change Fund, 2022). The fund operates in parallel with the *Least Developed Countries Fund (LDCF)*. Both SCCF and LDCF are managed by the GEF only.

However, the LDCF is exclusively dedicated to help LDC to adapt to new climate realities. The objective of LDCF financing is to enable the implementation of National Adaptation Programs of Action (NAPAs) at the country level. These are the strategies specific to the requirements of a country which is necessary for addressing the most urgent adaptation needs of that country (LDC Fund, 2022).

Under the Kyoto protocol which is an international treaty for emissions reductions, Article 12 focuses on efforts in direction of reducing GHG emissions. *Clean Development Mechanism* (CDM) aims at establishing a market mechanism that enables the achievement of emission reduction goals. Hence, it allows developed and industrialised countries to establish emission-reduction projects in developing countries that cannot undertake such projects on their own. In exchange, these developed countries get tradable Certified Emission Reduction (CER) credits roughly equivalent to a tonne of CO_2. These are saleable CERs and serve as a tool to measure whether a country has successfully met the prescribed Kyoto targets (The Clean Development Mechanism, 2022).

Similarly, Green Climate Fund (GCF) also focuses to limit or reduce GHG emissions in developing countries. In addition to mitigation, it also aims at helping vulnerable societies adapt to the unavoidable impacts of climate change (GCF, 2022).

As the name itself suggests, the *Adaptation Fund* focuses on the adaptation of harmful effects of climate change. As developing nations are less equipped to do so, the fund helps by financing projects and programs aimed at developing and implementing adaptation strategies. Its funding mainly comes from government and private donors (Adaptation Fund, 2022).

Under its purview the Climate investment fund (CIF) has the Clean Technology Fund (CTF) and Strategic Climate Fund. CIF is over $10 billion fund, established in 2008 (Climate Investment Fund, 2022). CIF aims at lowering the risk and cost of climate financing by providing long term and low cost financing to developing and middle-income countries.

Community Development Carbon Fund (CDCF) is operational since 2003 and presently has a USD115.9 million fund capitalization (The World Bank, 2022). It focuses on equitably distributing carbon finance resources for desired social, environmental, and economic benefits.

Figure 2 presents the cumulative data on the pledges, deposits, and project approvals made by multilateral climate change funds. According to the latest data (the year 2022), the current status of funds pledged stands at USD 43,184 million; Deposited funds amount to USD 34,848 million, and USD 28,380 million of funds are approved.

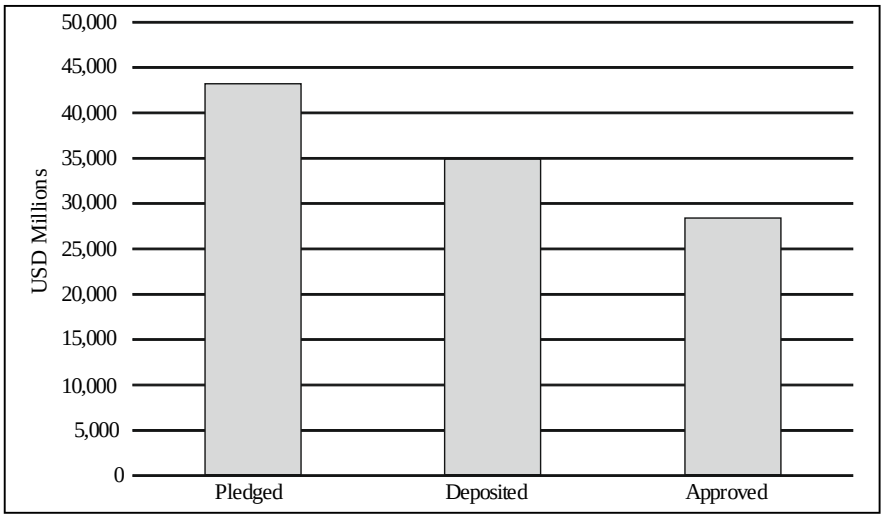

Figure 2: Status of Funds

Source: Climate Funds Update. Latest Data (2022).

2.4. Major Recipients of Climate Finance

Figure 3 presents the recipients of climate finance from the multilateral *climate change funds*. Among the lower income and lower middle-income groups of recipient countries, India is the biggest recipient country followed by Indonesia, Bangladesh, Magnolia, Vietnam, and Egypt. The detailed data pertaining to Figure 3 is presented in Appendix 1.

2.5. Major Contributor to Funds

Under the 'Cancun Agreements' in 2010 developed nations committed to collectively mobilize a corpus of USD 100 billion every year by 2020 to cater to the financial needs of poor nations and help them mitigate and/or adapt the climate change (Smith, *et al.,* 2011).

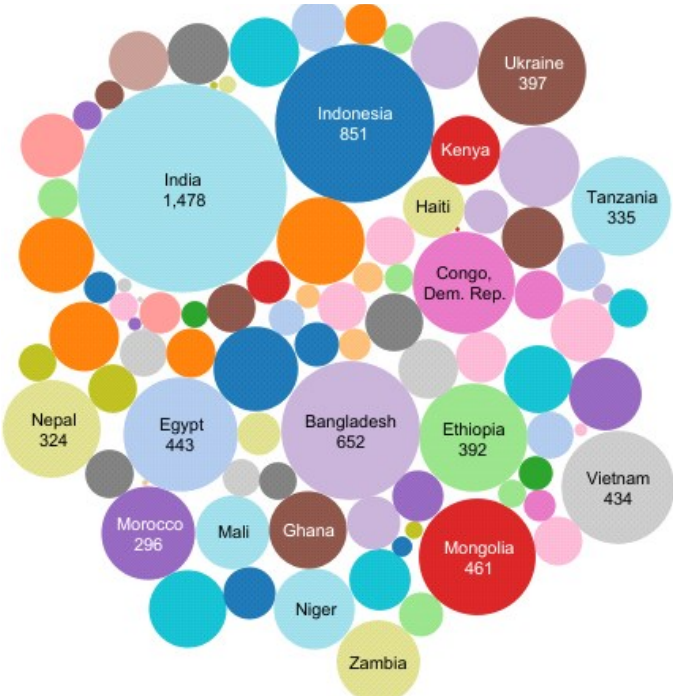

Figure 3 : Major Recipient Countries

Source: Climate Funds Update (All figures in USD millions)

Figure 4 presents data on major contributors of climate finance. As can be observed United Kingdom is the largest contributor to the climate fund and pledged USD 7,393 million. Followed by the United States, Germany, and Japan with a pledged corpus of USD 5,885 million and USD 5,874 million USD 4,852 million respectively. Among other countries, France, Norway, and Sweden are the major contributors. The detailed data pertaining to Figure 4 is presented in Appendix 2.

3. Objectives of the Study

With this backdrop, based on secondary research and data analysis, the present study discusses about the climate change and the need for climate finance, particularly in the context of India. The study focuses on the following objectives:

- To investigate the present state of climate issues in India
- To study the major sources of climate change in India.
- To study the impact of climate change on the Indian economy.
- To examine the major challenges ahead.
- To suggest policy recommendations.

Figure 4: Major Contributors

Source: Climate Fund Update

4. Data and Methodology

4.1. Data and Sample

The study is based on secondary data collected from various repositories and data provided by several multinational organisations and funds such as Intergovernmental Panel on Climate Change (IPCC), United Nations Framework Convention on Climate Change (UNFCCC), Climate Fund Update, World Bank, Ministry of Earth Sciences (MoES), Green Environment Facility and Climate Investment Fund. The available research in this area was systematically evaluated and conclusions were drawn accordingly. Apart from this information has also been gathered from several websites and press releases. The sample comprises of the data from 1990 to 2019 on GHG emissions by major countries.

4.2. Methodology

The present study is based on secondary data analysis comprising of research papers, reports, articles, and interviews. Comparative analysis of data collected for the period 1990 to 2019 is performed across major developed and developing nations. The present status of climate funding is analysed for the most recent year.

5. Institutional Arrangement for Climate Financing in India

In September 2011, '*Climate Change Finance Unit'* was set up as the first institutional response of GoI towards the need for a national-level climate finance unit. The mechanism of climate financing in India is made of domestic and international resources. Table 1 presents the international sources of climate financing in India. The domestic resources and financing mechanism can be segregated into public and private sources. Public climate finance draws funds via budgetary support both union and state, taxes, subsidies, and other market mechanisms. On the other hand, private sources are mainly comprised of debt and equity instruments, and partial risk guarantee facilities. As can be observed in Table 1, more than 50% of international funding comes from Clean Technology Fund (CTF). It promotes the demonstration, deployment, and transfer of low-carbon technologies which have significant potential for long-term GHG emission savings and implementation of technologies that uses renewable sources of energy and clean transport in emerging economies (Clean Technology Fund, 2020).

Table 1: International Sources of Climate Financing in India

Fund Name	*Fund Type*	*Funding Approved (USD millions)*	*Percentage of Overall*
Global Environment Facility (GEF7)	Multilateral	33.25	2%
Special Climate Change Fund (SCCF)	Multilateral	9.82	1%
Global Environment Facility (GEF4)	Multilateral	171.53	11%
Adaptation Fund (AF)	Multilateral	44.37	3%
Green Climate Fund IRM (GCF IRM)	Multilateral	134.36	9%
Pilot Program for Climate Resilience (PPCR)	Multilateral	0.2	0%
Partnership for Market Readiness	Multilateral	8.329	1%
Global Energy Efficiency and Renewable Energy Fund	Multilateral	14.97	1%
Clean Technology Fund (CTF)	Multilateral	846.99	56%
Global Environment Facility (GEF5)	Multilateral	32.93	2%
Global Environment Facility (GEF6)	Multilateral	22.94	2%
Global Environment Facility (GEF7)	Multilateral	11.7	1%
Scaling Up Renewable Energy Program (SREP)	Multilateral	0.55	0%
Green Climate Fund IRM (GCF IRM)	Multilateral	181.02	12%

Source: Climate Funds Update. Latest Data (2022). Compiled by Authors.

6. Issues and Challenges

Existing research has studied the historic drivers of emissions in India. Chandran and Tang (2013) investigated the causalities between coal consumption and emissions and GDP growth in India and compared it with China. Several other studies focused on household consumption of electricity as the

source of GHG emissions in India. Pachauri (2014) examined whether increased household access to and consumption of electricity affects the emissions in India and Das & Paul (2014) investigated what are major uses of electricity. Yang and Zhao (2014) looked into the effect of trade openness on energy consumption and emissions. Since India is among the fastest growing economy, and also among the top countries by total GHG emission, India's way forward will require developing more energy-efficient technology, reducing reliance and consumption of traditional non-renewable sources of energy, infrastructural investment to generate energy from renewable sources and target sustainable growth while complying with the commitments of Paris Agreement.

Talking about the Paris Agreement which was initiated in the year 2015 and officially implemented in the year 2016, the gravity of funding commitments made by developing nations remains questionable. Especially after the USA decided to exit from the "Paris Agreement" in the year 2017 under Donald Trump's leadership (McGrath, 2020). Although the USA decided to join back with yet another change of leadership in the year 2021 (U.S. Department of States, 2022), this has put a dent in the solemnity of the pact. This has also slowed down the pace towards the achievement of the ambitious goal of a USD 100 billion annual contribution to developing nations by the year 2020. But in 2019 only USD 79.6 billion was raised (McGrath and Rincon, 2021).

At the 26th UN Climate Change Conference in Glasgow (COP26) developed countries expressed their confidence that the USD 100 billion goal shall positively be met by 2023. Only time will tell the credibility of this decade-old commitment. However, the developing and poor nations are in immediate need of funds. The Figure 5 exhibits the amount provided and mobilised by developed countries since 2013. Clearly, the funds fell short of the committed amount every year while the adversities of climate change continue to become grave.

Apart from this following are some other noted issues with the multinational climate funds:

- Poor accounting framework leading to leads to double-counting, and exaggerated numbers.
- Allegations that the reported figures of the contribution by developed countries is inflated.
- The definition of climate finance lacks transparency and uniformity.
- Skewed funding with a limited focus on climate adaptation projects. The majority GCF funding is diverted toward mitigation projects in the renewable energy sector.
- Lack of scientific proof to support that the USD 100 billion funds shall be sufficient to address the problem.
- The majority of funds contributed by developed countries are being used domestically while the poor and vulnerable nations bear a much higher proportionate burden of emission and depletion of natural resources.

7. Impact of Climate Change: Observed and Projected Changes

India is deeply vulnerable to climate change due to its geographically 7,500-km long coastlines and dependence of the agriculture sector on the monsoon and rivers water. As per the latest record, the surface of the Indian Ocean has warmed faster than the global average (IPCC, 2021). Further to quote

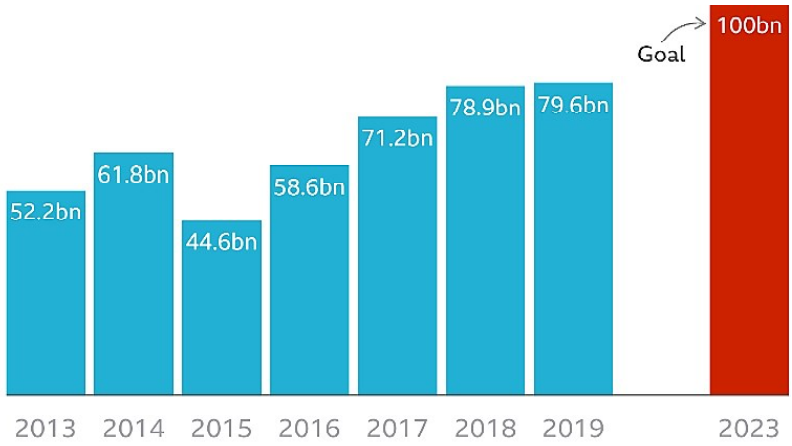

Figure 5: Amount Provided and Mobilised by Developed Countries (USD)

Source: OECD

the latest projection of IPCC on climate change effect on coastal cities, "there is a high probability that the rising sea level, caused by both sea level rise and storm surge, and extreme rainfall/river flow events will increase the occurrences of flooding". In another report by the Ministry of Earth Sciences (MoES), the Government of India further strengthen the weight of these projections. Krishnan, et al. (2020) predicted that India will face a major challenge to tackle the adverse effects of climate change over the next century due rise in the frequency and severity of droughts, greater variability in monsoon rainfall, and rising temperature.

Both frequency and spatial extent of droughts have increased significantly over the last 6 to 7 decades (from 1951 to 2016). There has been an overall decline in the summer monsoon rainfall, particularly in areas over central India. More alarmingly, over the same period, the areas affected by droughts have increased by 1.3% per decade. As per the latest projection in a report by the Ministry of Earth Sciences (MoES), GoI, this problem is expected to more severe by the end of the 21st century.

7.1. Housing Market

The buying decision in the housing market is affected by the potential vulnerability of the housing location to natural calamities. For instance, in India flood-prone areas of Kerala and some cities of Maharashtra have affected the demand for housing in such areas and hence drove down their pricing. Other factors such as the rising level of pollution in major metro cities, and disputes over the allocation of water and power supply also have an enormous impact on housing pricing.

Not only this, rapid urbanisation and the resulting depletion of resources, rise in temperature in cities with a growing population (IPCC, 2021), and excessive use of public transport and automotive has been a major contributor to climate change. A rising trend in urbanization is likely to further amplify the projected air temperature change in cities in the coming future this effect is known as the "*urban heat island effect*".

In its latest fact sheet under the 6th Assessment Report (AR6) of IPCC, urban geometry, human activities, and materials used for the construction of buildings were identified as three major reasons for the urban heat island effect. Materials used for construction activities absorb and retain heat during the day and release that at night. To make the matters worse dense and taller buildings in closer proximity store heat because of reduced ventilation. Further, use of domestic and industrial heating or cooling systems, automobile engines, etc. contributes the most to GHG emission.

Hence, on one hand, climate change is causing a shift of population to less vulnerable cities but then on the other hand the same is becoming the cause of climate change as well. Therefore, India faces a challenge to provide affordable housing to all while dealing with its adverse impact on climate. Climate resilience is crucial for India's affordable houses. Under the present government, the Low-cost housing initiative -Pradhan Mantri Awas Yojana (PMAY) was launched in the year 2015, the same year as the signing of the Paris Agreement. It aims to provide 50 million affordable homes. While on the social front this flagship housing program was lauded by the citizen, the construction-heavy nature of the scheme has obvious challenges on the environmental front. Emissions from cement production contribute around 6% to India's total CO_2 emissions and it has been growing steadily for the past 3 decades (Le Quéré, Andrew, & Canadell, 2016).

7.2. Equity Market

In its latest report on "Trend and Progress of Banking in India 2020-21" the Reserve Bank of India addressed the concerns that climate change can adversely affect the stability of the financial system in India (Herwadkar, 2021). A portfolio comprised of securities that are significantly exposed to carbon-emitting and polluting sectors are most sensitive to effects and policies on climate change. Among the specific group of investors, long-term institutional investors are more sensitive to the systemic risk of climate change compared to short-term and medium-term investors. Particularly insurance companies' future liability is more directly linked to these adverse changes. For instance, a greater frequency and magnitude of natural calamities have increased the occurrences of insurance claims. For the year 2017, total global losses due to weather catastrophes were USD 340 billion out of which USD138 billion were insured losses (Jena, 2020). According to United Nations, India has suffered USD79.5 billion in economic losses in 19 years due to disasters caused by climate changes and delays in tackling these risks can cost businesses including investors nearly USD 1.2 trillion over the next 15 years (Intellecap, 2020). Further, government commitment to reduce emission to deal with climate change suggest future policy regulations conducive to carbon-mitigating economic activities and penalizing carbon-emitting businesses.

Therefore, a portfolio rebalancing to make asset allocations in favour of green businesses is imperative to diversify the risk. Historical data shows that the S&P BSE Greenex underperformed the S&P BSE Sensex during 2010-2019 (BSE India, 2022). And this is after the 2015 "Paris Agreement" in which India committed to cut down the carbon emission intensity of GDP by 33%-35%. This implies that the stock market has not captured environmental risks yet and hence lacks efficiency, because logically the green companies should have performed better in hope of future government policies to incentivize these green businesses. However, we can expect the market to be efficient in the long run

as the investors begin to recognise the impact of climate change on business and learn ways to interpret this material, climate change risk, and opportunity, information.

7.3. Businesses

Climate change can impact businesses in multiple ways. This impact can be in form of a permanent disruption in the demand and supply dynamics of goods and services. Subsequently, these disruptions can leave a ripple effect on the broader macroeconomic environment, and sovereign rating of the nation and increase the required rate of return for investment in such countries. Effect of climate channels through the interlinkages between macro environment, supply chain, operations, and consumer market, to ultimately reflect on the business.

7.4. Economic Growth

India's GDP is expected to increase faster than all other economies from 2013 to 2040 (International Energy Agency, 2015). At the same time, with growing concern over man-made climate change and its negative impact, India is focusing on alternative sources of energy and technologies to reduce its dependence on fossil fuels. Currently, India's total per capita GHG emission stands at 1.77 Gt. Compared to developed nations such as the USA (13.97 Gt). Canada (16.6 Gt), Saudi Arabia (15.47 Gt.) this figure is very small. However, the rapidly growing population continues to be a challenge (World Bank, 2019). In absolute terms, however, India's GHG emission is the world's third highest since 2008 (Le Quéré, Andrew, & Canadell, 2016). Being, a developing country, India's projection for economic growth is strong which requires growing energy consumption and emissions. This put India on a trajectory of

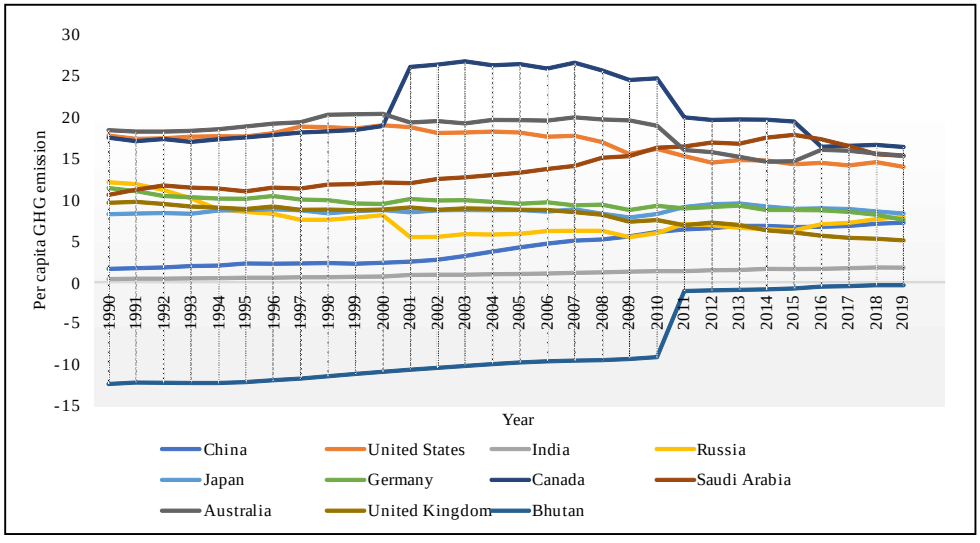

Figure 6: Total GHG Emission by Country (Per Capita)

Source: World Bank (2019)

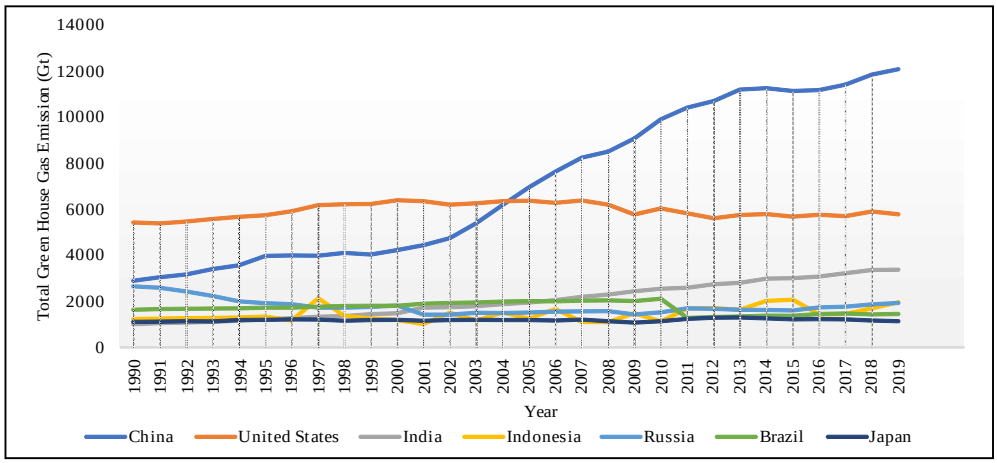

Figure 7: Total GHG Emission by Country

Source: World Bank (2019)

continuously rising GHG (Murthy, Panda, & Parikh, 1997; Raghuvanshi, Chandra, & Raghav, 2006; Sharma, Bhattacharya, & Garg, 2006).

As can be seen in Figures 6 and 7, the per capita GHG emission of India is very low compared to developed nations. But if the population continues to rise, which according to the United Nations projection is likely to surpass China's around 2025, then the total GHG emission is going to increase alarmingly (Jonas, Roy, Pal, Peters, & Andrew, 2020). Although energy consumption and level of emissions can be reduced by the use of new technologies. But any further effort to slow down the emissions growth will require strong decarbonisation of the energy sector.

8. Conclusion

A recent unprecedented chain of events has emphasized the need and importance of crisis preparedness and resilience building. The world has witnessed how 'tail events' such as the global pandemic crisis of Covid-19 can cause massive disruption in economic activity around the world. Not only this, the repercussions of the ongoing war between Ukraine and Russia have opened the eyes of many nations that are heavily dependent on carbon-intensive energy. The same has forced the nations to accelerate the transition to renewables.

Presently, the risk related to climate change is a major challenge for both developing as well as developed nations. However, low and lower-middle-income group countries are more vulnerable and hence require crucial financial and technical support from other developed and industrialised nations. Hence, several international funds have been established to help this poor nation to mitigate and/or adapt the effects of climate change. According to the present funding status, developed countries still fall short of their promised annual contribution of USD 100 billion. This, emphasise the need to mobilize both public and private finances to avoid any delay in policy actions.

While these climate change-related risks threaten the stability of the financial system of any economy, it also creates opportunities for investors to reallocate their capital towards assets with lower climate risk. This has important implications for portfolio rebalancing to diversify away climate change-related risk to the extent it is possible. Businesses that are focusing on providing goods and services to improve climate resilience mechanism/ adaptation planning are likely to be favoured. We have observed that the market has not been efficient in the pricing environment-related risks in security prices and the index based on green business has underperformed the broad market index. However, it can be argued that the market shall be efficient in the long run as the effects of climate change become more visible in portfolio returns. When it comes to the integration of climate risk in investment decision-making, the lack of reliable, consistent, and comparable data on companies' climate risk and opportunity remains to be the major deterrent. Therefore, the present study recommends policy actions to address the problem at hand.

9. Policy Recommendations

The present study emphasizes on India's deep vulnerability to climate change. As India will be dealing with the adverse effects of climate change over the next century as the frequency and severity of droughts is likely to increase, there will be greater variability in monsoon rainfall, and a marked rise in temperature. This requires proactive approach to formulate the appropriate policies. Some of these policy recommendation suggested by this study are presented below.

- *Integrating climate risk in ESG compliance framework:* Currently, ESG compliance guideline does not include climate risk as one of the evaluation criteria to arrive at the final ESG score. Mere compliance with the ESG norms does not indicate that the firm is not exposed to climate change risk.
- *Redefining the fiduciary responsibility of fund managers:* In India PFRDA, IRDA and SEBI regulate pension, insurance, and mutual funds. Currently, environmental risk and climate risk are not under the focus of these regulators. To ensure the integration of these imminent risks in investment decision-making and asset allocation, the same should be defined as a fiduciary responsibility of fund managers. SEBI should identify the climate change risk and opportunity as material information and makes the related disclosure mandatory for the listed companies. The availability of information on this risk factor shall enable the investor to make informed decisions.
- *Developing and strengthening the global climate information architecture:* A prerequisite for assessment of and pricing of climate risk for investment decision-making is the existence of strong information architecture. Strong information architecture has three pillars; first, availability of reliable and high-quality data, second consistency in disclosure related to climate risk, and third, principles to align investment to sustainability goals. Standard setting work should take into account the difficulties in data collection in emerging markets while ensuring that company-level disclosures are mainstreamed across these economies.
- *Mobilization of both public and private finance*: Reliance on global and international funds and domestic public sources of financing to mitigate the climate risk is not sufficient. As many

developing and poor economies continue to face challenges when it comes to access to finance, there is a strong need to understand the potential avenues to scale up private financing. According to the latest projection of IPCCC, in some economies, the requirement for climate finance is likely to go up by 3 to 4 times by the year 2030.

- *Need for a proactive attitude of supervisory and regulatory bodies on climate-related financial risks*: It is documented in several reports that climate risk exposes economies to systemic risk and threatens their financial stability. Therefore, it is necessary to capture the climate-related risk in supervisory processes for timely intervention to mitigate the effects.

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Appendix

Appendix 1: Major Recipient Countries

Country	*Fund (USD Million)*	*Country*	*Fund (USD Million)*
Afghanistan	69	Multi-country (Ghana, Kenya)	5
Angola	35	Multi-country (India, Indonesia, Philippines)	6
Bangladesh	652	Multi-country (Indonesia, Philippines)	30
Benin	79	Multi-country (Liberia, Madagascar)	1
Bhutan	114	Multi-country (Sudan, Somalia)	7
Bolivia	116	Multi-country (Uganda, Democratic Republic of Congo)	1
Burkina Faso	242	Multi-country (Ukraine, Tunisia)	45
Burundi	44	Myanmar	79
Cabo Verde	20	Nepal	324
Cambodia	260	Nicaragua	126
Cameroon	31	Niger	223
Central African Republic	28	Nigeria	93
Chad	62	Pakistan	168

contd. appendix 1

Country	*Fund (USD Million)*	*Country*	*Fund (USD Million)*
Comoros	80	Papua New Guinea	67
Congo, Dem. Rep.	354	Philippines	178
Congo, Rep.	91	Regional - East Asia and Pacific (Bhutan, Cambodia, Lao PDR, Myanmar)	6
Cote d'Ivoire	82	Regional - Sub-Saharan Africa (Benin, Kenya, Namibia, Nigeria, Tanzania)	80
Djibouti	63	Regional (The Comoros, Madagascar, Malawi and Mozambique)	14
Egypt	443	Rwanda	204
El Salvador	83	Sao Tome and Principe	35
Eritrea	24	Senegal	191
Ethiopia	392	Sierra Leone	55
Gambia	89	Solomon Islands	138
Georgia	98	Somalia	30
Ghana	203	South Sudan	28
Guinea	46	Sri Lanka	121
Guinea-Bissau	46	Sudan	128
Haiti	128	Swaziland	2
Honduras	155	Syrian Arab Republic	11
India	1,478	Tajikistan	164
Indonesia	851	Tanzania	335
Kenya	165	Timor Leste	98
Kiribati	60	Togo	59
Korea, Dem. Rep.	1	Tunisia	32
Kyrgyz Republic	70	Uganda	156
Lao PDR	130	Ukraine	397
Lesotho	84	Uzbekistan	35
Liberia	139	Vanuatu	82
Madagascar	72	Vietnam	434
Malawi	78	Yemen	48
Mali	185	Zambia	235
Mauritania	76	Zimbabwe	50
Micronesia	39	Multi-country (Colombia, Ecuador)	14
Moldova	27	Morocco	296
Mongolia	461	Mozambique	228

Source: Climate Fund Update

Appendix 2: Major Contributor Countries

Contributor Country	*Fund (USD million)*	*Contributor Country*	*Fund (USD million)*
United Kingdom	7,393	Cyprus	2
United States	5,885	Hungary	6
Germany	5,874	Estonia	2
Norway	3,442	Panama	1
Japan	4,852	Iceland	4
Sweden	2,149	Monaco	7
Australia	529	Indonesia	1
Canada	1,161	Poland	4
France	3,500	Bangladesh	0
Spain	685	Mongolia	0
Netherlands	696	5 EU Member States	47
Italy	851	11th EDF intra ACP allocation	89
Switzerland	555	APBN	5
Finland	407	Belgium (Brussels Capital Region)	13
Belgium	498	Belgium (Flanders)	29
Denmark	471	Belgium (Wallonia Regions)	23
European Commission	317	Belgium (Wallonia)	12
EC Fast Start Funding	84	BP Technology Ventures	5
Austria	254	Bulgaria	0
Ireland	107	Canada (Quebec)	2
European Development Fund	45	Cote d'Ivoire	1
Mexico	25	ENRTP programme	380
Luxembourg	108	European Union	16
China	19	Flanders	2
New Zealand	28	France (Paris)	1
Czech Republic	13	Global Goods and Challenges Programme (GPGC)	764
India	13	Intra Africa Caribbean and Pacific (ACP) Programme	47
Russian Federation	22	Investment Income	656
South Africa	7	Korea, Rep.	320
Slovenia	8	Malta	1
Peru	6	Nigeria	6

contd. appendix 1

Contributor Country	*Fund (USD million)*	*Contributor Country*	*Fund (USD million)*
Colombia	6	Petrobras - Brasil	8
Brazil	6	Private Sector Investors (24 investors from North America, Europe and Australasia)	112
TNC	5	Qatar	1
Pakistan	11	Qatar Fund for Development	1
Portugal	14	Sale of CERs	209
Greece	9	Slovak Republic	4
Turkey	2	Vietnam	1

Source: Climate Fund Update

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Impact of Lockdown Announcement on Indian Banking Sector: An Event Study Approach

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D53, E44, G14, G21, G41

Abstract: The worldwide financial market has been greatly affected by pandemic of Covid-19. Likewise Indian financial market and various sectors have also been affected by the pandemic. Covid-19 spread from Wuhan city, Hubei region of China in December 2019 to all over the world. On March 11, 2020 the World Health Organization (WHO) officially announced it pandemic. The first positive case of India was found on 30th January 2020. Prime Minister Shri Narendra Modi had declared nationwide lockdown to prevent the outburst of this pandemic on 24 March, 2020. To study the impact of lockdown announcements due to Covid-19 on banking sector in various phases of lockdown, event study methodology has used. The event day has been taken as announcement day of lockdown in various phases. Having decided sample and having defined event window and estimation period, AAR was calculated and these AARs were tested for their significance. Significance testing showed that most of the t-statistics were significant. It was concluded that investors were able to earn abnormal returns during event window period.

1. Introduction

The SARS-CoV-2 virus, which caused the Covid-19, reportedly found in Wuhan city for the first time, in Hubei region of China in December 2019, and with time it spread all over the world. On 30 January 2020, the World Health Organization (WHO) issued its first global alert regarding Covid-19 (WHO, 2020a). On March 11, 2020 the World Health Organization (WHO) officially declared the disease as pandemic. The countries with the largest number of confirmed cases in the world included the People's Republic of China, Italy, South Korea, France, Spain, Germany, Japan and the United States of America and the outbreak centre has been gradually shifted from China to Europe and the USA (He *et al.*, 2020). The 1st positive case of India was found on 30th January 2020. Now, there have been a total of

2, 97,62,793 confirmed cases in India, with 2,85,80,647 recoveries and 3,83,490 deaths as of 18 June, 2021. The main precautions to prevent its spread included social distancing, sanitization and wearing of mask. To fight with this pandemic, governments of different countries of the world adopted strict measures like quarantine, curfew, lockdowns, banned the transportation between countries, closure of educational institutes, parks, workshops and other institutions, cancel public events etc. These efforts resulted in slow down of economic activities worldwide. Economies of almost all the developed and developing countries were badly affected by this unforeseen pandemic.

The lockdown policy was used as a means to fight against Covid-19 in India. The government of India announced nationwide 'Janta Curfew' on 22nd March 2020 and lockdown policy to slow down the spread of pandemic from 24th March 2020 for 21 days restricting all the commercial and private activities. With the exception of medical and emergency services, all activities, religious places, educational institutes, construction and industrial activities were restricted. Lockdown was supposed to end on 15 April, but looking at the conditions of the country within the 21-day period, as confirmed cases and deaths were increasing, lockdown was extended for further 19 days till 3 May 2020 with few restrictions. On 1 May, 2020 Government of India extended this lockdown till May 17, 2020 but this time some of the non-essential activities were also allowed to revitalize the financial system. On 17 May, the lockdown was further extended till 31 May by the National Disaster Management Authority with additional relaxation. Table 1 shows the various phases of lockdown as follows:

Table 1: Phases of Lockdown in India (2020)

Lockdown	*Announcement date*	*Phase*	*Period*
Lockdown 1.0	24 March, 2020	25 March 2020 – 14 April 2020	21 days
Lockdown 2.0	14 April, 2020	15 April 2020 – 3 May 2020	19 days
Lockdown 3.0	1 May, 2020	4 May 2020 – 17 May 2020	14 Days
Lockdown 4.0	17 May, 2020	18 May 2020 – 31 May 2020	14 Days

Source: Authors' Own Compilation

As India is an emerging economy, banking sector is the main pillar of the Indian economy. Banks play a vital role in mobilizing the flow of money in the system and creating wealth in the financial system (Arora, 2021). Banks are accumulating deposits from the public and lend those deposits for the development of Agriculture, Industry, Trade and Commerce. In the recent past India has witnessed demonetization, which affected trading activities and stock returns as well as banking sector. Now outbreaks of Covid-19 and adoption of lockdown policy has put this sector in further stress. The banking sector is expected to be significantly affected because of the disturbing effects of the Covid-19 outbreak on income, spending and investment. Banks had to deal with wide range of problems as liquidity crunch, credit squeeze, increases in nonperforming assets and default rates, reducing returns from loans and investments and declining market interest rates. Government and RBI have taken some initiative to minimize the effect of this virus on the economy. It provided relaxation for three month in repayment of loans, provided relaxation in Asset Classification Norms to the public and

private sector Banks, reduced REPO Rate by 75 BPS, or 0.75% to 4.4, reverse REPO by 90 BPS, or 0.90% and CRR reduced to 100 BPS, or 1% to 3% and three month interest moratorium was permitted to all lending institutions.

The unexpected lockdown made a major adverse impact on the economy. The effect could have been even worse in countries like India, which is highly populated and does not have much advanced medical facilities especially in rural areas. Hence, the present study examines the impact of lockdown announcement on Indian banking sector by event study methodology.

2. Review of Literature

Several researchers have studied the economy and financial markets in the light of Covid-19.

Kaicker *et al.* (2022) examined association among Covid-19 and stock market returns in India by time-series analysis using firm-level data on a sample of 779 companies. It found that sectoral analysis provides empirical evidence on the sectors that have been worst and/or least affected as well as the degree of impact. Tomar (2022) examined Covid-19 led to change in volatility spillover and found that while Bankex did not show any change due to Covid-19, Auto sector received high volatility instead of dispensing it.

Ikwuagwu *et al.* (2021) investigated the diffusion of corona virus information and bank stock returns in Nigeria and came to the conclusion that the introduction of Covid-19 information into the banking sector in Nigeria leads to favourable abnormal returns and good investment. Yadav and Kumar (2021) evaluated the Indian financial markets prior to the implementation of Covid-19, the shock's likely impact on various segments of the economy and present an impact on financial markets and banking system. It found that the banking sector has been significantly damaged by this crisis, as a result of the lockdown in economic activity, more loans and EMIs have been stopped. According to Shrimali and Shrimali (2021), who utilised event study as a methodology to analyse the impact of the lockdown news on the bank business, the banking sector was negatively influenced by the announcement and will continue to be for some time.

Sunitha and Madhav (2021) examined the consequences of Covid-19 before and after it struck the banking industry and discussed the advantages and difficulties that the average person encountered as a result of the pandemic that followed. The influence of Covid-19 on the Indian stock market and the banking sector was examined by Jaiswal and Arora (2020). It was discovered that the Covid-19 pandemic had a negative impact on the banking industry's performance in India, causing the market to decline. It was also discovered that HDFC and Indusind Bank are more stable and profitable, whilst PNB is at the bottom.

Jasuja and Sharma (2020) looked at how Covid-19 affected various Indian economic sectors and analysed risk and return patterns throughout the pandemic while also evaluating volatility. It came to the conclusion that all of the sectoral indices included in the current analysis had negative average returns over this time period, with the automotive, metal, real estate, and capital goods industries being the most adversely affected.

Using Pooled OLS on a data set of 20 Bangladeshi commercial banks covering the period from 8 March to 30 November 2020 and the daily Covid-19 impacted and death cases, Rahman *et al.* (2020)

investigated the effect of Covid-19 on the bank's liquidity. It discovered that the bank's liquidity responded to Covid-19, and it also discovered that the bank's liquidity is highly impacted by social distance and government economic assistance.

According to Thomas *et al.* (2020), different sectors were affected differently by Covid-19 pronouncements on NIFTY Stocks; the financial industry showed the biggest negative return, followed by the pharmaceutical sector. The Covid-19 epidemic has resulted in poor performance across many industries. The highest mean return was produced by the fertilizer and service sectors. Stock markets began to rise after the key announcements, largely as a result of the stimulus plans outlined by the various governments. When Topcu and Gulal (2020) looked at the effect of Covid-19 on emerging stock markets from March 10 to April 30, they discovered that the pandemic's detrimental effects had progressively subsided and had started to taper down by mid-April.

3. Objective and Hypotheses of the Study

3.1. Objective of the Study

The main objective of present paper is:

- To study the impact of lockdown announcements due to Covid-19 on banking sector in various phases of lockdown.

3.2. Hypotheses of the Study

Based on the above objective, following hypotheses were framed: Stock prices are unaffected by lockdown announcements. In other words:

H_{01}: Stock market trading by investors following lockdown news does not allow for abnormal returns.

H_{02}: None of the AARs differ significantly from zero.

H_{03}: AARs are average abnormal returns in this case.

4. Research Methodology

Secondary data were collected for the purpose of the study. For the purpose of the study, Nifty Bank Index and the banks included in Nifty Bank Index were taken as sample. The Nifty Bank Index is a heavily capitalised weighted index of Indian banking stock companies. There are 12 Indian banking firms in this portfolio, both public and private sector banks. Table 2 shows the list of sample banks included in Nifty Bank Index. Therefore, the study is based on two sets of data: the daily close, open, high, and low prices of sample banks for the sample period, and the daily close, open, high, and low prices of the Nifty Bank Index. Data on the Nifty banks index's daily prices (open, low, high, close) have been gathered from the NSE's official website.

In this study, there are four events for four subsequent lockdown announcements. Therefore, data are collected from 27 October, 2019 to 3 June, 2020. It therefore included 23712 observations in total (13 Indices, Nifty Bank Index + 12 Banks) x 4 events x 114 Days x 4 kinds of prices, i.e. open, high, low, close).

Table 2: List of Sample Banks

Bank Name	*Nifty Bank Weightage Index (31 May, 2021)*
HDFC Bank	28.29%
ICICI Bank	21.37%
Kotak Mahindra Bank	12.36%
SBI	12.21%
Axis Bank	12.15%
IndusInd Bank	5.05%
AU Small Finance Bank	1.85%
Bandhan Bank	1.84%
Federal Bank	1.54%
IDFC First Bank	1.38%
PNB	1.11%
RBL Bank	0.85%

Source: Authors' Own Compilation

4.1. Event Study Methodology

The event research methodology is employed to examine how an event affects stock prices, which are used as the dependent variable. Here, announcing a lockdown was considered an event. The market model, on which the event analysis in this paper is based, consists of the following five steps, following Lodha and Soral (2015) & Lodha *et al.* (2018):

4.1.1. Defining an Event Window

In the present paper, the announcement of a lockdown has been handled as an event, with the date of the announcement serving as the event date. The event window sets the number of days before and after the event date that should be included in the study. The event window will now be open for an additional 11 days before and after.

Therefore, it was proposed to have an event window consisting of:

- Event date (t=0)
- Eleven trading days prior to event date (t-1, t-2, …….t-11)
- Eleven trading days after the event date (t+1, t+2, ……..t+11)

There were four event dates since there were four lockdown announcements within the sample period. Accordingly, there are four event windows for both the sample bank and the Nifty Bank Index.

4.1.2. Defining Estimation Period

The period utilised to estimate the company's returns using the market model, presuming that the event hasn't occurred, is referred to as the estimation period. The estimation timeframe excludes the

event window to minimise the influence of the event. The estimating phase generally begins before the event window. To determine the intercept and slope coefficients, a company's returns are regressed against market returns, such as those of the Nifty Bank Index (alpha and beta values respectively). Then, during the event window, these alpha and beta values are utilised to estimate the company's returns.

An estimation period of 90 days before to the event window was deemed suitable for the current study. Event window is unique for each of the estimating periods. Thus 4 estimation periods were there.

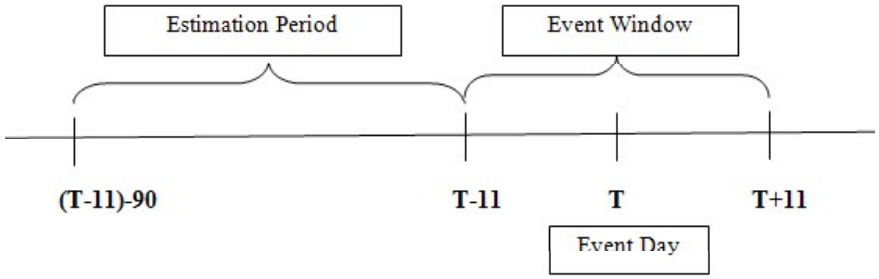

Figure 1: Estimation Period and Event Window

Source: Authors' Own Compilation

Table 3 shows the dates of lockdown announcement, Estimation period and Event Window.

Table 3: Event Window and Estimation Period for the Study

Lockdown	*Event Date**	*Estimation Period*	*Event Window*
Lockdown 1.0	24 March, 2020	27 October, 2019 to 5 March, 2020	6 March, 2020 to 13 April, 2020
Lockdown 2.0	14 April, 2020	14 November, 2019 to 24 March, 2020	25 March, 2020 to 30 April, 2020
Lockdown 3.0	1 May, 2020	2 December, 2019 to 15 April, 2020	16 April, 2020 to 19 May, 2020
Lockdown 4.0	17 May, 2020	16 December, 2019 to 29 April, 2020	30 April, 2020 to 3 June, 2020

* Event date is the announcement of lockdown

Source: Authors' Own Compilation

4.1.3. Estimation of Expected Returns

To start with, it is necessary to make the time series data stationary and therefore, returns have been calculated as follows:

- Security Returns $R_{it} = \log (P_{it} - P_{it-1})$ Equation 1
- Market Returns $R_{mt} = \log (P_{mt} - P_{mt-1})$ Equation 2

Here, R_{it} is return from security *i* at time *t*, P_{it} is the price of security *i* at time *t*, P_{it-1} is price of security *i* at time *t-1*, R_{mt} is the return from market index *m* at time *t*, P_{mt} is the value of market index *m* at time *t* and P_{mt-1} is the value of market index *m* at time *t-1*.

These estimated returns—also known as realised or actual returns—appear on both individual stocks and market indices. These returns should be compared to estimated returns. Using a market model, the normal returns have been computed based on the estimating period. The market model employs the subsequent OLS regression formula:

$$E(R_{it}) = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad \text{Equation 3}$$

The $E(R_{it})$ is the expected or normal return from security *i* at time *t*, α_i is intercept coefficient, β_i is the slope coefficient (or sensitivity of the stock to market returns), R_{mt} is return on market index *m* at time *t* and ε_t is residuals.

The coefficients α and β are determined for each estimated period by regressing individual stock returns on market index returns. Based on the actual market index returns for the same window, these coefficients have been utilised to estimate expected or normal returns from the security over the relevant event window (Lodha and Soral, 2015).

4.1.4. Abnormal Returns, and Average Abnormal Returns (AR and AAR)

It must be determined whether actual returns differ from those predicted after estimating expected or normal returns. Therefore, abnormal returns have been calculated using the difference between the security's actual and expected returns across the event window.

$$AR_t = R_{it} - E(R_{it}) \quad \text{Equation 4}$$

Where AR_t is Abnormal Returns from security *i* at time *t*, R_{it} is Actual Returns from security *i* at time *t* and $E(R_{it})$ is the Expected or normal returns from security *i* at time *t*

The Average Abnormal Returns (AAR) for a specific day in the event window are then calculated by averaging these abnormal returns, first annually and then cross-sectionally.

$$AAR_t = \frac{1}{N} \Sigma_{i=1}^{N} AR_i \quad \text{Equation 5}$$

It is important to keep in mind that when calculating the average abnormal returns (AAR), abnormal returns are examined collectively rather than individually because other events may occur; by averaging across all companies, these other events should have a minimal impact and allow for a more thorough analysis of the event under study.

4.1.5. Significance Testing

The statistical study used the Brown & Warner (1985) method to test the null hypothesis that such returns are equal to zero and determine the significance of the cumulative average abnormal returns. It

$$t_{(AAR)} = \frac{AAR_{i,t}}{\sigma_{(AAR)} / \sqrt{N}} \qquad \text{Equation 7}$$

Here, N is the number of earnings announcements on day t, and $\sigma_{(AAR)}$ is the standard deviation of AAR. The significance level for these estimated t values was set at 5%.

5. Results and Discussion

The returns of banks throughout the estimation period were regressed on the returns of the Nifty Bank Index, and the resulting Alpha and Beta values are displayed in Table 4 after estimating returns for each individual bank and the Nifty Bank Index.

Table 4: Alpha and Beta Values generated from Regression Equation

Event	*Event 1*		*Event 2*		*Event 3*		*Event 4*	
Nifty Bank	α	β	α	β	α	β	α	β
AU Small Financial Bank	0.766	-0.016	0.398	0.398	-0.024	0.972	-0.035	0.887
Axis Bank	0.153	-0.017	-0.046	1.337	0.087	1.273	0.025	1.304
Bandhan Bank	-0.156	-0.020	-0.444	1.320	-0.376	1.455	-0.147	1.517
Federal Bank	0.274	-0.020	0.074	1.367	-0.215	1.119	-0.131	1.134
HDFC Bank	0.001	-0.007	-0.027	0.802	0.082	0.867	0.095	0.831
IDFC FIRST BANK	0.059	-0.013	-0.149	1.116	-0.218	1.078	-0.221	1.080
ICICI Bank	0.340	-0.021	0.043	0.976	0.081	0.997	0.068	1.057
IndusInd Bank	-0.009	-0.016	-0.453	1.838	-0.369	1.977	-0.359	1.950
Kotak Mahindra	0.111	-0.007	0.173	0.868	0.200	0.954	0.177	0.944
PNB	-0.025	-0.027	-0.153	0.619	-0.578	0.427	-0.551	0.437
RBL BANK	0.534	-0.032	-0.141	1.134	-0.699	0.976	-0.627	1.037
SBI	0.271	-0.019	0.071	0.980	-0.227	0.818	-0.265	0.775

Source: Authors' Own Compilation

Table 4 shows that for the event 1 i.e. lockdown 1.0 all the beta values are negative, which implies negative impact of announcement on nifty banks indices. It is also worth noting that it was the period when everyone was having terror of the Covid-19 and hence the returns were negative. Apart from being negative, all the beta values are very low indicating low volatility as compared to market returns i.e. returns on Nifty Bank Index. The lowest volatility was shown by Kotak Mahindra Bank whereas the highest was for RBL Bank.

For event 2, all the beta values turned out to be positive; this indicates direct and positive relationship with Nifty Bank Index. This period had a surprise as beta values were very high. 6 out of 12 banks had beta value of more than 1, which shows their co-movement with Nifty Bank Index. Similar observations

were there for event 3 and event 4. Most of the beta values are near 1 or greater than one, which implies that these banks are more volatile than market return after the announcement of subsequent lockdowns.

Taking these alpha and beta values, expected or normal returns were estimated for individual stocks for each of the event window using actual Nifty Bank Index returns for that event window. Then Abnormal Returns (AR) were calculated by taking difference between actual or realized returns and expected returns. These abnormal returns were averaged cross sectionally to provide Average Abnormal Returns AAR (1), AAR (2), AAR (3) and AAR (4). Figure 2 depicts the plot of AAR obtained from Equation 5.

Figure 2 shows that abnormal returns were negative even before the event day for Event 1 (indicated by blue line). As there was a terror of Covid-19, this apprehension was reflected in negative returns due to fear selling. But on event day, it was much lower than other days. After the event day, returns started increasing rapidly showing that market was able to adjust speedily with this announcement. Later there were fluctuations in abnormal returns.

Line graph of event 2, 3 and 4 were more flattened than that of event 1. This shows that during event 2, 3 and 4 investors were not able to earn abnormal returns, as no significant peaks were found during the event windows. This implies that the shock caused by first event was high and then market learned to adjust with the lockdown announcement.

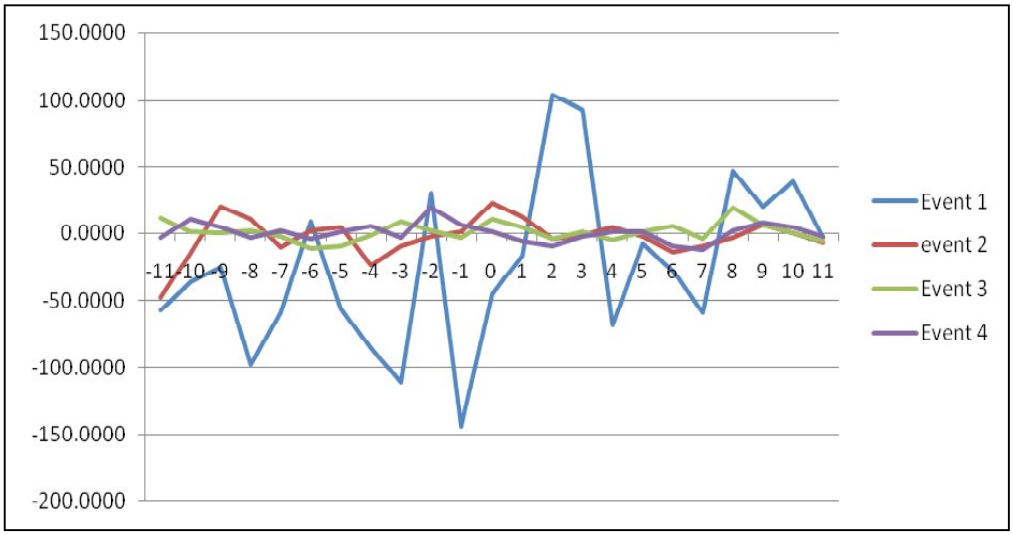

Figure 2: Plot of Average Abnormal Return for Different Events

Source: Authors' Own Compilation

Table 5 presents the average abnormal returns and their respective t-statistic for each of the events during event window.

Table 5: AAR and t-Statistic for Events 1, 2, 3 & 4

Days	*Event 1*		*Event 2*		*Event 3*		*Event 4*	
	AAR 1	*t-statistic*	*AAR 2*	*t-statistic*	*AAR 3*	*t-statistic*	*AAR 4*	*t-statistic*
-11	-57.063	-4.433	-47.874	-15.672	12.130	8.251	-3.287	-2.210
-10	-36.202	-2.812	-14.744	-4.827	1.306	0.888	10.698	7.195
-9	-24.791	-1.926	20.162	6.600	0.779	0.530	4.416	2.970
-8	-97.509	-7.575	10.929	3.578	2.058	1.400	-3.932	-2.644
-7	-58.931	-4.578	-9.816	-3.213	-1.739	-1.183	1.370	0.921
-6	8.955	0.696	1.897	0.621	-10.840	-7.374	-4.849	-3.261
-5	-55.810	-4.336	5.058	1.656	-9.480	-6.449	1.082	0.728
-4	-85.403	-6.635	-23.115	-7.567	-0.933	-0.634	5.533	3.721
-3	-110.818	-8.609	-9.381	-3.071	8.862	6.028	-3.600	-2.421
-2	30.321	2.356	-2.264	-0.741	2.085	1.418	19.319	12.993
-1	-143.369	-11.138	0.800	0.262	-3.144	-2.138	6.384	4.293
0	-45.106	-3.504	23.044	7.544	11.048	7.515	0.411	0.276
1	-16.314	-1.267	12.405	4.061	4.667	3.175	-5.880	-3.954
2	104.225	8.097	-4.023	-1.317	-3.691	-2.511	-9.400	-6.322
3	92.554	7.190	-1.494	-0.489	1.574	1.071	-2.465	-1.657
4	-67.630	-5.254	4.996	1.636	-4.643	-3.158	0.890	0.599
5	-7.296	-0.567	-2.363	-0.774	1.326	0.902	0.935	0.629
6	-26.956	-2.094	-13.750	-4.501	5.804	3.948	-10.116	-6.804
7	-58.436	-4.540	-9.410	-3.081	-3.493	-2.376	-12.399	-8.339
8	47.170	3.664	-3.046	-0.997	19.595	13.329	1.400	0.942
9	20.302	1.577	6.097	1.996	6.621	4.503	7.758	5.217
10	39.223	3.047	0.112	0.037	0.703	0.478	4.369	2.938
11	-3.091	-0.240	-6.676	-2.186	-5.624	-3.825	-2.788	-1.875

Source: Authors' Own Compilation

It is found from the results that Event 1 depicts high abnormal returns, although most of them are negative. This portrays the apprehension in general investors. Further most of AAR 1 values are significant as is depicted by their t-statistic (highlighted in bold). The highest abnormal negative returns were one day before the event day i.e.-143.37. There were higher abnormal negative returns during pre event period as compared to those during post-event period. After the event day, there were some increase in abnormal returns and some of them turned to be positive. Average abnormal returns were significant for 17 days during the event window.

For event 2, there were lesser abnormal returns as compared to event 1. The magnitude of abnormal returns was also very low. Returns showed low fluctuations depicting adjustment with the announcement.

Average abnormal returns were significant for 13 days during the event window. Event 3 had significant average abnormal returns for 14 days. Here majority of abnormal returns were positive which shows that market was no longer reacting in a negative manner for lockdown announcement. Event 4 had significant average abnormal returns for 15 days. Thus null hypothesis of zero abnormal returns is rejected at 5% level of significance.

6. Conclusion

The study attempts to explore the existence of semi-strong form of efficiency in Indian stock market with special focus on bank index. For this purpose, daily prices were collected for 12 banks which were constituent of Nifty Bank Index as on 31st May 2021, together with Nifty Bank Index. Lockdown announcement dates in 2020 in India were also collected. Estimation period was 90 days before the event window while event window consisted of event day, 11 days before and 11 days after the event. Market model was used to estimate expected returns, thereafter AARs were calculated.

The majority of the t-statistic was significant, according to significance tests. We might therefore draw the conclusion that the Indian stock market is not moderately efficient. Investors do not take in the news of the shutdown announcement as rapidly as necessary to create an efficient market. The reaction continues for some days. Investors were able to earn abnormal returns during event window period. The findings are contrary to prior researcher who found that banks' situation has worsened as a result of the lockout, but it will take longer for things to return to normal if it is lifted. (Sharma and Mathur, 2021). The annual profits/ losses of companies listed on BSE under banking sector gained profits during pandemic due to online services (Mehra and Saikia, 2021).

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Perceived Risk and Online Purchase Intention of Online Buying and its Affinity: Perceived Behavioral Control as a Moderator

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Keywords

Perceived risk, E-shopping, Customer e-satisfaction, Purchase intention, Perceived behavior

JEL Classification

L81, M31, O14

Abstract: The intention of this Conceptual Research work is to develop a model showing that the connection of the numerous magnitudes of perceived risk and the online purchase intention of consumers. Riding on the Theory of planned behavior (TPB), the model highlights the importance of perceived behavioral control to change the strength of the perceived risk and purchase intent and its association. This model links the purchase intention to actual purchase behavior of consumers and the model has been tested by applying hierarchical regression. The findings are helpful to understand the complex relationships between various dimensions of risk and online purchase intention. Mainly the perceived interactive control as a mediator in the relationships has an important theoretical and practical implications of concerning online buying.

1. Introduction

The previous researchers found that the impact of risk of consumer behavior which perceived the risk that has been thought to be a primary behavioral deterrent. Another landmark in marketing literature is the identification of several forms of risk. Researchers were able to see how perceived risk could influence customer behavior by categorizing it into different categories of risks namely; financial, product, time, delivery; social and psychological are the different perceived risk which has been fascinated the customer's attention over the years.

Perceived risk has highlighted a detrimental effect on the desire to adopt e-commerce in some research (Featherman *et al.*, 2003; Pavlou, 2003; Li and Huang, 2009). Researchers have traced the purchasing habits with the factors that stimulate the product type and purchasing channel. New

technology related to intake and the uses looked out for the same for purchase intention of the customers (Cunningham *et al.*, 2004; Cocosila *et al.*, 2009).

2. Review of Literature

The technological advancements in the present century have resulted in a paradigmatic change in consumer behavior (Lian and Lin, 2007). One of the significant changes is online buying by consumers (Gerber *et al.*, 2014; Tham *et al.*, 2019). Online buying enables individual to purchase very conveniently and also it is comfortable for the customers. This enables the consumers to observe various products and compare prices from multiple websites. There is an increase in e-commerce and social media which give a vast thickening result in online buying by consumers. The global online shoppers have increased from 1.7 billion in 2018 to 1.92 billion in 2019 and 2.14 billion in 2021 (Coppala, 2021; Zhao *et al.*, 2021).

One of the primary reasons which consumers prefer that online buying is 'convenient'. Consumers can access an extensive portfolio of goods and services and select what they need, through online stores 24x7, and the only requirement is the net connection. Consumers can search and buy any product at the global level without visiting any stores through offline and can also purchase goods offered by international vendors (Kim, 2002; Verhagen and van Dolen, 2011). Dawson and Kim (2009) documented that consumers find online shopping more convenient when compared to offline shopping.

For more motivation for online shopping convenience the purchase intention comes from the utilitarian and hedonic benefits of the products. Consumers derive practical benefits for their convenience, website flexibility, and various products available in online stores. More than that consumer engage in buying necessities, and to buy things is task-oriented and hence seriously consider the objective characteristics of the products (Babin*et al.*, 1994). Finally, consumers engage in online shopping to derive hedonic benefits that include shopping as fun, and zeal with emotional satisfaction (Li *et al.*, 2008).

While consumers enjoy the benefits of convenience, hedonic, and utilitarian benefits, it is also essential to highlight the risks involved in online shopping. Many researchers have documented that perceived risk focus a vital point in influencing consumers' buying intents and ultimate purchase decisions (Laroche *et al.*, 2005; Soltanpanah *et al.*, 2012). Perceived risk is a multi-dimensional construct, and various researchers have offered different types of perceived risks: social, financial, physical, performance, time, and psychological risks (Featherman and Pavlou, 2003; Garner, 1986; Ko *et al.*, 2004).

Through this study, we develop a theoretical model to highlight the consequences of various categories of perceived hazard on consumers' e-purchase intention. We also examine the association between numerous kinds of perceived risk an e buying intent through regulatory role of perceived behavioral control. At the same time, we investigate the relationship between online buying target and actual procurement behavior. A conceptual model followed by propositions are discussed with the expected moderate relationships based on the previous literature reviews.

3. Theoretical Framework and Conceptual Design

The notional base of the current framework comes from the Theory of Planned Behavior (TPB) developed by Ajzen (1991), which is an addition of the Theory of Reasoned Action (TRA) developed

by Ajzen and Fishbein (1980). The basic intent of TPB is that an individual's behavior depends on boldness, personal norms, and perceived behavioral control. The purpose of purchase behavior, and intention is analyzed by consumers' attitudes and individual norms (Hagger, 2019). The construct attitude represents an individual's evaluation of behavioral outcomes. Assertiveness of customers can be optimistic or undesirable, depending on the evaluation of behavior outcome. An intention to behave depends on the subjective norms, which represents whether the behavior is socially acceptable or not. The TPB contend that the intention to conduct is necessary but not sufficient whether the individual has adequate resources to perform to the act. For example, if two individuals have the intention to buy an automobile, a person who can pay will buy the car, whereas the person who does not have enough money may not be able to buy. Finally, the perceived behavioral control represents the personality's ease of performing an act. TPB has been used as a theoretical platform by several researchers who explored consumers' purchase behavior (Arora and Sahney, 2018; Pavlou and Fygenson, 2006; Singh and Srivastava, 2019; Suh and Han, 2003).

Riding on the TPB, this conceptual research work with a model is recognized to show an effect of apparent risk on the online purchase intent, leading towards actual purchase behavior. First, we explain the various risks of independent variables, such as perceived risk, which consists of financial, product, time, delivery, social, and psychological risk. Second, we introduce perceived behavioral control as an arbitrator in the association between various components of risks. Third, we explain how online purchase intention results are an actual purchase decision.

3.1. Perceived Risk

Many researchers have reported about the importance of considering the perceived risk in purchase decisions (Alreck and Settle, 2002; Garbarino and Strahilevitz, 2004). Here, the risk of buying products through e -services, has been one of the major concerns affecting consumer decision-making (Park and Stoel, 2005). Perceived risk act as a noteworthy variable in several other research works (Parayitam *et al.*, 2020). High risk associated with products and services keeps consumers away from online shopping.

3.1.1. Financial Risk

Since online buying involves spending money using credit cards/debit cards, consumers are concerned about the safety of their personal information. Though some consumers prefer to opt for other mode of paying for purchase such as cash on delivery, using third-party payment methods such as PayPal, the inherent threats cannot be minimized. Researchers in the past have documented the fear of credit card deception in the present-day digital world and cybercrimes, which is most common these days (Abrar *et al.*, 2017; Lu *et al.*, 2005).

3.1.2. Product Risk

This is related to the performance of a product, when consumers receive a different product than what has been ordered or what has been purchased, and product risk is rated as high. When the product purchased does not function as it was supposed to, consumers cannot verify the products through online (Kim, 2010). Product risk is also labeled as functional risk related to the performance

of the product or service bought by consumers. Several researchers have studied that product risk is destructively associated to e-buying intents because when consumers perceive high product risk in terms of the difference in the product quality mentioned in the website and product delivered, it is unlikely they would show the inclination to purchase (Popli and Mishra, 2015).

3.1.3. Time Risk

Time risk is concerned with the probability of time lost in buying decisions. It includes the time spent in returning the product if found defective, time lost when web server of the e-retailer is down for more extended periods. Consumers realize that online buying involves the unwanted wastage of time, may find it difficult to search appropriate websites, taking time to find the right product in the web, and time lost in waiting for the product delivery. Past researchers identified that time risk is negatively connected to the online purchase intention of consumers (Ye, 2004).

3.1.4. Delivery Risk

Delivery risk is concerned with the consumers' fear about the delay in the delivery of the product, getting a different product than ordered, damages during the delivery, etc. (Claudia, 2012). Some researchers found a negative association of delivery risk through online buying intention of consumers (Tham *et al.*, 2019).

3.1.5. Social Risk

Social risk is concerned with the embarrassment of the consumer's feel when the product was bought in low quality and disapproved by the social groups or peers. Social risk results in the consumer's destruction and reputation of consumers among their friends. To prevent this risk, consumers take the opinions of their friends and peers about the quality of the product and purchase the product only after their approval.

3.1.6. Psychological Risk

This is related to the displeasure of the consumer by choosing a low-quality or wrong product available among alternative several products. Psychological risk results in loss of self-respect (Stone and Gronhaug, 2003). Previous researchers found that this risk entails to reduce consumer's motivation to go in for online shopping, and psychological risk is negatively related to online buying (Han and Kim, 2017)

3.2. Perceived Behavioral Control

In this typical study the most crucial variable is the perceived behavioral control, which modifies the associations among various magnitudes of perceived risk and e- buying intents. As explained by Ajzen (1991), perceived behavioral control denotes to the point where a personality can perform the desired behavior. Perceived behavioral control deals with the aspects like 'I can't (I can buy this product). Closely associated with Bandura's concept of self-efficacy, perceived behavioral control is concerned with their ability to reach goal-directed behavior.

3.3. Online Purchase Intention

The primary dependent variable in this conceptual model is the online behavioral intention of consumers. Purchase intention is concerned with consumer's willingness to involve in purchasing through internet and web-surfing (Jamali, 2010). The purpose of consumers to use virtual shopping carts and the frequency with which the consumers engage in online buying is closely related to online purchase intention. For example, during the global pandemic, most consumers were inclined to purchase goods and services online, either because of frequent lockdowns and social distancing norms or exhibited higher online purchase intentions.

3.4. Actual Purchase Behavior

The final stage in consumers' decision-making is to engage in the purchase behavior. Once the consumers have decided to purchase products online, they go through websites, look for the products they want, and proceed to buy. First, they select the products and send them to the virtual purchase cart, and before making a final 'click' to purchase, they assess the risks involved and benefits from shopping and then decide to click. Once they press the button 'click,' consumers are said to engage in actual purchase behavior.

3.5. Conceptual Model and Propositions

The interrelationships among all the variables mentioned above were presented in a conceptual model.

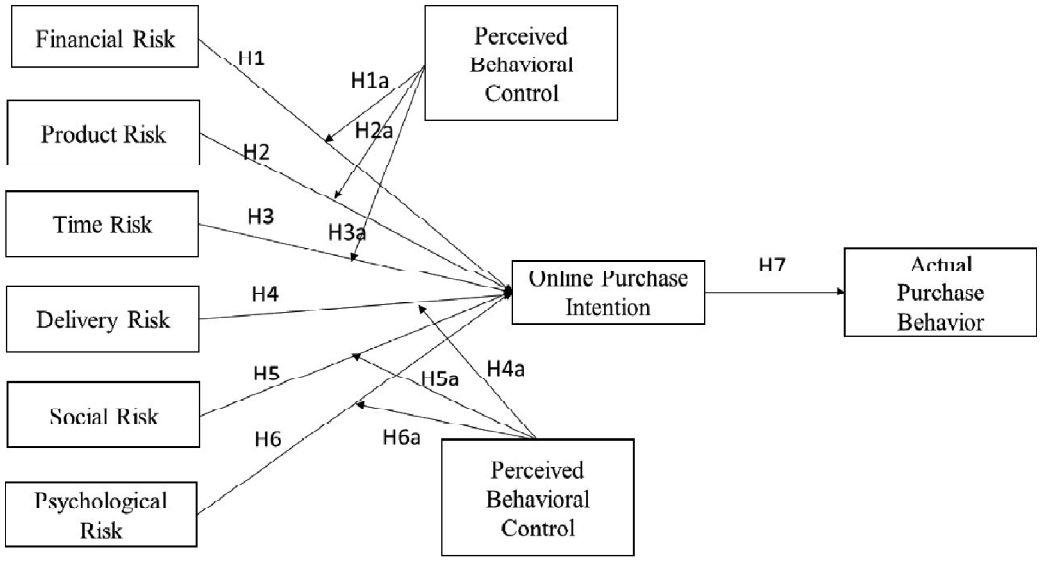

Figure 1: The Conceptual Model

Source: Authors' Own Compilation

4. Hypotheses of the Study

This model offers the following hypotheses.

H_{01}: Financial risk is negatively related to e-buying intent.

H_{02}: Product risk is negatively associated to e-buying determination.

H_{03}: Time risk is negatively correlated to online purchase purpose.

H_{04}: Delivery risk is negatively associated to online buying goal.

H_{05}: Social risk is negatively related to online buying intent.

H_{06}: Psychological risk is negatively associated to e - buying attitude.

H_{07}: E- purchase intention is positively related to actual buying behavior.

Moderator Hypotheses

H_{1a}: Perceived behavioral control curbs the relationship amongst financial risk and e-buying determination.

H_{2a}: Professed behavioral control moderates the association among product risk and e-buying attitude.

H_{3a}: Perceived behavioral control regulates the rapport amidst time risk and internet buying outlook.

H_{4a}: Observed behavioral control moderates the association between delivery risk and internet buying view.

H_{5a}: Perceived behavioral control moderates the association between social risk and e-buying behavior.

H_{6a}: Perceived behavioral control moderates the association between psychological risk and online purchase behavior.

5. Data and Sample

For the determination of this study the data was collected from 669 southern part of India. As far as gender is concerned, 288 (43.04%) sample respondents were male and 381 (56.96%) sample respondents were female. With regard to education, 357 (53.36%) sample respondents are with Under-graduate degrees, and 312 (46.64%) sample respondents are with Masters and Professional degrees. Nearly, 360 (53.8%) sample respondents had experience of below ten years and the remaining sample respondents hold experiences for more than ten years.

6. Data Analysis

Hierarchical regression was applied to test the hypothesis. The hierarchical regression results are presented in the given table below.

Table 1: Results of Risk and Perceived Behavioral Control on Online Purchase Intention

Dimensions	*1*	*2*	*3*	*4*
Dependent Variable→	*e- buying attitude Phase 1 'β'*	*e- buying attitude Phase 2 't' values*	*e- buying attitude Phase 3 'β'*	*e- buying attitude Phase 4 't' values*
Financial Risk	-.075	-1.900	-.839***	-4.368
Product Risk	.026	.584	.488**	2.001
Time Risk	-.112**	-2.677	-.729***	-4.010
Delivery Risk	.060	1.225	.357	1.425
Social Risk	-.085	-1.729	-.648**	-2.497
Psychological Risk	-.180***	-4.717	1.188***	5.643
Perceived Behavior Control	-.688***	-25.134	.447	2.648
Financial Risk x Perceived Behavioral Control			.179***	4.056
Product Risk x Perceived Behavioral Control			-.106	-1.881
Time Risk x Perceived Behavioral Control			.150***	3.529
Delivery Risk x Perceived Behavioral Control			-.073	-1.279
Social Risk x Perceived Behavioral Control			.133**	2.251
Psychological Risk x Perceived Behavioral Control			-.234***	-4.877
R^2	0.538		0.573	
Adj R^2	0.533		0.565	
ΔR^2			0.035	
F	109.82***		20.64***	
ΔF			9.06***	
Df	7,661		13,655	

Note(s): Standardized regression coefficients are reported; ***p < 0.000; **p < 0.05

Source: Authors' Own Compilation

As shown in the above table, time risk is meaningfully and negatively associated to e-purchase intention (β = -0.112, p < .05) thus assisting H3. The results also indicate psychological risk is destructively and suggestively associated through online buying intent (β = -0.688, p < .001), thus supporting H6. The regression coefficients of financial, product, delivery and social risks are not significant and hence Hypotheses 1, Hypotheses 2, Hypotheses 4, and Hypotheses 5 are not accepted in this study.

With regard to moderation effects, column 2 (Table 1) shows that the regression coefficient of multiplicative term financial risk and perceived behavioral control is significant ($\beta_{\text{financial risk x perceived behavioral control}}$ = 0.179, p < .001), thus subsidiary H_{1a}. The regression coefficient of multiplicative term time risk

and perceived behavioral control was significant ($\beta_{\text{time risk x perceived behavioral control}}$= 0.150, p < .001), thus associating H_{3a}. Further, the regression coefficients of multiplicative terms ($\beta_{\text{social risk x perceived behavioral control}}$= 0.133, p < .05) and ($\beta_{\text{psychological risk x perceived behavioral control}}$= - 0.234, p < .001) thus supporting H_{5a} and H_{6a}.

The moderation graphs are presented in Figures 2, 3, 4, and 5.

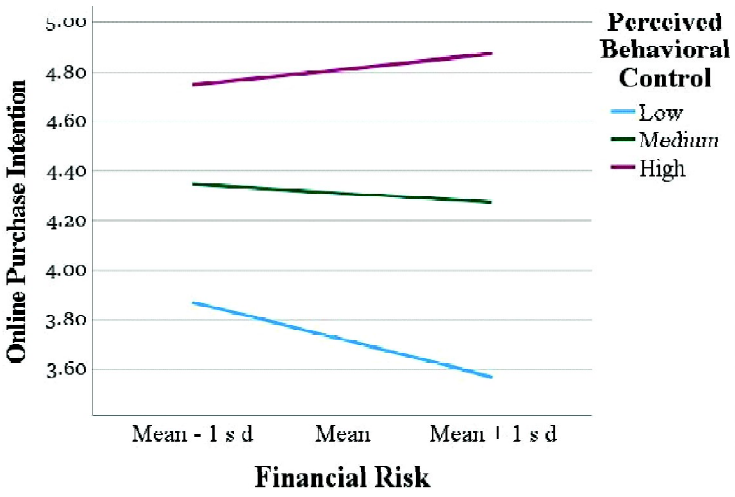

Figure 2: Financial Risk and e-buying Intention Relationship with Perceived Behavioral Control as a Mediator

Source: Authors' Own Compilation

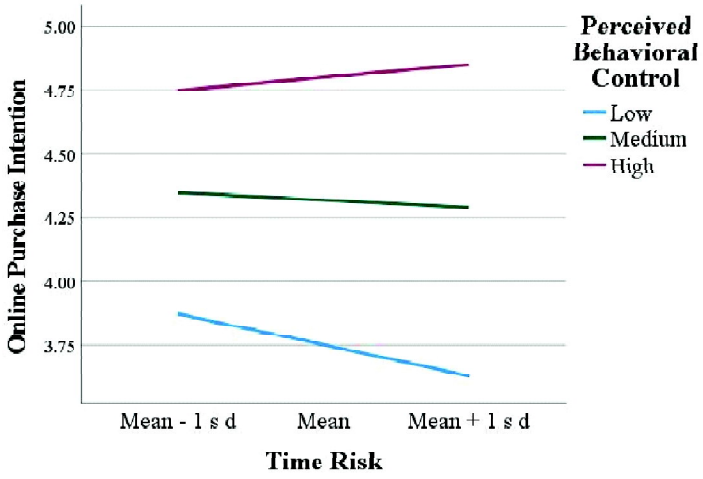

Figure 3: Time Risk and e-buying Behavior Association with Perceived Behavioral Control as a Mediator

Source: Authors' Own Compilation

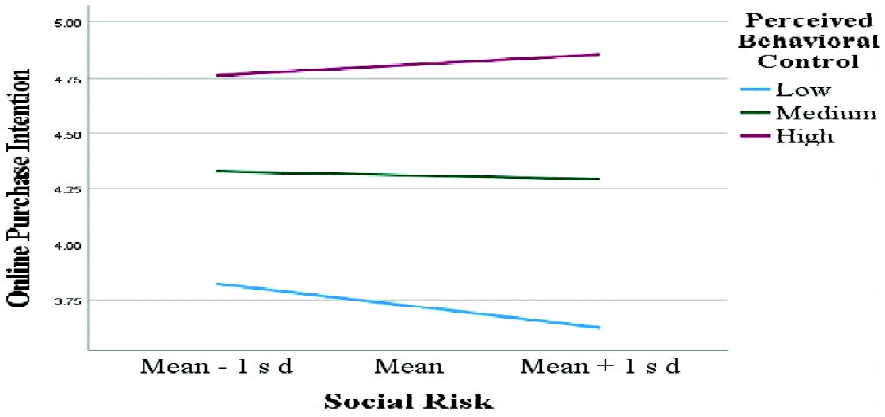

Figure 4: Social risk and e-buying Determination Affiliating with Perceived Behavioral Control as a Mediator

Source: Authors' Own Compilation

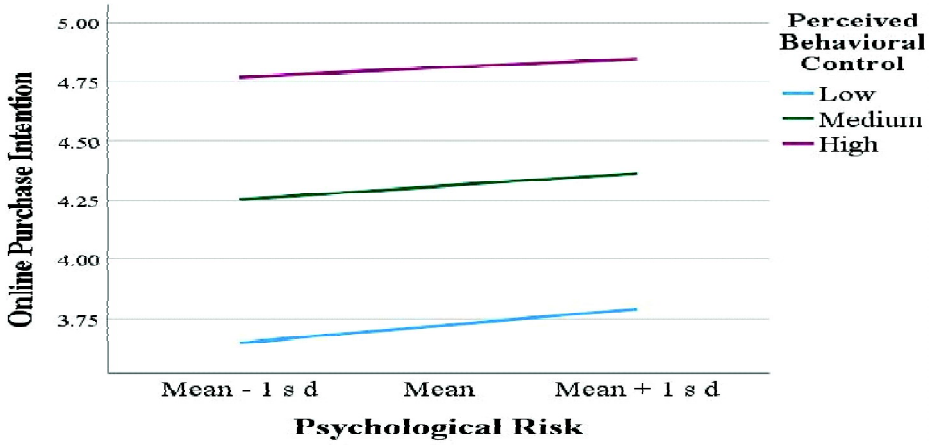

Figure 5: Psychological Risk and e-buying Understanding Associating with Perceived Behavioral Control as a Mediator

Source: Authors' Own Compilation

An interaction graphs show that sophisticated levels of perceived behavioral control are connected with advanced level of internet buying intention when various risks like financial, time, social, and psychological risks are low. Even when the levels of the numerous risks like, financial, time, social, and psychological risks remain increasing, higher levels of perceived behavioral control are associated with increase in the online purchase intention of consumers. These interaction graphs provide strong support for the moderation hypotheses.

The regression coefficient of e-buying attitude of customers on actual procurement tendency is positive and significant (0.716 $p < .001$), thus supporting hypothesis 7.

7. Discussion

The conceptual model developed and tested in this model represents modest attempt to show the relationship between various magnitudes of threats and e-purchase intent. The moderation effects, shown in Figures 2, 3, 4 and 5 add novelty to this research.

The moderating effects would also be similar in the sense that under the conditions of higher levels of perceived behavioral control would result in higher levels of online purchase intention when compared to the lower level of behavioral control. For example, as shown in Figure 2, even when financial risk increases from low to high, perceived behavioral control would increase the online behavioral intention. The underlying reasons could be the information exchanged between the members in the social media through EWOM; it is more likely that the financial risk as perceived may not be real. Hence, the consumers may exhibit electronically connected buying attitude.

Previous studies demonstrated the constructive association amongst purchase intention and actual consumer tendency; and the results supported the findings from the literature.

8. Conclusion

The present conceptual model helps understand consumer behavior, especially when consumers engage in online buying. The importance of professed danger theorized as an independent variable, pertaining to various dimensions of apparent risk are expected to affect online buying intention negatively. The perceived behavioral control acts as a moderator that changes the supremacy of the association amongst various dimensions of the risks. The implications of this study would be helpful to the e-retailers. The present model highlights the importance of the electronically connected consumer's attitude towards the perceived behavioral control.

From practitioners' view, the conceptual model tested and presented offers the retailers to focus on perceived behavioral control of consumers. In the present-day digital world dominated by social media, it is very likely that the consumers would influence each other in buying products and services. The perceived behavioral control exercised by consumers by following what their peers and co-consumers are responding to the online products plays important roles. Therefore, the retailers need to be cognizant of taking feedback about their products and periodically go over the reviews from the consumers. Often the consumer posts their experiences through social media and retailers need to consider these reviews and make required changes in products and services to satisfy the customers. As actual purchase behavior largely depends on the e- buying determination, as it is essential for retailers to consider changes in tastes and preferences of consumers expressed through social media. Overall, this study portrays the importance of perceived behavioral control in consumers' online purchase intention.

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Investigating Factors Affecting Accreditation Score of Higher Educational Institutions: A Case of Chhattisgarh

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Accreditation and assessment, Quality standards, Higher education, National assessment and accreditation council

JEL Classification

I21, I23, 129, C32

Abstract: Globalisation of higher education has compelled the Higher Educational Institutions (HEIs) and Universities to maintain the quality standard of higher education and boost innovation, skills, resilience and research mindset so as to meet the global dynamic requirements. Accreditation is an effective instrument of quality assurance for these institutions and universities since it provides educational institutions an increased sense of direction and identity with greater sense of accountability and enhanced credibility. National Assessment and Accreditation Council (NAAC) has been implementing the activity of quality assessment and accreditation of HEIs in India. The present study attempts to explore the factors affecting the criterion-wise score and also overall scoring pattern of accredited HEIs of Chhattisgarh state. Findings indicate that HEIs with postgraduation programme positively and that in rural areas negatively impact the accreditation scores. Results show developmental implications for all stakeholders including the government, the public and all institutions towards specific attributes for improving the accreditation scores or grades.

1. Introduction

Educational quality has an important role in strengthening the country's economic development and growth. Through social, economic, political and scientific aspects, education enables people to evolve into productive human resources. In India, following the independence, there was a radical change in the Higher Education sector. Since higher education was believed to regulate a country's future, Government of India gave higher education an utmost gravity. The objective of the government was to create the higher education system more expedient to the increasing demand of a developing economy. A holistic review of higher education was therefore imperative to restructure the entire system. Post-

independence, in the year 1948-49, the Radhakrishnan Commission (also called as University Grants Commission) was therefore appointed to review the status of the universities. As per the recommendations of Radhakrishnan Commission (1948), University Grants Commission (UGC) was constituted as a bridge between the central government and the universities.

In 1986, the National Policy of Education asserted on the need for evaluating and assessing the quality of higher educational institutions, which was further recommended and emphasised by Programme of Action (POA) in 1992. This led to the development of the National Assessment and Accreditation Council (NAAC) in 1994 by UGC. Over the two decades, NAAC has been implementing the activity of quality assessment and accreditation of higher educational institutions (HEIs) in India.

Assessment process on one hand involves identification of strengths and weaknesses of HEIs, whereas accreditation on the other, provides educational institutions an increased sense of direction and identity with greater sense of accountability and enhanced credibility. Therefore, assessment and accreditation for HEIs is not an end in itself, rather it is an instrument to achieve total quality with the use of robust methodology. Apart from accreditation, HEIs are ranked by various Ranking Agencies based on their own criteria and methodology since 2003. Overall, ranking and accreditation assures that these institutions satisfy the quality standards and foster active competition amongst the institutions so as to maintain and strengthen the quality.

To grow into more institutional friendly as well as to enhance the quality of HEIs, refinements in the assessment and accreditation process was implemented by NAAC in 2017. The new process, proposed a Quality Indicator Framework (QIF) to elicit quantitative (62.5 per cent weightage) and qualitative (37.5 per cent weightage) aspects of the process with the help of robust methodology. Thus, assessment and accreditation procedure of NAAC brought forth better understanding of quality education and also sensitised the HEIs regarding the seven quality parameters. These seven criteria which serve as basis for assessment of HEIs illustrate the key areas of functions and activities of HEIs, such as academic and administrative aspects of institutional functioning and also other emerging issues related to HEIs. These criteria are, Curricular Aspects (C1), Teaching-Learning and Evaluation (C2), Research, Innovations and Extension (C3), Infrastructure and Learning Resources (C4), Student Support and Progression (C5), Governance, Leadership and Management (C6) and Institutional Values and Best Practices (C7).

Further, NAAC also issues directives and encourages the HEIs to resolve much of its concerns with the help of the criteria and key indicators related to quality assessment and accreditation process. As per the all India survey on higher education (AISHE), 2019-20, in India there are 1043 universities, 42343 colleges and 11,779 stand alone institutions. Of these, 401 universities and 8,658 colleges have been accredited by NAAC.

Given that the established processes of accreditation are examined and amended at a regular interval, they act as an enabler for educational institution to recognise its strength, weaknesses and aid in planning, improving and developing necessary areas/aspects so as to get accredited. It also facilitates the potential students to gauge the quality of institutions and thereby make informed decision. As per the report by Hegde *et al.* (2021), numerous government colleges across India scored less than 2.00 in their cumulative grade point average (CGPA) except for few of the colleges. Also, according to Hassan

et al. (2019), although in India several universities and colleges have undergone accreditation process, it is still imperative to examine the accredited institutions in terms of CGPA and other variables like type of institution, constitution (co-educational, women's college), funding pattern (self-financed, grant-in aid, etc.) and so on, in order to obtain clear view on trend analysis. It is therefore necessary to study which factors (attributes) of such institutions have significant impact on the overall scoring pattern of CGPA under different criteria as assigned by NAAC. In India, hitherto, to best of knowledge, none of the studies have been undertaken to analyse the factors impacting the CGPA of HEIs.The present study thus seeks to fill the gap in the literature by empirical analysing the effect of factors on CGPA of accredited HEIs for the state of Chhattisgarh.

1.1. Status of Higher Educational Institutions in Chhattisgarh

The state of Chhattisgarh with high density of tribal population, is endowed with fauna and flora (rich in mineral resources) thereby giving it a potential to develop cutting-edged research in the various relevant areas, which is in accordance with the global expectations, standards and challenges. The higher education and the enrolment in these institutions in the state of Chhattisgarh has grown exponentially after it was carved-out from the State of Madhya Pradesh (see table 1). The State over the years also witnessed a significant rise in the number of HEIs offering conventional as well as technical, professional and medical courses. As per the report on AISHE 2019-20, there are 28 universities and 807 colleges in the State, of which seven universities and 172 colleges are accredited by NAAC.

Table 1: Number of Private and Government College and Enrolment in College

	Private Un-Aided	*Private Aided*	*Private Total*	*Government*	*Total*
Number of Colleges	353	81	434	373	807
Enrolment	1,23,008	37,254	1,60,262	2,67,687	4,27,949

Source: AISHE report 2019-20

Figure 1a and 1b indicates overall increasing trend in the student enrolment (gender wise) in various colleges over the years in Chhattisgarh. As is evident, the enrolment of female students has increased across all the courses over the years in the State. Interestingly, compared to all the courses, undergraduate courses witnessed highest rise in enrolment of students (both male and female) followed by diploma courses rather than the post graduate courses.

However, the present situation of higher education system in Chhattisgarh is complex and challenging. In 2017, the gross enrolment ratio (GER) was around 13 per cent well behind the national average of 22 per cent of GER. Further, as per the findings of Maiti *et al.*, (2022), there is a considerable difference in the quality of HEIs within government and private universities of Chhattisgarh state, specifically in context of classroom infrastructure, quality of teachers, extra-curricular courses, gender

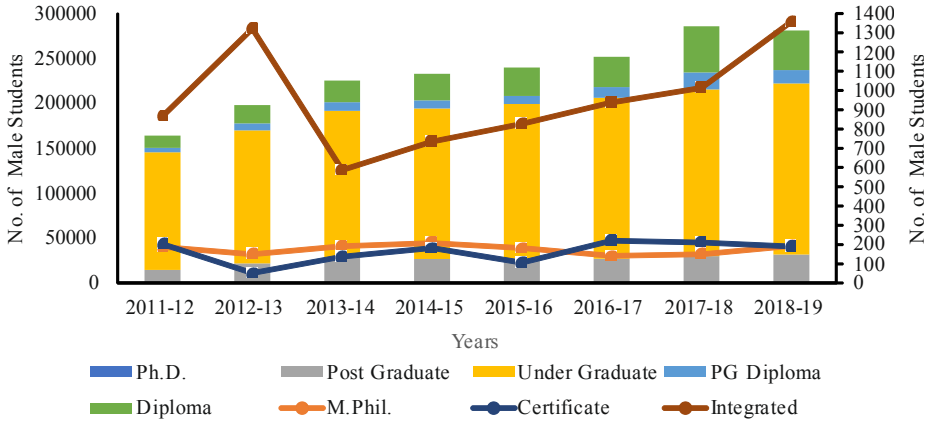

Figure 1a: Trends in the Male Students Enrolment over the Years

Source: Authors' Compilation from AISHE report 2019-20

parity ratio, etc. According to Kumar *et al.* (2021) accreditation may impact various core aspects of higher education, namely enrolments, academic prominence and internationalisation, research and development, quality of teaching and employability.

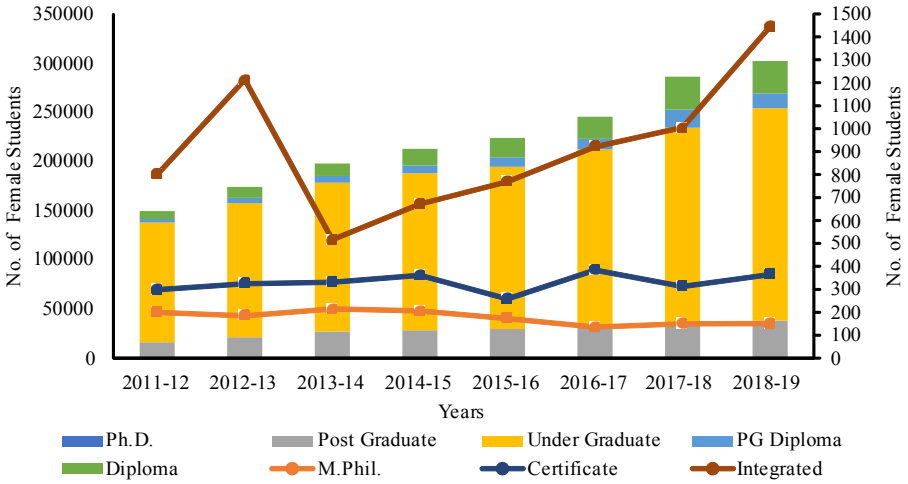

Figure 1b: Trends in the Female Students Enrolment over the Years

Source: Authors' Compilation from AISHE report 2019-20

2. Review of Literature

In several countries accreditation of higher education is quality endorsing process which comprises accreditation standards, self-review and peer review procedures, implementation of performance indicators, and so on. Accreditation thus has an important role in ensuring quality and quality

improvement for HEIs. Three strands of literature are surveyed for the current study. First, relates to literature on performance indicators and quality enhancement in HEIs in developed countries. The study conducted by Sarrico (2022) on the performance and quality of HEIs discusses the importance of performance indicator in light of the challenges faced by HEIs while utilising these indicators. The study also highlights the strengths and weaknesses of employing these indicators and the continuous burden surrounded by pressure of accountability, inspiration and innovation that these institutions witness while implementing performance indicators for improvement. Barbato *et al.* (2022) in their research recommend that a holistic approach should be implemented while evaluating the teaching and learning quality, although some competences and learning outcomes emerge more significant in enhancing the quality of teaching and learning. They also concluded that the perception of utility of performance indicator list amongst different stakeholder, viz., leadership, quality management staff, teachers and students, differs substantially and gets impacted by external factors and also collective internal practices. Stura *et al.* (2019) explored the relationship between quality performance and different discipline areas in 118 study programmes of Italy. They found significant relationship between technical/ engineering study programmes and good quality assurance results.

Second consists of impact of accreditation on various aspects of HEIs in developed and developing countries. Acevedo-De-los-Ríos and Rondinel-Oviedo (2021) in their paper examined the importance and value addition of accreditation as a means of ensuring quality for HEIs specifically in the area of architecture. Qualitative evaluation effect was observed by reviewing academic indicators and standards such as, pass rate or weighted average per year, before and after the accreditation procedures. The study also examined the positive impact of a quality assessment of accessible accreditation to students, teachers, and employers. In order to understand self-evaluation, evaluation and accreditation (quality mechanism) system among various disciplines, Makhoul (2019) in his research investigated whether teaching and learning gets enhanced and propels institutional changes because of attainment of accreditation in HEIs of Lebanon. It was deduced that accredited bodies in the country lack standard and shared practices. This study finds that there is a link between education recognition and growth of teaching and learning in these institutions. Dattey *et al.* (2014) in their study empirically examined the different effect of accreditation on public and private universities in Ghana. They found that there was wide gap in the assessment scores amongst these two categories of universities and that public universities perform better in assessment process.

Third, comprises of ranking and accreditation of HEIs in context of India. Fernandes and Singh, (2021) in their paper focused on accreditation and ranking system of Indian university to determine its efficiency in enhancing the academic quality so as to achieve better status globally in terms of quality. The study found laxity in the accreditation and ranking processes by Indian accreditation and ranking bodies as compared to the rigorous global accreditation and ranking practices. Srinivas (2019) in his study critically examined the HEIs controlled by central government of India vis-a-vis state level universities and colleges. He concluded that in context of quality of resources and funding, institutions directly under the control of central government perform reasonably good as compared to the state level universities and colleges. The state level institutions struggle with basic administrative infrastructural issues like vacant posts, political instability, legal proceedings and other issues. This further has led to

deterioration of the quality culture and quality enhancement thereby further marginalising the bottom of the pyramid. Gupta *et al.* (2021) in their study investigated the issues related to higher education in India and whether the ranking and accreditation systems have created a quality environment in the Indian higher education institutions. The study throws light on some of the important issues and challenges faced by Indian higher education that requires immediate attention. The study indicates that the ranking and accreditation system has significant impact on the performance consequences of the Indian institutions. Kumar *et al.* (2021) studied in detail about accreditation as a quality stamp which ensures that the program has gone through a meticulous process of peer evaluation. An accredited institute is thus based on the pre-determined detailed principle that complies with the minimum requirement.

3. Objectives

Given the above setting, the main intent of this paper is to empirically examine which variables or factors of accredited HEIs in Chhattisgarh contribute significantly to the overall scoring pattern of CGPA under different criteria as assigned by NAAC. The main objectives therefore are:

- To analyze the trend amongst accredited colleges in context of sources of fund, locations of institution, gender-based categories, program level, and program specializations.
- To study the correlation between the variables and the overall CGPA and Criterion wise grade point average (GPA) scoring pattern
- To investigate the impact of various variables of colleges on the scoring pattern of overall CGPA and Criterion wise GPA.

4. Data and Methodology

With an aim to empirically study the factors affecting the scoring pattern of HEIs, the present paper focuses on accreditation status of educational institutions of Chhattisgarh state. The data of 110 colleges have been taken for the analysis purpose as per CGPA score which was available from official website of NAAC. The data on scoring pattern of each college has been collected from Peer Team Reports and Self Study Reports, Annual Quality Assurance Reports and other materials available from NAAC.

Further, as mentioned earlier Hassan *et al.* (2019), stressed on the need to examine the accredited institutions in terms of CGPA and other variables like type of institution, constitution (co-educational, women's college), funding pattern (self-financed, grant-in aid, etc.) and so on, in order to obtain clear view on trend analysis. Therefore, in order to conduct quantitative analysis, data of these colleges on different variables viz., sources of fund, locations of institution, gender-based categories, program level, and program specializations were used. The empirical analysis was conducted in two steps: first, Pearson's correlation was employed in order to test the association between variables under the study and then multiple regression analysis was conducted to gauge the impact of variables on the scoring pattern of overall CGPA and Criterion-wise GPA.

The multiple regression is employed to predict the value of a dependent variable when two or more independent variables are given. The regression thus allows to estimate the best fit of the model and share of each independent variable in the total variance explained. However, to employ multiple

regression few assumptions such as independence of residuals, no autocorrelation, no multicollinearity and no heteroscedasticity are essential. Following regression equation was used to analyse the association between the variables:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots \ldots + \beta_p x_{ip} + \epsilon \quad (1)$$

where,

y_i = dependent variable, x_i = explanatory variables, β_0 = intercept, β_p = slope coefficients for each explanatory variable, ϵ = error term or residual term.

Thus, the regression equation for Curricular aspects (C1) is as follows:

$$C1_i = \beta_0 + \beta_1 \, Source\ of\ funding_{i1} + \beta_2 \, Location_{i2} + \beta_3 \, Gender_{i3} + \beta_4 \, Program\ Level_{i4} + \beta_5 Programbased\ category_{i5} + \epsilon \quad (2)$$

Similar specification is assumed for each criterion and also overall CGPA by replacing the dependent variable with specific criteria score of interest and also overall CGPA.

5. Findings and Discussions

5.1. Trend Analysis

Table 2 indicates CGPA range wise distribution of accredited colleges of Chhattisgarh. Evidently out of 110 accredited colleges in the state, less than one per cent obtained highest CGPA (3.51 to 4.00) whereas around 48 per cent of colleges scored between 2.01 to 2.50. Further, figure 2 indicates CGPA range wise distribution of colleges in terms of source of funding and its location. It could be inferred that government funded colleges as well private colleges that scored between 2.01 to 2.50 and between 3.01 - 3.25 were almost at par with each other.

Contrarily, the accredited grant in aid colleges were far lesser in numbers (five colleges) and were mostly concentrated between the CGPA range of 2.01 to 2.50. In context of location of these colleges, compared to urban area colleges, a greater number of rural and semi-urban colleges (29 per cent) have scored between 2.01 to 2.50 CGPA, whereas, 21 per cent of colleges in urban areas have secured CGPA of more than 2.50 compared to that of rural and semi-urban areas.

Table 2: CGPA Range wise Distribution of Accredited Colleges of Chhattisgarh

CGPA range	*Number of Colleges*
1.51 to 2.00	18
2.01 to 2.50	53
2.51 to 2.75	21
2.76 to 3.00	9
3.01 to 3.25	8
3.51 to 4.00	1
Total	110

Source: Authors' Compilation from NAAC website

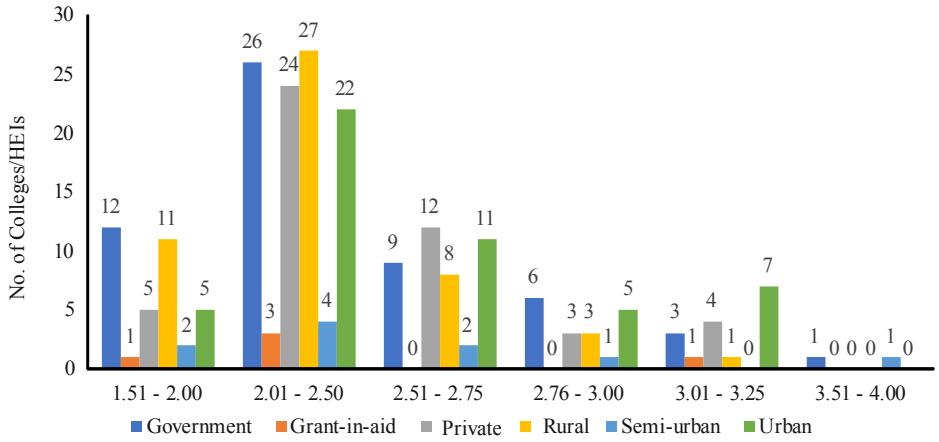

Figure 2: CGPA Range wise Distribution of Accredited Colleges as per Source of Funding and Location

Source: Authors' Compilation from NAAC website

Further, figure 3 displays CGPA range wise distribution of colleges in terms of gender (Co-education, Women's only), programme level (undergraduate level-UG, postgraduate level- PG). Interestingly in Chhattisgarh, most of the colleges (more than 90 colleges) that got accredited were co-ed and had PG level programmes. However, among these colleges, colleges that scored between 2.01 to 2.50 CGPA were also highest (43 per cent-coeducation colleges and 39 percent-PG level), followed by colleges scoring between 2.51 to 2.75 CGPA (18 per cent-coeducation colleges and 17 percent-PG level).

Lastly, figure 4 exhibits CGPA range wise distribution of accredited colleges in terms of programme-based (discipline) category viz., education, engineering and general. The trend shows that out of the total number of accredited colleges, highest number of colleges that scored between 2.01 to 2.50 CGPA belong to education and general category colleges, whereas, fewer percentage of colleges in all the three categories have scored more than 2.50 CGPA. As mentioned before, it is thus clear from trend analysis that accredited colleges of Chhattisgarh have not performed well in terms of overall CGPA scoring.

5.2. Correlation and Regression

Next step is to find out the whether the variables like sources of fund, location of institutions, gender-based categories, program level, and program specializations are correlated with CGPA scores and Criterion wise GPA. Further, it is also necessary to estimate whether these variables affect the overall CGPA and Criterion wise GPA scoring pattern. To this end, Pearson's correlation test and multivariate regression has been employed. The results of Pearson's correlation matrix between the variables under the study has been presented in table 3.

Evidently, on one hand CGPA scores and the variable location is negatively correlated, on the other, CGPA scores and variables such as gender and source of funding have very weak correlation.

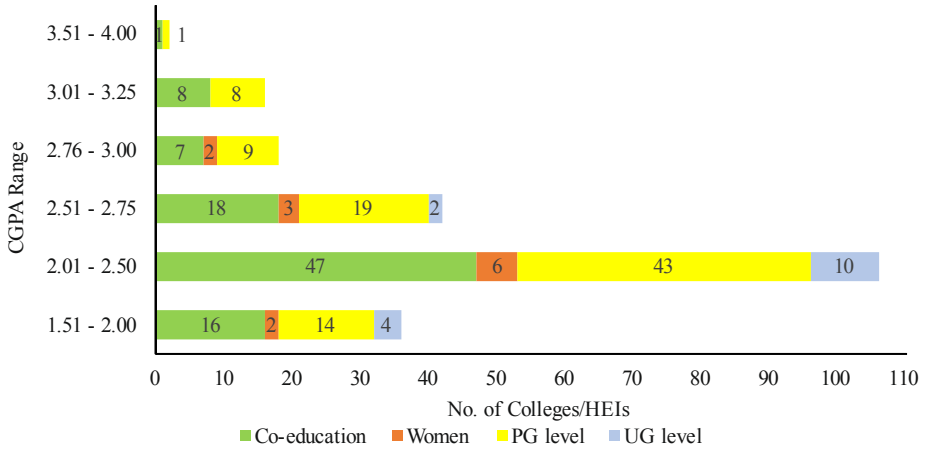

Figure 3: CGPA Range wise Distribution of Accredited Colleges as per Gender and Programme Level

Source: Authors' Compilation from NAAC website

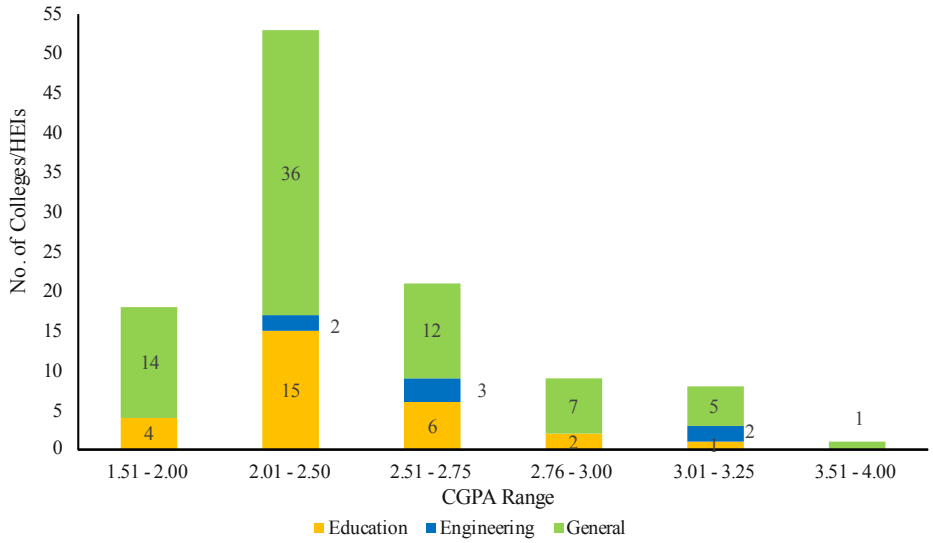

Figure 4: CGPA Range wise Distribution of Accredited Colleges as per Programme-based Category

Source: Authors' Compilation from NAAC website

Interestingly, the variable location has negative correlation not only with overall CGPA but also with each GPA of each criteria. Overall it can be deduced that colleges located in rural and semi-urban areas do not perform well in terms of their scoring pattern compared to their counterparts. There is weak positive or negative correlation between Gender and different seven criteria.

Table 3: Correlation Matrix

	CGPA	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*
Source of funding	0.07	0.11	-0.12	-0.03	0.33	0.12	0.04	0.10
Location	-0.32	-0.20	-0.37	-0.15	-0.25	-0.19	-0.27	-0.24
Gender	0.03	0.01	0.03	0.13	-0.04	0.03	-0.07	-0.01
Programme level	0.24	0.19	0.36	0.26	0.06	0.10	0.17	0.13
Programme based category	0.14	0.25	-0.11	0.02	0.38	0.15	0.16	0.14

Source: Authors' Calculation

Further, in terms of Criterion-wise scoring pattern, the observations are: a) there is moderate positive relationship between programme level and teaching-learning and evaluation (C2), b) criteria infrastructure and learning resources (C4) and variables sources of funding as well as programme-based category have positive relationship with each other, c) location and criteria teaching learning and evaluation (C2) is negatively correlated with each other. However, the correlation just shows the relationship between the two variables and does not examine the effect of one variable on the other. Therefore, multiple regression has been used to know which explanatory variable affects the dependent variable and to what extent dependent variable get affected by explanatory variables. Table 4 reflects result of multiple regression by using equation (1).

Table 4: Regression Analysis

Independent Variable	*Dependent Variable*							
	CGPA	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*	*C7*
Source of funding	0.02**	0.02	-0.01	0.03	0.11***	0.06	-0.03	0.04
Location	-0.10*	-0.07	-0.14*	-0.05	-0.08	-0.09	-0.12**	-0.13**
Gender	0.08	0.13	0.01	0.26***	0.09	0.13	-0.07	0.05
Programme level	0.31*	0.44*	0.33*	0.44*	0.31**	0.28	0.25***	0.28
Programme-based category	0.11	0.29*	-0.03	0.08	0.25*	0.14	0.18***	0.13
Constant	2.09*	1.80*	2.39*	1.55*	2.06*	2.11*	2.05*	1.96*
R square	0.17	0.16	0.23	0.11	0.24	0.07	0.13	0.09
Robustness Tests								
Leven's Test (F statistics)	1.27	1.10	1.30	1.23	1.34	1.21	1.22	1.32
Durbin-Watson	1.78	1.93	1.88	2.04	2.15	1.60	1.79	1.92
Normality Statistics	0.83	0.74	0.63	0.73	0.91	0.84	0.71	0.82
F-Statistics	4.36	3.86	6.29	2.57	6.45	1.64	3.02	2.16
Sig.	0.00	0.03	0.00	0.03	0.00	0.05	0.01	0.06

Source: Authors' Calculations

Note: * 1% significance level, ** 5% significance level, *** 10% significance

It is evident from table 5 that the most important factor affects the overall CGPA scoring pattern is the programme level offered by the college. In other words, the findings indicate that colleges which give PG level programme have more positive impact on the scoring pattern compared to UG level. Programme level also significantly and positively impacts the GPA of Curricular Aspects (C1), Research, Innovations and Extension (C3), Infrastructure and Learning Resources (C4) and Governance, Leadership and Management (C6). Intuitively, it could be argued that HEIs offering post graduate program will have more inclination to develop, implement and revise their curriculum to suit to the changing global, national and regional developmental needs. They also strive to create more infrastructure with information communication and technology (ICT) enabled facilities like smart class, learning management system (LMS), etc., and frequently upgrade their research facilities and provide an ecosystem for innovation and creation of knowledge. Additionally, these institutions also optimise the usage of their available resources by offering different PG courses.

Another factor location of the college has negative impact on the overall CGPA and also on each Criterion- wise GPA. However, it is observed that HEIs in rural and semi urban areas affect adversely and significantly not only to the scoring pattern of overall CGPA but also to criteria such as Teaching-Learning and Evaluation (C2), Governance, Leadership and Management (C6) and Institutional Values and Best Practices (C7). As highlighted by Aneja (2015), the probable reasons are: i) HEIs in rural area specifically face dearth of quality teachers and teaching. There is absence of proper quality training to upgrade the teachers and the teaching methods even today are imperialist in nature; ii) quality of Indian school in such areas is extremely low, leaving students unequipped with proper training and priori knowledge. This results into further deterioration of their performance at higher educational level; iii)HEIs in rural areas lack proper infrastructure like incompetent library, classrooms, laboratory, and state-of-art computer facilities; iv) these HEIs also face issues of accountability of governance and management.

The factor programme-based category although does not have significant impact on overall CGPA, it does significantly and positively affect the GPA of Curricular Aspects (C1), Infrastructure and Learning Resources (C4) and Governance, Leadership and Management (C6). This means traditional colleges (general category) comprising of arts, commerce and science faculty are doing better as compared to teachers' education and engineering colleges. The explanations possibly are: a) these courses impelled by local demand and job requirements continuously undergo syllabi restructuring with quality teaching and evaluation system; b) such institutions have efficient and effective use of infrastructure and facilities (like sports, printing, internet, etc.) along with well-resourced laboratories and ICT based services on the campus;c) the management of such institutions are driven by specific targets, have transparency in decision making and decentralised execution, optimum utilisation of monetary resources and proper management of budgets.

Surprisingly the factor gender (co-ed or women's only colleges) do not have any significant impact on the overall CGPA scoring pattern or on Criterion-wise GPA except for Research, Innovations and Extension (C3).This implies that co-ed or women's college does not have any impact on the accreditation scores.

Overall the regression estimators pass all the robustness checks. In other words, the model is free from autocorrelation (as indicated by D-W statistics) and multicollinearity (since variance inflation

factor-VIF, for all variables and equations ranges between 1.06 – 3.45). Further, the normality tests confirm that the residuals are normally distributed and Levene's test point that residual of dependent variable is equal across all variables, i.e. there is no problem of heteroscedasticity.

6. Recommendations

To reach and achieve highest scores and grade for accreditation there is an urgent need for HEIs in the state of Chhattisgarh in specific and for other states in general to relook at the access and equity, quality standards, relevance, infrastructure and optimum utilisation of financial resources. Additionally, all stakeholders including the government, the management and all institutions should focus on the following:

- The State Government may develop the policy for Higher Education in Chhattisgarh covering all aspects of Higher Education.
- Provide financial assistance specifically to Government colleges and Universities for payment of necessary fees and meet minimum expenditure for facilitating the visit.
- Hold seminars and workshops for creating awareness, assist HEIs to prepare SSRs and explain various contents involved in the process. Handholding policy is to be followed for weak institute.
- There must be a benchmark for excellence, therefore for creating better environment in teaching and research, decentralised special courses in the remote and backward area should be encouraged thereby creating new university and colleges.
- Special efforts to propagate education for women and also for rural and tribal areas.
- Collaborating with other universities/research institutions/industries for various programmes.
- Ensuring of high standards of accountability and transparency.

7. Conclusion

Globally it is evident that the established processes of accreditation act as an enabler and positively impact the quality and excellence of HEIs, since they are amended, modified and reviewed periodically. NAAC has been implementing the activity of quality assessment and accreditation of HEIs in India. The present study attempts to explore the factors viz., sources of fund, locations of institution, gender-based categories, program level, and program specializations affecting the Criterion-wise score and also overall scoring pattern of 110 accredited HEIs of Chhattisgarh state.

Trend analysis results indicate that out of total number of accredited colleges surveyed in this study, very few colleges obtained highest CGPA whereas larger number of these colleges scored between 2.01 to 2.50. Additionally, a greater number of rural and semi-urban colleges have scored between 2.01 to 2.50 CGPA. The correlation analysis suggests overall moderate correlation between the variables under the study. Findings of regression estimates demonstrate that HEIs with postgraduation programme positively and that in rural areas negatively impact the overall CGPA and also few Criterion-wise GPA. Furthermore, HEIs offering general stream does influence positively to few Criterion-wise GPA but not to overall CGPA. However, the CGPA or Criterion-wise scores were not affected by source of funding pattern of these institutions or on the basis of gender (co-ed or women's only) in the state.

The present investigation thus reveals that an educational institution offering post graduate programme has positive influence on accreditation scores, whereas, an institution situated in rural area (or remote or backward areas) influence the scores negatively. Therefore, findings of this study are expected to serve as general guidelines to all stakeholders including the government, the management and all institutions. The diagnosis of accredited HEIs of Chhattisgarh state indicates suitable strategic measures like efficient use of all available resources and opportunities, capacity building, supportive management, etc., so as to achieve successful and sustainable quality education both at state and regional level.

This study is limited to investigation of factors affecting the accreditation scores of HEIs of Chhattisgarh state only based on secondary source. Further research could be carried on for accredited HEIs of other states and a comparative analysis could be undertaken using econometric tools. Also, a primary survey could be undertaken to understand problem at root level.

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Impact of Currency Futures Issuance on Foreign Exchange Rate Volatility in India

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Keywords

Currency futures, ARCH, GARCH, Heteroskedasticity, Pre futures, Post futures

JEL Classification

F3, C32, F39, F41

Abstract: This article examines the effect of currency futures on foreign exchange rate volatility in India focusing on USD-INR, EUR-INR, GBP-INR and JPY-INR. For the period from February 2002 to February 2020, the daily exchange rate values of all the four currencies against the Indian rupee (INR) were collected. The Augmented Dicky Fuller (ADF) test of the unit root was performed to check the stationarity of the time series data utilized in the study. After verifying the presence of heteroskedasticity with the ARCH LM test, GARCH (1, 1) modelling is employed to assess the impact of the launch of currency futures on the volatility of India's foreign exchange rate. The findings clearly depict that presence of volatility persistence is there for USD-INR, GBP-INR, EUR-INR, and JPY-INR. The volatility of returns of exchange rate before and after currency futures was discovered to be different as it is higher in pre futures period for USD-INR, and GBP-INR whereas for EUR-INR and JPY-INR it is higher in post futures period.The major implication is that when constructing hedging strategies, investors must account for volatility persistence between currency futures and spot markets.

1. Introduction

New information about the market has an effect on financial market trading. The current study is an attempt to detect the effect of currency futures on the underlying currency spot market. It is intended to examine the shift in volatility and information in the time period of post derivatives. This paper presents a discussion of results about the influence of the inception of the currency futures market in India. The focus of the current research is on the result of the inception of currency futures on foreign exchange rate volatility in the Indian stock market concerning USD-INR, JPY-INR, GBP-INR

and EUR-INR. Currency derivatives first appeared in July 2008, when currency futures for the US dollar were introduced. These were later extended to other key currencies such as the euro, pound and yen. Currency derivative securities trading in India has developed significantly since its introduction in 2008,no. of contracts climbed from 3,26,72,768 in 2008 to 71,83,33,857 contracts in 2022. Such significant growth in such a short period of time is worthy of notice. Because of their huge trading volume, we look at currency and foreign exchange rate volatility as well as the underlying spot markets. As a result, these products are expected to represent the Indian futures and spot markets' scheme of volatility interaction mechanisms. We make two contributions in this regard. Firstly, we examine the broadly networked currency futures markets, the patterns of volatility and shock propagation markets by using pairs of currencies USDINR, GBPINR, EURINR and JPYINR. The variance dynamics of financial time-series data with a high frequency have been simulated since Engle's debut in 1982, and later generalization by Bollerslev. It's becoming more common to use an ARCH specification (1986).

As a result, for estimating the mean and conditional variance in the stated return series, the GARCH (1,1) model is used. Another contribution relates to the markets in which we specify, it includes all currency pairs in the field of currency futures in India. Along with it, Nifty returns are taken as an independent variable. In the previous studies, the data period used was quite limited, however, our extended data, which spans nearly 18 years, is thought to be sufficient to capture the dynamics of volatility interaction; as a result, this study should throw more insight into the correlation among the currency futures and foreign exchange rate volatility. The literature about the derivative has a different effect on the underlying spot market shows that Derivatives' effect on the underlying cash markets differs by country and that various observations have been made at different times. One set of academics feels that futures and options products increase the underlying market's speculative and volatile nature by introducing some degree of instability (Figlewski, 1981; Ross, 1989; Stein, 1987). Contrary to popular belief, certain studies show that information moves rapidly between futures and cash markets, resulting in increased total capital market efficiency. The futures market also plays an important job in discovery of price in the equity market, as well as maintaining prices in both the futures and spot markets (Danthine, 1978; Bologna and Cavallo, 2002). Furthermore, the uniqueness of the financial system of India necessitates a special study, as the generalizations made about industrialized countries may not hold true in this case. Furthermore, in India, futures, particularly currency futures, are considered tender. Given that the Indian economy is growing and opening up and incorporating with other major economies across the world, and that the government recognizes the significance of foreign commerce and thus foreign exchange, this type of research is critical.

2. Review of Literature

2.1. Currency Derivatives

The currency derivatives are used by investors for hedging their foreign exchange rate risk (Tebogo, 2012). Guru (2009) analyzed the forex derivatives market in India. Rising foreign currency turnover and growth in foreign investment give rise to the use of currency futures. Currency derivatives are mainly used for hedging purposes, arbitrage purposes and price discovery. Speculation is the least

preferred objective of currency derivatives. Guru (2010) by using the USD-INR currency pair analyzed how trading of currency futures impacted volatility and spot exchange rate returns. The futures market proved as a driver of the spot market because the futures market has more informational content compared to the spot market. To manage the currency exchange rate risk various strategies are used. Currency derivatives are one of the most suitable currency risk management tools (Pandey, 2014; Sivakumar and Sarkar, 2008). In a study, Mittal (2012) concluded that the issuance of derivatives products for hedging of foreign exchange rate risk has enabled the integration of the national economy with the world economy.

The Indian currency derivatives market is growing at a swift phase both in terms of volume and trading since currency futures and options were introduced in India (Pallavi, 2015; Mahanta, 2012). Similarly, Guru (2009) explored the recently launched currency futures market in India and its growth and global trends in the forex derivatives market. Exchange-traded currency derivatives were increased as compared to OTC derivatives. USD-INR was the most traded currency pair at the initial stage (Rajkumar and Rani, 2012). Furthermore, some researchers explored the growth and development of the Indian currency futures market and analyzed that there was increased exchange rate volatility of USD-INR during conventional and non-conventional trading hours (Chakravarty and Parveen, 2010). The currency forward market plays a major role in determining foreign exchange spot rates and minimizing the risk associated with it (Srikanth *et al*., 2012).Currency derivatives are useful to achieve stability in the earnings in foreign exchange market (Tebogo, 2012). Furthermore, Kadyan (2014) analyzed the Indian rupee role as an international currency. It was concluded from the study that Indian rupees were not an international currency at the time of the study. The Indian rupee has high volatility and its chances of becoming an international currency are still so far.

In a study, Pandey (2014) analyzed currency risk management by using currency derivatives tools. The study explained the transaction, translation and economic exposure. Currency derivatives were proved as a successful tool for risk hedging involved in the foreign exchange market. The monthly turnover of currency derivatives at NSE during February 2018 rose at 5,06,671 crore from 1,57,554 crores in December 2011. The Currency futures and options average daily turnover reached Rs. 16778.20 crore in 2015 (Pallavi, 2015). In a study some new features like the addition of late-night hours, options and various products in different currencies, cross currencies were also suggested (Chakravarty and Parveen, 2010).

2.1.1. Currency Futures

In the Indian market study of foreign exchange rate volatility and currency derivatives influence on foreign exchange rate volatility is more important because it is still in the developing stage. There is excessive volatile market in the currency market and the starter of currency futures affect the volatility of EUR-INR (Gupta, 2017). Pandey (2011) analyzed that in terms of open interest and contracts traded at MCX and NSE currency futures were developed at a rapid phase because it was proved as a good deal to hedge the risk. Volatility, trading volume and depth of the market are related to each other in the currency futures market. Similarly, Guru (2010) considered that there is no existence of cause-and-effect relationship between currency future volume, open interest and volatility of the spot market.

Results also presented that the effect of volatility in the futures market on the spot market can be said below. Also tells that return in the forward market affect volatility of return in the future market. As volatility increases, it brings high trading in hedging instruments. And when it decreases it brings low trading.

Many variables influence the foreign exchange derivatives market (Pavaskar and Kala, 2013). Chatrath *et al.* (1996) discovered a positive connection between volatility in daily exchange rate changes of the Japanese Yen, British Pound, Canadian dollar, Deutsche Mark, and Swiss Franc and the level of trading activity of futures in these currencies. Similarly, some other studies also found a positive association among currency derivatives and the volatility of foreign exchange rates while some of them found no relationship between these factors (Sahu, 2012; Rastogi, 2011). While some studies evidenced that volatility has decreased after currency futures were launched in India. In a study, Nath and Pacheco (2018) explored India's currency futures market. There is also the effect of good news on spot exchange rate return as it causes more volatility (Kumar, 2015; Thenmozhi and Thomas, 2007). Futures and spot markets both have an impact on each other in some way (Thenmozhi and Thomas, 2007).

In India, volatilities in the exchange rate of various foremost currencies (US Dollar, Euro etc.) instigate volatility in the daily exchange rate value of the Indian Rupee (Sahoo, 2012). Studies concerning the currency futures marketplace's effect on the foreign exchange rate volatility provide mixed results for various nations. Some of the studies found evidence that the issuance of currency futures brings high instability in the foreign exchange market while some other research found no effect on foreign exchange rate volatility (Sharma, 2011). The starter of currency derivatives brings efficiency to the market as they are helpful in hedging and speculation purposes because the currency exchange rate is harder to predict for market participants (Liu, 2007; Tornell and Yuan, 2012). Sriram and Senthil (2013) found that the Spot market reacts to new information quicker as compared to the futures market and because of unidirectional causation in the foreign exchange market spot causes the futures.

By examining the short-term causal correlation amidst futures market return and the spot market return of JPY-INR traded in India it was found that there was a unidirectional cause and effect relationship between these two markets (Raghu and Shanmugam, 2013). There is also the bi-directional association between currency spot and futures market. The futures market has a very large impact on the spot market (Bhat and Suresh, 2014; Yaganti *et al.*, 2015). In the case of the following currencies - USD, EURO, GBP and JPY, the relationship among the spot market and the futures market was analyzed by using an error correction model. It was found that the futures market come out as the leading market (Kharbanda and Singh, 2017). In a study, a bidirectional causal association was also found between volume and returns (Mittal and Kumar, 2016). Similarly, in a study effect of currency derivatives on foreign exchange rate volatility of Pound sterling was examined and it was found that trading of currency futures in India has reduced the foreign exchange rate volatility. Futures contracts are reflected as an impartial forecaster of variations in the spot rate for the USD-INR (Kumar and Truck, 2014). Pre futures period has a consistent shock of volatilities having ARCH and GARCH effect as compared to moderate ARCH effect in the post-introduction period (Kumar *et al.*, 2015). There is also the effect of recent news on currency derivatives as well as the previous day's effect starts reducing.

It was also indicated that in the after-currency futures period currency futures trading lessens the volatility of JPY-INR and GBP-INR and increases the volatility of EURO INR during the post currency period (Sakthivel *et al.*, 2017a). (Sakthivel *et al.*, 2017b), Furthermore, Kumar (2017) examined the coexistent and causative association between return, volatility and trading volume of currency future market for these currency pairs USD-INR, EUR-INR, GBP-INR and JPY-INR. A positive relationship was found between currency future return and trading volume. Exchange-traded currency derivatives were increased as compared to OTC derivatives. USD-INR was the most traded currency pair during the time of the study (Rajkumar and Rani, 2012). In a study, it was found that Currency futures have a poorer hedging efficacy than OTC forwards (Mohanraju, 2014). When there are no directly available currencies in the market then cross hedging is also used by various firms (Chang and Wong, 2003).

3. Objectives and Hypothesis of the Study

3.1. Objectives of the Study

The main objectives of the study are:

- To investigating the effect of the issuance of currency futures in the Indian currency derivatives market as well as to know about the efficiency of the market.
- To assess spot foreign currency market volatilities for pre-and post-future eras and to compare the spot foreign exchange market's stability and depth throughout both times.

3.2. Hypothesis of the Study

The following research hypothesis is framed and tested for analyzing the above-mentioned issues.

H_{01}: The issue of currency futures has an effect on foreign exchange market volatility in India.

4. Research Methodology

4.1. Data

Data has been collected for the time series that is recorded in the form of the currency derivatives market. For investigating the effect of currency futures on foreign exchange rate volatility in India, four currency pairs are selected in the study those are USD-INR, GBP-INR, JPY-INR and EUR-INR. The choice of these currency pairs is based on the availability of data as there are only four currency pairs issued in India in the futures market. Daily closing prices for pre futures introduction as well as after futures issuance are collected for tracing the trend of volatility changes after currency futures. In the study, the official websites of NSE and RBI are used for collecting data related to currency futures and spot prices. To assess the influence of currency futures on foreign exchange rate volatility data sample period is selected as 18 years of data from February 2002 to February 2020.

After that, it is split into two sub-period pre futures time periods spanning from February 2002 to August 2008 for USD-INR and February 2002 to October 2010 for EUR-INR, GBP-INR and JPY-INR (Kumar, 2015). In the case of post futures, August 2008 to February 2020 for USD-INR whereas

EUR-INR, GBP-INR and JPY-INR data spans from October 2010 to February 2020. Because currency futures are one of several drivers of the degree of fluctuation in the spot exchange rate, the study also utilized the CNX Nifty's daily closing values for the same time period to separate the influence of Exchange rate volatility is influenced by currency futures and a variety of other factors. As an independent variable, the CNX Nifty's lagged value has been used in the mean return equation for this reason (Kumar, 2015; Sahu, 2012).Daily return data series is chosen for the study. It has been obtained by continuously compounding logarithmic returns, as follows:

Rt = Log (Pt / Pt-1)

Here, Pt=Price at time t (Natural log value), Pt-1 = price at time t-1(Natural Log value)

4.2. Research Methodology

4.2.1. Stationarity Testing

For econometric modelling, it is necessary for data to be stationary. To determine if the series is cohesive, it needs to be checked for constant mean and variance. For the data, there is a unit root in the time series, according to the null hypothesis. To investigate whether the Currency pairs USD-INR, GBP-INR, EUR-INR, and JPY-INR time series are stationary, the null hypothesis in the ADF test is that the series has a unit root. The ADF test is used to find the unit root in a series of the raw data for the period of pre and post phase as well as the whole sample. The ADF test is applied at a level with intercept and trend, where alternative hypotheses got accepted. The Akaike Information Criteria are used to estimate the lag duration for ADF testing (AIC).

4.2.2. Volatility

4.2.2.1. Currency Futures

For investigative the effect of the issuance of currency futures and options on foreign exchange rate volatility; the first difference has been used. As it is the foremost requirement for the application of further volatility-based models. Furthermore, the ARCH-LM test is applied to know about the presence of volatility clustering in the time series. It is resulted that the p-value is less than 0.05, the null hypothesis of the arch test, that there is no impact of the arch, is rejected, proving the presence of volatility clustering. Hence, the significance of the ARCH LM test suggests the existence of volatility clustering in the error term. After that to examine empirically the effect of the issuance of currency futures and options in the Indian stock market on foreign exchange rate volatility standard generalized Autoregressive Conditional Heteroskedasticity (GARCH) model is applied. Returns on the Nifty are used as an independent variable (Kumar, 2015, Sahu, 2012).

The arch term's coefficient is indicated by α, which is employed in the variance equation and reflects the impact of yesterday's news (error) on today's volatility. Along with this, the coefficient of GARCH denoted by β reflects the persistence of volatility. In case, the b coefficient is higher than volatility persistence would be on the higher term. Another condition included in the GARCH model is that the entire addition of mutually coefficients of arch and GARCH term should not exceed 1. It

shows the volatility is decaying and the rate of decaying is 1 – (α+β), also representing a stationary process (Gujrati, 2009). The GARCH model's general mean equation is as follows:

$$Y_t = \delta + \beta_1 Y_{t-1} + \beta_1 r\_nifty_{t-1} + \varepsilon_t$$

where Y_t represents the currencies, r_nifty_{t-i} represents the previous day nifty return and ε_t is error term assuming that the data set is normally distributed with a constant mean and time varying variance (h_t).

The variance equation of the GARCH model is as follows:

$$h_t = \partial_0 + \sum_{i=1}^{p} \varphi_i h_{t-i} + \sum_{j=1}^{q} \zeta_j u_{j-i}^2$$

where h_t is representing by the conditional variance constituted of its own lag and the squared errors lagged values. $\Sigma_{i=1}^{p} \varphi_i$ represents the effect of GARCH term which captures the persistence of volatility in short run while $\Sigma_{j=1}^{q} \zeta_j$ is the ARCH term captures the previous day news effect. Long run persistence of volatility is determined by summing up the coefficients of ARCH and the GARCH term.

Further the models are also tested for the stability by conducted diagnostic testing. ARCH test has been conducted to examine the presence of heteroscedasticity in the residuals of the model.

5. Results and Discussion

Unit root test results pre-futures, and post-futures and for the full sample period are provided in tables 1, 2 and 3. Because the value for the ADF test is not less than 0.01 at the level, the null hypothesis is not rejected, which specifies that the series for all the periods is not stationary at the level (Phillips, 1987). By continuing the same process for the first difference it is interpreted that as the P-value is less than the significant value, we reject the null hypothesis and accept the alternative hypothesis. This inculcates that the first difference is that it does not have a unit root. Thus, by taking the first difference all the series become stationary and integrated into the first order. The non-stationary data null hypothesis is rejected for all series at a 5% level of significance, according to the ADF test results.

Table 1: Unit Root Test for Whole Sample

Series	*ADF Test*			
	At level Form With Trend & Intercept		*AT 1st difference With Only Intercept*	
	t-Statistic	*Prob.**	*t-Statistic*	*Prob.**
USD_INR	-2.156	0.514	-31.195	0
EURO_INR	-3.209	0.083	-65.133	0.0001
GBP_INR	-2.537	0.310	-64.720	0.0001
YEN_INR	-2.447	0.355	-67.903	0.0001
CNX_NIFTY	-3.214	0.082	-61.776	0.0001

Source: Authors' Own Compilation

Notes: The Test Equation include drift and trend terms at level, for First Difference Only Drift is included. The lag order in the ADF Test Equation based on SIC equation. *and ** At 5% and 1%, respectively, indicate significance.

Table 2: Unit Root Test for Pre-Introduction of Futures in India

Series	*ADF Test*			
	At level Form With Trend & Intercept		*AT 1st difference With Only Intercept*	
	t-Statistic	*Prob.**	*t-Statistic*	*Prob.**
USD_INR	-1.213	0.907	-29.949	0
EURO_INR	-2.942	0.149	-46.042	0.0001
GBP_INR	-2.586	0.287	-44.586	0.0001
YEN_INR	-1.514	0.825	-46.897	0.0001
CNX_NIFTY	-2.216	0.480	-41.238	0

Source: Authors' Own Compilation

Notes: The Test Equation include drift and trend terms at level, for First Difference Only Drift is included. The lag order in the ADF Test Equation based on SIC equation. *and ** At 5% and 1%, respectively, indicate significance.

Table 3: Unit Root Test for Post Introduction of Futures in India

Series	*ADF Test*			
	At level Form With Trend & Intercept		*AT 1st difference With Only Intercept*	
	t-Statistic	*Prob.**	*t-Statistic*	*Prob.**
USD_INR	-2.411	0.374	-52.657	0.0001
EURO_INR	-2.075	0.559	-46.772	0.0001
GBP_INR	-1.661	0.768	-47.083	0.0001
YEN_INR	-2.350	0.406	-49.618	0.0001
CNX_NIFTY	-2.962	0.143	-45.963	0.0001

Source: Authors' Own Compilation

Notes: The Test Equation includes drift and trend terms at level, for First Difference Only Drift are included. The lag order in the ADF Test Equation based on SIC equation. *and ** At 5% and 1%, respectively, indicate significance.

Figure 1 indicates the analysis of volatility of GARCH variance series versus Return series. Table 4 represents the outcomes of the heteroskedasticity based Model GARCH (1,1) for USD/INR for the full sample period, pre futures and post futures. GARCH model conclusions for USD/INR are contained in column 3 whole period while column 4 is for pre futures and column 6 for post future in table 4. As shown in the Table 4, the mean equation indicates that in the case of USD/INR, the previous day return and the error are helpful in predicting the current day return because the AR(1)is significant for

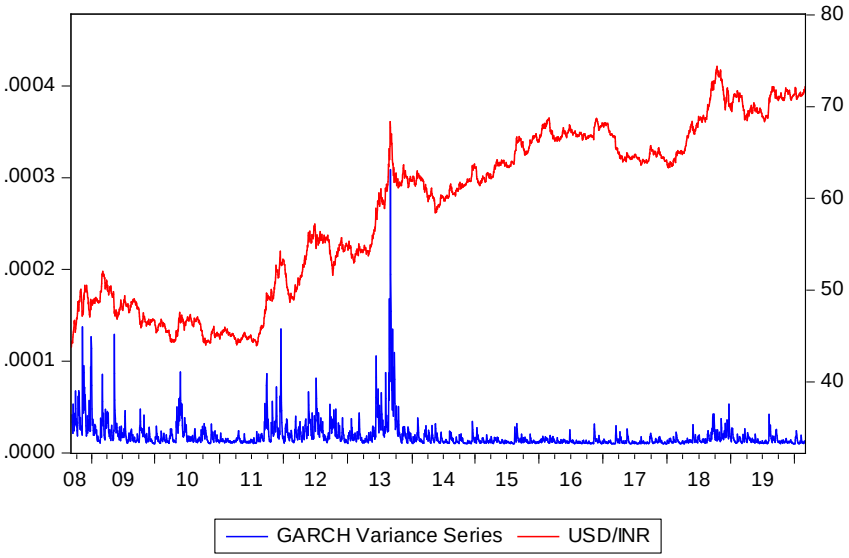

Figure 1: GARCH Variance Series versus Return Series

Source: Authors' Own Compilation

the whole period and pre futures however not for the post futures whereas MA(1) is significant in post futures only. In the case of post futures, the AR term is not significant, implying no influence of previous day return on the current day returns. Further, the previous day's nifty return insignificant and negative in all three scenarios, for the whole period (-0.011), pre futures (-0.007) and post futures(-0.065) implying a negative influence on the current day USDINR returns for three-time horizons.

In the empirical analysis, the essential conditional volatility clustering for the GARCH model is also checked by the ARCH test. Since the null hypotheses of the ARCH LM test suggest the significant volatility clustering in both series. Therefore, the GARCH model has been applied. The model of GARCH (1,1)is best suited for the whole period and pre futures and GARCH (1,1) is found best for post futures period on the basis of the bottom values of AIC and SIC. Results of the model can be seen from Table 4, pervious day news is significantly influencing the current day volatility as the coefficient of ARCH term is significant for both the series at 1% and 5% level. Volatility persistent is also high as the coefficient of GARCH term is significant at 5% and further, there as on of volatility is persistence because the sum of coefficients of GARCH term is greater than the ARCH term. Additionally, the addition of ARCH and GARCH term is less than the 1 implying that the volatility is decaying.

The diagnostic testing is conducted to inspect the stability of the estimates. The results of diagnostic test indicates that the model is not suffering from autocorrelation problem as the Durbin-Watson statistic value is approx. 2 for these three-time period of USD-INR .Furthermore, as the p-value of the ARCH test with two lags is not significant, the null hypothesis that there is no ARCH effect is not rejected, implying that the ARCH effect is no longer present in the error term.

Table 4: GARCH on USD-INR

Equation	*Coefficient*	*Whole Period*	*Pre-Future*	*Post - Future*
Mean Equation	C	0.000(0.000)***	-0.012(0.000)***	0.000(0.127)
	DNSE(-1)	-0.011(0.000)***	-0.007(0.004)***	-0.065(0.000)***
	AR(1)	-0.041(0.011)**	-0.051(0.070)*	0.270(0.136)
	MA(1)	-	-	-0.351(0.044)**
	Break (28 Apr 2008)	0.000(0.006)***	-	-
Variance Equation	C	0.000(0.040)**	0.001(0.003)***	0.000(0.000)***
	RESID (-1)^2	0.204(0.000)***	0.448(0.000)***	0.150(0.000)***
	GARCH(-1)	0.407(0.000)***	0.325(0.003)***	0.600(0.000)***
	GARCH(-2)	0.419(0.000)***	0.337(0.000)***	-
	T-DIST. DOF	5.738(0.000)***	4.186(0.000)***	20(0.000)***
	AIC	-8.679	-0.475	-8.043
	SIC	-8.666	-0.448	-8.026
	DW	1.927	1.856	1.949
Diagnostic test	ARCH 1	0.000	0.326	0.868
	ARCH 2	0.794	0.325	0.004

Notes: P- Values are provided in the parenthesis. ***,**,* indicating the significant at 1%, 5% & 10% level of significance respectively. D1 represents the Dummy variable for respective dates.

Source: Authors' Own Compilation

Table 5: GARCH on EURO-INR

Equation	*Coefficient*	*Whole Period*	*Pre-Future*	*Post – Future*
Mean Equation	C	0.013(0.095)*	0.025(0.575)	0.009(0.429)
	DNSE(-1)	-0.044(0.000)***	-0.032(0.118)	-0.086(0.000)***
	AR(1)	-0.309(0.350)	-	-
	AR(2)	-	-0.004(0.951)	-
	MA(1)	0.311(0.348)	0.005(0.937)	0.034(0.086)*
	D1(22 Oct 2008)	-	-0.003(0.981)	-
	D2(17 May 2004)	-	-0.018(0.929)	-
	D3(28 Aug. 2013)	-	-	3.813(0.736)
	D4(10 Nov. 2016)	-	-	-3.265(0.688)
Variance Equation	C	0.008(0.001)***	0.422(0.118)	0.006(0.005)***
	RESID(-1)^2	0.069(0.000)***	0.150(0.141)	0.046(0.000)***

contd. table 5

Equation	*Coefficient*	*Whole Period*	*Pre-Future*	*Post – Future*
	GARCH(-1)	0.571(0.046)**	0.600(0.012)**	0.937(0.000)***
	GARCH(-2)	0.340(0.210)	-	-
	T-DIST. DOF	8.609(0.000)***	20(0.233)	7.469(0.000)***
	AIC	1.737	2.326	1.658
	SIC	1.751	2.354	1.679
	DW	2.008	2.112	1.974
Diagnostic Test	ARCH 1	-0.445	-0.268	-0.109
	ARCH 2	-0.444	-0.268	-0.793

Notes: P- Values are provided in the parenthesis. ***,**,* indicating the significant at 1%, 5% & 10% level of significance respectively. D1, D2, D3 & D4 represents the Dummy variable for respective dates.

Source: Authors' Own Compilation

Table 5 represents the outcomes of the GARCH Model for EUR-INR for the full-time period, pre futures and post futures. The outcomes for EUR-INR are contained in column 3 whole period while column 4 is for pre futures and column 6 for post future in table 5. As shown in the Table 5, the mean equation indicates that in the case of EUR/INR, the previous day return and the error are not helpful in predicting the current day return because the AR(1,2)is not significant for the whole period and pre futures however not for the post futures whereas MA(1) is significant only in post futures at 10% level of significance. In the case of post futures, the AR term is not significant, implying no influence of previous day return on the current day returns. Further, the previous day's nifty return is significant and negative in all three scenarios, for the whole period (-0.044), pre futures (-0.032) and post futures (-0.086) implying a negative influence on the current day EURINR returns for three-time horizons. In the empirical analysis, the essential conditional volatility clustering for the GARCH model is also checked by the ARCH test. Since the null hypotheses of the ARCH LM test suggest the significant volatility clustering in both series. Therefore, the GARCH model has been applied.

The GARCH (1,2) model is best suited for the whole period and GARCH(1,1) is found best for times before and beyond the currency futures on the basis of the lowest values of AIC and SIC. Table 5 displays the model's results, previous day news is significantly influencing the current day volatility as the coefficient of ARCH term is significant for both the series at 1% and 5% level. Volatility persistent is also high as the coefficient of the GARCH term is significant at 5% and further, the reason for the volatility is persistence because the sum of coefficients of the GARCH term is greater than the ARCH term. Additionally, the addition of ARCH and GARCH terms is less than 1 implying that the volatility is decaying.

Diagnostic testing is conducted to examine the stability of the estimates. The results of the diagnostic test indicate that the model is not suffering from an autocorrelation problem as the Durbin-Watson statistic value is approx. 2 for these three-time periods of EUR-INR. Furthermore, the null hypothesis of the ARCH test that there is no ARCH effect is not get rejected thus suggesting that

there is no ARCH effect left in the error term as the p-value of the ARCH test with 2 lags is not significant.

Table 6: GARCH on GBP-INR

Equation	*Coefficient*	*Whole Period*	*Pre-Future*	*Post - Future*
Mean equation	C	0.012(0.138)	0.013(0.276)	0.039(0.262)
	DNSE(-1)	-0.030(0.000)***	-0.017(0.029)**	-0.064(0.037)**
	AR(1)	0.011(0.477)	-0.003(0.896)	-
	D1(29 Aug. 2013)	-	-	-0.040(0.084)*
Variance Equation	C	0.010(0.000)***	0.006(0.002)***	0.027(0.003)***
	RESID(-1)^2	0.052(0.000)***	0.057(0.000)***	0.049(0.000)***
	GARCH(-1)	0.922(0.000)***	0.928(0.000)***	0.874(0.000)***
	T-DIST. DOF	7.993(0.000)***	11.289(0.000)***	6.981(0.000)***
	AIC	1.74	1.721	1.745
	SIC	1.75	1.741	1.762
	DW	1.989	2.006	1.943
Diagnostic test	ARCH 1	0.685	0.389	0.88
	ARCH 2	0.685	0.388	0.633

Notes: P- Values are provided in the parenthesis. ***,**,* indicating the significant at 1%, 5% & 10% level of significance respectively. D1 represents the Dummy variable for respective dates.

Source: Authors' Own Compilation

Table 6 represents the outcomes of the GARCH Model for GBPINR for the whole period, for times before and beyond the currency futures issuance. The outcomes for GBPINR are contained in column 3 reflect the whole period while column 4 is for pre futures and column 6 for post futures in table 6. As shown in Table 6, the mean equation indicates that in the case of GBPINR, the previous day return and the error are not helpful in predicting the current day return because the AR term is not significant, implying no influence of the previous day return on the current day returns. Further, the previous day's nifty return is significant and negative in all three scenarios, for the whole period (-0.030), pre futures (-0.017) and post futures (-0.064) implying a negative influence on the current day GBPINR returns for three-time horizons. In the empirical analysis, the essential conditional volatility clustering for the GARCH model is also checked by the ARCH test.

Since the null hypotheses of the ARCH LM test suggest the significant volatility clustering in both series. Therefore, the GARCH model has been applied. The GARCH (1,2) model is best suited for the whole period and GARCH (1,1) is found best for time period before and beyond the future on the basis of the lowest values of AIC and SIC. Table 6 displays the model's results, pervious day news is significantly influencing the current day volatility as the coefficient of ARCH term is significant for

both the series at 1% and 5% levels. Volatility persistent is also high as the coefficient of the GARCH term is significant at 5% and further, the reason for the volatility is persistence because the sum of coefficients of the GARCH term is greater than the term of ARCH model. Additionally, the addition of ARCH and GARCH terms is less than 1 implying that the volatility is decaying.

Diagnostic testing is conducted to examine the stability of the estimates. The results of the diagnostic test indicate that the model is not suffering from an autocorrelation problem as the Durbin-Watson statistic value is approx. 2 for these three time periods of GBPINR. Furthermore, as the p-value of the ARCH test with two lags is not significant, the null hypothesis that there is no ARCH effect is not rejected, implying that there is no ARCH effect remaining in the error term.

Table 7: GARCH on JPY-INR

Equation	*Coefficient*	*Whole Period*	*Pre-Future*	*Post - Future*
Mean equation	C	0.006(0.737)	-0.011(0.366)	0.011(0.330)
	DNSE(-1)	-0.060(0.0)***	-0.041(0)***	-0.208(0)***
	AR(1)		-0.060(0.012)**	-0.054(0.007)***
	AR(2)	-0.613(0.001)***		
	MA(2)	0.610(0.001)***		
	D1(18 mar 2011)	5.814(0.982)		-3.623(0.644)
	D2(29 Aug. 2013)	-5.828(0.982)		
	D3(22 Aug. 2013)	0.002(0.927)		
Variance Equation	C	0.009(0)***	0.011(0.005)***	0.009(0.002)***
	RESID(-1)^2	0.077(0)***	0.130(0)***	0.066(0)***
	GARCH(-1)	0.910(0)***	0.299(0.065)*	0.917(0)***
	GARCH(-2)	-	0.556(0)***	-
	T-DIST. DOF	6.404(0)***	6.732(0)***	7.099(0)***
	AIC	2.077	2.079	2.009
	SIC	2.093	2.102	2.028
	DW	2.096	2.034	1.998
Diagnostic test	ARCH 1	0.153	0.182	0.137
	ARCH 2	0.153	0.182	0.843

Notes: P- Values are provided in the parenthesis. ***,**,* indicating the significant at 1%, 5% & 10% level of significance respectively. D1 represents the Dummy variable for respective dates.

Source: Authors' Own Compilation

Table 7 represents the outcomes of the GARCH Model for JPY-INR for the full-time period, pre future and post future. The outcomes for JPY-INR are contained in column 3 whole period while column 4 is for pre futures and column 6 for post future in table 7. As shown in Table 7, the mean

equation indicates that in the case of JPY-INR, the previous day return and the error are not helpful in predicting the current day return because the AR(1) is significant for the pre futures and post futures and AR(2) is significant for whole period whereas MA(2) is significant in whole period at 1% level of significance. Further, the previous day's nifty return is significant and negative in all three scenarios, for the whole period (-0.060), pre futures (-0.041) and post futures (-0.208) implying a negative influence on the current day JPYINR returns for three-time horizons. In the empirical analysis, the essential conditional volatility clustering for the GARCH model is also checked by the ARCH test. Since the null hypotheses of the ARCH LM test suggest the significant volatility clustering in both series. Therefore, the GARCH model has been applied.

The GARCH (1,2) model is best suited for pre futures and GARCH (1,1) is found best on the basis of the lowest AIC and SIC values for the entire time and the post-futures period. Outcomes of the model can be seen in Table 7, previous day news is significantly influencing the current day volatility as the coefficient of ARCH term is significant for both the series at 1% and 5% levels. Volatility persistent is also high as the coefficient of the GARCH term is significant at 5% and further, the reason for the volatility is persistence because the sum of coefficients of the GARCH term is greater than the ARCH term. Additionally, the addition of ARCH and GARCH terms is less than 1 implying that the volatility is decaying.

Diagnostic testing is conducted to examine the stability of the estimates. The diagnostic test's results indicate that the model is not suffering from an autocorrelation problem as the Durbin-Watson statistic value is approx. 2 for these three-time periods of YEN-INR. Furthermore, as the p-value of the ARCH test with two lags is not significant, there is no ARCH impact, according to the null hypothesis is not rejected, implying that there is no presence of ARCH effect remaining in the error term.

6. Summary and Conclusion

The impact of the issuance of Currency futures as traded on the Indian stock exchange. is investigated in this article on the particular currency pairs USD/INR, GBP/INR, EURO/INR, and JPYINR foreign exchange rate volatility. So as to investigate the volatility before and after the issuance of currency futures in India the timeline is segregated into two phases, pre futures and post futures. Besides this NSE data have been collected as an independent variable. After confirming stationarity first data has been tested for the presence of volatility clustering by using the ARCH LM test. Its results clearly specified a significant arch effect in the data series. The volatility of the currency derivatives market is influenced by fluctuations in spot prices before and after the futures market's creation. The study's conclusions clarify that development in currency derivatives market effects significantly spot market. The results conclude that the majority of the data comes from the prior day's volatility for USDINR, GBPINR, EURINR and JPYINR. Recent information has a minor impact on volatility. Furthermore, In the case of GBPINR, JPYINR and USDINR persistence are greater in pre futures period whereas for EURINR it is higher in post futures period (Rastogi, 2011; Sahu, 2012; Kumar, 2015).

Currency futures have made the Indian foreign market more dynamical and durable in terms of volatility, with movements lasting longer in the post-future period. Through the current study better

regulatory framework can be planned. Prior to and following the implementation of currency futures, the ARCH and GARCH coefficients of trading for all currency pairs how that the persistent and clustering effect of old news is higher. The implication is that in the currency futures market, both hedging and speculative actions tend to set out each other's net influence on spot currency market volatility. By using these estimates regulatory authorities, as well as policymakers, can forecast the formerly unanticipated newly launched currency pairs in the field of the currency derivatives market. That will be effective for sustainable development.

7. Managerial Implications

Through the current study better regulatory framework can be planned. By using these estimates regulatory authorities, as well as policymakers, can forecast the formerly unanticipated newly launched currency pairs in the field of the currency derivatives market. That will be effective for sustainable development. It is beneficial when the policy shift of introducing exchange-traded currency futures has been welcomed, there are still several issues that need to be solved in order to improve market efficiency for hedgers, traders, and market makers in the currency spot and futures markets. Our findings support the rising interconnectedness between worldwide financial markets and Indian markets, implying that diversification has become a bit more challenging endeavour as the world has gotten more global. However, because these currency derivatives products are publicly available information, investors may use them as part of their knowledge set and measure educated traders' predictions.

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Studies on Dividend Policy: A Bibliometric Analysis

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JEL Classification

G35, G32, G31

Abstract: Dividend is one of the controversial topics in financial management which mean out of earning of management how much is distributed to the shareholders and what percentage is retained in business. The main objective of the study is to provide comprehensive overview of previous studies related with the topic 'Dividend Policy' in context of statistical analysis of published articles/documents around the world. For this purpose, the study employed bibliometric analysis, which was conducted through Bibliometrix library and Biblio-Shiny platform of RStudio. Web of science database was used for collection of data with the keywords "dividend policy", "Dividend payouts", "Determinants" and "Lintner model" covering the period of 20 years from 2002 to 2022. The findings of the study depict that in 2011, there was great increment in number of publications and from 2018 the publications are continuously increasing. USA, UK and China are the pre-eminent countries having significant contribution in research on dividend policy.

1. Introduction

With the advancement of economic scenario, investment in different sectors of economy is rapidly increasing. Due to increase in investment, there is increase in return also. These returns are the earnings for the companies. These earnings can be utilized in different ways like retained in business for growth purpose or it may be distributed to the investors (Dong *et al.*, 2005). The amount which is dispersed to the shareholders for their investment is known as Dividend. Warner (2019) "A dividend is money that is regularly paid by a business to its shareholders using profits, cash reserves or even debt". Dividend policy refers to the financial policies regarding payment of dividend. It refers to firm's decision about its earnings, which mean how much of its earnings is distributed among equity shareholders & how much is retained in business. Dividend payouts decision is considered as an integral part of firm's financial ecosystem (Mensa *et al.,* 2014).

Dividend decision is like a puzzle which remains unsolved as different researchers have different viewpoints regarding dividend policy. There are various questions pertaining to dividend policy which still remains unanswered "Why do firm pay dividend?" Why does investor pay attention to dividend?" "What are the factors on which dividend depends?" There is ongoing debate on the variables that influence dividend policy from the starting of Lintner hypotheses (1956). In the similar manner Black (1976) describe that "the harder we look at the dividend picture, the more it seems like a puzzle, with the pieces that just do not fit together". Dividend is one of the controversial topics of study as different researchers have different point of view like: Dividend policy is affected by executive stock option holdings & stock options (De Cesari and Ozkan, 2015), growth opportunities (Flavin and O'Connor, 2017), creditor rights & culture (Byrne and O'Connor, 2017), bank risk taking (Onali, 2014), new CEO compensation (Chen *et al.,* 2019), restricted monetary policies (Pandey and Bhat, 2007), corporate social responsibilities (Cheung, *et al.,* 2018), leverage (Cooper and Lambertides, 2018), family control, tangibility & firm size (Yousaf, 2019), Institutional ownership & board composition (Abdelsalam *et al.*, 2008; Matta *et al.* , 2022), profitability (Renneboog and Trojanowski, 2007) and many more variables. Lintner (1956) proposed that dividend depends upon current earnings and lagged dividend of firms. But Imran (2011) in Pakistani engineering firms considered that dividend depends upon many other factors like EPS, Sale Growth, Profitability, Lagged Dividend, Free Cash Flows & Size. In the similar manner in study of non-financial Pakistani firms Arif and Akbar (2013) concluded that Investment Opportunities, Profitability, Size and Taxation are the prominent indicators of dividend policy.

Renneboog and Trojanowski (2011) reveal that dividend payout decisions of firms are affected by liquidity needs of directors. Michaely and Roberts 2011 in their study disclose that Ownership structure and incentives are the main factors that play an important role in determining dividend policy. Some of the firms those paying dividend, now they stop paying (Michaely and Moin 2022). There are no appropriate sets of factors influencing dividend policy of all the firms because dividend policy is highly volatile to various factors like firm & market characteristics and alternative forms of dividend (Baker and Weigand 2015).There are different viewpoints pertaining to dividend policy. So there is a need of study which will facilitates in examination of larger sets of data, trends in subject area and the specialized content.

The main purpose of this study is to focuses on following research questions (RQ) related with dividend policy over the year 2002-2022. These are as under:

- RQ 1: To focus on statistical results of dividend policy.
- RQ 2: What are the important keywords related with dividend policy?
- RQ 3: Which source is most significant in terms of publishing articles related with dividend policy?
- RQ 4: Who are the main contributing Authors related with dividend policy?
- RQ 5: Which country or Institution have highest contribution in the study? And also, to find out the co-citation network of papers and sources related with dividend policy.

The study was conducted through Bibliometric analysis, which will provide detailed description about the studies pertaining to dividend policy. One can easily approach the top papers in context of

dividend policy on basis of top authors. It will provide information regarding the main contributing authors, countries, institutions, important keywords, co-occurrence network of keywords etc. The main implication of the study is that it facilitates in examination of larger sets of data, trends in subject area, specialized content. It also facilitates in predicting the emerging trends in context of studies on dividend policy.

2. Research Methodology

2.1. Bibliometric Analysis of Study

The word Bibliometric was first propounded by Paul Otlet (1934) which means "the measurement of all aspects related to the publication and reading of books and documents". It is a statistical method which is used for analysis of books, articles, documents and other publications on basis of scientific data. It is a quantitative method for describing, monitoring and evaluating the published research articles/documents. It was carried out through Bibliometric library and Biblio-Shiny platform of RStudio. Biblio-shiny is shiny application which gives a web-interface for the purpose of bibliometric analysis. It depicts comprehensive outlook of Dividend policy like authors, author's collaborations, citation, co-citation, journal, affiliated institutions, top countries, keywords and co-occurrence of keywords etc.

2.2. Data Collection

The data for the study had been collected through web of science database as on January 28, 2022 covering a period of 20 years from 2002 to 2022.In web of science database, the search was made through following words "Dividend Policy" or "Dividend Payouts" and "Determinants" and "Lintner Model". This search gave a core collection of 2435 results, then after certain refinement on basis of publication years, web of science categories, document types, language etc., it was reduced to 1004 results. On basis of title of the study, a total of 415 articles which were written by 839 authors were selected for Bibliometric Analysis performed through Bibliometric library and Biblio-Shiny platform of RStudio. Figure: 1 describe the workflow of study as firstly the main keywords were identified for search in web of science database and 415 articles were selected. After that collected data were analyze through bibliometric library and biblio-shiny platform of R studio.

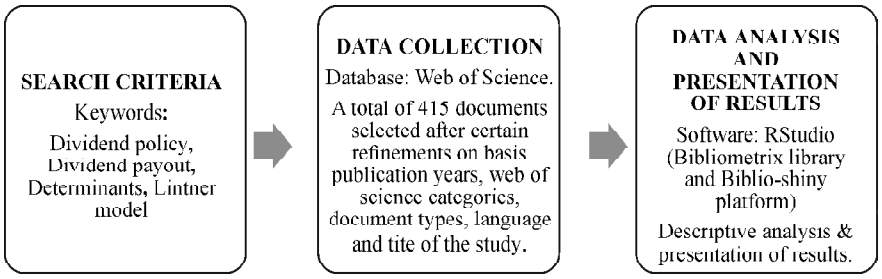

Figure 1: Workflow of Study

Source: Authors' Own Compilation

3. Descriptive Analysis and Presentation of Results

3.1. Statistical Results

Table 1 elucidates the main information about the study that was analyzed through R studio. This table is based on data extracted from web of science database, which is the most widely used, oldest and authoritative database for publications & citations. This study comprised a total of 415 documents, which consists of published articles, articles from book chapters, early access and proceeding papers. It covers a total timespan of 20 years from 2002 to 2022. The 415 documents in the study were published by 839 authors from different institutions and countries around the world with average citations 29.13 per document and the authors collaboration index is 2.22. The documents used in this study includes a sum total of 8614 references, 654 keywords plus and 888 author's keywords.

Table 1: Information about Study

Description about Data	*Results*
Time Duration	2002-2022
Sources	66
Documents	415
Average years from publication	7.82
Average Citations per Documents	29.13
Average Citations per year &Documents	2.57
References	8614
DOCUMENT-TYPES	
Article	395
Articles from book chapter	1
article; early access	9
article; proceedings paper	10
DOCUMENT-CONTENTS	
Keywords Plus	654
Author's Keywords	888
AUTHORS	
Authors	839
Author Appearances	1023
Authors of single-authored documents	65
Authors of multi-authored documents	774
AUTHORS COLLABORATION	
Single-authored documents	67
Documents per Author	0.495
Authors per Document	2.02
Co-Authors per Documents	2.47
Collaboration Index	2.22

Source: Authors' Own Compilation

3.2. Keywords Evolution

Keywords are the important words/main idea which gives vital information about the study. A keyword is word that gives information about the content present in a particular document. Two types of keywords are used the first one is Author keywords: it comprises of words selected by author which in their opinion best represent the content of document, the other is keyword plus: it comprises of frequently occurring words in title of the cited articles. Figure: 2 represent the word cloud of Author keywords. It is clearly visible from this figure that the word "Dividends", "Payout policy", "Corporate Governance", "Dividend Payout" are the most highlighted. The author Ferris *et al.* (2009) in "Catering effects in corporate dividend policy: The international evidence" used dividend and catering as keywords. Andres *et al.* (2009) in their paper titled as "Dividend policy of German firms A panel data analysis of partial adjustment models" used dividend policy, payout policy, dividend smoothing, corporate governance as keywords.

Figure 2: Word Clouds of Author's Keywords

Source: Authors' Own Compilation

Figure 3 show the occurrence of most relevant keywords. It portrays the frequency of keywords like the word "policy" occurs 124 times, "earnings" occurs 100 times and the word "payout policy"

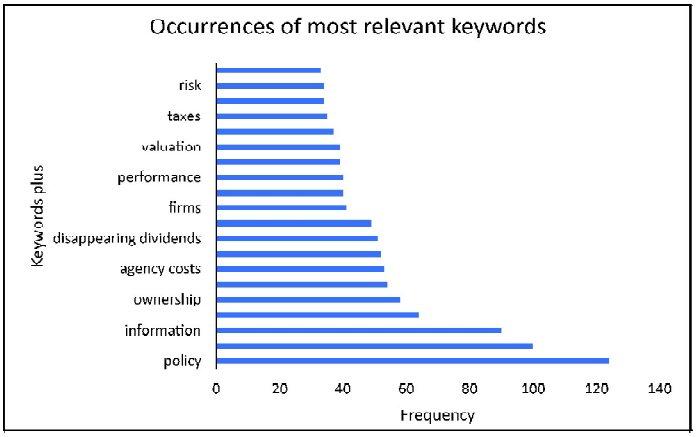

Figure 3: Occurrence of Most Relevant Keywords

Source: Authors' Own Compilation

occurs only 52 times. The article "The evolving relation between dividend and flexible payouts: A different evolution" written by Armitage, S. and Gallagher, R. (2021) used policy, disappearing dividend, earnings, cash, market, determinants as keywords.

Figure 4 represent the co-occurrence between the keywords. Co-occurrence of keywords means the together occurring of keywords. Figure 4 shows the clusters of different colors and the interconnection between them. In blue cluster payout policy, information investment, disappearing dividends, share repurchase etc. are the highlighted words and these are interrelated to each other.

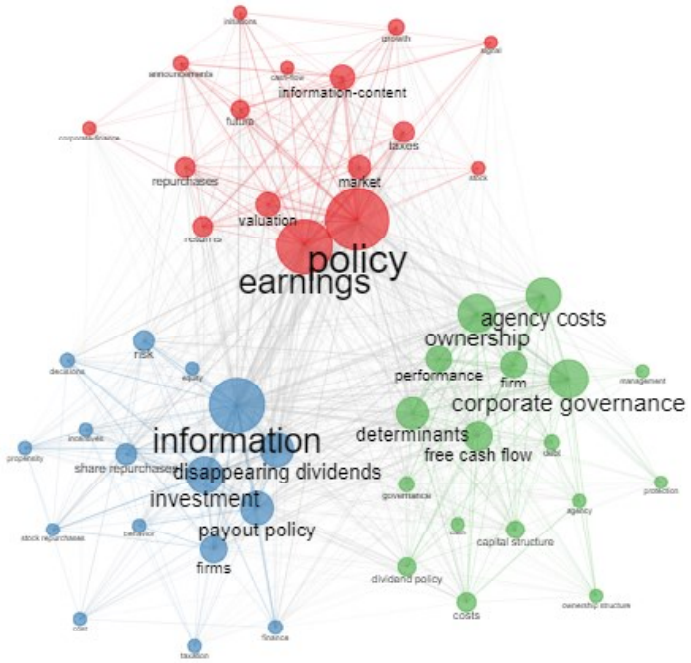

Figure 4: Co-Occurrence Network between Keywords Plus

Source: Authors' Own Compilation

Figure 5 depict the word growth of keywords. It is the graphical representation of keywords associated with dividend policy. These are Agency cost, corporate governance, determinants, disappearing dividend, earnings, information, investment, ownership, payout and policy. It shows growing tendency of these keywords over the time period from 2002 to 2022.

Figure 6 shows the Dendrogram of keywords plus. Dendrogram is like a tree plot consisting of hierarchical relation between different keywords. The analysis of dendrogram is based on the height at which the keywords are connected. The blue lines show the keywords related with dividend policy and the red lines shows the factors determining the dividend policy. The words at same height have similar significance.

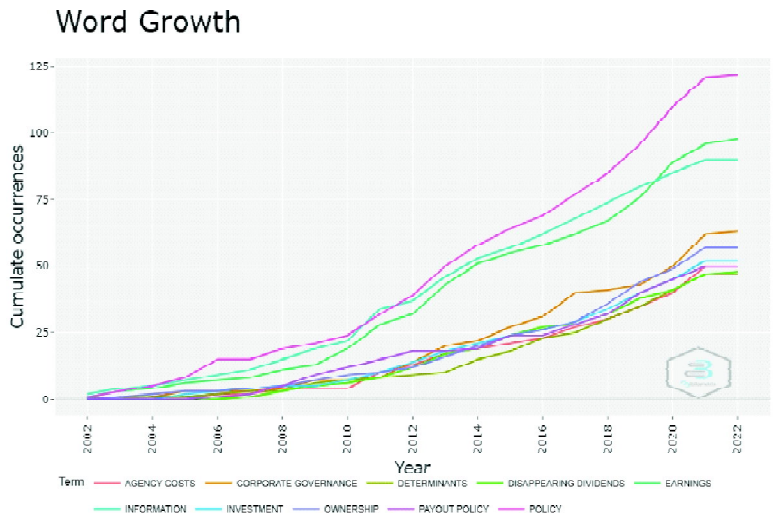

Figure 5: Word Growths of Keywords

Source: Authors' Own Compilation

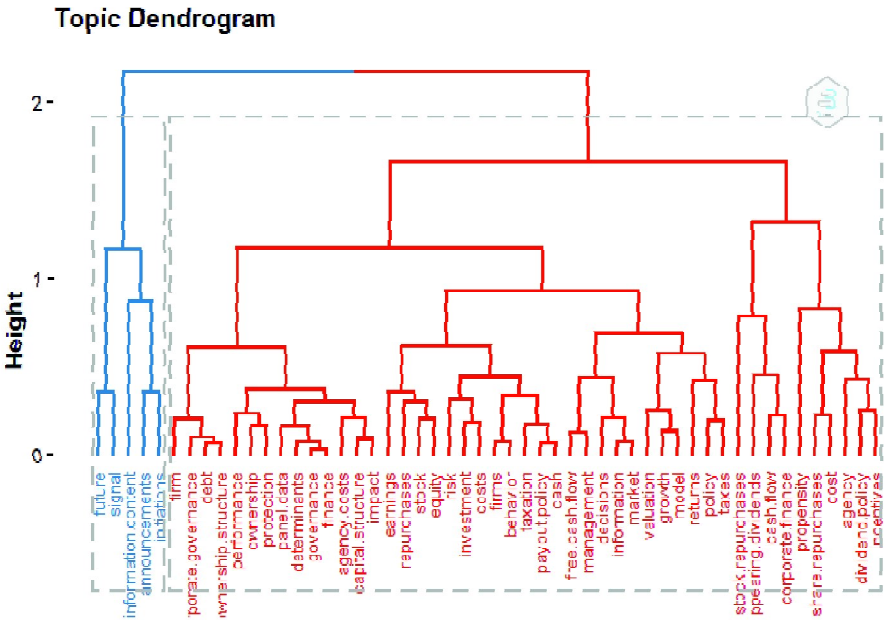

Figure 6: Dendrogram of Keywords Plus

Source: Authors' Own Compilation

3.3. Source's Significance

In field of research, sources are the online platform where one can get access of articles, documents, books, journal etc. There are various journals available but the quality journals are those whose impact factor is higher. The impact factor of journal is measured with the help of h index which is based upon publications and citations of particular journal.

Figure 7 portray the source significance on basis of number of publications and value of h index. It shows that The Journal of Corporate Finance has 58 highest number of publication and also the value of h index of this journal is highest. The most significant source for the study of Dividend Policy is "Journal of Corporate Finance" followed by "Managerial Finance", "Journal of Business Finance & Accounting" and "Journal of Financial Economics" etc.

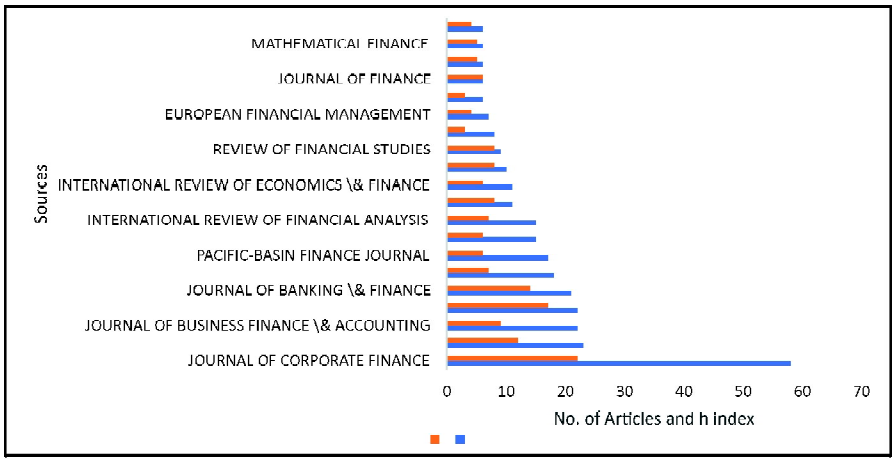

Figure 7: Main Source/Journal (Top 20)

Source: Authors' Own Compilation

Figure 8 represent most local cited top 20 journals. The larger value of citations indicates the quality and impact of particular source. The Journal of Financial Economics has highest numbers of citations 2956 which is followed by Journal of Finance has 2622 numbers of citations. As shown in Figure: 7 "Journal of Corporate Finance" has highest value of h index and articles but its local citation is 613 only.

3.4. Top Authors

Top Authors or the main authors who have highest contribution in study can be identified through number of publications, citation score, value of h index etc. The study includes a total of 415 documents written by 839 authors. Figure 9 depict the total citations of top 20 Authors. It depicts that MICHAELY R from Cornell University, Johnson school of management, USAhas highest total citations 2023, BRAV A of Duke University, Fuqua School of Business, USA, GRAHAM JR of Duke University,

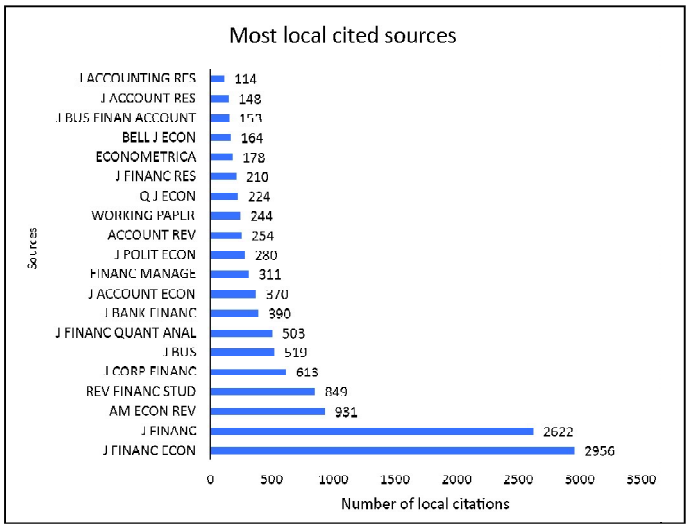

Figure 8: Most Local Cited Sources (Top 20 sources)

Source: Authors' Own Compilation

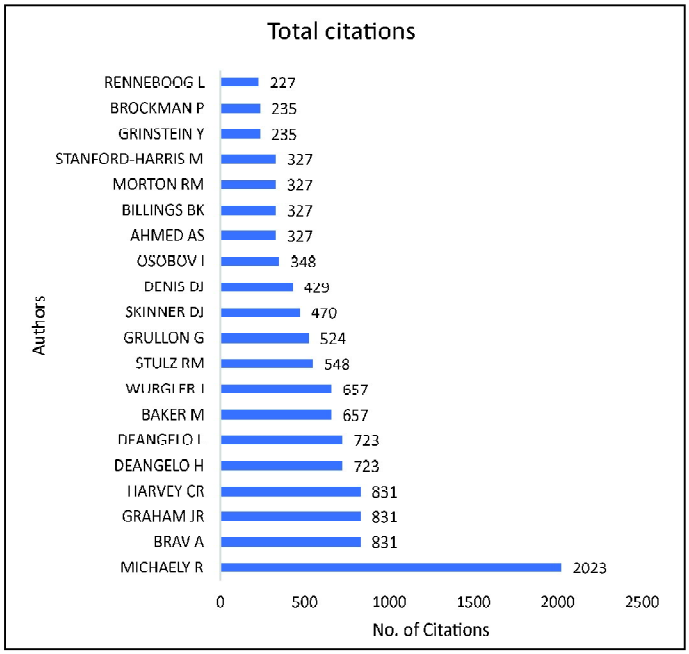

Figure 9: Most Cited Authors (Top 20)

Source: Authors' Own Compilation

Durham, USA& HARVEY CR have same number of citations 831.MICHAELY, R. also have highest number of publications and greater value of h index.

Figure 10 portray relevance of top 20 authors by number of citations of their particular article. The citation score of any article represents its significance. Brave *et al.* (2005) from Duke University of USA has highest number of citations 821 on their article titles as "Payout policy in the 21st century". The second highest citation 548 is of DeAngelo *et al.* (2006) from university of southern California, USA in their document titled as "Dividend policy and the earned/contributed capital mix: a test of the life cycle theory". There are many other authors who have splendid citation score like Baker and Wurgler (2004) in their article titled as "A catering theory of dividends", Grullon (2002), Denis (2008) etc.

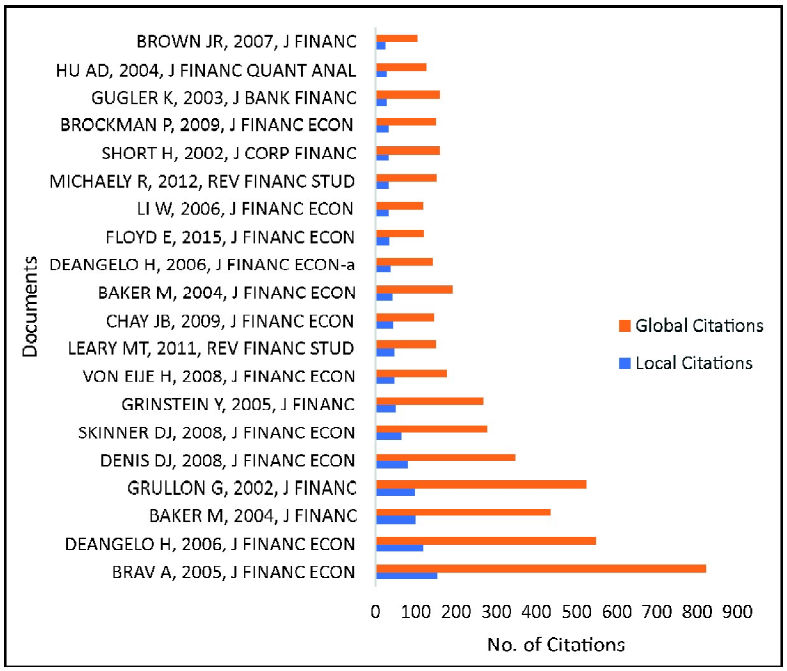

Figure 10: Relevance of Authors by Number of Citations and Particular Article (Top 20)

Source: Authors' Own Compilation

Figure 11 clearly show the production of top 20 authors over the time period of 20 years from 2002 to 2022. The author Michaely of Cornell University, Johnson School of Management, USA has greatest contribution in field of research related with the topic dividend policy over the years from 2002 to 2022. He published an article on titled "Dividend, share repurchase and substitution hypothesis" in 2002 having citation score 524, in 2004 titled as "The information content of share repurchase program" having citation score 298, in 2022 titled as "Disappearing and reappearing dividends" and many more.

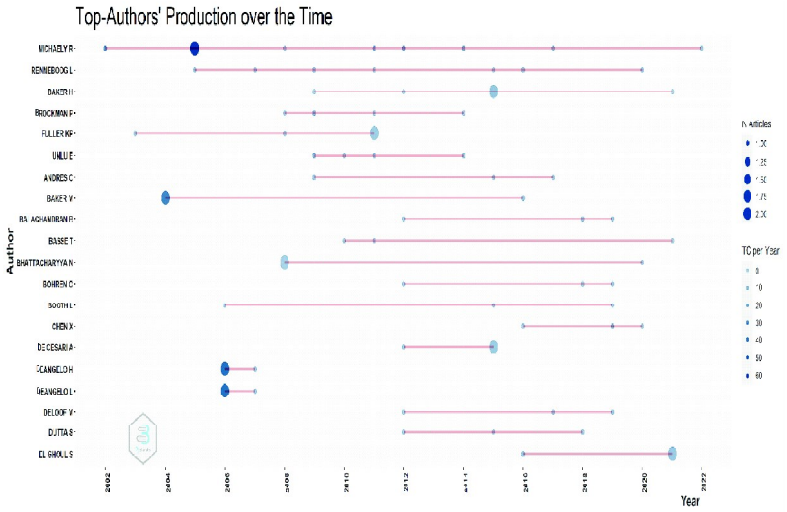

Figure 11: Time Evolution of Authors (Top 20)

Source: Authors' Own Compilation

Another author Renneboog of Tilburg university, Netherland worked for 15 years from 2005 to 2020, he wrote an article titled as "When do German firms change their dividend?" in 2005, "How relevant is dividend policy under low shareholders protection?" in 2020 etc. There are many other authors who have significant contribution in the field of research related with Dividend policy like Baker, Brockman etc.

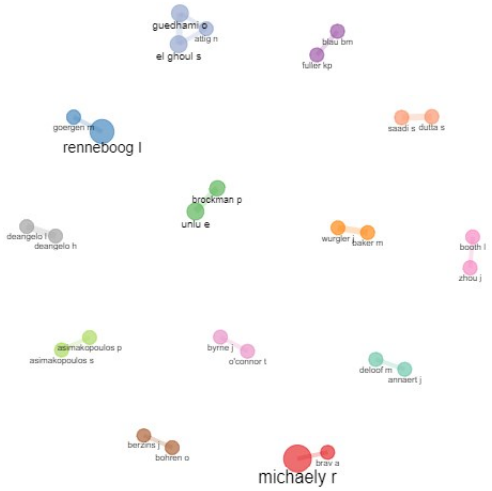

Figure 12: Collaboration Networks of Authors

Source: Authors' Own Compilation

Figure 12 represent the collaboration network between different authors. It shows the collaborative work of authors with the help of different colors clusters. Grey color cluster shows the collaborative work of DeAngelo and DeAngelo of university of southern California, USA. They jointly worked on an article in 2006 titled as "The irrelevance of the MM dividend irrelevance theorem" and in 2008 titled as "Reply to Dividend policy: Reconciling DD with MM". The green color cluster indicates the collaborative work of Brockman, P. and Unlu, E. They jointly work on the document in 2009 named as "Dividend policy, creditor rights and the agency cost of debt" and in 2011 0n "Earned/contributed capital, dividend policy and disclosure quality: An international study".

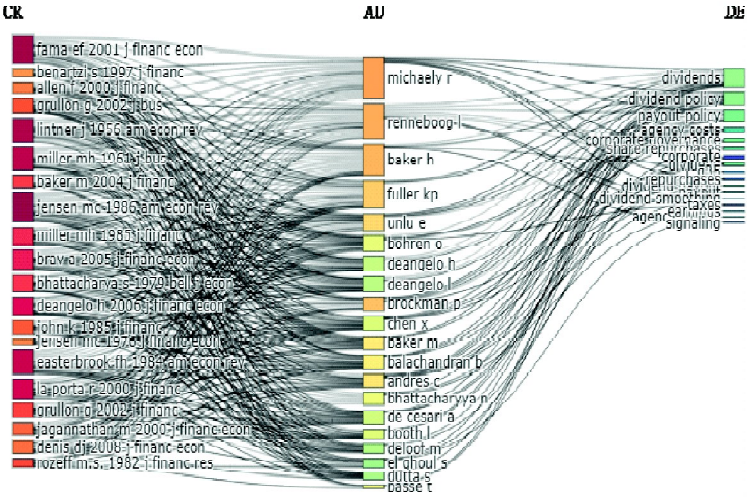

Figure 13: Three-Fields Plot References-Authors-Keywords

Source: Authors' Own Compilation

Figure 13 depict the interconnection between references, authors and keywords with the of Three-Fields Plot. Under this, there are three sections the left section represents the references, middle one indicates the authors and the right section represent the keywords used in the studies. The grey lines between these sections show the inter-relation between references, authors and the keywords. The main keywords used by different authors are dividend, dividend policy, payout policy, agency cost, dividend smoothing etc.

3.5. Top Institutions

Various authors have significant contribution in field of research on Dividend policy. They have affiliations with different universities and institutions. Figure: 14 clearly portrays the top 20 affiliated institutes, University of Missouri, Columbia, Missouri has highest number of published articles. The other universities like Harvard University (Cambridge, United States), Cornell University (Ithaca, United States) and Tilburg University (Netherlands) also have great number of published articles.

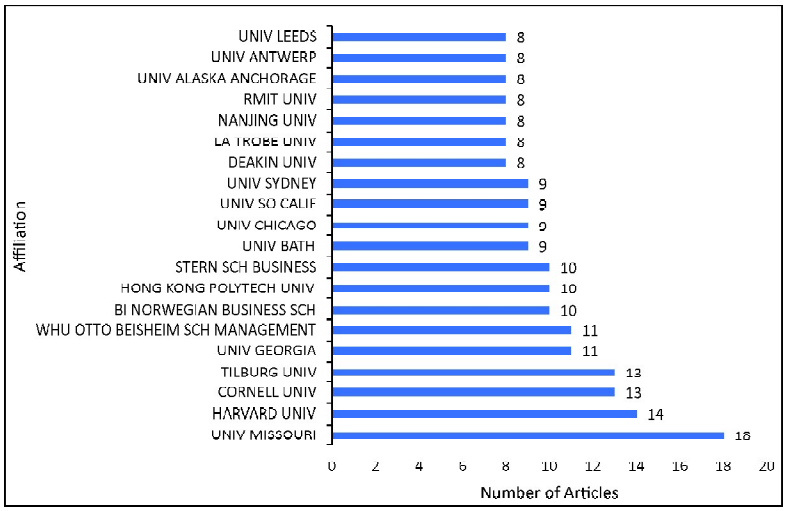

Figure 14: Top 20 Affiliations of Institutes

Source: Authors' Own Compilation

Figure 15 represent the Collaboration network of institutes. It is shown through different color clusters. The green color cluster shows the collaborative work of Cornell University (Ithaca, United States and Duke University (Durham, USA).

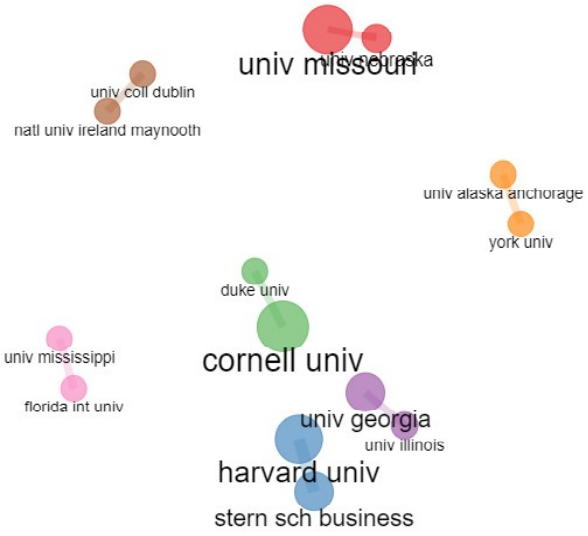

Figure 15: Collaboration Networks of Institutes

Source: Authors' Own Compilation

3.6. Top Countries

USA has highest numbers of publications on the topic Dividend Policy both in terms of single country publications and multiple country publications as shown in figure 16. The contribution of other countries like United Kingdom, China, Australia and Canada is also appreciable.

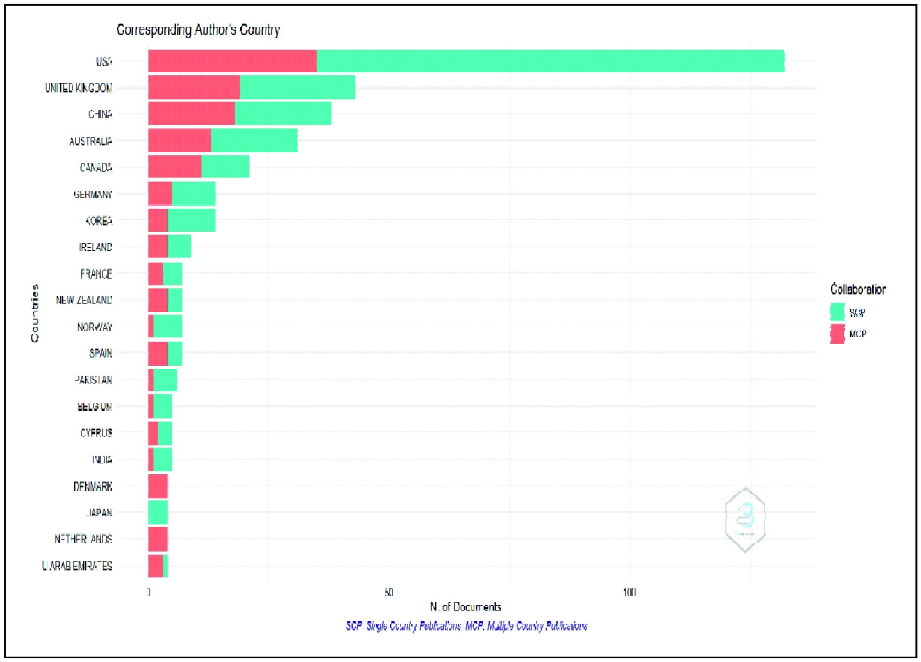

Figure 16: Corresponding Author's Country (top 20)

Source: Authors' Own Compilation

The country USA has topped the list of Country Scientific Production on the topic of Dividend Policy as shown in Figure: 17. USA has published a total of 434 articles followed by China 144, UK 128, and Australia 93 etc.

Different countries also work in collaborative way which makes the research more authentic. Figure 18 have different color clusters which indicate the Collaboration network between various countries. The red color cluster shows the collaboration of USA, Singapore, China, Canada etc.

3.7. Co-citation

When two articles are cited together by another article it is known as co- citation. Figure 19 represent the Co-citation network of papers published by different authors. It is shown with the help of various clusters of different colors and the lines between then shows the interrelation.

Region	Frequency
USA	434
CHINA	144
UK	128
AUSTRALIA	93
CANADA	54
SOUTH KOREA	47
GERMANY	42
NETHERLANDS	25
FRANCE	23
IRELAND	22
NORWAY	20
BELGIUM	19
NEW ZEALAND	18
SPAIN	18
PAKISTAN	17
ISRAEL	14
JAPAN	13
SINGAPORE	13
INDIA	12
TURKEY	11

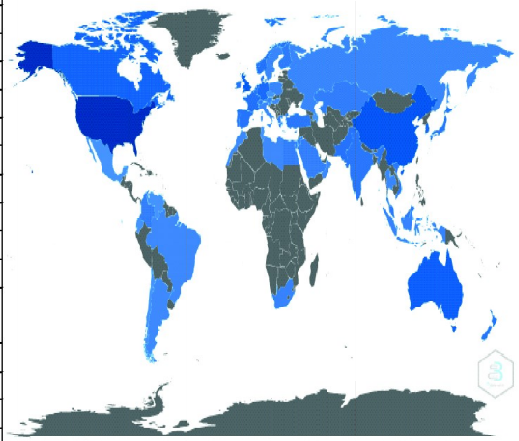

Figure 17: Countries Scientific Production

Source: Authors' Own Compilation

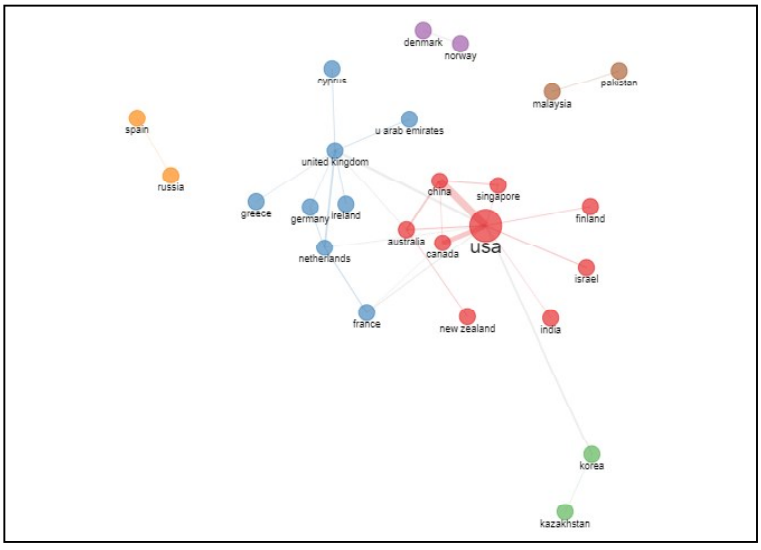

Figure 18: Collaboration Network between Countries

Source: Authors' Own Compilation

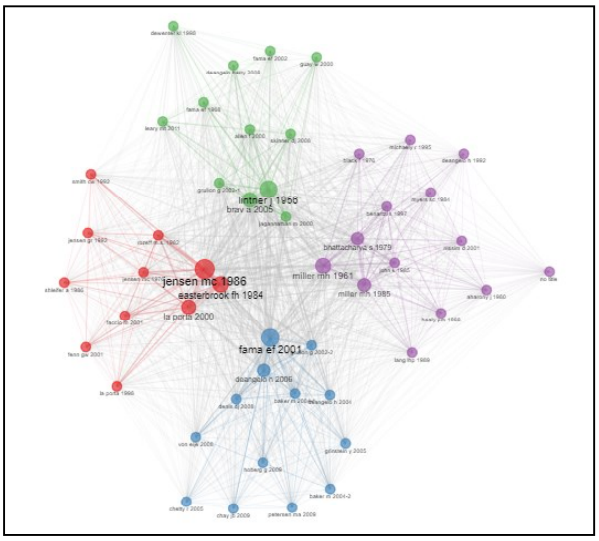

Figure 19: Co-Citation Network of Papers

Source: Authors' Own Compilation

Figure 20 show the Co-citation network of sources. It is clearly visible from this figure that how different sources are connected to each other.

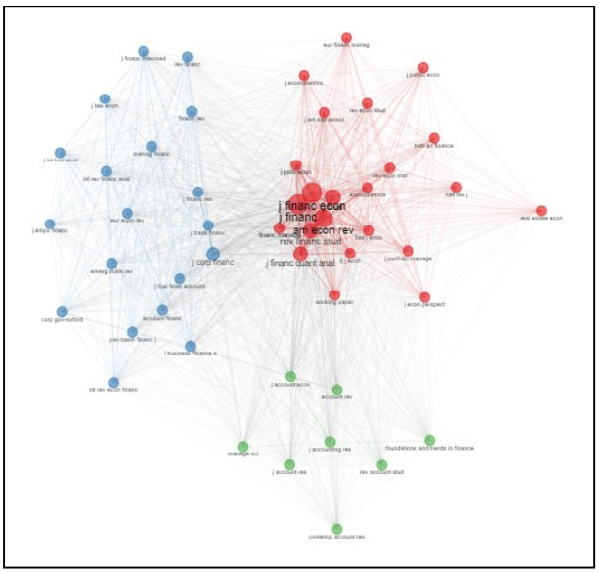

Figure 20: Co-Citation Networks of Sources

Source: Authors' Own Compilation

4. Conclusion

The publications/documents related with Dividend Policy were analyzed through Bibliometric Analysis. It was discovered that the research on the topic Dividend Policy has been increasing with some fluctuations. In 2011, there was great increment in number of publications and from 2018 the publications are continuously increasing. USA, UK and China are the pre-eminent countries having significant contribution in research on Dividend Policy, in both overall production and in single & multiple countries publications. The major affiliated institutes associated with the study are University of Missouri, Harvard University and Cornell University. The most significant source related with Dividend Policy is Journal of Corporate Finance, as it has highest number of published articles and greater value of h index. Journal of Financial Economics is also considered as important because of highest number of local citations. The author Michaely, R. of Cornell University, Johnson School of Management, USA has greatest contribution in scientific production over the period from 2002 to 2022. The keyword analysis shows that the keywords used by the authors are dividends, payout policy, share repurchases, dividend smoothing, corporate governance, agency theory, agency cost etc. and the main frequently occurring words (keywords plus) are policy, earnings, information, corporate governance, ownership, investment, agency costs, payout policy etc. The growth chart of key words depicts that the keywords namely agency cost, corporate governance, determinants, earnings, information, investment, ownership, policy and payout shows increasing trend over the years.

The theoretical implications of the study provide a detailed description on the research topic Dividend Policy through Bibliometric Analysis. It shows scientific production over the years, important keywords including Author keywords and frequently occurring words, most significant Journal, Top Authors, Top institutions, Top countries and their scientific collaboration on the research topic Dividend Policy. The main practical implication of the study is that it will be beneficial for the researcher as it provides a base for historical and theoretical foundation for Dividend Policy research. The main limitation of the study is that the Data used for Bibliometric Analysis was extracted from only one database, Web of Science. There are many other database with many scientific publications and with different authors, keywords, etc. It may be possible that when bibliometric analysis is performed with different database the results may vary. The further study on this topic can be made by using other databases which will give more reliable and genuine results.

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Influence of Firm Characteristics on Cash Holdings: Evidence from Indian Iron & Steel Industry

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Abstract: Cash holding is an important area of recent debate in corporate finance due to its growing significance in the changing corporate settings. Further, the varying significance of cash holdings across industries is also adding another dynamic to corporate finance literature. Under these backdrops, this paper investigates the influence of firm characteristics on cash holdings in Indian Iron & Steel industry over 2007 - 2019. To mitigate the potential endogeneity problem in the data, the study uses dynamic panel regression i.e., Generalized Method of Moments (GMM). The regression result documents that firm characteristics viz cash flow, dividend, assets tangibility, and profitability positively influence the cash holdings while firm size, leverage, net working capital, and R&D expenditure negatively influence cash holdings. However, the influence of growth opportunities is insignificant. Further, the study reveals that leverage, cash flow, and R&D expenditure are the prominent firm characteristics influencing cash holdings in the Iron & Steel industry. This paper adds to the present literature concerning cash holdings by tracing out the firm-level factors affecting cash holdings in the Iron & Steel industry.

1. Introduction

Cash management has received the growing attention of firms, investors, and analysts in present times due to its growing importance in the corporate world. Cash shows the ability of a firm to pay its obligations as and when they become due. It is the input and outcome of every business as cash is invested in the business in the form of acquisition of fixed assets and investment in operations like the purchase of raw materials, payment of wages, etc. which passes through subsequent phases of work-

in-progress, finished goods and sales to get converted into cash. Hence, cash is the basic input and also the ultimate outcome for the business. Though it is a crucial asset for the business in the time of need, it is unproductive and costly to hold. Keynes (1936) documented that firms' propensity to hold cash is induced by transaction need, precautionary need, and speculative need while Jensen (1986) pointed out the agency need for cash holdings.

Corporate financial theories viz. the Static Trade-off theory of Myer (1977), the Pecking Order Theory of Myers and Majluf (1984), and the Agency theory of Jensen (1986) have well documented the firms' behaviour to keep cash. Trade-off theory posits that the firm's cash balance is arrived at by having a trade-off between the costs of cash crunch and the opportunity cost of cash. Pecking Order Theory postulates that firms, first of all, choose to sponsor the investment from retained earnings succeeded by borrowings, and lastly from equity. In the situation of surplus funds from the operation after meeting firm's investment needs, the firms pay back the borrowed money first and then hold cash. Agency Theory states that the managers choose to hoard higher cash balances to gratify their self-interests that don't match with that of shareholders. Based on these theories, there are propositions about the response of different firm-level variables to the cash position and this study is an attempt to test those propositions in the context of the Indian Iron & Steel Industry.

This study is original in the sense that previous studies have identified the factors determining the firms' cash holdings in India as well as in the global context in general whereas this study seeks to identify the factors determining the firms' cash holdings in Indian Iron & Steel industry. The significance of analyzing cash holdings at the industry level is based on the fact that the cash requirement of firms differs owing to the nature of activities which dictates the working capital cycles as well as investment needs. The Iron & Steel industry is considered in the study as this industry occupies a prominent place on the global map and it has immense contribution in boosting all other industries more specifically automobile, transport, infrastructure, real estate, etc. which in turn ensures economic development (Ashton, 1951). Hence, the soundness and survival of this industry are basic to the development of other industries and the economy. Further, the significance of the Indian Iron & Steel industry to the world economy lies in the fact that it is the second-largest contributor of crude steel after China and the largest contributor of sponge iron in the world (World Steel Association, 2020). The heavy investments in physical assets as well as the presence of a long cash conversion cycle make the Iron & Steel industry more sensitive to cash holdings which is evident from the economic crisis of 2008 and the demonetization of 2016. The news of unprecedented variation in cash holdings across Iron & Steel firms made a lot of hue and cry in the corporate world (Mint, 4th October 2013). Further, the high exposure of banks to steel firms became a matter of worry for banks amid slower demand for steel leading to reduced cash flow and cash holdings as well (The Economic Times, 09th September 2015). All these developments require the attention of researchers. In the above backdrop, it is worth analyzing the cash holdings of the Iron & Steel industry.

2. Review of Literature

The analyses of cash holdings of firms, more specifically the factors determining the cash holdings, have garnered sound focus in the empirical financial literature. At the global level, prior works concerning

determinants of cash holdings have emphasized many facets like firms' financial constraints (Gautam *et al.*, 2014; Denis and Sibilkov, 2009; Almeida *et al.*, 2004),corporate governance (Chauhan *et al.*, 2018), financial crisis (Bliss *et al.*, 2015; Al-Najjar, 2013; Song and Lee, 2012; Campello *et al.*, 2011; Atif *et al.*, 2019; Cambrea *et al.*, 2021), ownership structure (Gupta and Bedi, 2020; Moin *et al.*, 2020; Locorotondo *et al.*, 2014; Matta *et al.*, 2022; Anand *et al.*, 2012; Paskelian and Nguyen, 2010; Bhat and Bachhawat, 2005; Deloof, 2001), firm diversification (Subramaniam *et al.*, 2011; Duchin, 2010; Tong, 2011), stock liquidity (Nyborg & Wang, 2021), capital structure (Guney *et al.*, 2007), macro-level factors (Wang *et al.*, 2014: Stone *et al.*, 2018; Chang and Tang, 2021), geopolitical risk (Wang *et al.*, 2021; Kotcharin and Maneenop, 2020; Demir *et al.*, 2019), etc from the viewpoint of the firm in general. In the Indian context, very few studies such as Maheshwari and Rao (2017), Chauhan *et al.* (2018), Paskelian and Nguyen (2010), Anand *et al.* (2012), Bhat and Bachhawat (2005), Saluja and Drolia (2015), Gautam *et al.* (2014), and Al-Najjar (2013) have studied the factors affecting corporate cash holdings in general. But Damodaran (1997) documented a laudable variation in cash & cash equivalents holdings as a portion of assets across industries and the difference in cash holdings across industries can be attributed to the transaction needs for cash & cash equivalents in different lines of business. This is for the reason that the span of the cash conversion cycle of firms varies across industry groups based upon the nature of the production process and sales pattern. This observation of Damodaran (1997) motivates to inquiry into the factors influencing cash holdings of industries. Hence, this study seeks to analyze the firm characteristics as factors affecting cash holdings in the Indian Iron &Steel industry. Further, as far as the firm-specific characteristics are concerned, brief reviews of prior studies are narrated as follows:

2.1. Firm Size

Trade-off theory posits that small firms encounter problems in arranging external capital as they are new, less known, subject to more information asymmetry, and show greater sensitivity to imperfection in the capital market (Almeida *et al.,* 2002; Sethi and Swain, 2019). So small firms keep higher cash holdings. As per pecking order theory, large firms hold large cash as large firms are considered to be successful and run with huge cash holdings after fulfilling investment requirements (Ferreira and Vilela, 2004). Agency theory also assumes large firms to hold large cash as such firms have wider shareholder distribution leading to enhanced flexibility of managers over investment and holding of cash.

2.2. Growth Opportunities

Trade-off theory assumes more cash holdings by growing firms. The reason can be attributed to the fact that relying on an internal source of finance mitigates the possibility of forgoing investment avenues and avoids costly external finance. Though the projection of pecking order theory commensurates with that of trade-off theory, there is a difference in their stand point. The former focuses on transaction cost where as the latter focuses on precautionary need (Chauhan *et al.,* 2018; Maheshwari and Rao, 2017; Hu *et al.*, 2019). However, from the agency theory perspective, managers having poor investment avenues keep higher cash for investment in value-destroying avenues (Ferreira and Vilela, 2004).

2.3. Leverage

Firms with higher debt keep higher cash balance as debt increases the possibility of financial distress. Besides, as per Trade-off theory, cash decreases the possibility of under-investment which is highly pronounced in the prevalence of riskier borrowings. Pecking order theory opines that leverage is inversely associated with cash balance on the ground that an increase in debt results from the exhaustion of all its internal resources of finance that decreases the cash holdings (Gill and Shah, 2012; Bashir, 2014). Agency theory postulates that highly debt-ridden firms are under stringent monitoring and debt covenants by lenders that impair the managerial flexibility to hoard large cash (Gao *et al.*, 2013; Subramaniam *et al.*, 2011).

2.4. Cash Flow

As cash flow is immediate liquidity for the business, an inverse association of cash flow with cash holdings is expected by the Trade-off theory (Kim *et al.*, 1998; Hardin *et al.,* 2009; Subramaniam *et al.*, 2011). But the Pecking order theory presumes firms having higher cash flow pile up higher cash than firms with lower cash flow (Chauhan *et al.*, 2018; Sethi and Swain, 2019; Hu *et al.*, 2019).

2.5. Dividend

Dividend-paying firms can raise external capital at a lesser cost than a non-paying firm and as a result, non-paying firms depend on internal sources of capital to avoid costlier external capital. So, a negative relationship of dividend payment with cash balance is projected as revealed by Hu *et al.* (2019) and Kim *et al.* (2011). Conversely, higher cash holdings induce dividend payments. Hence, a positive relationship of dividend payment with cash balance is presumed (Ozkan and Ozkan, 2004; Gogineni *et al.*, 2012; Maheshwari and Rao, 2017; Chauhan *et al.*, 2018).

2.6. Net Working Capital

Trade-off theory expects the cash holdings to get negatively influenced by net working capital because assets with ready market value work as a replacement for holding extra cash. Chauhan *et al.* (2018), Hu *et al.* (2019), Mesfin (2016) and Ozkan & Ozkan (2004) opine that the liquidation cost of current assets is negligible as compared to other assets. So firms having higher receivables and inventory are expected to maintain lesser cash holdings denoting an inverse association of net working capital with cash holdings.

2.7. Research and Development Expenditure

As R&D Expenditure requires large cash outflow, the firms making R&D expenditures are presumed to have less cash. The reason is R&D based innovations are financed by the internal source to get rid of the high cost of external funds stemming from the uncertain outcome, intangibility, and information asymmetry associated with R&D. So R&D is primarily sponsored through internal funds and equity issues which reduce the cash balance (Bates *et al.,* 2009; Maheshwari & Rao, 2017). Conversely, firms making R&D are supposed to garner large cash inflows resulting from increased sales revenue (Wang *et al.*, 2014; Chauhan *et al.*, 2018; Hu *et al.*, 2019).

2.8. Assets Tangibility

Tangible assets are regarded as the replacement for cash as, in the situation of cash shortfall, the firm can dispose of its tangible assets. Moreover, the firm having higher collateral as tangible assets faces lesser problems in raising funds through debt, and as a result, such firms have a lesser propensity to keep cash (Islam, 2012).

2.9. Profitability

Trade-off theory assumes a more profitable firm to keep small cash as profit is a ready form of liquidity. So, profitability and cash balance are inversely related (Pinkowitz and Williamson, 2001; Al-Najjar, 2013). In contrast, as per pecking order theory, firms with more profit keep more cash for future requirements (Ali and Yousaf, 2013; Mugumisi and Mawanza, 2014; Chauhan *et al.*, 2018).

So based on above literature review, the following hypotheses are developed:

H_0: Firm characteristics don't influence cash holdings of Indian Iron & Steel manufacturing firms.

H_1: Firm characteristics influence cash holdings of Indian Iron & Steel manufacturing firms.

3. Research Methodology

3.1. Data and Sample

We collected data on Indian Iron & Steel manufacturing firms listed on the Bombay Stock Exchange and National Stock Exchange from the PROWESS database of the Centre for Monitoring the Indian Economy. The dataset spans over 13 years from 2007 to 2019. Initially, a sample of 17,807 manufacturing companies was gathered of which 17,307 were found to be with missing data. Hence, out of the remaining 500 firms, 52 firms having the first two-digit National Industrial Classification (NIC)codes of 24 and 25 are classified as Iron & Steel industry. We used the NIC code published by the Central Statistical Organisation under the Ministry of Statistics and Programme Implementation, Government of India for categorising firms as this code specifies the nature of economic activity in which a company or an economic entity is engaged (Mishra and Akbar, 2015; Gill and Kaur, 2015; Bhatt and Bhattacharya, 2017; Komera *et al.,* 2018; Singh *et al*, 2018; Sethi and Swain, 2019).

3.2. Model Specification

To investigate the impact of firm characteristics on cash balance, we have specified Generalized Methods of Moments regression model. Dynamic panel estimation using GMM is capable of correcting heterogeneity, time-invariant effect, measurement error, omitted variable bias, persistence, and endogeneity issue (Caselli *et al.,* 1996). Particularly, System GMM is appropriate for data-sets having moderate periods where some variables are endogenous and there is a dynamic relationship between variables (Sheikh *et al.*, 2018). With 52 firms spanning over 13 years (means N>T), the sample is appropriate for System GMM. Cash holdings are considered a dynamic variable as it is influenced by its past observations. All explanatory variables are considered endogenous. This model needs selection

of lag length, so lag (0 1) is taken in all cases. Data estimation is done through Two-Step System GMM (xtdpdgmm command in Stata). The estimated autoregressive dynamic panel model is as follows:

$$\text{Cash Holdings}_{it} = \alpha_0 + \beta_1 \text{Cash Holdings}_{it-1} + \beta_2 \text{Cash Holdings}_{it-2} + \beta_3 \text{Firm Size}_{it} + \beta_4 \text{Growth Opportunities}_{it} + \beta_5 \text{Leverage}_{it} + \beta_6 \text{Cash flow}_{it} + \beta_7 \text{Dividend}_{it} + \beta_8 \text{Net Working Capital}_{it} + \beta_9 \text{R \& D Expenditure}_{it} + \beta_{10} \text{Assets Tangibility}_{it} + \beta_{11} \text{Profitability}_{it} + \varepsilon_{it}$$

Where,

Cash Holdings = Cash & Cash equivalents/Net assets (Net assets = Total assets - Cash & cash equivalents).

Firm Size = Natural logarithm of Net assets.

Growth Opportunities = Market-to-book value [(Book value of Net assets - Book value of Equity +Market value of Equity) / Book value of Net assets].

Leverage = Total debt /Net assets.

Cash Flow = Cash flow from operation /Net assets.

Dividend = A dummy variable that takes 1 for dividend-paying firms and 0 otherwise.

Net Working Capital = (Net working capital -Cash & cash equivalents) / Net assets.

R&D Expenditure = R&D expenditure /Net assets.

Assets Tangibility = Fixed assets /Net assets.

Profitability = EBIT /Net assets.

4. Results and Discussion

4.1. Descriptive Statistics

Table 1: Descriptive Statistics

Variables	*Mean*	*Median*	*Minimum*	*Maximum*	*Std. Dev.*	*C.V.*
Cash Holdings	0.053	0.018	0.000	0.631	0.093	1.747
Firm Size	9.669	9.275	5.446	14.412	1.860	0.192
Growth Opportunities	1.487	1.106	0.456	16.016	1.374	0.924
Leverage	0.671	0.660	0.085	5.374	0.327	0.488
Cash Flow	0.088	0.080	-0.375	0.533	0.097	1.103
Dividend	0.709	1.000	0.000	1.000	0.455	0.642
Net Working Capital	0.403	0.154	-2.235	10.425	0.855	2.119
R&D Expenditure	0.001	0.001	0.000	0.108	0.007	4.675
Assets Tangibility	0.634	0.606	0.070	2.042	0.290	0.457
Profitability	1.007	0.879	0.011	3.580	0.527	0.524

Source: Authors' Own Compilation

From table 1, it is observed that the mean cash holdings of the Iron & Steel industry stand at 5.3% of net assets and the median cash holdings stand at 1.8% of net assets denoting a huge variation

in cash holdings across firms. The standard deviation and coefficient of variance of cash holdings stand at 0.093 and 1.747 respectively. The mean size, growth opportunities, leverage, cash flows, dividend, net working capital, R&D expenditure, assets tangibility, and profitability of the Iron & Steel industry stand at 9.669, 1.487, 0.671, 0.088, 0.709, 0.403, 0.001, 0.634, and 1.007 respectively.

4.2. Correlation Matrix

Table 2: Correlation Matrix

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
(1) Cash Holdings	1									
(2) Firm Size	0.079	1								
(3) Growth Opportunities	0.408	-0.026	1							
(4) Leverage	-0.049	-0.122	0.008	1						
(5) Cash Flow	0.226	-0.068	0.250	-0.287	1					
(6) Dividend	0.230	0.118	0.126	-0.388	0.200	1				
(7) Net Working Capital	0.118	-0.203	0.080	-0.188	0.137	0.238	1			
(8) R&D Expenditure	0.061	-0.007	0.031	-0.003	0.087	0.040	0.002	1		
(9) Assets Tangibility	0.040	-0.293	-0.077	0.115	0.238	-0.274	-0.100	0.157	1	
(10) Profitability	0.086	-0.607	0.177	-0.015	0.233	-0.010	0.181	0.075	0.215	1

Source: Authors' Own Compilation

Table 2 depicts Karl Pearson coefficient of correlation between the variables. The correlation coefficient ranges between 0.002 and 0.607 which implies the absence of collinearity problem. Besides, variance inflation factor (VIF) test is performed to examine multicollinearity among the variables. The highest VIF value of 2.088 implies no multicollinearity among the variables (Chatterjee and Hadi, 2015; O'Brien, 2007).

4.3. Regression Results

Table 3: Result of the Two-step System GMM Regression

	Dependent Variable		*Cash Holdings*
Independent Variables	*Coefficient*	*Std. Err.*	*P-value*
Intercept	2.385	1.949	0.221
Cash Holdings L1	0.441***	0.045	0.000
Cash Holdings L2	0.141***	0.032	0.000
Firm Size	-0.516***	0.183	0.005

contd. table 4

	Dependent Variable		*Cash Holdings*
Independent Variables	*Coefficient*	*Std. Err.*	*P-value*
Growth Opportunities	0.013	0.052	0.806
Leverage	-1.019**	0.507	0.044
Cash flow	1.626***	0.322	0.000
Dividend	0.433***	0.124	0.000
Net Working Capital	-0.471***	0.164	0.004
R&D Expenditure	-4.975**	2.425	0.040
Tangibility	0.546**	0.275	0.047
Profitability	0.871***	0.233	0.000
Firm-year observations	572		
No. of firms	52		
No. of Instruments	43		
AR (1) test p-value	0.000		
AR (2) test p-value	0.531		
Sargan-Hansen test p-value	0.432		

Source: Authors' Own Compilation

Note: ***, ** and * stand for statistical significance at 1%, 5% and 10% respectively.

4.4. Diagnostics Tests

The Hansen test examines the overall validity of the instruments taking the H_0 as 'instruments as a group is exogenous'. As the p-value of the Hansen Test fails to reject the H_0($p>0.10$), it is concluded that the instruments are valid. Another requisite criterion is that the number of instruments must be less than or equal to the number of groups to eliminate over-identification which gets satisfied for the model. Other diagnostics tests include AR1 and AR2 for examining the presence of autocorrelation. The AR1 depicts first-order serial autocorrelation (i.e. differenced error term is serially correlated at AR1) while AR2 detects autocorrelation at levels. The AR1 statistics show the presence of first-order serial autocorrelation. The H_0 for AR2 statistics is 'no autocorrelation in the error term' which is accepted indicating no serial autocorrelation in the model.

4.5. Analysis

Table 4 reports the influence of firm characteristics on cash balance in the Iron & Steel industry measured using GMM. The result shows that the current cash balance is positively affected by its two lags which confirm the dynamic nature of the cash holdings. The influence of firm characteristics is discussed in the succeeding section.

4.5.1. Firm Size

The negative influence of firm size on the cash balance means that in the Iron & Steel industry, cash holdings decline in response to an increase in firm size. It supports the finding of Bates *et al.* (2009),

Al-Najjar (2013), Sun *et al.* (2012), Kim *et al.* (2011), Chauhan *et al.* (2018), Gogineni *et al.* (2012), Sethi and Swain (2019), Kim *et al.* (1998), and Opler *et al.* (1999).

4.5.2. Growth Opportunities

Growth opportunities exert an insignificant influence on cash balance and this finding corroborates with the findings of Islam (2012) & Drobetz and Gruninger (2007). The reason for the insignificant impact can be attributed to the fact that very few companies that are already grown up are working in this industry. Hence, even though there is a growth opportunity, the companies don't accumulate cash for that purpose.

4.5.3. Leverage

Leverage is having a significantly negative association with cash holdings which aligns with the pecking order theory. It implies that firms having more debt, hold less cash because firms choose debt financing when all internal sources are exhausted. Further, higher interest payment on account of higher leverage reduces the cash reserve. This observation goes in consonance with the observation of Chauhan *et al.* (2018), Hu *et al.* (2019), Al-Najjar (2013), Gogineni *et al.* (2012), Bhat and Bachhawat (2005), Opler *et al.* (1999), Kim *et al.* (1998), & Ali and Yousaf (2013).

4.5.4. Cash Flow

There is a significantly positive association of cash flow with cash holdings. It goes in agreement with the pecking order theory that firms with higher cash flow from operation keep higher cash balances. This result agrees with prior results of Fereira and Vilela (2004), Chauhan *et al.* (2018), Hu *et al.* (2019), Ali and Yousaf (2013), Stone and Gup (2013), Sun *et al.* (2012), Sethi and Swain (2019), Ozkan and Ozkan (2004), Maheshwari and Rao (2017), Opler *et al.* (1999), Mesfin (2016), & Mugumisi and Mawanza (2014).

4.5.5. Dividend

Consistent with the findings of Chauhan *et al.* (2018), Maheshwari and Rao (2017), Ali and Yousaf (2013), & Gogineni *et al.* (2012), the effect of dividends on cash holdings is positive indicating a greater propensity of dividend-paying firms to hoard cash.

4.5.6. Net Working Capital

Net working capital is negatively linked to cash holdings which supports the trade-off theory. It is because assets with ready market value work as a replacement for holding extra cash and the cost of disposing of the current assets is lesser than other assets. Hence, firms having higher receivables and inventory keep lesser cash holdings. This finding supports the earlier evidence of Chauhan *et al.* (2018), Hu *et al.* (2019), Kim *et al.* (2011), Bates *et al.* (2009), Al-Najjar (2013), Maheshwari and Rao (2017), Sun *et al.* (2012), Stone and Gup (2013), & Opler *et al.* (1999).

4.5.7. Research and Develpement Expenditure

In agreement with the revelation of Bates *et al.* (2009), & Maheshwari and Rao (2017), R&D expenditure has a significantly negative impact on cash holdings as R&D-based innovations are financed from

internal sources which reduces the cash balance.

4.5.8. Assets Tangibility

Assets tangibility hasa significantly positive influence on cash balance which means that the firms with more fixed assets generate and hold more cash.

4.5.9. Profitability

Supporting the propositions of pecking order theory, profitability and cash holdings are positively associated. Chauhan *et al.* (2018), Mugumisi and Mawanza (2014), & Ali and Yousaf (2013) also obtained the same result.

5. Findings & Suggestions

5.1. Findings

The above discussion reveals that in the Iron & Steel manufacturing firm, cash flow, dividend, assets tangibility, and profitability exerta positive effect on cash balance while firm size, leverage, net working capital, and R&D expenditure exert a negative effect on the cash balance. However, the effect of growth opportunities is insignificant. Further, cash flow and R&D expenditure are the prominent firm characteristics influencing cash holdings in this industry.

5.2. Suggestions

Firms with higher leverage maintain less cash which may bring the possibility of financial distress and impede further investment due to the increased cost of capital. So the firm should keep more cash to mitigate these problems.

Firms with more R&D expenditure hold less cash but information asymmetry created by R&D owing to its uncertain outcome and intangible nature may put the firm in a disadvantageous position and affect operations and investment. So firms are required to keep more cash balance.

Tangibility is having a positive bearing on cash holdings but firms with more fixed assets may leverage the benefits of having flexibility in securing external finance by pledging the fixed assets as and when required. Hence, such a firm may keep less cash reserve.

6. Conclusion

This paper investigates the influence of firm characteristics on the cash balance of the Indian Iron & Steel industry. Firm characteristics namely firm size, growth opportunities, leverage, cash flow, dividend, net working capital, R&D expenditure, assets tangibility, and profitability are considered to investigate their influence on cash holdings. It is documented that except for growth opportunities, all other firm characteristics pose a significant influence on cash holdings of the Iron & Steel industry. This study is restricted to the Indian Iron & Steel industry only and a few firm characteristics have been analyzed. The outcomes of this paper are helpful for corporate boards, managers, investors, and rating agencies in designing economic decisions. This study can be widened to other

industries and consider other firm characteristics and macroeconomic variables affecting the cash holdings.

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Tax Revenue and Economic Growth Nexus in India: An ARDL Bounds Testing Approach

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GDP, Direct tax, Indirect tax, Total expenditure, ARDL

JEL Classification

N1, H2, H6, M31

Abstract: This paper examines the effectiveness of direct and indirect tax revenue on gross domestic product (GDP) in the Indian economy over the period 1970-71 to 2020-21. Using autoregressive distributed lag (ARDL) model, the study finds a positive and significant impact of direct and indirect tax on the country's GDP both in long run and in short run. Additionally, by using multiple regression analysis, this study evaluates the short-term effects of the major components of direct and indirect tax on India's economic growth. The GDP of India is significantly and favourably influenced by personal income tax, corporation tax, and total government spending. While customs duties have a substantial and negative impact on GDP, excise duties have a significant and positive effect. In India, there is a unidirectional causality between GDP and direct tax revenue and a bi-directional causality between GDP and indirect tax revenue. To address the issue of economic disparity, governments must exercise caution when establishing the tax components that would promote long-term growth and development.

1. Introduction

Taxation is an important fiscal instrument and a key source of revenue for governments all around the world. It is considered as an important factor that affects economic growth(Li and Lin, 2015). Whereas economic growth is one of the macro economic variables related to tax revenues (Demir, 2014).A significant portion of a country's total revenue comes from both direct and indirect taxes. In India, however, indirect tax revenue accounts a larger portion of total revenue than direct tax does (Panda *et al.*, 2020).

Governments collect a significant amount of revenue through taxation sources in order to effectively carry out numerous welfare programmes for its citizens as well as achieve long-term economic growth and development. When it comes to achieving long-term economic growth, taxation is an important weapon available to most governments across the world. In case of developing country like India, a fiscal challenge is a major concern in terms of deficits. As a result, decreasing the proportion of revenue deficit to GDP is a crucial priority before the Indian government in order to achieve long-term economic growth. However, it's critical to understand which tax components should be addressed.

Different empirical works have various viewpoints in establishing a relation of taxation with GDP. Some studies reveal that tax revenue has an adverse impact on economic growth (Ferede and Dahlby, 2012), (Brian *et al.*, 2012), (Greenidge and Drakes, 2009), (Poulson and Kaplan, 2008), (Gwartney and Lawson, 2006), but some other studies opine that tax revenues have a favourable impact on economic growth of an economy (Padovano and Galli, 2001; Onakoya*et al.*, 2016; Scarlett, 2011; Okafor, 2012). However, other research contends that taxes have both a positive and negative influence on economic growth (Ugwunta and Ugwuanyi, 2015; Lee and Gordon, 2005). The fact that these findings are contradictory encourages us to re-investigate the association that tax revenue establishes with economic growth in India. As a response, we attempt to study the influence of total direct as well as indirect tax revenues on the country's GDP growth. Furthermore, the research also disaggregates the several important components of direct as well as indirect taxes and examined their individual impact on India's economic growth.

Figure 1 depicts the growth rates of GDP, direct tax as well as indirect tax revenue in India. It shows that direct and indirect taxes have negative growth rate in 2020-2021 as well as GDP also

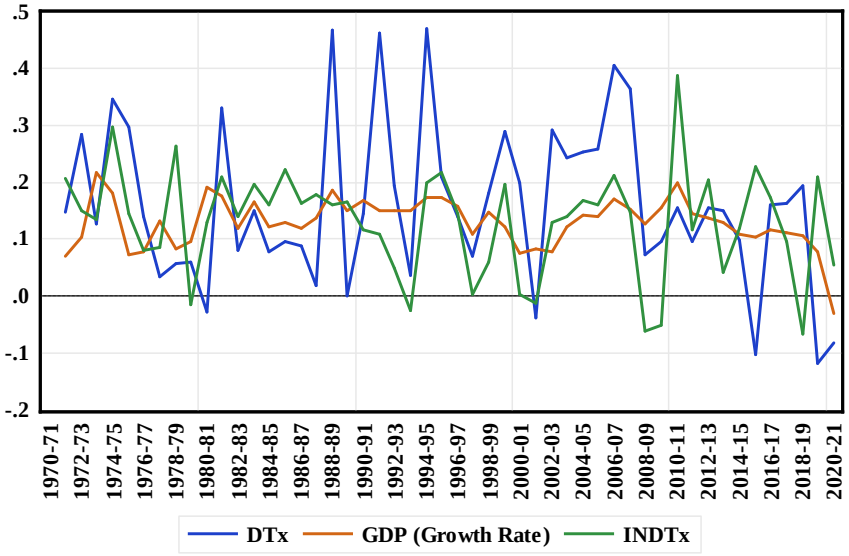

Figure 1: Growth Rate of GDP, Direct Taxes and Indirect Taxes in India

Source: Authors' Own Compilation

exhibits the same behaviour in 2020-21. The growth rate of direct tax was 15 per cent in 1970-71, but it decreases and becomes negative, -8 per cent in 2020-21. Similarly, the growth rate of indirect tax is 21 per cent in 1970-71, then decreases over the year and becomes negative (6 per cent) in 2020-21. Additionally, the GDP growth rate is 7 per cent in 1970-71, which increases with time, although it is negative in 2020-21, i.e. -3 percent.

2. Review of Literature

Arvin *et al.* (2021) opined that there are endogenous temporal causal links exist among government spending, tax revenue, institutional quality and economic growth in lower-income and lower-middle-income countries (LICs and LMICs) in the short run as well as in the long run. The short-term outcomes are not uniform, but they do reflect a variety of causal connections that occasionally promote one another. However, the long-run outcomes are relatively consistent, namely government spending, tax revenue and institutional quality.

Neog and Gaur (2020) have established the linkage between tax structure and GDP growth in India, taking the share of tax revenue to GDP as a control variable from 1980-2016 and conforms the presence of a long-term relationship between these two variables. The study depicts that the growth rate is reduced by income tax, corporate tax and excise duty, but the custom duty improves the economic performance in the long-run. So far as corporate tax is concerned, it adversely affects the growth during the short-run. This analysis, however, finds no evidence of a minimum effect in the tax-growth connection for India.

Geetanjali and Venugopal (2018) investigate the influence of direct taxation on GDP growth in India from 2000 to 2016 putting Ordinary Least Squares method. According the study direct taxes has a substantial impact on growth rate of GDP. Therefore emphasis should be placed on tax collection as well as addressing concerns of tax evasion. Ogundana *et al.* (2017) have used ordinary least square regression technique to investigate the evolution of direct as well as indirect taxes and their influence on Nigerian GDP growth from 1994 to 2013. According to the study, indirect taxes have a favourable substantial influence on growth of the economy, but direct taxes have a favourable but negligible effect on growth of Nigeria's economy. For this reason, the study recommends that the government must concentrate more on indirect taxes when it comes to non-essential goods so that the well-being of the poor is not compromised.

Helhel and Demir (2014) have examined a connection between tax revenues and Turkish economic development both for short and long time period spanning 1975 to 2011 by using cointegration model and Granger causality technique. According to the research, there is a long-term association between tax revenue and economic growth, but no such connection exists during short time period. Ray *et al.* (2012) has found long-run linkages between taxation and real GDP growth in India. The pair-wise granger- causality test reveals bidirectional causation between economic growth and total tax revenue, as well as economic growth and indirect tax. However, there is no discernible link between economic growth and direct taxes. Furthermore, it has been found that more of indirect tax revenues, as well as total revenues, encourages substantial economic growth in the country.

Ilaboya and Mgbame (2012) have carried out an assessment of the dynamic behaviour of indirect taxes and economic growth in Nigeria. The study discovered an adverse and negligible influence of

indirect taxation on Nigerian economic growth. Furthermore, trade openness has a considerable and favourable influence on the growth of Nigerian economy. Aamir *et al.* (2011) looked at each of the direct and indirect tax effects on total revenue in India and Pakistan, and then compared the results. Indirect taxes generate more revenue in Pakistan, while direct taxes generate more revenue in India. As per the study, direct taxes should be given more consideration in Pakistan because the growing gap between rich and poor could be worse in the country.

3. Objectives and Hypotheses of the Study

3.1. Objectives of the Study

The main objectives of the study are:

- To examine the linkages between gross domestic products (GDP), direct and indirect tax revenue in India.
- To investigate the short-run effects of personal income tax, corporate tax, and total government spending on GDP.
- To examine short run linkage among custom duty, excise duty, total expenditure and GDP.

3.2. Hypotheses of the Study

H_{01}: There is no significant linkage among gross domestic products, direct taxation and indirect taxation in India.

H_{02}: Personal income tax, corporate tax and total expenditure do not influence GDP.

H_{03}: GDP is unaffected by excise duty, customs duty and total expenditure.

4. Research Methodology

4.1. Data Description

The present research relies on secondary data from the Reserve Bank of India (RBI) Database, which spans the years 1970-1971 to 2020-21. The study includes variables such as Gross Domestic Product *(GDP)* taking base year 2011-12 as a proxy measure for growth, Direct taxation*(DTx),* Indirect taxation *(IndTx),* Personal income tax *(PITx),* Corporate tax *(CTx),* Excise duty (*ED*), Custom duty (*CD*) and Total expenditure (*TExp*) measured in Indian Rupee. All these variables have been converted to natural logarithms form to reduce the difficulties of heteroscedasticity to a minimum possible level. Augmented Dickey Fuller (ADF) model of Dickey and Fuller (1979) and Phillip Perron (*PP*) unit root test of Phillips & Perron (1988) have been used to check the stationary properties of the variables.

4.2. Model Specification

Model – 1: ADF Model Unit Root Test

$$\Delta Y_t = \alpha + \phi t + \delta Y_{t-1} + \gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + \ldots + \gamma_p \Delta Y_{t-p} + U_t \quad (1)$$

Where, Y_t denotes a series, α is intercept, $\delta = \beta - 1$, β = Coefficient of Y_{t-1} ΔY_t = first difference of Y_t and U_t represents error terms. In this model null hypothesis is d $\delta = 0$ while the alternative hypothesis is $\delta < 0$ (Dickey and Fuller, 1979). The lag length is selected according to Schwarz Bayesian criterion (SBC).

Model – 2: Phillipse Perron (PP) model of unit root test

$$\Delta Y_t = \text{JI} Y_{t-1} + \beta_i D_{t-i} + e_t \tag{2}$$

Where is an I(0) with zero mean and is a deterministic trend component. The hypothesis is tested for (Shrestha and Bhatta, 2018).

Model – 3: ARDL Bounds Testing Cointegration Approach

The series are tested for stationarity in the first phase, and cointegration analysis (ARDL bounds test) is performed in the second phase to investigate the short run and long run impact of the of direct tax and indirect tax revenue on economic growth in India. The ARDL modelof Pesaran *et al.* (2001)is put forth in the following equation.

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} \Delta Y_{t-i} + \sum_{i=0}^{p} \beta_{2i} \Delta x_{t-i} + \sum_{i=0}^{p} \delta\varepsilon_i \Delta z_{t-i} + \lambda_1 y_{t-1} + \lambda_2 x_{t-1} + \lambda_3 z_{t-1} + v_t$$

$$\Delta LnGDP_t =$$

$$\alpha_0 + \Sigma_{i=1}^{p} \beta_{1i} (\Delta LnGDP)_{t-i} + \Sigma_{i=0}^{p} \beta_{2i} (\Delta LnDTx)_{t-i} + \Sigma_{i=0}^{p} \delta\varepsilon_i (\Delta LnIndTx)_{t-i} + \tag{3}$$

$$\lambda_1 LnGDP_{t-1} + \lambda_2 LnDTx_{t-1} + \lambda_2 LnIndTx_{t-1} + v_t$$

Here 'λs' and 'βs' represent long run and short run coefficients, respectively. The null hypothesis assumption of the equation is $\lambda 1 = \lambda 2 = \lambda 3 = 0$, which describes the absence of long run relationship, Whereas alternative hypothesis states that $\lambda 1 \neq \lambda 2 \neq \lambda 3 \neq 0$ (Shrestha & Bhatta, 2018).

Model – 4: Multiple Regression Model

To investigate the linkage among GDP growth and the important components of direct tax revenue like personal income tax and corporate tax, multiple regression model has been used in third phase.

$$Y = \beta_0 + \beta_1 X_1 + + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_t \tag{4}$$

Where;

Y = Gross Domestic Product
X_1 = Personal Income Tax
X_2 = Corporate Tax
X_3 = Total Government spending
β_0 = The intercept
β_1 = The rate of change in GDP per unit change in Personal Income Tax
β_2 = The rate of change in GDP per unit change in Corporate Tax

β_3 = The rate of change in GDP per unit change in Total Government spending

ε_t = Random error

Therefore the Multiple Regression Model can be expressed as following manner;

$$LnGDP = \beta_0 + \beta_1 LnPITx + \beta_2 LnCTx + \beta_3 LnTEx + \varepsilon_t \quad (4a)$$

In fourth phase we have also employed multiple linear regression equation to examine the short run relationship among the GDP (dependent variable) and major components of indirect tax which includes excise duty and custom duty revenue (independent variables).

$$LnGDP = \beta_0 + \beta_1 LnCD + \beta_2 LnED + \beta_3 LnTEx + \varepsilon_t \quad (4b)$$

Model – 5: Ganger Causality Test

The bi-variate Granger causality test by Granger (1969) has been utilised to investigate the causality between the time series variables GDP, direct tax and indirect tax revenues. The following two regression equations were estimated using the Granger causality test (Maziarz 2015; Gokmenoglu *et al.* 2015; Ginevičius *et al.* 2019; Stern 2011):

$$y_t = \beta_{1,0} + \Sigma_{i=1}^{p} \beta_{1,i} y_{t-i} + \Sigma_{j=1}^{p} \beta_{1,p+j} x_{t-j} + \varepsilon_{1t} \quad (5)$$

$$x_t = \beta_{2,0} + \Sigma_{i=1}^{p} \beta_{2,i} y_{t-i} + \Sigma_{j=1}^{p} \beta_{2,p+j} x_{t-j} + \varepsilon_{1t} \quad (6)$$

Here *P* refers to number of lags, and β is the parameter while ε implies the error term. If the p parameters $\beta_{1,p+j}$ are simultaneously significant then the null hypothesis of *x* does not Granger causes *y*. is rejected. On the contrary, if the *p* parameters $\beta_{2,i}$ are simultaneously significant then we do not accept the null hypothesis that y does not cause *x*. The assumption of Granger causality model is that if past values of *X* can forecast the current period value of *y* then Granger causality exists from x to y. We utilise Granger causality test to investigate the presence of any causality, whether unidirectional or bidirectional between government expenditure, direct and indirect tax revenues.

5. Results

Table 1: Unit Root Test Results

Test	*ADF*		*PP*	
	Level- I(0)	*1st Diff.- I(1)*	*Level- I(0)*	*1st Diff.- I(1)*
LnCTx	-1.445977	-5.367448**	-1.372307	-5.323446**
	(0.5524)	(0.0000)	(0.5884)	0.0000
LnPITx	-2.300931	-8.55577*	-2.230953	-8.613791*
	(0.4256)	(0.0000)	(0.4626)	(0.0000)
LnGDP	-0.736036	-3.22835***	0.92999	-3.197335***
	(0.9644)	(0.0909)	(0.9442)	(0.0969)

contd. table 1

Test	ADF		PP	
	Level- I(0)	1st Diff.- I(1)	Level- I(0)	1st Diff.- I(1)
LnCD	-0.762392 (0.9622)	-6.228007* (0.0000)	-0.837839 0.9548	-6.194461* (0.0000)
LnED	-3.278756*** 0.0816	____	-3.226481*** (0.0910)	____
LnTEx	-1.995736 (0.5890)	-5.628103* (0.0001)	-2.079590 0.5442	-5.439820*** 0.0002
LnDTx	-0.884119 (0.9497)	-6.152045* (0.0000)	-1.123415 0.9146	-6.133152* 0.0000
LnIndTx	-2.445149 0.3530	-7.103628* 0.0000	-2.317925 0.4168	-8.195922* 0.0000

Note: *, ** and *** represent the significance at 1per cent, 5 per cent and 10 per cent level respectively.
Source: Authors' Own Calculation

Empirical results of unit root test through both ADF and PP test as per Table 1 shows that the GDP, corporation tax, personal income tax, customs duties, direct tax, indirect tax and total expenditure are stationary at the first difference. Only excise duties becomes stationary at level. It describes variables are stationary at mixed order. We have used ARDL model to examine the relationship among GDP, direct tax revenue and indirect tax revenue both in short and long run. On the other hand multiple regression analysis of the Ordinary Least Square (OLS) technique (Gujarati and Porter, 2012) is utilised to study short run relationship among GDP, total expenditure and major components of direct tax as well as indirect tax. In this regard two models have been developed as in Eqn. (4a) and Eqn. (4b).

Table 2: Bounds Test Results for Cointegration as per Akaike Information Criteria (AIC)

Model	F-statistic	k
$LnGDP_t = f(LnDTx_t, LnIndTx_t)$	6.516575*	2
	Critical Bound Values	
Level of Significance	Lower Bound I(0)	Upper Bound I(1)
1%	4.13	5
2.5%	3.55	4.38
5%	3.1	3.87
10%	2.63	3.35

Note: * indicates significance at 1per cent level.
Source: Authors' Own Calculation

Table 2 shows the result of ARDL bound test for conforming Cointegration among variable in long run. The Cointegration results demonstrate that there is existence of long run positive and substantial impact of the direct tax and indirect tax on India's GDP. The F-statistic value 6.516575 > 5 of critical upper bound value at 1% level of significance.The examination of the cointegration results allow us to use the ARDL model in the data series taken under study. Optimal lag structure for all models is based on Akaike information criterion (Sakamoto *et al.*, 1986). The ARDL estimation is given in the following table 3.

Table 3: ARDL Estimation Result for Short run and Long run

Dependent Variable: GDP, Selected Model: ARDL(1, 0, 0)

Cointegrating Form (Short Run Coefficients)				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
D(LnGDP)	0.771119*	0.054064	14.26319	0.0000
D(LnDTx)	0.078181*	0.023187	3.371738	0.0015
D(LnIndTx)	0.144624*	0.037752	3.830920	0.0004
Constant	0.927073	0.194951	4.755405	0.0000
CointEq (-1)	-0.228881*	0.008487	-26.96933	0.0000
Adj. R-squared	0.999681			
Long Run Coefficients				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
LnDTx	0.355015*	0.060357	5.881938	0.0000
LnIndTx	0.601968*	0.082858	7.265047	0.0000
C	4.17	0.384518	10.86657	0.0000

Note: *, ** and *** represent the significance at 1per cent, 5 per cent and 10 per cent level respectively.

Source: Authors' Own Calculation

Table 3 shows the ARDL estimation findings of the long and short run coefficients. The long-term data demonstrate that the direct tax and indirect tax has a positive and significant impact on India's GDP. According to the results, a 1per cent rise in Direct tax (DTx) corresponds to a 0.078 per cent increase in GDP in short run, and 0.35 per cent in long run and vice versa. There are numerous reasons for the beneficial influence of the direct tax on GDP because of the share of direct tax to GDP is high as compared to indirect tax, thus higher the tax leads to higher the govt. expenditure and higher the GDP in return. Secondly, the study discovers that in India, indirect tax also has a favourable impact on GDP. In case of indirect tax (INDTx) the coefficient is 0.6019 and P-value is 0.0000<0.01 in long run whereas it is 0.144624 and P-value is 0.0004< 0.01 in short run.It depicts thatif indirect tax

increases 1per cent it leads to affect GDP positively and significantly by 0.60 per cent in long period whereas it is 0.14 per cent in short period.

5.1. Cusum and Cusumsq Test

We utilise the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) test technique (Brown *et al.*, 1975) to investigate the recursive residuals shown in Figs 2 and 3 and to check the stability of the calculated ARDL model. The critical boundaries at the 5per centlevel of significance are represented by the straight lines. The null hypothesis of instability is accepted when the CUSUM and CUSUMSQ of the recursive residuals cross these two straight lines. The CUSUM and CUSUMSQ, on the other hand, remain within the lines' restricted area, indicating that the calculated ARDL model is suitable and effective.

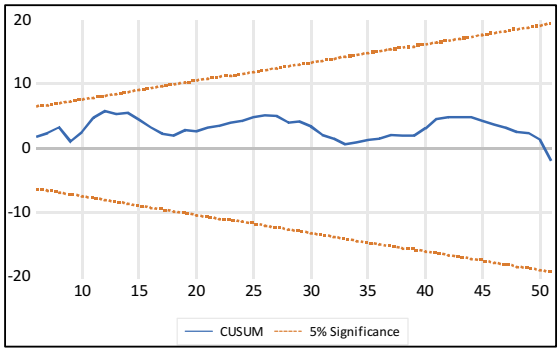

Figure 2: CUSUM Test

Source: Authors' Own Compilation

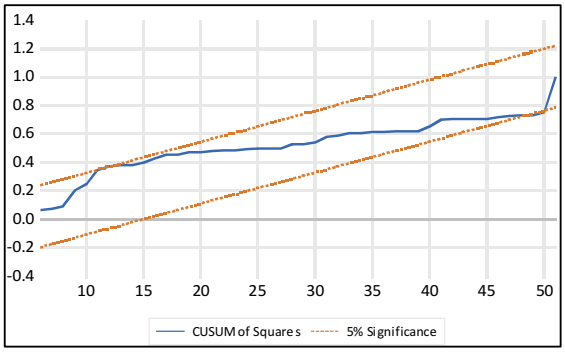

Figure 3: CUSUM-of- Squares Test

Source: Authors' Own Compilation

Table 4: Multiple Regression Analysis

Dependent Variable: LNGDP
Method: Least Square

Variables	*Coefficient*	*t-Statistics*	*Prob.*
C	3.221754	15.37689	0.0000*
LnPITx	0.060983	2.130527	0.0384**
LnCTx	0.212353	3.643545	0.0007*
LnTEx	0.674246	13.20591	0.0000*
R-squared	0.998097		
Adjusted R- squared	0.997976		
F-statistics	8217.663		
Prob(F-statistics)	0.000000		
Durbin-Wals on stat	0.462268		

Note: *, ** and *** represent the significance at 1per cent, 5 per cent and 10 per cent level respectively.
Source: Authors' Own Compilation

Based on Table 4 it can be stated that F Prob. value = 0.00000 < 0.05 which means simultaneously significant effect. This shows that Personal income tax, Corporation tax, and Total expenditure have a significant effect on the Gross domestic product in India. In-case of Personal income tax, coefficient is 0.060983 and P-value = 0.0384< 0.05, so it can be inferred that one per cent rise in personal income tax leads to increase in GDP by 0.06 per cent which is significant. Similarly, the Corporation tax has a 0.21 per cent positive impact on growth of GDP at one per cent level of significance where P-value = 0.0007< 0.01. In a partial test of total expenditure where P-value = 0.0000 < 0.01, it has 67 per cent positive impact on GDP. So it can be inferred that there is significant and positive effect of these variables on India's GDP. As the value of Adjusted R-squared = 0.997976, all the concerned independent variables have a very strong effect of 99.79 per cent on growth of gross domestic product of India.

Table 5: Multiple Regression Analysis

Dependent Variable: LNGDP
Method: Least Square

Variables	*Coefficient*	*t-Statistics*	*Prob.*
C	1.833484	18.27405	0.0000*
LnCD	-0.114643	-3.032622	0.0039**
LnED	0.163691	1.723187	0.0914***
LnTEx	0.960922	9.933864	0.0000*
R-squared	0.997039		
Adjusted R- squared	0.996850		
F-statistics	5275.708		
Prob(F-statistics)	0.000000		
Durbin-Wals on stat	0.614257		

Note: *, ** and *** represent the significance at 1per cent, 5 per cent and 10 per cent level respectively.
Source: Authors' Own Compilation

Table 5 depicts that Prob. (F-statistics) = 0.00000 <0.05, indicating that there is simultaneous significant effect of independent variables. It demonstrates that custom duties, excise duties, and total expenditure all have a major impact on India's GDP growth. The coefficient value is -0.114643 and P-value = 0.0039< 0.05 in the case of custom duties implies that it has a significant and negative effect on India's GDP growth. Similarly, the excise duties, with coefficient 0.163691 and P-value of 0.0914< 0.10has a significant and positive effect on GDP of Indian economy. On the other hand coefficient 0.960922 and P-value = 0.0000< 0.05 in a partial test of total expenditure can be inferred that there is a significant and positive influence on GDP. The value of adjusted R-squared = 0.996850 indicates that all the independent variables have a 99.68 per cent effect on India's GDP.

5.2. Residual Tests

Table 6: Diagnostic Test Results for Multiple Regression

Diagnostic test	*(Eqn. 4a)*	*(Eqn. 4b)*
Heteroscedasticity Test: (Breusch-Pagan-Godfrey test)	Obs. R-squared =6.890053 Prob. = 0.0755	Obs. R-squared =4.635462 Prob. = 0.2005
Test of Normality	Jarque-Bera statistics = 1.105809** Prob.= 0.575277	Jarque-Bera statistics = 2.235887** Prob.= 0.326951
Q statistics	All Prob. > 0.05	All Prob. > 0.05

Note: *, ** and *** represent the significance at 1per cent, 5 per cent and 10 per cent level respectively.
Source: Authors' Own Compilation

From the diagnostic test (table 6) it is observed that this growth model is efficient for this study because there no heteroscedasticity, the residuals are normally distributed and also the residuals are stationary. So it satisfies most of the assumption of OLS and provides adequate description of the data therefore it can be accepted as final growth model.

5.3. Granger Causality Test

As per table 2 and 3, a long-run linkages exists among GDP, direct and indirect tax revenue in India. But to investigate the presence of causal link among variables the study employs granger causality technique. As depicted in table 7, the bi-directional causal relationship between gross domestic products on indirect tax revenue is statistically consistent at the 5 per cent level, which implies that causality exists from gross domestic product to indirect tax revenue. Therefore the null hypothesis of gross domestic products which does not cause indirect tax revenue can be rejected. In addition, null hypothesis

Table 7: Result of Granger Causality Test

Null Hypothesis, Lags:3	*F-Statistic*	*Prob.*
LNDTX does not Cause LNGDP	0.25111	0.8601
LNGDP does not Cause LNDTX	2.52980	0.0704***
LNINDTX does not Cause LNGDP	2.94973	0.0438**
LNGDP does not Cause LNINDTX	3.58963	0.0215**
LNINDTX does not Cause LNDTX	0.45773	0.7133
LNDTX does not Cause LNINDTX	1.29022	0.2906

Note: *, ** and *** represent the significance at 1per cent, 5 per cent and 10 per cent level respectively.
Source: Authors' Own Compilation

of indirect tax revenue which does not cause gross domestic products can also be rejected. Moreover causality between indirect tax and direct tax revenue is not significant. However only unidirectional causation exists between two variables which is from gross domestic products to direct tax.

6. Findings

In the short run, 1(one) percent increase in direct tax leads to a 0.078 percent increase in GDP and 0.35 percent in the long run. In case of indirect tax, GDP is positively and significantly influenced by 0.14 percent in short period and 0.60 percent in long period. Therefore indirect tax impacts more on GDP growth than direct tax in India. Personal income tax has a 0.06 percent impact on GDP growth, whereas corporation tax has a 0.21 percent positive impact. Custom duties has a significant and negative effect on India's GDP growth by -0.11 percent. But excise duties with coefficient 0.163691 has a significant and positive effect on India's GDP. On the other total expenditure of the government has much higher positive impacts than tax revenues on GDP of the country. It is also evident that bi-directional causality exists between gross domestic products and indirect tax revenue as well as unidirectional causality prevails from gross domestic products to direct tax revenue in India. On the other hand there is no any causal relationship is found between direct and indirect taxation.

7. Conclusion

The results of ARDL model evident that indirect tax has a more favourable and significant impact on economic growth than direct tax on economic growth of India both in a short as well as long period. Government of India should enhances economic growth through realizing the increase in tax revenues in terms of both direct and indirect tax. The government should concentrate on increasing indirect tax collection while expanding the number of people who are required to pay direct taxes, particularly those in the informal sector. So far as GST is concerned in form of indirect tax, essential goods and services are to charge either very less or to be exempted from taxation. In the same time more GST has to be imposed on luxury goods of any kind. Indirect tax structure in terms of goods and services tax (GST) needs to be restructured. Otherwise it harms the interest of economically weaker section. However in order to raise tax revenue from direct tax, government should look into the issues of tax evasion and can extend tax base to generate more revenue. So far as government expenditure is concerned it should be channelized for investment in utilising natural wealth as well as human resources to promote sustainable growth.

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Herding Behaviour in Equity Market: A Systematic Literature Review

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Abstract: Performance of financial markets across the globe are not only influenced by the fundamentals but also by the behaviour of investors and their psychology (also known as behavioural finance). This has deepened the interest of researchers in exploring various types of biases that affect investors' decisions. This paper is based on exploring one such bias, herding behaviour. Herding behaviour involves an investor mimicking the behaviour of other investors in the market for investment decision making irrespective of fundamentals. The current paper systematically reviews the literature based on 76 empirical studies during 1991-2022 detecting herding behaviour in equity markets, the nature of the herding and the reasons behind the herding behaviour. Findings of study reveal that herding behaviour is a phenomenon which has occurrences in the short run and not in the medium and long run, herding is more prominent in developing nations than developed nations, and herding is more prevalent during the crisis period and is contagious in nature.

1. Introduction

The pillars of standard finance relied on two main assumptions, rationality of investors and arbitrage. It assumes that investors act rationally in the market and if there is any mispricing in the market that is corrected through arbitrage and security prices would automatically come to its fair value. On the other hand, behavioural finance is based on the premise of investor's psychology not on rationality and limits to arbitrage (Barberis and Thaler, 2003). Behavioural Finance is developed in response, when standard finance models failed in explaining a host of anomalies such as P/E effect, January effect, Monday effect, small firm effect etc. Behavioural finance studies the effect of personal biases on the decision making of investors. Following are the common biases of behavioural finance: overconfidence, self-attribution bias, hindsight bias, confirmation bias, loss aversion, narrative fallacy, representative bias, framing bias, anchoring bias and herding mentality. This review article aims at exploring the different aspects associated with the herding mentality also known as herding behaviour.

Decision making of individuals is influenced by others in real life. When deciding which school to attend or which hotel to make reservations at, individuals frequently imitate their predecessors. Hotels with high reservations, schools with more kids or a shop with more customers tends to be more alluring to an individual who intends to make a decision, this usually is known as herd behaviour, where the individual is not making a rational choice by himself exploring the options but instead following the herd. Herd behaviour is a phenomenon which is also found in the financial markets. Investors instead of making their own decision they frequently follow the market or the other investors. This behaviour of investors where they imitate market and other investors, make the investors irrational. Understanding the decision-making pattern or investor's behaviour in financial markets is important and explained as one of the important reasons for the volatility in the financial market. During the times of financial market stress herding is more prevalent in the market led to further crash (Devenow and Welch, 1996).

Christie and Huang (1995) find evidences of investor herding, which is actually causing the volatility in stock returns. If investors are conscious of and yet influenced by market or other investors, then considered following a herd (Bikhchandani and Sharma, 2001). Economists and practitioners are keenly interested in herding behaviour in financial markets. Economists are more interested in the potential effect of investor behaviour on stock prices and on its risk-return characteristics which further impact the asset pricing models and market practitioners on the other hand are interested in the profitable trading opportunities created as a result of herding among investors. Investors herding in financial markets led the prices of the securities far away from their intrinsic or fundamental (Tan *et al.*, 2008).

Empirical analysis of herding behaviour in equity markets in the past have resulted in ambiguous results. Therefore, it is very important to first understand the concepts, structural themes and influences surrounding herding behaviour in equity markets. This review emphasis on the herding behaviour by individual investors as well as institutional investors in the equity markets of developing and developed countries, how the herding impacts the equities markets and what are the probable causes behind the presence of herding in the equity markets.

2. Methodology and Review Structure

2.1. Methodology

The current study is based on systematic review of literature (SLR). Scopus database was referred to gain insights on articles having keywords "herding" and "behaviour" In total 76 relevant research articles have been extracted after screening.

2.2. Selection and Evaluation

The screening of articles conducted as per the classic reviews (Alegre and Moleskis, 2021; Moher *et al*, 2009; Kumar and Goel, 2015; Spyrou, 2013). Scopus database was referred to gain insights on articles having keywords "herding behaviour". In all, 2095 documents were extracted and further refined for the field finance and economics. The screening criteria comprised documents investigating herding behaviour from 1991 till 2021. Time span of 1991 onwards was chosen as the study period

as herding behaviour in capital markets first pointed out in early 1990s. Bikchandani *et al.* (1992) and Banerjee (1992) were the ones who first pointed out that once a good number of agents arrived at a decision in the market, the chances of other agents mimicking their actions is very high even by disregarding their own information and opinion. The time period selected was 1991 to 2022 for screening but after other exclusion criterion relevant research studies were found between 1998 to 2022.

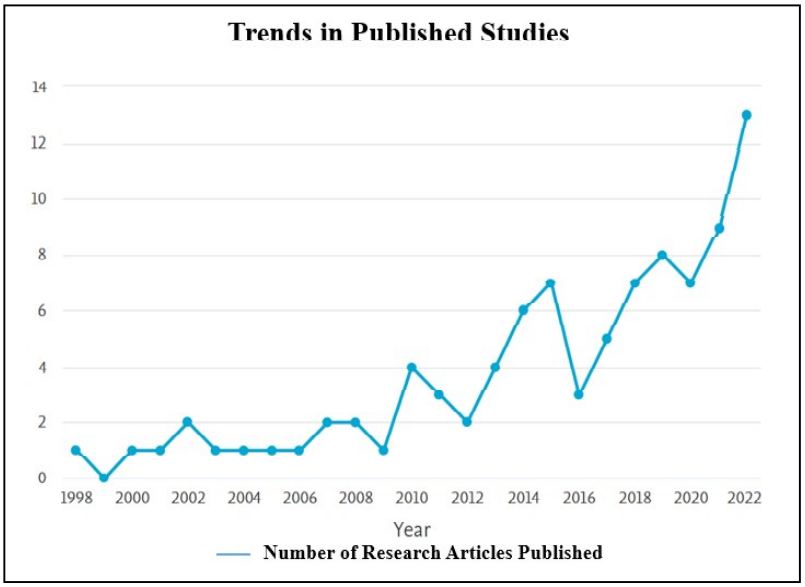

Figure 1: Trends in Published Studies

Source: Authors' Own Compilation

Fields of study comprised business, management and accounting, economics, econometrics and finance. Further, the study was limited to 14 significant journals published in English in the field of economics and finance having "herding", "herding behaviour", "behavioural finance" and "stock market" as keywords. For SLR Keupp and Gassman (2009) suggested journal impact factor criteria for selecting papers, as a result top quality papers extracted from journals having impact factor more than one (Fig. 2).Also, the citations of the research articles from these selected journals are very high (Fig. 3), which implies that research articles published in these journals are likely to accept ideas that are analysed, very closely evaluated and used in further studies. Few research papers eliminated on the basis of lower impact factor of the journal (Paul and Criado, 2020).

This review article based on the previous empirical studies detecting herding behaviour in equity market and the behaviour of the herding, if exist and what are the reasons behind the herding behaviour. After screening through the above-mentioned criteria, in all 97 articles were shortlisted. We studied all the 97 articles to find the irrelevant articles. We further screened the research articles to find their

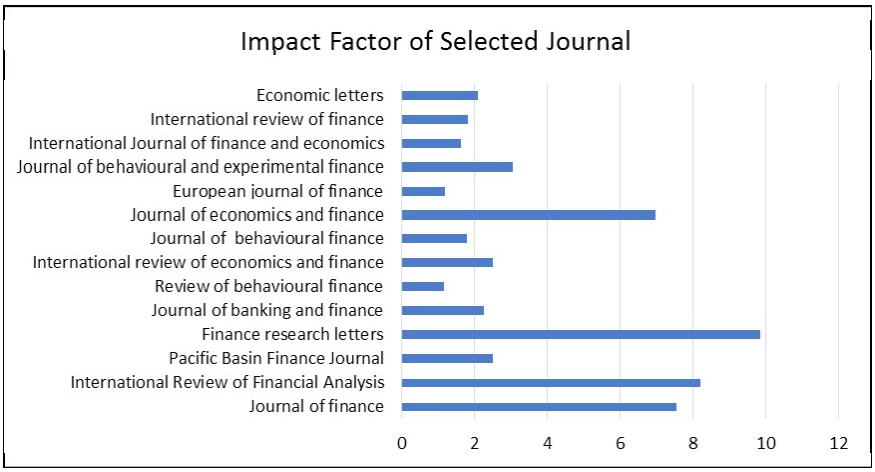

Figure 2: Impact Factor of Selected Journal

Source: Authors' Own Compilation

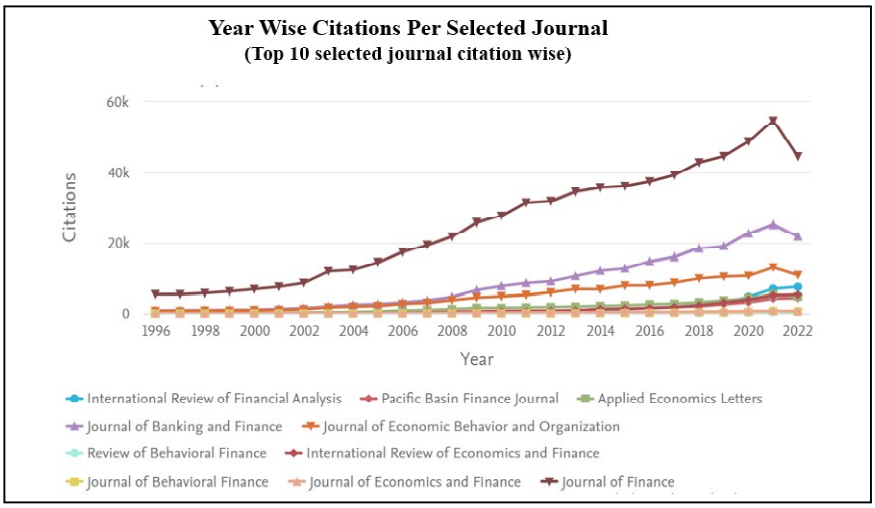

Figure 3: Year-wise Citations per Selected Journal

Source: Authors' Own Compilation

relevance for the study, resulted in elimination of 21 papers and finally we used the 76 papers for review. We used the PRISMA framework to select the research articles for the study.

a) We used the time period from 1991 to 2022, because the herding behaviour in capital market first studied in early 1990s and the gain the momentum in late 1990s with many unexplained anomalies in the financial markets and failure of fundamentals explaining the behaviour of investors during the crises.

b) We used herding, behavioural finance and stock market as other keywords as further search criteria to access the relevant studies for our review.

c) The literature finally identified 76 relevant studies for the review from the 14 journals having high impact factor and citation scores. We also find an increase in the studies of herding behaviour in top rated journals in the last few years.

d) Empirical analysis of herding behaviour in equity markets in the past have resulted in ambiguous results. Therefore, it is very important to first to understand the concepts, structural themes and influences surrounding herding behaviour in equity markets. This review emphasis on the herding behaviour by individual investors as well as institutional investors in the equity markets of developing and developed countries.

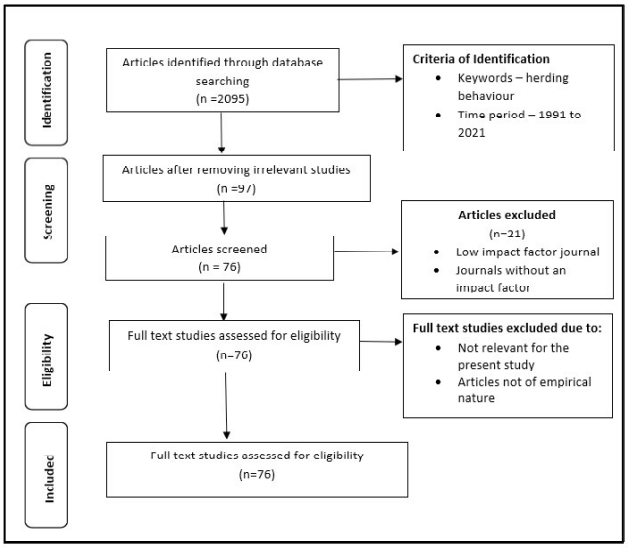

Figure 4: PRISMA Framework for Current Study

Source: Authors' Own Compilation

3. General Overview

3.1. Herding Behaviour

Herding behaviour is the human tendency of following the herd (crowd), for making decisions and conclusions, which would not have been made if they were alone. It is based on the concept of social conformity and the want to not be differentiated vastly from others, where alignment of one's own idea with that of others seems proper. The term 'herd behaviour' is common both in the academic world and outside it. Outside of academia, the definition of herd behaviour is somewhat obscure. It has its roots in the analogy of financial investors taking on the traits of animals, who choose to stay

with the herd 'like sheep or lemmings do'. It is a correlated or co-integrated behavioural pattern among individual investors, firms of an industry or even stock markets of a country (Dermier *et al.,* 2006) and an apparent intent by one investor to imitate the action of other investors in the market (Bikhchandani and Sharma, 1992).

Hwang and Salmon (2004) argue that herd behaviour is in fact a form of inconsistency in the face of the EMH assumptions, as current prices of stocks can be driven far away from their fundamental value or intrinsic values (the equilibrium stock value according to conventional stock market models like the Capital Asset Price Model), generating stock prices which do not give us the true picture of the company's value. There were enough examples in the markets during the 1970's to suggest that herding behaviour was a practice which was rampant. An attempt to explain herding using EMH was unsuccessful as the information uniformity amongst the investors was missing in the markets and indeed, investors could exploit this information gap and gain abnormal returns, which contradicts the EMH. This could throw the markets into an imbalance and lead to inexact values of securities because of the irrationality at play (Demirer and Kutan, 2006).

Herding behaviour in finance, in general, can be termed as an action that is influenced by surrounding investors in the financial market. But every parallelisticaction in the financial market need not be termed as herding behaviour in its true sense.

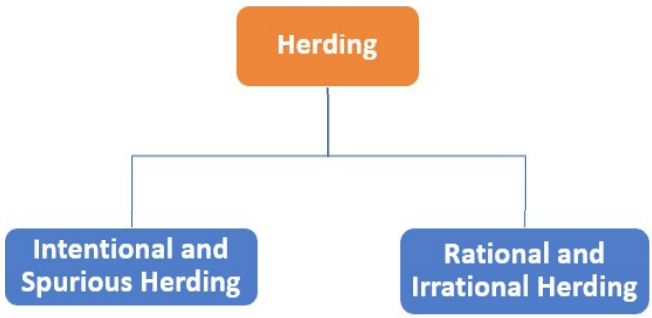

Figure 5: Types of Herding

Source: Authors' Own Compilation

3.2. Intentional and Spurious Herding

Devenow and Welch (1996) were the first one to categorize herding into two significant but less understood branches, that of intentional herding and spurious herding. They recognized various incentives at play when analyzing the two types of herding (for example, externalities, bankruns, liquidity in market etc.). Kremer and Nautz (2013) broadened the spectrum and talked about three types, including a type they termed 'unintentional herding'. Unintentional/spurious herding takes place when the investing patterns of market participants are in sync because all of them receive the same information structure, on whose basis they plan their buy/sell/hold decision. But this reaction cannot be termed as herding

in its true form, as the market participants are merely responding to information set which is publicly available and can be analysed.

This is in stark contrast to intentional herding, which is defined as an obvious intent of an investor who attempts to emulate the actions of other investors in the market (Bikhchandani and Sharma, 2001). The decisions arrived at by investors in this scenario is not based on the information set, which might be completely ignored in some cases, but on the desire to mimic and garner returns like other investors (Caparrelli *et at*., 2004). Spurious herding does not affect market inefficiency and is sometimes seen as a measure of market efficiency as investors make optimal use of the available set of information. Contrary, intentional herding does affect stock prices and contributes towards market inefficiency.

3.3. Rational and Irrational Herding

Christie and Huang (1995) further classified herding as rational and irrational. Often, humans tend to herd towards moments of conformity and certainty. During market stress investors feel more comforted in following the masses in the market instead making their own decision, which make them feel less prone to incorrect decision. Thus, investors are more likely to herd in the times of financial downturn or market stress.

Rational approach relates to a situation where the investors observe the general decision-making process in the market and then take their decision on the previous action of other investors. An investor then invests if the number predecessors who invest in a particular security is at least two times bigger than the number of predecessors who do not invest in that security (Bikhchandani and Sharma, 2001). Thus, if the investor is getting a clear signal from the market not to invest in an asset class but does so anyway just because the previous three investors were participating, then it is the form of rational herding. This is so because the individual here chooses to not include their private information into the private pool of data, which might be detrimental for future investors.

3.4. Institutional Herding

As explained before, herding can be undertaken by either individuals or institutions. The study of institutional herding can be categorized into the early studies, which suggest no signs of herding in such settings, and the more recent studies, which suggest otherwise.

Sias (2004), inspected the data for US and found that institutional herding did exist and that such investors generally buy and sell the same securities as each other and tend to follow the positive feedback trading strategies- a signal of market inefficiency. But surprisingly, he did not encounter any evidence confirming that institutional herding drove securities prices away from their fundamental or intrinsic values, which led to Sias (2004) arguing that the institutional herding is the result of deduced information by institutions from other institution's transactions.

Choi and Sias (2009) similarly, reported a high level of institutional industry herding. They have taken industry level data and proved that the industry level herding stems from manager's decisions and these levels of herding are more prevalent in smaller and more volatile industries. Many other studies inspect institutional herding for other markets than US and the consensus points to the fact that smaller markets are plagued with the problem of herding, in general. Let us first talk about results

from the European markets. Wylie (2005) found that, using UK data (a developed market), a very small number of equity fund manager herd in case of large cap stocks with little to no herding with regard to stocks with lower capitalizations. Holmes *et al.* (2013) found evidences for herding in Portugal equity market by using monthly institutional ownership data and further analysis reveals that this is intentional rather than spurious herding and often becomes a problem due to reputational reasons. Similar evidence confirming institutional herding can also be found from Asian market studies as well. Kim and Nofsinger (2005) carry out a comparative study between Japan and the US and found that Japan is plagued with lower level of institutional herding compared to the US. Iihara *et al.* (2001) employed yearly percentage change in institutional ownership as an intermediary for investor herding to study the data set for Japan and found that both institutional as well as foreign investors portray herding. Li *et al.* (2017), in a study of Chinese equity markets, argue that institutional herding in Chinese markets is more than individual herding because of the possession of a big data set in the hands of the institutions, whereas individuals can only herd based on public information and attention-grabbing events.

When we talk about institutional herding, we should also talk about herding of analyst recommendations, as these recommendations by the analysts are what form the decision-making block for individual investors. Hong *et al.* (2000) employed an I/B/E/S (Institutional Brokers Estimate System) dataset of 8,421 US security analysts. They have recorded their forecasted earnings from 1983 to 1996, to examine how their career concerns could have dictated what kind of a recommendation they would provide and the reliability of their forecasts. The result manifests that, on average, analysts who have just started out in their career and make forecasts on the basis of their own analysis and judgements instead following the market are more likely to be fired than the experienced analysts who follow the market. In simpler terms, new analysts generally herd more than their more experienced peers. This was reasoned out as follows: An agent who faces a threat to his career prospects will tend to conform more than an agent who does not face any such impeding threats.

Welch (2000) used the database of 226 U.S. brokers from 1989 to 1994 and found that the recommendation of any analyst would have a positive influence on the other analyst's forecasts and recommendations. This influence is stronger during the time of bullish market conditions, implies a very low quality of aggregation of information during uptrends. There also are studies which show no such herding bias with respect to analysts. According to a study by Bernhardt *et al.* (2006), analysts use their own data and do not participate in herding. He criticized the previous researches on the grounds of poor methodologies employed. According to him, methodologies in the past that show analyst herding point to clustering as a form of herding. Chen and Jiang (2006) used the revised methodology to analyse Chinese analyst recommendations and found that most analysts rely on their own private information set, which may or may not be biased. If there is bias involved, then it is supposed to be attributed to the factor of incentives and not behavioural anomalies. Similarly, Naujoks *et al.* (2009) confirms this for the German analyst data.

Therefore, while comparatively older data and studies are analysed, we arrive at a conclusion that herding is present in analyst recommendations. But these findings were devoid of sensitivity analysis and came under the scrutiny of various researchers later on, who pointed out the flaws in the

methodologies employed by the early studies. Newer studies, with better methodologies and sensitivity analysis in place present the view that analyst recommendations are formed only based on private information held by them and one analyst's recommendations are independent of other analyst's recommendations.

4. Review of Empirical Findings based on the Extant Literature

As per previous empirical studies carried out to analyse the presence of herding, there is a consensus on the fact that characteristics of an emerging economy makes it very conducive for its financial markets to manifest herding, in comparison of developed market (Economou *et al.*, 2011). Bikhchandani and Sharma (2001) pointed out that 'comparatively low level of transparency, poor reporting requirements & accounting standards, costly acquisition of information and relaxed regulations' were some of the possible complications with the emerging economies. This section is divided into two parts viz., herding during normal market conditions and during times of market stress.

4.1. Herding during the Normal Market Times

On the basis of the review of extent literature this section can be further divided in two parts. First, the studies confirming the herding and second, the studies denying the presence of herding.

4.1.1. Studies Confirming the Presence of Herding

Chang *et al.* (2000) studied the markets of emerging economies, i.e., Taiwan and South Korea and then compared the results with that of developed markets like Hong Kong and Japan and confirmed the presence of herding in emerging economies (South Korea and Taiwan). Lam and Qiao (2015) conducted an industry-level analysis and found that herding is prevalent in Hong Kong, especially in stocks of the financial services industry. A similar industry-level inspection was carried out by Guo and Shih (2008) for high technology stocks listed in the Taiwanese market and concluded that herding is high in case of such stocks, in comparison to traditional industries. Zheng *et al.* (2017) examined herding behaviour in nine Asian markets at industry level and found significant evidences for industry level herding. They further found that herding is more prominent in the Technology and Financial industries and weaker in Utility industry.

Cakan and Balagyozyan (2014) conduct a study for the Turkish Stock Exchange between 2002 and 2014 and found significant evidences of herding in the equity markets, especially in the finance, services and technology sector. They also conducted a specific study to understand the pervasiveness of herding during the financial crisis and found that the finance sector did show herding during the 2008 crisis period. Demirer and Kutan (2006) theorized that small cap stocks and the presence of large number of retail investors in the non-financial sectors lead to herding. These conditions are endemic to emerging markets, where large cap stocks are few and the development of the financial sector is low on the scale of measure. Chiang and Zhend (2010) examined the herding behaviour in eighteen countries from 1988 till 2009. Their study confirmed the presence of herding in Asian markets and developed stock markets except U.S. They found no evidence of herding in U.S. stock market however; U.S. stock market was found to be a reason of herding in non-U.S. markets.

Cakan *et al.* (2019) studied the relationship between speculation in oil markets and herding in equity market for Russia, Brazil and Turkey. They found that a greater oil speculation led to herding in stock market of Russia and Brazil whereas no significant evidences of herding for Turkey. Salem (2019) conducted a study in Jordan and Saudi Arabia to understand the Arab female investment behaviour with respect to investment literacy, investment confidence, risk tolerance and herding behaviour. He found that Arab women investors tend to herd more as a result of lower investment confidence, literacy and risk tolerance level.

A study conducted by Tan *et al.* (2008) confirmed the presence of herding in both Chinese A-share and B-share stock market. Chong *et al.* (2017) found the significant evidences for herding during the up and down markets for Chinese stock market. They also found that the main reasons behind the herding in Chinese stock market are analyst recommendation, small investor horizon and risk. One of the most quoted studies in the field of herding is the study of Lao and Singh (2011), where they analysed the market conditions in the case of India and China and they also concluded that herding does exists in these markets.

Galariotis *et al.* (2015) conducted a study for testing herding for U.S. and U.K. top stocks towards market consensus. They found that investors in U.S. tend to herd on release of important macro data. During different crisis period, in U.S. market investors herd as a result fundamentals and non-fundamentals whereas in U.K. investors herd as a result of fundamentals only. Kim and Nofsinger (2005) found that institutional herding is higher in developing nations and confirm this theory using empirical evidence from the Japanese market. This study was complimented by Jeon and Moffet's similar analysis in the context of Korea (Jeon and Moffett, 2010).

4.1.2. Studies Denying the Presence of Herding

One of the most quoted studies in the field of herding is the study of Lao and Singh (2011), where they analysed the market conditions in the case of India and China and concluded that herding does exists in these markets. In direct contrast to Lao and Singh's (2011) study, Demirer and Kutan (2006) established no herding for the Chinese markets, by studying Shanghai stock exchange and Shenzen stock exchange. They were not the only ones who denied herding behaviour in Chinese market. Gebka and Wohar (2013) inspected herding in 32 countries around the world. This was one of the studies with a higher number of countries under study than usual. Surprisingly, no significant evidences found for the presence of herding when the markets were studied as a whole, although the sectoral performances did exhibit herding from time to time.

Intraday data for the NYSE analysed by Gleason *et al.* (2004) which too did not find evidences for herding amidst sectoral ETFs. Henker *et al.* (2006) conducted the same study for the Australian stock market and found that intraday trading does not show illustrate herding. Garg and Gulati (2013) stated that according to their investigation, Indian markets are also free of any herding patterns.

4.2. Herding during the Market Stress times

Since herding can cause prices to bloat and shrink manifold, they hold the potential to create bubbles and lead to financial crises. Many studies have been conducted to find the association between financial

crises and herding. Chang *et al.* (2000) concluded that the herding is inconsistent and asymmetric, after studying the herding behaviour in the South Korean equity market. But interestingly, they noticed that herding among investors was more prevalent during times of sporadic financial crises. By sporadic, we mean financial crises occurring at irregular intervals in an economy. Dang and Lin (2016) examined the herding for the stocks of Chi Minh Stock Exchange, Vietnam. They found intentional herding during the crises period, and magnitude of herding falls following the crises. Hwang and Salmon (2004) conducted a similar study with South Korean (emerging market) and US (developed market) markets and found that herding was present before the crisis, while there is a fight of fundamentals amid crises.

Data of individual stocks were analysed for South European countries and after analysis Economou *et al.* (2011) found significant evidences that herding is more prominent during financial distress in countries like Greece and Italy. This was a time when these countries were reeling under political and financial instability. Economou et al. (2016) also examined the herding behaviour in Athene Stock Exchange with respect to the crises during 2007 to 2015. They found significant evidences for herding during the time of crises. Mobarek *et al.* (2014) extended their and included 11 European countries and the results showed significant evidence of presence of herding during the periods of market stress (bearish markets). According to them, this prominence is higher in continental countries, with Germany being one of the main influencers in contributing towards market herding in the region.

Bowe and Domuta (2004) analysed foreign investor and domestic investor investment patterns using the data from Jakarta stock exchange for finding herding and positive feedback trading during pre, post and 1997 Asian crisis. They found the significant evidences of herding that foreign and domestic investors herd but foreign investors tend to herd more than domestic investors. Hwang and Salmon (2001) also conducted their separate studies on developed markets like US, UK and an emerging market- South Korea. This was done to study any differences in the herding behaviour present based on the development level of the market in question. They found that the Russian and Asian crises (1997 & 1998) were a major contributor on herding towards market returns in South Korea. In the developed nations, when the crises become noticeable, the herding behaviour connection with the market return becomes very weak; in effect this means that herding behaviour does not exists during financial crises in developed markets. Lao and Singh (2011) analysed the relationship between abnormal market return and extreme market returns for the equities markets of India and China by comparing the prevalence of herding behaviour during normal market conditions i.e., when the market is silent and extreme market conditions (when the markets are turbulent). By extreme market conditions, they meant both upward and downward movements. Additionally, the investors in these markets were described as inexperienced who are easily manipulated by external information delivered by the media. They too, found significant evidence of herding behaviour during market distress.

Chiang and Zheng (2010) generalized the studies after studying the global markets and concluded that herding is triggered during the times of financial crises from the origin country and contagiously affects the neighboring countries. This was explained with the help of similar conformist views, conservationist standard and psychological viewpoints due to close physical proximity. Similar studies later supported this theory of the contagious nature of herding, i.e., it can be transferred from one

market to another or in simpler terms, presence of herding in one market can lead to herding in nearby and related markets as well. Chiang et al. (2007) gave the example of the financial crisis in Asia in the late 1990's which affected the equity markets to a huge extent in that area. Similar results were found when individual events were analysed. For example, the crisis involving the Mexican Peso in 1994 and the Black Monday crash that happened in 1987.Corsetti *et al.* (2005) found out that the contagion effect need not be for countries in close physical proximity, but the mere factor of market interdependence can lead to the spread of the herding behaviour. They found that crisis in Hong Kong that took place in 1997 had severe consequences as far as the French stock market. Chiang and Zheng (2010) tried to find similar data for the US and Latin American markets. Some observations did point to interdependence of financial markets and the contagion effect, but it was not really significant. Some stock markets also tend to herd together in a similar fashion and therefore because of this accumulation effect, crises may occur. McAleer and Caporin (2012) categorized evidence of contagious herding taking place between American and Asian stock markets. Boyer *et al.* (2006) found that the main culprits here were international investors, who tend to be heavily invested in emerging markets.

All in all, there is increasing evidence of the prominence of herding behaviour in association with financial crises and this has been supported by empirical analysis of many studies done using data from the past two decades, spanning both developed and emerging markets.

5. Discussion and Conclusion

Herding is a phenomenon in the financial markets, where the market participants tend to ignore the information they have, and mimic the actions of other investors, rationally or irrationally. This behaviour is akin to market inefficiency and goes against the principles of Standard Finance, including the Efficient Market Hypothesis (EMH), which says that all the information is available to all the market participants and that each market participant acts rationally based on their own analysis of the market conditions.

The current paper systematically reviewed the literature based on 76 empirical studies during 1991-2022 detecting herding behaviour in equity markets, if any, the behaviour of the herding, and the reasons behind the herding behaviour. Herding behaviour is a phenomenon which has occurrences in the short run and not in the medium and long run. The literature very much cleared that emerging markets experience a higher level of herding than the developed markets. Probable reason can be the reliance on unorganized sources for information, lack of transparency, inefficient institutional infrastructure, immature retail investors, unavailability of the information etc. in case of emerging markets. During the time of market stress herding is more prevalent in both emerging as well as developed markets as investors feel more comfort in following the herd. Herding behaviour is detected in equity markets not only for retail investors but also for institutional investors, as their capability to access the information set is more regressive.

Herding is also present in analyst's recommendations and young analysts tend to herd more than the experienced ones. Herding in the equity markets derive the securities price far away from its intrinsic or fundamental value and make the market inefficient and can make the market more volatile, which could imply that investors need to hold a larger portfolio to spread the risk out, as compared to when the markets are efficient. The study has certain limitations which gives the further scope for studies.

Firstly, the study is based on review of studies listed in Scopus database exclusively. The research could be extended to other databases. Secondly, the study is limited to herding in equity market only. Herding could be explored in derivatives markets, mutual funds, real estate, crypto currency, and money market as well.

Further, the literature showcases lack of exploration of herding in developing nations (specifically South East Asia and Africa). The data which has been used for detecting the herding in the equity market is generally on daily closing prices. It would be interesting to depict the trends on herding using high frequency data including intra-day prices. Thirdly, the current paper is restricted to conceptual analysis of the empirical evidences of the extant literature. Statistical analysis could be employed via meta-analysis to further validate the findings of this paper on quantitative grounds.

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Forecasting Nifty Using Autoregressive Integrated Moving Average Model

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Nifty 50, ARIMA, AIC, Correlogram, Parsimony

JEL Classification
C2, C22, C5, C53, C87

Abstract: The study focuses on the forecasting capability of Auto Regressive Integrated Moving Average model for the nifty 50 index and how far the econometric models are dependable to prognosticate stock market indices. For this purpose, data have been collected from 15 June 2020 to 28 Jan 2022 Based on these data, forecasting is made from 18 Jan2022 to 28 Jan 2022. The series is converted into 1st difference as level data is not stationary, After making it stationary for nifty the researcher determines AR (p) lag and MA (q) lag through ACF and PACF tests. The ARIMA (1, 1, 3) model is accepted as the model that fulfills parsimony as this model having maximum significant variable, sigma square is minimum and Adjusted r^2 is maximum and AIC (Akaike info criterion) and SIC (Schwarz criterion) are minimum. The E-views 10 software package is used for ARIMA analysis. At last, it is seen that the ARIMA is not capable of forecasting data for a long period of time as time progresses it tends to forecast inaccurately. The investor cannot solely depend upon this model for their investment in securities market. Rather they must use other technical analysis tools.

1. Introduction

In a country like India a few people are investing their hard earned money in securities market but, there is always curiosity amongst the retail investors to predict the market index for a specific time period. In this approach, the econometric model plays a pivotal role in forecasting stock market indexes for a short duration. After India adopted LPG (liberalization, privatization, and globalization) in 1991 after that a lot of reforms took place and SEBI was set up in order to control securities market in a proper manner (Pandey *et al.*, 2021). While we talk about stock market in the Indian context, we basically concentrate on Nifty and Sensex.

The index of Bombay Stock Exchange is known as Sensex which comprises of top 30 (market capitalization) scripts, which are actively traded. Created in 1986, the Sensex is the oldest stock index in India and is operated by Standard & Poor's (S&P). Another popular index in India is Nifty, which is the benchmark index of national stock exchange. It comprises 50 stocks of large companies according to market capitalization. The nifty was launched on 22 April 1996. Since its inceptions, the nifty has

delivered around 17 percent returns. It is surprising to note that the nifty index, which was 1000 base in November 1995 grew to 17000 in the year 2022 for the month of January. So for a layman there is always a keenness in his/her mind as to what will be the change in the forthcoming week or month so that a retail investor can buy or sale a securities at optimum price/a premium (Pandey *et al*., 2020).

Many technical tools and econometric models are there to predict the nifty index .The Box-Jenkins model, i.e., ARIMA is quite a famous tool for prediction. Univariate time series models are so unique, where the econometricians make models and forecast financial variables by using only facts contained in their own past values and possible current as well as past values of an error term. The time series models are an attempt to capture empirically relevant features of the observed data that may have arisen from a variety of different structural models. An important class of time series model is the family of Autoregressive Integrated Moving Average (ARIMA) model which was developed by Box and Jenkins, the noble laureates in the year 1976. Time series models are widely accepted when structural models fail. When data is arranged in time wise like daily, weekly or monthly basis, the researchers use (ARIMA) autoregressive integrated moving average. It is an extension of Autoregressive Moving Average Model .The only difference between the two models is that in the case of ARMA, the data is stationary at level but in the case of ARIMA the data are stationary at 1st difference.

2. Review of Literature

Reliance, TCS, HDFC and INFOSYS from 2010 to 2020, data has been collected and applied various statistical tools like correlation, ARIMA, Monte Carlo simulation and compounded annual growth rate for detecting relationships and tried to forecast the prices of above securities using ARIMA But they conclude that the share price was not following linearity so they suggested that one should follow non-linear model (Jackson *et al*., 2021).

Pathak and Kapadia (2021) forecasted the nifty index by using data of the preceding 5 years (September 2015 to September 2020) and they found that ARIMA model was quite capable of predicting for a short period of time and they found that ARIMA was quite capable of forecasting data for short period of time.

Kulkarni *et al*. (2020) attempted to forecast the future price of Infosys shares using ARIMA model by R programming language. In their paper, Data of Infosys share price had collected from 2007 to 201 and data (2007-2014) used for ARIMA fitted sample on the basis of above data the model trying to forecast Infosys share price from 2014 to 2015 and the authors found that ARIMA was quite capable to predict share price for a short term. Vikram *et al*. (2022) have analyzed the volatility of Indian stocks using GARCH model and identified the least volatile stocks of Indian exchange.

Agustin (2019) collected data of Indonesia stock index from jan2017 to feb2019 and applied ARIMA model after they concluded that ARIMA (1,1,1) model was best having 78% accuracy. Huang (2019) had revealed that ARIMA model was quite capable of forecasting whether American market is efficient or not. In his studies, he compared Random Walk Model and ARIMA model and MDM test. Later he found that ARIMA was quite capable of forecasting US market. He had experimented these above models on data of daily returns of S&P 500 Index starting from October 19th, 1988 to October 18th 2018.

Koulis *et al.* (2018) collected data starting from 4th Jan (2010) to 31st December (2015) and applied ordinary least square method, error correction model, ARDL model for risk management. The researcher found that varying hedge ratio was more important rather than fixed hedge ratio. Almasarweh and Wadi (2018) had taken banking data from Amman Stock Market in Jordan and tested the ability of ARIMA in forecasting banking data. In their article, the authors collected data of 2000 observations between 1993 and 2017 and applied ARIMA model. It had been seen that ARIMA(1,1,2) model having 1.4 root mean square error was the best model, further the researchers concluded that ARIMA was best for short term prediction.

The combination of ARIMA and ANN(Artificial Neural Network) will provide robust results as compared to independent use of ARIMA model (Babu & Reddy, 2014). The researchers tried to monitor accuracy of results in both ARIMA and ANN independently and jointly subsequently they found that the combination of ARIMA and ANN was more powerful rather than the single model of ARIMA or ANN.(Babu and Reddy, 2014)

Emenike (2012) had attempted to forecast index of Nigerian Stock Exchange by ARIMA model. In his research the researcher had collected data on monthly basis beginning from the year (1985) to December (2008) for fit sample whereas January 2009 to December 2009 for forecast sample .He found that ARIMA model failed to predict accurately during the period of Jan 2009 to December 2009 as it was the time period of Lehman Brother crisis. (Emenike, 2012)

Devi *et al.* (2012) the researcher had collected data of nifty50 index, Reliance, Ofss, Abb and JSW Steel from 2007 to 2011.the author used ARIMA and MAPE, PMAD and % error accuracy to discriminate between actual data and forecasted data, later they found that MAPE was more in JSW steel and PMAD is more in case of ABB further % of error accuracy in ABB followed by reliance. Balsara *et al.* (2007) found that the ARIMA model was capable to forecast accurately than the naive model. In their study the authors collected data of 2 categories of share price (class A and class B) of Shanghai Stock Exchange on daily basis from 1991 to 2005 and then applied ARIMA model to forecast the future price of the script by adopting both the naive model and ARIMA model. Later they discovered that ARIMA outperformed the naive model considerably

3. Objective and Hypothesis of the Study

3.1. Objective of the Study

The main focus of this paper is to see how far the Auto Regressive Integrated Moving Average Model is able to predict Nifty index for a short period of time.

3.2. Hypothesis of the Study

H_{01}: ARIMA model is not capable of predicting NIFTY for shorter period of time.

4. Research Methodology

The primary objective of the ARIMA model is to forecast for future on the basis of past data. ARIMA is a time series model which is widely used in finance and economics for prediction. This model used

time series data to forecast future and also detect autocorrelation in the respective data. This model is a stochastic modeling approach which can be used to forecast the chances of future value lying in the overall confidence limit. The utmost necessary for ARIMA model is that the variable must be in stationary. Unlike traditional regression model, in ARIMA model Y_t the dependent variable has to be explained by the previous or lagged values of Y_t itself and the lagged value of e_t, which becomes uncorrelated random error term having arithmetic mean zero and fixed variance i.e a white noise error term.

ARIMA consists of two words AR and MA. AR means autoregressive and MA means moving average. In AR the independent variables are lagged dependent variables. There are no other independent variables.

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + e_t$$

Here Y_t – It refers to the dependent variable

$Y_{t-1,}$ Y_{t-2} - These are different lags of dependent variable included as independent variable in the model

β_1 and β_{2-} these are coefficients of independent variables.

α- it is a slope or intercept or constant in the model

e_t –Error tem in the model

$$Y_t = \alpha + \beta_1 Y_{t-1} + \beta_{2t-2} \ldots\ldots\ldots\ldots \beta_p Y_{t-p} + e_t$$

This is called AR order of p i.e. AR (P).

MA stands for moving average. In this we used lag error terms as independent variables.

$$Y_t = \alpha + \beta_1 e_{t-1} + \beta_2 e_{t-2} \ldots\ldots\ldots\ldots \beta_q e_{t-q} + e_t$$

In the above equation, q is the different lag error terms are used as independent variable. Independent variable $e_{t-1,\ through}$ e_{t-1} is uncorrelated error terms. Moving average models are abbreviated MA(q) as "q" has the number of lagged error terms present in the time series data. The name moving average comes from the fact the moving average of past error term with the mean of dependent variable to produce a moving average of the dependent variable. In ARIMA the word "I" stand for integrated i.e. the data must be stationary if it is not we have to make it stationary by taking the first difference, i.e., denoted by I(1).

The ARMA model equation is as follows

$$Y_t = \alpha + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_p y_{t-p} + e_t + \omega_1 e_{t-1} + \omega_2 e_{t-2} + \omega_q e_{t-q}$$

α – it is a constant

(β_1..$\beta_{p)}$- These are the coefficients of lag value of the dependent variable

$Y_{t-(1\ldots..p)}$- these are the numbers of lag of the dependent variable

E_t- error term

$E_{\ (t-(1\ldots q))}$- these are the numbers of lag for error term

$\beta(_{1..q})$ – Coefficient of error term on different lag

For determination of p and q for AR and MA, the author had conducted ACF and PACF tests. The ARIMA model has been discussed in four head

- Identification
- Estimation
- Diagnostic Test
- Forecasting

5. Data Analysis

The author has collected data for the nifty index from 15-6-2020 to 28-1-2022. The data is secondary in nature. Here the author has taken only 2 years data for forecasting as ARIMA model is only used for short term prediction. To use ARIMA model we have to see whether the variable is stationary or not as the nifty data is not stationary in level so we have to take 1st difference to became stationary. Stationary is an important condition of an ARIMA model for several reasons. One important reason is that a model whose coefficients are non-stationary will exhibit the unfortunate property that the effect of previous value of error term will have an impact on the recent value of Yt as time progresses.

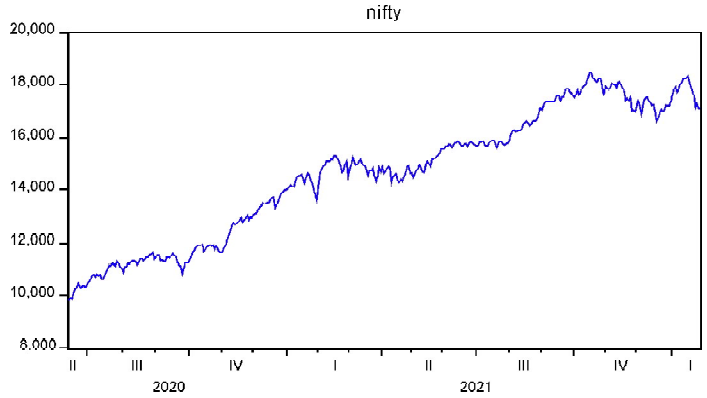


Figure 1: Nifty at Level

Source: Author's Own Compilation

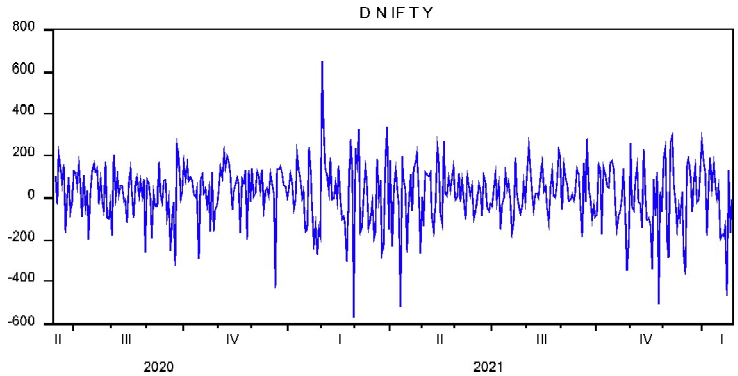


Figure 2: Nifty at 1st Difference

Source: Author's Own Compilation

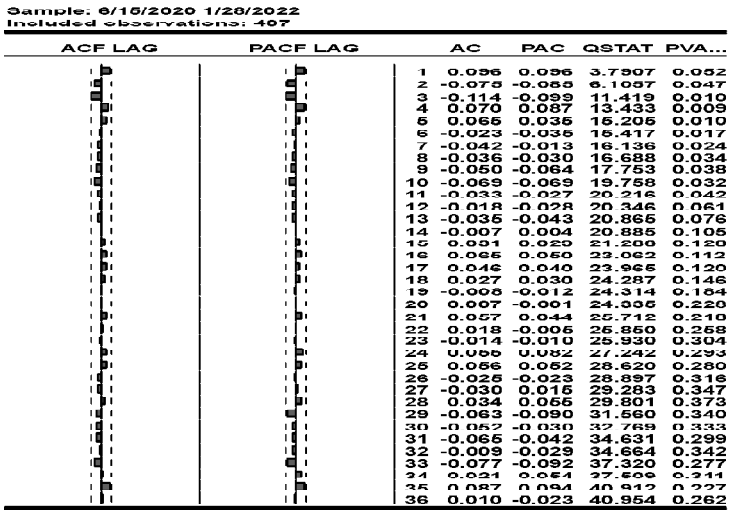
In figure 1 it is clearly visible that nifty is not stationary rather it is in trend but while we are taking 1st difference data it became stationary in figure2

Table 1: Unit Root Test for Level Data and for 1st Difference Data

Level Data	*Level of significance*	*t-Statistic*	*Prob.**
Augmented Dickey-Fuller test statistic		-1.6214	0.4707
Test critical values:	1% level	-3.4464	
	5% level	-2.8685	
	10% level	-2.5705	
1st Difference Data			
Null Hypothesis: D(NIFTY) has a unit root			
		t-Statistic	*Prob.**
Augmented Dickey-Fuller test statistic		-10.034	0
Test critical values:	1% level	-3.981	
	5% level	-3.421	
	10% level	-3.1332	

Source: Author's Own Compilation

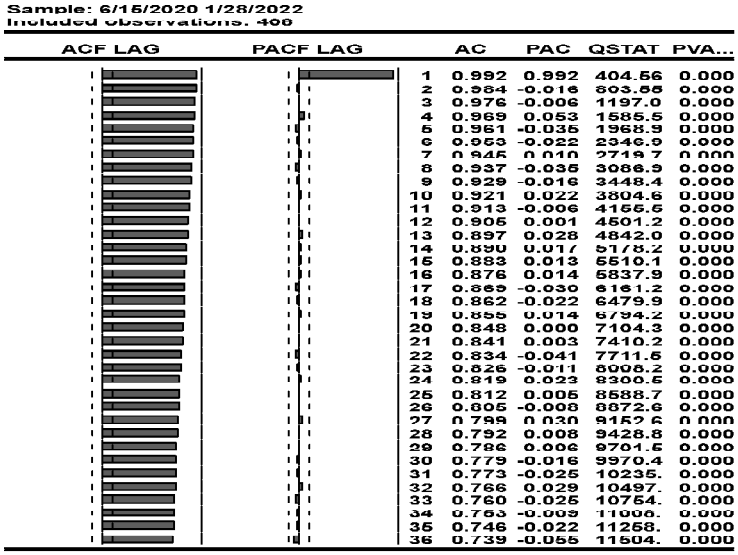
The nifty is not stationary at level. It is confirmed form the Augmented Dickey Fuller test as the p value is .4707 which is more than .05 so we accept null hypothesis that series is not stationary so to become stationary the variable must be converted into 1st difference. From Table-1 it has been shown that the variable NIFTY is stationary at 1st difference as the probability value is 0 which is less than .05 so null hypotheses is rejected and the series has no unit root. Now we can proceed further for determination of correllagram for fixing the value of "p" and "q" for autoregressive lag and moving average lag. In order to proceed further AR and MA lag the partial auto correlation function (PACF) and auto correlation function (ACF) are used. PACF gives correlation between the dependent variable and its lag value while keeping the shorter lag constant. The first correlation value for Y_t and Y_{t-1}, second one is Y_t and Y_{t-2} then Y_t & Y_{t-3} and so forth. The correlation between Y_t and Y_{t-2} does not include the effect of Y_t&Y_{t-1}.Due to this reason it is known as partial auto correlation function. ACF is different from PACF used with autoregressive model. It gives correlation coefficient between the dependent variable and the same variable with different lag, but the effect of shorter lag is not kept constant. This means that the effect of shorter lag is included in the numbers given with autocorrelation function. The correlation among current dependent variable and its second lag include the effect of correlation between current dependent variable and its first lag. This is the opposite of PACF.



	AC	PAC	QSTAT	PVA...
1	0.036	0.036	3.7507	0.053
2	-0.075	-0.089	6.1057	0.047
3	-0.114	-0.099	11.419	0.010
4	0.070	0.087	13.433	0.009
5	0.065	0.035	15.205	0.010
6	-0.023	-0.035	15.417	0.017
7	-0.042	-0.013	16.136	0.024
8	-0.036	-0.030	16.688	0.034
9	-0.050	-0.064	17.753	0.038
10	-0.069	-0.069	19.758	0.032
11	-0.033	-0.027	20.216	0.042
12	-0.018	-0.028	20.346	0.061
13	-0.035	-0.043	20.866	0.076
14	-0.007	0.004	20.885	0.105
15	0.031	0.025	21.200	0.120
16	0.026	0.050	21.382	0.112
17	0.046	0.040	23.965	0.120
18	0.027	0.030	24.287	0.146
19	-0.005	-0.012	24.314	0.184
20	0.007	-0.001	24.335	0.220
21	0.057	0.044	25.712	0.210
22	0.018	-0.006	25.850	0.258
23	-0.014	-0.010	25.930	0.304
24	0.055	0.052	27.242	0.293
25	0.056	0.052	28.620	0.280
26	-0.026	-0.023	28.897	0.316
27	-0.030	0.015	29.283	0.347
28	0.034	0.066	29.801	0.373
29	-0.063	-0.090	31.560	0.340
30	-0.052	-0.030	32.769	0.333
31	-0.065	-0.042	34.631	0.299
32	-0.009	-0.029	34.664	0.342
33	-0.077	-0.092	37.320	0.277
34	0.021	0.054	37.509	0.311
35	0.087	0.094	40.912	0.227
36	0.010	-0.023	40.954	0.262

Figure 3: Correlogram of Nifty at Level

Source: Author's Own Compilation



	AC	PAC	QSTAT	PVA...
1	0.992	0.992	404.56	0.000
2	0.984	-0.016	803.85	0.000
3	0.976	-0.006	1197.0	0.000
4	0.969	0.053	1585.5	0.000
5	0.961	-0.035	1968.9	0.000
6	0.953	-0.022	2346.9	0.000
7	0.945	0.010	2719.7	0.000
8	0.937	-0.035	3086.9	0.000
9	0.929	-0.016	3448.4	0.000
10	0.921	0.022	3804.6	0.000
11	0.913	-0.006	4155.5	0.000
12	0.905	0.001	4501.2	0.000
13	0.897	0.028	4842.0	0.000
14	0.890	0.017	5178.2	0.000
15	0.883	0.013	5510.1	0.000
16	0.876	0.014	5837.9	0.000
17	0.869	-0.030	6161.2	0.000
18	0.862	-0.022	6479.9	0.000
19	0.855	0.014	6794.2	0.000
20	0.848	0.000	7104.3	0.000
21	0.841	0.003	7410.2	0.000
22	0.834	-0.041	7711.6	0.000
23	0.826	-0.011	8008.2	0.000
24	0.819	0.023	8300.6	0.000
25	0.812	0.005	8588.7	0.000
26	0.805	-0.008	8872.6	0.000
27	0.799	0.030	9152.6	0.000
28	0.792	0.008	9428.8	0.000
29	0.786	0.006	9701.5	0.000
30	0.779	-0.016	9970.4	0.000
31	0.773	-0.025	10235.	0.000
32	0.766	0.029	10497.	0.000
33	0.760	-0.025	10754.	0.000
34	0.753	-0.009	11006.	0.000
35	0.746	-0.022	11258.	0.000
36	0.739	-0.055	11504.	0.000

Figure 4 : Correlogram at 1st Diffrence

Source: Author's Own Compilation

In the correlogram diagram the index of nifty at level data having ACF(Auto correlation function) and PACF(Partial auto correlation function) of different lag lies outside the confidence limit in figure number 3 but while we taking 1st difference the lag structure are within the bounds limit in figure

number 4. So looking at DNIFTY correlogram, the possible models for ARIMA are (1,1,1), (2,1,1), (3,1,1), (1,1,3), (2,1,3); but among 5 ARIMA structure we have to choose the best model. The model parsimony define the best having maximum significant variable, sigma square is minimum and Adjusted r^2 is maximum and AIC (Akaike info criterion) and SIC (Schwarz criterion) is minimum. Different models with regression output are as follows.

6. Result and Discussion

6.1. Model Identification

Table 2: Model (1)

Dependent Variable: D(NIFTY)
Method: ARMA

Variable	*Coefficient*	*Standard Error*	*t-Statistic value*	*Probability*
Constant	21.32067	8.061464	2.644764	0.0085
AR(1)	-0.188986	0.440552	-0.428976	0.6682
MA(1)	0.292498	0.432026	0.677037	0.4988
SIGMASQ	19453.4	976.8399	19.91463	0
		Test Results		
R^2	0.011028	AIC		12.73373
Adjusted R^2	0.003517	SIC		12.77372

Source: Author's Own Compilation

In model (1) table 2 it reveals that AR(1) and MA(1) has not significantly contributed as p value is more than .05 and also t value is less than2. In this model neither the previous value of nifty nor the

Table 3: Model (2)

Dependent Variable: D(NIFTY)
Method: ARMA

Variable	*Coefficient*	*Standard Error*	*t-Statistic value*	*Probability*
Constant	21.30751	7.366469	2.8925	0.004
AR(2)	-0.099972	0.047642	-2.098401	0.0365
MA(1)	0.082394	0.042518	1.937853	0.0534
SIGMASQ	19298.17	1014.554	19.02133	0
		Test Results		
R^2	0.018919	AIC	12.72576	
Adjusted R^2	0.011468	SIC	12.76575	

Source: Author's Own Compilation

error term previous value has significant impact for prediction. AR (1) contributing negatively as the coefficient value is -0.188986 but MA (1) contributing positively. Adjusted R^2 value is quite less so model is not acceptable.

In table 3 model 2 the AR(2) contributing negatively (-.099972) while MA(1) has positive effect but AR(2) is significant as p value is less than .05 on the other hand MA(1) have no significant effect. The adjusted r^2 value is .011 so it is more effective as compared to model1.

Table 4: Model (3)

Dependent Variable: D(NIFTY)
Method: ARMA

Variable	*Coefficient*	*Standad Error*	*t-Statistic value*	*Probability*
Constant	21.25114	7.275124	2.921069	0.0037
AR(3)	-0.134646	0.046961	-2.867197	0.0044
MA(1)	0.102389	0.042345	2.417973	0.0161
SIGMASQ	19128.65	1033.219	18.51364	0
	Test Results			
R2	0.027538	AIC	12.71703	
Adjusted R2	0.020152	SIC	12.75702	

Source: Author's Own Compilation

In table 4 model(3) it shows that all the variable are significant as the p value is less than .05 and the constant, MA(1) are contributing positive effect on nifty on the other hand AR(3) have negative effect on nifty. Adjusted R^2 is .020 so is quite effective as compared to model 1 and model 2.

Table 5: Model (4)

Dependent Variable: D(NIFTY)
Method: ARMA

Variable	*Coefficient*	*Standard Error*	*t-Statistic value*	*Probability*
Constant	21.18988	7.077473	2.993989	0.0029
AR(1)	0.083449	0.042261	1.974601	0.049
MA(3)	-0.149554	0.046649	-3.205958	0.0015
SIGMASQ	19125.62	1046.973	18.26754	0
	Test Results			
R2	0.027692	AIC		12.7169
Adjusted R2	0.020307	SIC		12.75689

Source: Author's Own Compilation

In model 4 table 5 the AR (1) and MA (3) and constant all are significant as the variables probability values are less than .05. MA (3) has negative effect on dependent variable while other are positive effect. The adjusted r^2 value is .020 it is quite high among the above model.

Table 6: Model (5)

Dependent Variable: D (NIFTY)
Method: ARMA

Variable	*Coefficient*	*Standard Error*	*t-Statistic value*	*Probability*
Constant	21.16138	6.050285	3.497584	0.0005
AR(2)	-0.090621	0.048446	-1.870557	0.0621
MA(3)	-0.137016	0.047293	-2.897195	0.004
SIGMASQ	19104.85	1063.554	17.96322	0
	Test Results			
R2	0.028748	AIC	12.71581	
Adjusted R2	0.021371	SIC	12.7558	

Source: Author's Own Compilation

In model 5 it is clear that constant have positive contribution while AR (2) and MA (3) is negative contribution towards dependent variable. AR(2) probability value is .06 which more than .05 on the other hand other variable are significant as their p value are less than 0.05.

6.2. Model Estimation

Table 7: Different Model

Arima Model	*(1,1,1)*	*(2,1,1)*	*(3,1,1)*	*(1,1,3)*	*(2,1,3)*
Significant Coefficent (max)	0	1	2	2	1
SIGMASQ (MIN)	19453.4	19298.17	19128.65	19125.62	19104.85
ADJ R2 (MAX)	0.003517	0.011468	0.020152	0.020307	0.021371
AIC(MIN)	12.73373	12.72576	12.71703	12.7169	12.71581
SIC(MIN)	12.77372	12.76575	12.75702	12.75689	12.7558

Source: Author's Own Compilation

From the figure Table 7 it is confirm that ARIMA (1,1,3) model is the best model as it follows parsimony. Besides this model has maximum significant coefficient, minimum sigma square, maximum adjusted r^2, AIC and SIC is minimum.

As per ARIMA (1, 1, 3) model the nifty equation will be as follows.

Nifty $(Dy_t) = 21.18988+0.083449(y_{t-1}) +(-0.149554)_{et-3}+e_t$

6.3. Diagnostic Test

After deciding the model we have to check the error term for (1,1,3) model and it should be stationary. The stationary of error term can be checked through conventional unit root test or Q statistics.

Table 8: Unit Root Test for Error Series

H_0: Residual has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on AIC, max lag=17)

	Level of Significance	*t-Statistic*	*Prob.**
Augmented Dickey-Fuller test statistic		-19.9627	0
Test critical values:	1% level	-3.44624	
	5% level	-2.86844	
	10% level	-2.57051	

Source: Author's Own Compilation

In Table 8 as the probability value is less than .05 of unit root test for residuals so the null hypothesis is rejected error term has stationary.

6.4. Forecasting

Here the researcher tries to forecast nifty from 18-1-2022 to 28-1-2022 on the basis of sample data ranging from 15-6-2020 to 17-1-2022. The forecasted nifty versus actual nifty is as follows.

Table 9: Comparison of Actual Nifty with Forecast

Date	*Actual*	*Forecast*	*Mean % Error*
18-Jan-22	18113.05	18325.8865	-1.17505
19-Jan-22	17938.4	18350.7709	-2.29882
20-Jan-22	17757	18364.0725	-3.41878
21-Jan-22	17617.15	18384.6041	-4.35629
24-Jan-22	17149.1	18405.739	-7.32773
25-Jan-22	17277.95	18426.9243	-6.64995
27-Jan-22	17110.15	18448.1138	-7.81971
28-Jan-22	17101.95	18469.3037	-7.99531

(MEAN % ERROR) = ((ACTUAL – FORECAST)/ACTUAL*100)

Source: Author's Own Compilation

From table 9 it is confirmed that mean percentage error is increasing as time progress. The error percentage is -1.17 and -2.29 on 18th and 19th January but it became-7.81 and -7.99 on 27th and 28th January 2022.

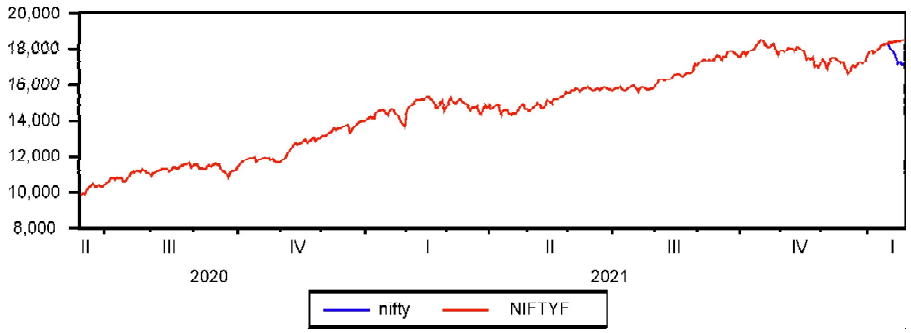


Figure 5: Nifty and Forecast Nifty Diagram

Source: Author's Own Compilation

From the figure 5 it is confirmed that ARIMA model is able to forecast nifty accurately for shorter period only. As the time progresses the chances of error increase. In this studies the error of 5% cover from 18-1-2022 to 21-1-2022 but after that margin of error significantly rises from 5% above and touch 7.99%.(24-1-2022 to 28-1-2022)

7. Conclusion

The paper concludes that the ARIMA model is not able to prognosticate nifty indicators directly (H_1) and as time progress ARIMA fails to handle the stock market volatility. The predicted result has compared with actual result later it is seen that as the time progress the error percentage is increasing. It is suggested that ARIMA model must be used in confluence with another econometric model or with artificial intelligent (ANN) so that this ARIMA model may be suitable. Further it is suggested that the investor or trader should not use this model solely for their investment. As the stock market is largely unpredictable it is better to use ARCH (Auto Regressive Conditional Hetroscedasticity) or GARCH (Generalized Autoregressive Conditional Hetroscedasticity) model for better prophecy. The biggest problem in the case of ARIMA model is that it assume future will be continue on the base of history. Thus, this model is unable to function when there is a fiscal shock or market crash. During the time of the 2008 US financial crash this model was unable as there was an unforeseen fall in the market.

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Analysis of Randomness in the Pharmaceutical Sector of Indian Stock Market: Pre- and During Covid-19 Period

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JEL Classification

G01, G14, G17, G41, E44

Abstract: This paper examines the behavior of stock prices outperforming pharmaceutical industries of India during the Covid-19 pandemic period. The top 10 pharmaceutical companies listed in the National Stock Exchange were selected for the present study. The study is divided into two periods I. Pre-pandemic period (1st April 2019 to 19th Feb 2020) and II. During the pandemic period (20th Feb. 2020 to 31st Dec 2021). The analysis by a series of tests viz. ADF unit root test, variance ratio test and runs test indicate the randomness in the time-series data. The results also suggest the weak-form efficiency of the Indian pharmaceutical industry during the selected period. The present investigation will serve as a precursor for an extended study on stock pricing analysis as well as provide a guideline to all stakeholders, portfolio managers, and market participants to gauge the randomness of the stock market as well as the role of technical analysis.

1. Introduction

The Efficient Market Hypothesis (EMH) is a happening topic that many financial experts and stock market analysts have been eager to develop and examine the modes of stocks' current price behavior and their future price movement and predictions. As per the term Efficient Market Hypothesis (EMH) as defined by its creator (Fama, 1970) the stock market is to be considered efficient if its stock prices are followed wholly by all available information. When any news or information arrives and spreads rapidly, its effect on the stock prices, whether positive or negative, is almost immediate. For obvious reasons, the time of incidence or appearance of such information or news cannot be predicted and as it affects the stock prices, new stock prices are different from older stock prices. This makes them random in nature (Bodie *et al.*, 2008). The efficiency of the market depends completely on how, when, and to what extent information is made available to investors. EMH is based on the informational efficiency of the market. That means all investors know everything about the market and they act

rationally. It is a good example of weak form efficiency. This weak form is qualitatively similar to the random walk activity, which states that old market rates of stocks are not able to provide information in predicting future prices of stocks thus a study of technical analysis with the help of charts, graphs, different tools, that is also based on old trends of the stock prices is not useful for the investors for prediction purposes. It is assumed that in an efficient market, there would be no chance for overvalued and undervalued stocks. The stock market prices and the true value of stocks would not differ. If the market is efficient, then stock prices will behave randomly (Samuelson, 1965) whereas (Hayek, 1945) says that prices of any stock can only move due to news coming into the market and therefore they are unpredictable.

As the Indian capital market has witnessed tremendous development after liberalization (Shaikh, 2013). Since the inception of the National Stock Exchange in 1994, the implementation of several useful ideas such as dematerialization, reduction in the settlement days, screen-based trading system, transparency in the derivatives market as well as improved efficiency and safety of the Indian stock markets has been instrumental in changing the Satta Bazar identity of the Indian stock market to a modern, developed and matured stock market. This has also been extremely useful in reducing insider trading and speculative activities after the infamous Harshad Mehta scam in 1992 (Bill, 2017). It was an eye-opener to the governing body of the Indian stock market, the Securities Exchange Board of India (SEBI) which then had taken many strict measures to make the Indian stock market more efficient.

While Indian stock is improving in its efficiency, the pharmaceutical industry of India has become the third largest industry in the world in 2020 (McKinsey & Co., Report, 2020). India exports to more than 200 countries and India's share in global trade is around 20%. Being an emerging market, the pharmaceutical industry is important for revenue generation and job creation. It is essential to study the randomness of this industry, which is a crucial part of the Indian stock market. The Indian stock market faced volatility twice before the pandemic Covid 2019, due to a reduction in operations in the 1992 Harshad Mehta scam and the 2008 financial crisis. Infection of diseases is not limited to human beings but it affects the health and financial condition of the country (Mayer, 2000). But in the pandemic Covid -19 crisis, though all other sectors were affected badly, the pharmaceutical industry of India has had a positive impact due to high demand from all over the world and factories closed in China due to lockdown (Mittal and Sharma, 2021). The pharmaceutical sector is rapidly growing, as exports have increased to other countries. According to a recent study it is estimated that the Indian pharmaceutical sector supplies more than 50% of the various vaccines demand for the world, more than 40% of the generic pharma demand for the United States, and 25% of various medicines for the United Kingdom. Thus, it is no wonder that India contributes towards the second largest share of the global pharmaceutical and biotech technical workforce. Also, according to the Indian economic survey, the domestic market is expected to grow three times in the next decade. (IBEF Report, March 2022)

During the pandemic period, the demand for medicines, vaccines, and other products has increased rapidly which led to a boom in this sector (Mohapatra, 2020). Indian pharmaceutical companies are in demand in the international market due to investments in research in vaccinations. Table 1 shows 2022 data of the top 10 Indian pharmaceutical companies selected for the study.

Table 1: Turnover of Top 10 Pharmaceutical Companies of India in 2022

S. No	*Name of the Company*	*Annual Turnover (Rs. Crore)*
1	Sun Pharmaceutical Industries Limited (SUNPHARMA.NS)	2,19,407
2	Divi's Laboratories Limited (DIVISLAB.NS)	1,18,290
3	Cipla Limited (CIPLA.NS)	84,711
4	Apollo Hospitals Enterprise Limited (APOLLOHOSP.NS)	68,595
5	Dr. Reddy's Laboratories Limited (DR REDDY.NS)	66,681
6	Piramal Enterprises Limited (PEL.NS)	53,322
7	Torrent Pharmaceuticals Limited (TORNTPHARM.NS)	46,769
8	Alkem Laboratories Limited (ALKEM.NS)	41,864
9	Aurobindo Pharma Limited (AUROPHARMA.NS)	39,797
10	Biocon Limited (BIOCON.NS)	39,608

Source: Authors' Own Compilation

The study is divided into two parts to check the changes occurring in the pharmaceutical industry during the pre-pandemic period and during the pandemic period. And to see if there are any opportunities available for investors to make abnormal gains by investing in this industry during the pandemic period. Also, to analyze whether the stock prices of pharmaceutical companies pursue a random walk activity as expected by the market efficiency.

It is expected that the approach discussed in the present study can be implemented for a detailed investigation of any sector of the stock market during global (natural and political) crises, political decisions such as elections, annual budget releases, etc. In such scenarios, many investors, brokers, academicians, students, as well as the stock market regulatory authorities will be able to gauge the importance and determine advanced applications of the present study.

2. Review of Literature

A review of the notable studies reveals mixed opinions about the efficiency and the behavior of various stock markets. Some notable studies are reviewed in the following sections.

Earlier many researchers supported weak form efficiency in different countries' stock markets with the help of various statistical tests (Chen, 2008) to examine the random walk hypothesis (RWH) of European and North American markets. And to (Chan *et al.*, 1992) examine the weak form efficiency of Hong Kong, Taiwan, Japan, United States, Singapore, and Korean markets. (Worthington and Helen, 2004) studied European Markets RWH. Basically, worldwide testing of the random walk hypothesis is studied by many researchers.

Weak form inefficiency supports profitable trading in the market. Investors can enjoy hefty gains by taking the help of old prices. Random walk theory is an extension of the efficient market hypothesis, which states that a subsequent share price of any stock changes randomly with its former stock prices.

It is assumed that some news or information related to an industry or a company directly affects stock prices every day. In other words, the previous day's information has no news value for the next day. Every day's prices change with the news or information coming in on that day. According to this theory, all stock prices are independent. The current prices of any stocks are not dependent on past prices of them. It means that past rates of stocks do not contain any beneficial information which may help the investors to predict the future rates of these stocks. Many researchers work on the efficiency of weak form, some of them are of the opinion that markets do not have weak form efficiency (Rahman, 2016; Arora, 2013; Kumar and Singh, 2013 with Thomas and Dileep, 2010) while some of them are in favor of weak form efficiency in the market (Belgaumi, 1995; Chavannavar and Patel, 2016; Jain *et al.*, 2013) EMH is one of the popular financial theories that describe the behavior of stock prices on stock exchanges. It states that a series of rates of any stock is always random in nature. Therefore, all methods of forecasting future rates of stocks are pointless due to such unpredictable, unreliable walks of series of prices.

Ahmed (2019) studied Dhaka Stock Exchange's (DSE) two indices and found that DSE is an inefficient market, prices are not randomly behaved and therefore investors fully depend on past prices to predict future prices as real-time information of listed companies is not available. It shows that the Dhaka market is inefficient in nature. Sook and Qaiser (2015) observed in Malaysian financial firms' stock prices series that, for the short run it may be possible to predict the future rates of financial firms on the basis of their past prices but it is not possible in the long run. In Malaysia, the financial sector follows a weak form of efficiency. The rates of these stocks move randomly. Urrutia (1995) proves that emerging Latin American stock exchanges were not following a random walk. It shows that the current prices were not depending on the past prices of the stock which indicated a weak form of efficiency.

Pandey and Mohapatra (2017) studied the Indian capital market for pre and post-sub-prime, whereas after studying the National Stock Exchange and Bombay Stock Exchange's two years stock prices, Sharma (2011) has stated that there is an absence of abnormalities in these markets which shows the Indian stock market's efficiency. Both the markets from an information point of view are efficient, all information in the market is available to the investors freely and equally and therefore manipulative practices are not possible to earn extra abnormal profits by adopting any pattern. All prices of stocks have been already reflected by the old information as well as nearer forecasted information. Nayak (2012) concluded that the Indian stock market is following cent percent a random walk. He further added that in India, the stock market is efficient. The clear information made available to all investors is equal hence cheating in the stock prices of companies in Indian stock exchanges is not possible. Therefore, forecasting future rates of the stock market is not dependent on old rates of the stocks. According to him, the stock markets of India are at a strong level of efficiency, investors have to trade on the basis of trust in the Indian market. He applied a runs test to check the validity of the random walk.

Kushwah *et al.* (2013) also examined the stock markets of India, which follow weak form efficiency. Many changes like modernization, liberalization, globalization, and international level technology make the Indian market more efficient in information. They also added that, in India, due to revolutions in

the stock market and its transparency, now there is no use to follow up technical analysis which is based on the past rates trend. Jain P. and his co-workers (2013) checked the informational efficiency of the Indian stock market covering the recession period. They concluded that BSE indices were inefficient in the pre-recession period but the rest of the four indices were showing that Indian stock markets are efficient in weak form. Mathivannan and Selvakumar (2015) proved that the random walk is followed by the National Stock Exchange and it follows a weak form. That means the size and movement of the next stock price is changing in a random manner.

Whereas some researchers do not agree with the opinion, according to them Indian stock markets have weak form inefficiency and therefore do not follow a random walk. Madhusoodanan (1998) stated that random walk is not followed by the Indian capital market, and the variances in the rates of stocks are not equal. Mishra (2009) studied the Bombay Stock Exchange for testing the completeness of the stock market of India and found that BSE is not an efficient market. Random walk does not exist in this market which indicates the absence of weak form efficiency. Verma Rao (2007) observed the Indian stock market for three years 1998-99, 1999-2000 and 2000-21. He found that in the first two years the Indian market was showing weak form inefficiency while in the last year it was showing weak form efficiency in the market.

According to Thomas and Dileep (2010) in the Global Crisis period 2008, the Indian capital market was showing inefficiency of weak form. It means that from old rates of stocks investors, analysts can easily estimate the future rates of stocks. The market does not follow random walks. They applied Auto correlated tests on the data collected from National Stock Exchange and Bombay Stock Exchanges. Ehsan (2021) on the basis of the monthly return of Renata ltd pharmaceutical company of Bangladesh found weak form efficiency in Dhaka Stock Exchange with the help of the Augmented Dick Fuller (ADF) test and Variance Root Test.

Gupta and Narwal (2022) studied Indian stock market stationarity with the help of the ADF test. Whereas Ume *et al.* (2017) say that in the Pakistan stock market weak form inefficiency exists. Investors can earn hefty profits on the basis of past stock prices. They also used ADF and Runs tests to check the randomness of stock prices. Randomness in stock markets varies from country-to-country and industry-to-industry. We feel it is required to undertake detailed research of important sectors like the pharmaceutical sector which plays an important role in the Indian economy. We have tested Indian pharmaceutical companies by using the same tests to check the randomness of prices in the same industry during the crisis and pre-pandemic periods. The current paper focuses on the pharmaceutical industry of India to check whether stock prices of this industry are behaving randomly or not. Whether there is a pattern involved in the market to make abnormal gains in pandemic conditions? The attempt is to check the randomness of the pharmaceutical industry and its market efficiency during the two periods under study.

3. Objective and Hypothesis of the Study

3.1. Objective of the Study

The main objective of the study is:

- To study the randomness in the Indian pharmaceutical sector during pre-pandemic and during the pandemic Covid- 19.

3.2. Hypothesis of the Study

The hypothesis has been established to achieve the above objectives.

H_{01}: The pharmaceutical sector of India follows Random Walk.

4. Research Methodology

The purpose of this study is to observe the random walk of the pharmaceutical sector of India. Therefore, the research design is descriptive in nature. The study is divided into two periods I. Pre-pandemic (1st April 2019 to 19th March 2020) and II. During the pandemic (20th February 2020 to 31st December 2021) taking daily adjusted closing price data of ten top pharmaceutical companies of India, listed in NSE available on finance.yahoo.com website. The study is based on the pharmaceutical companies in India only. The study has adopted both parametric (Augmented Dicky- Fuller - unit root, Variance ratio) and non-parametric (Runs) test to check the weak form efficiency of the Indian pharmaceutical industry in selected periods. The values are calculated with the help of SPSS 25 and E-Views software.

5. Results and Discussions

5.1. Descriptive Statistics

The descriptive statistics of daily returns of Indian pharmaceutical companies for pre-pandemic period and during the pandemic period are depicted in table 2 and table 3 respectively.

5.1.1. Descriptive Statistics of Daily Returns of Selected Companies in Pre-Pandemic Period

Table 2 shows descriptive statistics of selected companies during the pre-pandemic period. Out of all selected pharmaceutical companies except SUNPHARMA.NS, CIPLA.NS, PEL.NS,

Table 2: Descriptive Statistics of Daily Returns in Pre-Pandemic Period

Sr. No.	*Name of the company*	*Mean*	*Std. Deviation*	*Skewness*	*Kurtosis*	*Min.*	*Max.*
1	SUNPHARMA.NS	-0.0005	0.0188	-0.0822	2.7368	-0.0906	0.0566
2	DIVISLAB.NS	0.0013	0.0161	-1.4296	9.3097	-0.0975	0.0551
3	CIPLA.NS	-0.0006	0.0147	0.2782	0.4697	-0.0369	0.0455
4	APOLLOHOSP.NS	0.0017	0.0188	1.0094	4.2276	-0.0645	0.0957
5	DRREDDY.NS	0.0009	0.0141	0.2069	2.0373	-0.0567	0.0519
6	PEL.NS	-0.0018	0.0306	-0.2163	1.7571	-0.1339	0.0795
7	TORNTPHARM.NS	0.0009	0.0171	1.0501	4.4600	-0.0546	0.0948
8	ALKEM.NS	0.0020	0.0145	0.5681	0.9480	-0.0333	0.0506
9	AUROPHARMA.NS	-0.0008	0.0287	0.2659	19.5848	-0.1897	0.2027
10	BIOCON	0.0002	0.0198	-0.3254	2.2024	-0.0865	0.0705

Source: Authors' Own Compilation

AUROPHARMA.NS have positive returns ranging from BIOCON (0.02%) to ALKEM (0.20%). The standard deviation ranges DRREDDY.NS (1.41%) to PEL.NS (3.06%). All return series are positively skewed except SUNPHARMA.NS, DIVISLAB.NS, PEL.NS, and BIOCON. In the case of AUROPHARMA.NS (19.58) kurtosis value is high compared to others.

5.1.2. Descriptive Statistics of Daily Returns of Selected Companies During Pandemic Period

Table 3 shows descriptive statistics of selected companies during the pandemic period. All selected pharmaceutical companies have positive returns ranging from BIOCON (0.06%) to APOLLOHOSP.NS (0.26%). The standard deviation is ranging from PEL.NS (1.88%) to AUROPHARMA.NS (2.97%). All return series are positively skewed. In the case of AUROPHARMA.NS (11.49) kurtosis value is high compared to others.

Table 3: Descriptive Statistics of Daily Returns during Pandemic Period

Sr. No	*Name of the company*	*Mean*	*Std. Deviation*	*Skewness*	*Kurtosis*	*Min.*	*Max.*
1	SUNPHARMA.NS	0.0018	0.0211	0.4343	5.1781	-0.1116	0.1101
2	DIVISLAB.NS	0.0019	0.0206	0.3241	5.3231	-0.1100	0.1196
3	CIPLA.NS	0.0019	0.0213	1.2026	5.2493	-0.0685	0.1304
4	APOLLOHOSP.NS	0.0026	0.0278	0.5485	6.5982	-0.1499	0.1549
5	DRREDDY.NS	0.0011	0.0197	1.1205	9.6143	-0.1049	0.1387
6	PEL.NS	0.0017	0.0188	1.0094	4.2276	-0.0645	0.0957
7	TORNTPHARM.NS	0.0011	0.0210	0.5674	5.4236	-0.0790	0.1335
8	ALKEM.NS	0.0009	0.0193	1.1441	9.5838	-0.0789	0.1494
9	AUROPHARMA.NS	0.0009	0.0297	0.1407	11.4919	-0.1681	0.1912
10	BIOCON	0.0006	0.0222	0.1471	3.3877	-0.1091	0.0940

Source: Authors' Own Compilation

5.2. Parametric Test

5.2.1. Augmented Dickey-Fuller (ADF) Unit Root Test

The ADF unit root test is used in order to check stationarity in the return series of selected companies for both periods and the results are depicted in Table 4 and Table 5.

5.2.1.1. ADF Unit Root Test of Selected Companies for Pre-Pandemic Period

Table 4 shows that for all 10 companies, t-statistic values are lesser than critical values at the 1% level, which rejects the null hypothesis that the time series has a unit root. It means that the time series of all companies are stationary at a level without a unit root.

Null Hypothesis: Series has a unit root.

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=14)

Table 4: Augmented Dickey-Fuller (ADF) Unit Root Test for Pre-Pandemic Period

Sr. No.	*Name of the company*	*Coefficient*	*Std. Error*	*t- Statistic*	*Prob.**
1	SUNPHARMA.NS	-1.1492	0.0672	-17.1047	0
2	DIVISLAB.NS	-1.2175	0.0663	-18.3623	0
3	CIPLA.NS	-1.1411	0.0679	-16.8186	0
4	APOLLOHOSP.NS	-1.0251	0.068	-15.0813	0
5	DRREDDY.NS	-1.0715	0.0679	-15.7756	0
6	PEL.NS	-0.9879	0.0682	-14.4941	0
7	TORNTPHARM.NS	-1.0337	0.0695	-14.8815	0
8	ALKEM.NS	-1.0879	0.0678	-16.0572	0
9	AUROPHARMA.NS	-1.0694	0.0774	-13.8194	0
10	BIOCON	-1.0687	0.068	-15.7179	0

Test critical values: 1% level - 2.575662

5% level -1.942296

10% level -1.615725

*MacKinnon (1996) one-sided p-values.

All values are significant at a 1% level of significance.

Source: Authors' Own Compilation

5.2.1.2. ADF-Unit Root Test of Selected Companies During Pandemic Period

Table 5 shows that all 10 companies t – statistical values are lesser than critical values at the 1% level, which rejects the null hypothesis that the time series has a unit root. It means that the time series of all companies are stationary at a level without a unit root.

Null Hypothesis: Series has a unit root.

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=14)

5.2.2. Multiple Variance Ratio Test

In order to check homoscedasticity and heteroscedasticity in the return series of selected companies, the Multiple Variance test is used for pre-pandemic and during pandemic periods and the results are depicted in Table 6 and Table 7 respectively. The randomness of daily returns of selected companies is examined by using a variance ratio test with the help of 2, 4, 8, and 16 lags in both periods.

Table 5: Augmented Dickey-Fuller (ADF) Unit Root Test during Pandemic Period

Sr. No.	*Name of the company*	*Coefficient*	*Std. Error*	*t- Statistic*	*Prob.**
1	SUNPHARMA.NS	-1.0516	0.0465	-22.5909	0.0000
2	DIVISLAB.NS	-1.0381	0.0466	-22.2755	0.0000
3	CIPLA.NS	-1.0097	0.0466	-21.6589	0.0000
4	APOLLOHOSP.NS	-1.0553	0.0466	-22.6663	0.0000
5	DRREDDY.NS	-0.9725	0.0465	-20.8990	0.0000
6	PEL.NS	-0.9725	0.0465	-20.8990	0.0000
7	TORNTPHARM.NS	-0.9508	0.0465	-20.4257	0.0000
8	ALKEM.NS	-1.1042	0.0660	-16.7292	0.0000
9	AUROPHARMA.NS	-1.0280	0.0451	-22.7769	0.0000
10	BIOCON	-1.0480	0.0466	-22.4998	0.0000

Test critical values: 1% level - 2.575662

5% level -1.942296

10% level -1.615725

*MacKinnon (1996) one-sided p-values.

All values are significant at 1% level of significance.

Source: Authors' Own Compilation

5.2.2.1. Multiple Variance Ratio Test of Selected Companies for Pre-Pandemic Period

Table 6 shows that the null hypothesis of homoscedasticity is rejected as the p-value of selected companies is less than 5% significance level and accepts heteroscedasticity in the series.

Table 6: Multiple Variance Ratio Test in Pre- Pandemic Period

Sr. No.	*Name of the company*	*Lags (q)*	*VR(q)*	*Z Statistic*	*Probability value*
1	SUNPHARMA.NS	2	0.4417	-4.6461	0.0000
		4	0.2002	-4.0791	0.0000
		8	0.1030	-3.4399	0.0006
		16	0.0620	-2.6819	0.0073
2	DIVISLAB.NS	2	0.3985	-4.2976	0.0000
		4	0.2391	-3.3865	0.0007
		8	0.1024	-3.0484	0.0023
		16	0.0523	-2.5567	0.0106
3	CIPLA.NS	2	0.4298	-5.8682	0.0000
		4	0.2163	-4.6861	0.0000

contd. table 6

Sr. No.	*Name of the company*	*Lags (q)*	*VR(q)*	*Z Statistic*	*Probability value*
		8	0.1256	-3.6522	0.0003
		16	0.0631	-2.8093	0.0050
4	APOLLOHOSP.NS	2	0.5160	-4.9781	0.0000
		4	0.2506	-4.4895	0.0000
		8	0.1307	-3.6227	0.0003
		16	0.0700	-2.8198	0.0048
5	DRREDDY.NS	2	0.4758	-5.4673	0.0000
		4	0.2434	-4.8041	0.0000
		8	0.1140	-4.0716	0.0000
		16	0.0700	-3.0063	0.0026
6	PEL.NS	2	0.4682	-5.7852	0.0000
		4	0.2469	-4.6457	0.0000
		8	0.1342	-3.6174	0.0003
		16	0.0616	-2.8278	0.0047
7	TORNTPHARM.NS	2	0.5098	-4.5494	0.0000
		4	0.2382	-4.2553	0.0000
		8	0.1227	-3.4478	0.0006
		16	0.0660	-2.7092	0.0067
8	ALKEM.NS	2	0.4125	-5.2922	0.0000
		4	0.2164	-4.1435	0.0000
		8	0.1330	-3.3032	0.0010
		16	0.0600	-2.6634	0.0077
9	AUROPHARMA.NS	2	0.4863	-3.7850	0.0002
		4	0.2697	-3.3819	0.0007
		8	0.1264	-2.9977	0.0027
		16	0.0787	-2.4933	0.0127
10	BIOCON	2	0.4666	-5.1253	0.0000
		4	0.2445	-4.3018	0.0000
		8	0.1277	-3.5449	0.0004
		16	0.0584	-2.7928	0.0052

Source: Authors' Own Compilation

5.2.2.2. Multiple Variance Ratio Test of Selected Companies During Pandemic Period

Table 7 shows that the null hypothesis of homoscedasticity is rejected as the p-value of selected companies is less than a 5% significance level and accepts heteroscedasticity in the series during the pandemic period.

Table 7: Multiple Variance Ratio Test during Pandemic Period

Sr. No.	*Name of the company*	*Lags (q)*	*VR(q)*	*Z Statistic*	*Probability value*
1	SUNPHARMA.NS	2	0.4507	-6.2467	0.0000
		4	0.2207	-5.3601	0.0000
		8	0.1162	-4.3801	0.0000
		16	0.0652	-3.1791	0.0015
2	DIVISLAB.NS	2	0.4655	-6.2457	0.0000
		4	0.2374	-5.2914	0.0000
		8	0.1210	-4.3364	0.0000
		16	0.0605	-3.3231	0.0009
3	CIPLA.NS	2	0.4781	-6.1483	0.0000
		4	0.2466	-5.2854	0.0000
		8	0.1209	-4.3371	0.0000
		16	0.0616	-3.3876	0.0007
4	APOLLOHOSP.NS	2	0.4484	-4.3311	0.0000
		4	0.2450	-3.6690	0.0002
		8	0.1210	-3.3061	0.0009
		16	0.0652	-2.7647	0.0057
5	DRREDDY.NS	2	0.5091	-5.1539	0.0000
		4	0.2476	-4.8631	0.0000
		8	0.1220	-4.2980	0.0000
		16	0.0684	-3.3565	0.0008
6	PEL.NS	2	0.4947	-6.9153	0.0000
		4	0.2681	-5.6825	0.0000
		8	0.1370	-4.5925	0.0000
		16	0.0634	-3.5822	0.0003
7	TORNTPHARM.NS	2	0.5047	-6.7980	0.0000
		4	0.2638	-5.7426	0.0000
		8	0.1423	-4.5234	0.0000
		16	0.0673	-3.5157	0.0004
8	ALKEM.NS	2	0.5451	-5.0827	0.0000
		4	0.2516	-5.1130	0.0000
		8	0.1245	-4.2770	0.0000
		16	0.0639	-3.2991	0.0010
9	AUROPHARMA.NS	2	0.4541	-4.8512	0.0000
		4	0.2483	-4.0376	0.0001
		8	0.1067	-3.3514	0.0008
		16	0.0585	-2.3989	0.0164
10	BIOCON	2	0.4592	-6.3680	0.0000
		4	0.2386	-5.3822	0.0000
		8	0.1253	-4.4023	0.0000
		16	0.0592	-3.4260	0.0006

Source: Authors' Own Compilation

5.3. Non - Parametric Test

5.3.1. Runs Test

The study is based on non-parametric variables. The statistical tool of runs test is applied to the data to test the randomness in the return series of selected companies for pre-pandemic and during pandemic periods. Results are given in table 8 and table 9 respectively. Runs test checks the hypothesis of two-tailed data sequences and also checks the statistical independence of the time series. It is a statistical procedure that is used in examining whether, in a given sequence of observations, the value of one observation is based on subsequent observations. It is considered that observation values are independent of each other and complete sequences are random in nature.

5.3.1.1. Runs Test of Selected Companies for the Pre-Pandemic Period

Table 8 reveals that at a 5% level of significance Z values of all the companies in the pre-pandemic period are below a critical value (±1.96) except PEL.NS. It means accepting a null hypothesis that there is a randomness in the series of all companies during a pre-pandemic period except PEL.NS (2.44).

Table 8: Runs Test Values for Pre-Pandemic Period

Sr. No.	*Name of the company*	*Count of Runs*	*Value of Z*	*2 Tailed Asymp. Sign*	*S/NS*
1	SUNPHARMA.NS	115	0.679	0.497	S
2	DIVISLAB.NS	116	0.815	0.415	S
3	CIPLA.NS	116	0.815	0.415	S
4	APOLLOHOSP.NS	118	1.086	0.277	S
5	DRREDDY.NS	117	0.950	0.342	S
6	PEL.NS	128	2.444	0.015	NS
7	TORNTPHARM.NS	112	0.272	0.786	S
8	ALKEM.NS	114	0.543	0.587	S
9	AUROPHARMA.NS	118	1.086	0.277	S
10	BIOCON	118	1.086	0.277	S

Source: Authors' Own Compilation

5.3.1.2. Runs Test of Selected Companies During Pandemic Period

Table 9 reveals that at a 5% level of significance Z values of all the companies during the pandemic period are below a critical value (±1.96) except TORNTPHARM.NS. It means accepting a null hypothesis that there is a randomness in the series of all companies during a pandemic period except TORNTPHARM.NS (2.05).

Table 9: Runs Test Values During Pandemic Period

Sr. No.	*Name of the company*	*Count of Runs*	*Value of Z*	*2 Tailed Asymp. Sign*	*S/NS*
1	SUNPHARMA.NS	252	1.863	0.062	S
2	DIVISLAB.NS	242	0.931	0.352	S
3	CIPLA.NS	243	1.025	0.306	S
4	APOLLOHOSP.NS	228	-0.373	0.709	S
5	DRREDDY.NS	230	-0.186	0.852	S
6	PEL.NS	222	-0.931	0.352	S
7	TORNTPHARM.NS	254	2.049	0.040	NS
8	ALKEM.NS	225	-0.652	0.514	S
9	AUROPHARMA.NS	226	-0.559	0.576	S
10	BIOCON	230	-0.186	0.852	S

Based on the median (S=Significance and NS = Non-significance.)

Source: Authors' Own Compilation

6. Summary and Conclusion

This paper has examined the weak form efficiency of the top 10 Indian pharmaceutical companies in pre-pandemic and during pandemic periods. By applying the ADF test, Variance Ratio Test, and Runs test, it is examined that the Indian pharmaceutical sector has randomness in stock prices.

During pre-pandemic period all companies have positive returns except SUNPHARMA.NS, CIPLA.NS, PEL.NS, AUROPHARMA.NS whereas during the pandemic period all selected companies have positive returns. Companies like SUNPHARMA.NS, DIVISLAB.NS, PEL.NS, and BIOCON are negatively skewed in the pre-pandemic period but during the pandemic including them, all selected companies are positively skewed. ADF unit root test examined that in both selected periods all companies have stationarity in the return series. Multiple variance ratio tests proved that all companies' return series have heteroscedasticity in return series in both selected periods. Runs test proved that in the pre-pandemic period except for PEL.NS, all other companies have randomness in the stock prices, whereas during the pandemic period except TORNTPHARM.NS, all other companies' return series have randomness. Out of selected companies, the majority of companies have return series random in nature.

That means the pharmaceutical sector stock prices are not under the impact of any pattern. The scripts are not using historical information. The change in stock prices is independent of each other. According to runs test results, all top NSE-listed pharmaceutical companies' share prices have moved randomly. Their historical movement of prices or trend of stock prices cannot be used in forecasting the market rates of stocks. This means that future prices are not based on past prices of stocks and they cannot be predicted as they follow random walks. Investors cannot benefit from the past prices of these companies as also suggested by (Mathivannan and Selvakumar, 2015). Price prediction is very difficult for investors as well as analysts for the pharmaceutical sector as it follows random walks.

Technical analysis is not helpful in forecasting new prices. The investors have to depend on the information efficiency rather than depending on old prices. There is less scope for speculative activities in the pharmaceutical sector of the Indian stock market.

On the basis of the study, it is observed that India has to implement appropriate policies for improving the efficiency of stock markets. The closing prices of all pharmaceutical sector companies cannot be predicted by the investors on the basis of past prices or any historical information about these stocks. It shows no connectivity in current and old rates of stocks (Thomas and Dileep, 2010). There is no chance to earn abnormal returns in all these scripts. This shows that for these stocks historical prices are not beneficial on which one can predict the future prices of these stocks. This is a result of information symmetric or efficiency in the stock market of India. It also shows that the stock prices are independent. Indian markets are less manipulative and efficient in providing information equally and freely to their investors. There is less chance of taking the help of manipulative activities to earn an abnormal profit based on changes happening in old prices. As the study shows that there is no chance for the manipulation of prices of these stocks, it is advisable for investors to depend on the efficiency of the stock market. It is also very difficult to predict the future prices of these stocks which results in no chance for speculative activities in the stock market.

Based on the present study, we also suggest that all regulatory bodies should take special efforts in attracting small, medium, and foreign investors towards investment in listed stocks of Indian stock markets. The trading volume will increase, which will be helpful to reduce profitable trading in the Indian stock market. The current study is based on only the pharmaceutical sector of India. There is a future scope to do the study on different industrial sectors of India as well as of other countries and do the comparison between them, which will help to understand the stock markets behavior of various countries in different sectors. Not only that, by taking into consideration, the growing integration of Indian financial markets with other countries, there is a need to understand the correlation between daily Indian stock prices with other countries' stock prices of various sectors.

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Socio-Economic Status of Female Entrepreneurs in Northeast India

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Abstract: The status of women in north-eastern India is quite different from that of women in other parts of the country. However, Indian societies are governed by values, culture, and traditions, which are almost the same in all the regions. Thus, better women's status is possible when they are given equal rights and they become empowered. The entrepreneurship is a vibrant step towards economic empowerment of women which brings better status for women in the society. The women of north-eastern region of India are privileged to have almost equal status with men as compared to mainland Indian women. The womenfolk work hand in hand with men in all spare of life in northeast India. The present paper is based on the socio-economic status of female entrepreneurs in north eastern region. The basic objective of the paper is to figure out the level of women empowerment through entrepreneurship in the north-eastern region of India. The paper outlines that female entrepreneurs in the north east have similar kinds of social recognition and levels of income.

1. Introduction

Entrepreneurship is not just a concept of having business, it can be considered as a process of empowerment to the poor and women in the economy. The process of strengthening the potential of individuals or groups is referred to as empowerment. There is evidence to suggest that countries with a higher number of women entrepreneurs in their population have progressed significantly more quickly than other countries. Surprisingly, India was rated 140th out of 156 nations in the Global Gender Gap Report by the World Economic Forum in 2021(WEF, 2021).Women make up roughly 48 percent of the population in India (Census, 2011), however they only play a very limited role in economic growth of India. Women's entrepreneurship growth will empower women while also hastening the economic development process (Sethi, 1998). In India, women's earnings are projected to be one-fifth of men's. As a result, women play a critical role in the Indian economy in this increasingly complicated socio-economic context.

Women are now taking up business roles in order to find significance in their lives. Women in business are thus a relatively new phenomena in India (Singh and Singh, 2012). Women are gradually transitioning from being housewives to being female entrepreneurs. Some of the changes could be attributed to education, a shift in cultural norms, or globalisation. Entrepreneurial success is influenced by environmental elements such as social (Kumar, 2014), economic, legal, political, and technological aspects, all of which influence their activities and contribute to successful entrepreneurship (Shakila and Melwyn, 2021). When given the necessary exposure, education, expertise, and support, these women will entail to be valuable assets in India's economic progress. The entrepreneurial success is influenced by environmental elements such as social, economic, legal, political, and technological aspects, all of which influence their activities and contribute to successful entrepreneurship.

The women entrepreneurs of north east India work equally as men in the society. They work hand in hand with men to support the family and contribute in the region's economy. The north-eastern states comprise of tribal population mostly, who belongs to rural areas and associated with agriculture, farming and other activities.

The present study extensively uses the term female entrepreneurship. Thus, the female entrepreneurs are those who start a business by their own. In other words, a female or women entrepreneurs are individuals who initiate and organise an entrepreneurial venture. Women entrepreneurs are those who are willing to take on new challenges are ambitious, hardworking, patient, motivated, adventurous, conscientious, educated, and intellectual. According to Government of India, "an enterprise owned and controlled by women with a minimum financial stake of 51 percent of the capital and at least 51 percent employment offered to female" are considered as female owned enterprises.

2. Review of Literature

In a developing economy like India, the savings of individual in the rural areas are being utilized in establishing micro enterprises. Hence, the rural entrepreneurship and its association have been given much importance since it brings in socio economic empowerment in rural and backward region. The studies conducted by various researchers cited various aspects of women empowerment through entrepreneurship. The demographic parameters such as age, education, and family type have a significant impact on working women's socioeconomic status, particularly their monthly income and savings (Kulkarni and Srinivas, 2019).

In the northeast part of India, scholars found that women have autonomy in decision making and also get better social support which backs the enthusiasm to work more and achieve greater heights. In this section few selected studies are highlighted for better understanding of the socio-economic factors related to women entrepreneurs in northeast India. The religious beliefs, gender discrimination, lack of education, cultural norms, fear of failure, lack of confidence, lack of moral support from family, financial constraints, etc. are various aspects to consider those have impact on women entrepreneurs (Patil and Choudhary, 2020).

Women entrepreneurs and their contributions to the state economy are influenced by socio-cultural factors (Pradeepika, 2017). The study conducted by Chatterjee *et al.* (2017) reveal that psychological and socio-cultural factors have an impact on the core human attributes of an entrepreneur

and influenced entrepreneurial growth is positively. Women entrepreneurs benefit from a variety of entrepreneurial activities that provide them with similar rights, privileges, and responsibilities as their male counterparts, and they are able to enhance their socioeconomic situation(Bora, 2019).Female entrepreneurs are confident in their lives, and their socio-economic standings have improved significantly after venturing to entrepreneurial activities (Shakila and Melwyn, 2021).The personal traits of female entrepreneurs that influence their success (Jeni *et al.*, 2021). Further, female entrepreneurs' age and education increase, they obtain more knowledge, which help them generate more money, and their socio-economic level rises automatically(Lakshmi *et al.*, 2019).It was also discovered that entrepreneurial skills and micro-finance have an impact on life satisfaction, which enhances the socio-economic condition of women entrepreneurs (Prathiba and Shanmugasundaram, 2021).

The positive and negative aspects of female entrepreneurs' lives help to paint a more complete and accurate picture of women's overall status in the North East Indian regions (Singh *et al.*, 2020).However entrepreneurs lack skills, knowledge and proper training in their activities in most of the women owned enterprises (Kulkarni and Srinivas, 2019).

It also demonstrates that the most important economic issues affecting women entrepreneurs' effectiveness include a lack of financial access, strong competition, and insufficient access to training, technology, and raw materials(Jeni *et al.*, 2021).The primary economic issues that affect the performance of women entrepreneurs include marketcompetition, lack of market access and lack of business training (Mall, 2020). Women entrepreneurs struggle more in manufacturing business due to some social obstacles (Rahaman, 2018).In rural areas weaving is practiced by a wide range of entrepreneurs, and it is possible that it is an income-generating activity for them (John and Kamini, 2016). Rural women's economic interdependence and social status can both benefit from entrepreneurship (Sarma, 2014).Hence, due to their participation in entrepreneurial activities, rural women gained more self-confidence, self-reliance, and independence (Saikia and Deka, 2017).

Most of the female entrepreneurs were having high respect in the family and society. There were high participation in the social activities among the sample entrepreneurs (Singh & Monga, 2013). The women entrepreneurs become economically self-reliant, economically independent, gained respect in the society (Awati and Deshpande, 2020). The main motivating factor to start an enterprise was to earn money (Sinha, 2015), self-actualisation, status of independence, family encouragement, generation of income (Patil and Choudhary, 2020).It was also suggested that, providing vocational education and training programs that focus on entrepreneurship education to the rural female micro-entrepreneurs in the region(Goswami *et al.*, 2017).

3. Objectives and Hypotheses of the Study

3.1. Objectives of the Study

- To study the demographic characteristics of female entrepreneurs in northeast India.
- To examine the social status of women entrepreneurs in northeast India.
- To figure out the level of economic empowerment of female entrepreneurs in the northeast India.

3.2. Hypotheses of the Study

H_{01}: There is no relation between capital cities and range of monthly income among female entrepreneurs in north east India.

H_{02}: There is no relation between capital cities and level of social recognition among female entrepreneurs in north east India.

4. Research Methodology

4.1. Materials and Methods

The study focused on the socio-economic status of women entrepreneurs and issues related to female entrepreneurship in north east India. The present study is empirical in nature and data collected from capital cities of northeastern India. The population of the study is unknown. Hence, equal numbers of female entrepreneurs were selected from different cities in the region. The convenience sampling technique has been used for the purpose of obtaining the sample units for the study.

Table 1: Sample Respondents from the Capital Cities of Northeastern States of India

Sl.		*Frequency*	*Percent*
1	Agartala	30	12.5
2	Aizwal	30	12.5
3	Dispur	30	12.5
4	Gangtok	30	12.5
5	Kohima	30	12.5
6	Imphal	30	12.5
7	Itanagar	30	12.5
8	Shillong	30	12.5
	Total	240	100.0

Source: Authors' Own Compilation

For the purpose of study 30 numbers of respondents from each capital cities of northeastern India were selected to fill the survey questionnaires. Hence, in total 240 numbers of female entrepreneurs from formal and informal sectors have been in corporated in the study. The primary data of the study is presented with the help of tables, graphs and charts, and analyzed and interpreted with descriptive statistics. Further, the correlation has been observed between demographic variables with socio-economic factors to analyze the result lucidly.

4.2. Study Area

The present is conducted on the capital cities of North Eastern States of India. The eight north eastern states and there capital cities are depicted in the table 2.

Table 2: Northeastern States and its Capital Cities

Sl.	*North Eastern States*	*Capital Cities*
1	Arunachal Pradesh	Itanagar
2	Assam	Dispur
3	Manipur	Imphal
4	Meghalaya	Shillong
5	Mizoram	Aizawl
6	Nagaland	Kohima
7	Sikkim	Gangtok
8	Tripura	Agartala

Source: Authors' Own Compilation

The northeastern states composed of different ethnic groups and the artistic talents are tremendous in the region. The female population is also very active in the economic activities in the northeastern region.

5. Data Analysis

In order to accomplish the objectives laid in this paper, the results of the filed survey are depicted in the subsequent tables and due interpretation and discussion have been made. These characteristics are discussed in the following tables:

The table 3 depicts that the sample female entrepreneurs mostly are in the age group of 31 years to 40 years of age. It means the female entrepreneurs of north east India are mostly youth. However, only 3.8 percent of female entrepreneurs are in the age group of 61 years or more. The table also shows that around 20 percent of female entrepreneurs are graduated and 20 percent are matriculated. The region shows 11.7 percent of female entrepreneurs do not have formal education at any level and on contrary 9.6 percent of sample female entrepreneurs are holding post graduate qualifications. The study shows that 73.8 percent of female entrepreneurs of north east India are married and rest 26.2 percent sample entrepreneurs are unmarried.

Table 3: Demographic Profile of Female Entrepreneurs

Sl.	*Particulars*	*Groups*	*Frequency*	*Percent*
1	Age Group	18 - 30 Years	56	23.3
		31 - 40 Years	90	37.5
		41 - 50 Years	57	23.8
		51 - 60 Years	28	11.7
		61 Years & Above	9	3.8
		Total	240	100.0

contd. table 3

Sl.	*Particulars*	*Groups*	*Frequency*	*Percent*
2	Educational Qualification	Illiterate	28	11.7
		Primary	47	19.6
		Matriculation	48	20.0
		Intermediate	45	18.8
		Graduate	49	20.4
		Post Graduate	23	9.6
		Total	240	100.0
3	Marital Status	Unmarried	63	26.2
		Married	177	73.8
		Total	240	100.0
4	Social Category	General	64	26.7
		Other Backward Class	31	12.9
		Schedule Tribe	131	54.6
		Schedule Caste	14	5.8
		Total	240	100.0
5	Religious Belief	Hindu	74	30.8
		Buddhist	23	9.6
		Muslim	11	4.6
		Christian	96	40.0
		Indigenous Belief	36	15.0
		Total	240	100.0

Source: Authors' Own Compilation

The tables 3 also projects that, around 54.6 percent of sampled female entrepreneurs in the study area belong to scheduled tribe category followed by 26.7 percent entrepreneurs are from general category. The table further presents that only 5.8 percent of female entrepreneurs are from scheduled caste category. It can be viewed that 40 percent of the female entrepreneurs are Christians. Around 30.8 percent of entrepreneurs are Hindus, followed by 15 percent of them follows Indigenous belief. Notably, only 4.6 percent of entrepreneurs are from Muslim religion in the sampled studied.

The table 4 projects that 74.2 percent of sampled women entrepreneurs are from the urban areas and rest 25.8 percent of them are from rural part of the capital cities of the region. The study also reflects the type of family setup for sampled female entrepreneurs in the region. It is also found that 53.8 percent female entrepreneurs are in joint family system and rests are in nuclear setup. Around 47.5 percent of female entrepreneurs cited that they have six and more members in their families. Whereas, only 12.5 percent of entrepreneurs stated that they have upto 2 members in the irrespective families.

Table 4: Entrepreneur's Family and Enterprise Profile

Sl.	*Particulars*	*Groups*	*Frequency*	*Percent*
1	Family Type	Nuclear	111	46.3
		Joint	129	53.8
		Total	240	100.0
2	No. of Family Members	Upto Two	30	12.5
		Three to Five	96	40.0
		Six &Above	114	47.5
		Total	240	100.0
3	Family Support	Yes	174	72.5
		No	66	27.5
		Total	240	100.0
4	Location	Urban	178	74.2
		Rural	62	25.8
		Total	240	100.0
5	Trained or not	Yes	144	60.0
		No	96	40.0
		Total	240	100.0
6	Years of existence	Less Than 3 Years	70	29.2
		3 Years to 5 Years	91	37.9
		More than 5 Years	79	32.9
		Total	240	100.0

Source: Authors' Own Compilation

In addition, the table 4 depicts that 72.5 percent of the sampled women entrepreneurs get support from their family members for operating business. However, 27.5 percent of women entrepreneurs cited that they do not get family support for their business in the region. It is also analysed that 60 percent of sample women entrepreneurs in northeast India are trained for running enterprises. However, still 40 percent of female entrepreneurs have not attended any training for operating business venture. The table also shows that 37.9 percent of female entrepreneurs have less than 3 years of experience in running enterprises; followed by 32.9 percent entrepreneurs operating their enterprises since more than 5 years.

The study found that 56.3 percent of the female entrepreneurs of northeast India invested own money as initial source of finance. However, 28.8 percent of female entrepreneurs invested own and borrowed capital for initial source of finance for their business. It is reflected from the present study that almost 98 percent of female owned enterprises are sole trading form. The table 5 also states that only 17.5 percent of female entrepreneurs have opted for the service-based enterprises. However, the female entrepreneurs mostly started manufacturing enterprises in the region.

Table 5: Source of Finance and Types of Female Owned Enterprises

Sl.	*Variables*	*Groups*	*Frequency*	*Percent*
1	Sources	Owned	135	56.3
		Borrowed	36	15.0
		Both	69	28.8
		Total	240	100.0
2	Ownership Style	Sole Trading	235	97.9
		Partnership	5	2.1
		Total	240	100.0
3	Nature	Service Based	42	17.5
		Manufacturing Based	198	82.5
		Total	240	100.0

Source: Authors' Own Compilation

Table 6: Monthly Income of Female Entrepreneurs

Sl.	*Income in Rs.*	*Frequency*	*Percent*
1	Upto 25,000	98	40.8
2	25,001 - 50,000	88	36.7
3	50,001 &Above	54	22.5
	Total	240	100.0

Source: Authors' Own Compilation

The study found (table 6) that 40.8 percent of female entrepreneurs of north east India earn income upto Rs 25,000 p.m., followed by 36.7 percent earns in between Rs 25,001 to Rs 50,000 p.m. However, only 22.5 percent of women entrepreneurs earn more than Rs 50,000 p.m. from their business in the study area.

Table 7: Social Recognition for the Female Entrepreneurs

Sl.	*Recognition Level*	*Frequency*	*Percent*
1	Low	44	18.3
2	Medium	86	35.8
3	High	110	45.8
	Total	240	100.0

Source: Authors' Own Compilation

The table 7 reflects that 45.8 percent of sample entrepreneurs have high level of social recognition in the society. Around 35.8 percent female entrepreneurs responded that they got medium level of social recognition after establishment of enterprises. However, 18.3percent of entrepreneurs cited that they have low level of social recognition.

The table 8 depicts various factors to measure the socio-economic status of female entrepreneurs of northeast India. The study projects that 94.2 percent of sample female entrepreneurs responded for better education for their children. Similarly, around 88 percent of female entrepreneurs responded that they can be able to avail better healthcare facilities after becoming the entrepreneurs. Also, around 97 percent of female entrepreneurs responded that they can afford better clothing for their families regularly after becoming businesswomen. With respect to community participation, around 69.6 percent sampled female entrepreneurs responded that their community participation have improved after becoming entrepreneurs.

In case of Household Income, 80.4 percent of female entrepreneurs stated that it has been improved due to their involvement in entrepreneurial activities. However, only 52.9 percent entrepreneurs cited that they were able to save money from their business income. Similarly, only 29.6 percent female

Table 8: Socio-Economic Factors to Measure Status of Female Entrepreneurs

Sl.	*Factors*	*Responses*	*Frequency*	*Percent*
1	Better Education for Children	Yes	226	94.2
		No	14	5.8
2	Access to Good Healthcare Facilities	Yes	212	88.3
		No	28	11.7
3	Better Clothing for Family	Yes	233	97.1
		No	7	2.9
4	Community Participation	Better	167	69.6
		Same as Earlier	73	30.4
5	Income of Household	Improved	193	80.4
		Same as Earlier	47	19.6
6	Savings from Income	Yes	127	52.9
		No	113	47.1
7	Insurance Policy Purchased	Yes	71	29.6
		No	169	70.4
8	Assets Creation	Yes	89	37.1
		No	151	62.9
9	Housing Situation	Improved	191	79.6
		Same as Earlier	49	20.4
	Total		240	100.0

Source: Authors' Own Compilation

entrepreneurs purchased insurance policy and rest are not at all insured with any insurance policy in the studied region. The 62.9 percent of female entrepreneurs further stated that they were not able to create assets out of their business earnings. However, most (79.6 percent) of sample female entrepreneurs have responded that their involvement in entrepreneurial activities have improved their hosing situation in the locality.

6. Results and Discussion

To test both the hypotheses of the study, chi square test has been applied to test the null hypotheses. Subsequently, few inferences have also been drawn with the help of cross tabulation as well.

Table 9: Crosstab between Capital Cities and Monthly Income

Sl.	*Capital Cities*	*Range of Monthly Income*			*Total*
		Upto Rs. 25,000	*Rs. 25,001- Rs. 50,000*	*Rs. 50,001 & Above*	
1	Agartala	13 (43.3)	10 (33.3)	7 (23.3)	30 (100.0)
2	Aizawl	9 (30.0)	14 (46.7)	7 (23.3)	30 (100.0)
3	Dispur	24 (80.0)	4 (13.3)	2 (6.7)	30 (100.0)
4	Gangtok	8 (26.7)	19 (63.3)	3 (10.0)	30 (100.0)
5	Kohima	10 (33.3)	13 (43.3)	7 (23.3)	30 (100.0)
6	Imphal	9 (30.0)	13 (43.3)	8 (26.7)	30 (100.0)
7	Itanagar	10 (33.3)	9 (30.0)	11 (36.7)	30 (100.0)
8	Shillong	15 (50.0)	6 (20.0)	9 (30.0)	30 (100.0)
	Total	98 (40.8)	88 (36.7)	54 (22.5)	240 (100.0)

Source: Authors' Own Compilation

** Value in parentheses is in percentage*

The table 9 reflects that 80 percent of female entrepreneurs of Dispur earn monthly income upto Rs 25,000 p.m. and only 6.7 percent of them earns more than Rs 50,000 p.m. On the other hand, 63.3

Table 10: Result of Chi-Square Tests on Capital Cities and Monthly Income

	Value	*Df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	39.616[a]	14	.000
Likelihood Ratio	39.628	14	.000
Linear-by-Linear Association	2.109	1	.146
N of Valid Cases	240		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.75.

Source: Authors' Own Compilation

percent of female entrepreneurs of Gangtok city earn in between Rs 25,001 to Rs 50,000 monthly. It is also found that 36.7 percent female entrepreneurs of Itanagar earn monthly income more than Rs 50,000 from their business.

The Chi-Square result on table 10 states $p<0.05(14, N=240)$. Hence we reject the Null Hypothesis. Thus, there is significant relation exists between the capital cities and the level of monthly income earned by the female entrepreneurs in northeast India.

Table 11: Result of Crosstab between Capital Cities and Social Recognition

Sl.	*Capital Cities*	*Level of Social Recognition*			*Total*
		Low	*Medium*	*High*	
1	Agartala	8 (26.7)	7 (23.3)	15 (50.0)	30 (100.0)
2	Aizawl	5 (16.7)	14 (46.7)	11 (36.7)	30 (100.0)
3	Dispur	2 (6.7)	7 (23.3)	21 (70.0)	30 (100.0)
4	Gangtok	0 (0.0)	16 (53.3)	14 (46.7)	30 (100.0)
5	Kohima	4 (13.3)	11 (36.7)	15 (50.0)	30 (100.0)
6	Imphal	8 (26.7)	12 (40.0)	10 (33.3)	30 (100.0)
7	Itanagar	8 (26.7)	9 (30.0)	13 (43.3)	30 (100.0)
8	Shillong	9 (30.0)	10 (33.3)	11 (36.7)	30 (100.0)
	Total	44 (18.3)	86 (35.8)	110 (45.8)	240 (100.0)

Source: Authors' Own Compilation

** Value in parentheses is in percentage*

From the table 11 it can be observed that female entrepreneurs of Gangtok doesn't have low level of social recognition, however 30 percent of female entrepreneurs of Shillong cited low social recognition in the society. On the other hand, most (53.3 percent) female entrepreneurs of Gangtok receive medium level of social recognition. It is observed that most (70 percent) female entrepreneurs of Dispur receive high social recognition after becoming an entrepreneur.

Table 12: Chi-Square Tests between Capital Cities and Social Recognition

	Value	*Df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	26.688[a]	14	.021
Likelihood Ratio	31.780	14	.004
Linear-by-Linear Association	3.084	1	.079
N of Valid Cases	240		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.50.

Source: Authors' Own Compilation

The Chi-Square result on table 12 states $p<0.05$ (14, N=240).Hence we reject the null hypothesis. Thus, there is significant relation exists between the capital cities and the level social recognition received by the female entrepreneurs in northeast India.

7. Conclusion

Women can play an important role in the growth of an economy. Women who are economically and socially empowered strengthen the existing workforce and contribute to regional growth. Furthermore, economic empowerment for women means confidence and autonomy, which leads to the creation of wealth. The current study examined the personal histories and business characteristics of female-owned businesses in northeast India. One of the key findings of the study is that the status of female entrepreneurs in northeast India is identical. The study looked at the demographics, income levels, and social recognition of female entrepreneurs in the region. The study's key findings confirm that women are socially and economically empowered after embarking on an entrepreneurial journey. As a result, female entrepreneurs in northeast India gain economic independence and a higher standard of living.

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9.	Prof. Sarbesh Kumar Mishra	2019-F09
10.	Prof. Srinivas Subbarao Pasumarti	2019-F10
11.	Prof. Sukanta Kumar Baral	2019-F11
12.	Dr. Pradeepta Kumar Samanta	2019-F12
13.	Prof. Santosh Kumar Mohapatra	2019-F13
14.	Prof. Arka Kumar Das Mohapatra	2021-F14
15.	Prof. Sasmita Rani Samanta	2021-F15
16.	Prof. Santosh Kumar Tripathy	2021-F16
17.	Prof. Abhijit Dutta	2021-F17
18.	Prof. Jayanta Kumar Parida	2021-F18
19.	Prof. Damodar Biswal	2021-F19
20.	Prof. Sudhansu Sekhar Mahapatra	2021-F20
21.	Prof. Ambika Prasad Pati	2021-F21
22.	Dr. Abhay Kumar Panda	2021-F22
23.	Dr. Amiya Kumar Mohapatra	2021-F23

INCUMBENCY CHART OF OFFICE BEARERS

Orissa Commerce Association (OCA) started in 1970 in G. M. College Sambalpur, which was the first College to have B. Com. as an under Graduate Course in Orissa. The pioneering founding members of OCA are:

1. Prof. Paresh Chandra Ray
2. Prof. Suryakanta Das
3. Prof. Batakrushna Mohanty
4. Prof. Durga Prasad Nayak

Sl. No	Year	Venue	President	Secretary	Managing Editor of Orissa Journal of Commerce	Number of Issues Published
1.	1970	G.M. College, Sambalpur	Sri Harihar Patel, Ministry of Industires, Govt. of Orissa	*	*	*
2.	1971	Khalikote College, Berhampur	Prof. P.C.Ray, Secretary, Board of Secondary Education, Orissa	*	*	*
3.	1973	Ravenshaw College, Cuttack	Prof. P.C.Ray, Secretary, Board of Secondary Education, Orissa	*	*	*
4.	1974	G.M. College, Sambalpur	Prof. (Dr) Surya Kant Das, Professor of Commerce, Utkal University, Bhubaneswar	Prof. Batakrushna Mohanty, Prof. of Commere, G. M. College, Sambalpur	Dr. Abhaya Kumar, Reader, Department of Commerce, Utkal University	One Issue
5.	1976	Utkal University, Bhubaneswar	Mr. M.P. Modi, I.A.S. Managing Director, IDC	*	*	*
6.	1977	Bhadrak College, Bhadrak	Prof. (Dr) Surya Kant Das, Professor of Commerce, Utkal University, Bhubaneswar	*	*	*
7.	1978	S.C.S. College, Puri	Prof. Batakrushna Mohanty, Principal, G.M. College, Sambalpur	*	*	*
8.	1980	Berhampur University, Bhanja Vihar, Berhampur	Prof. Batakrushna Mohanty, Principal, G.M. College, Sambalpur	*	*	*
9.	1981	K.S.U.B. College, Bhanjanagar	Prof. Ganga Prasad Panda, Principal Lingaraj Law College, Berhampur	*	*	*
10.	1982	Dhenkanal College, Dhenkanal	Shri Durga Prasad Nayak, Principal, Sonepur College, Sonepur.	Dr. Girija Prasad Acharya	Dr. Pramod Ku. Sahu, Berhampur University	One Issue
11.	1983	Ispast College, Rourkela	Prof. Bijay Narayan Pattnaik, Utkal University, Bhubaneswar	Dr. Girija Prasad Acharya	*	*
12.	1985	F.M. College, Balasore	Prof. (Dr.) J.J. Rao, Ravenshaw College, Cuttack	Dr. Girija Prasad Acharya	*	*
13.	1986	Ganjam College, Ganjam	Prof. (Dr) Ramakanta Jena, Dean, Faculty of Commerce, Utkal University, Bhubaneswar	Dr. Girija Prasad Acharya	Dr. Ghanashyam Panda, Berhampur University	One Issue

Sl. No	Year	Venue	President	Secretary	Managing Editor of Orissa Journal of Commerce	Number of Issues Published
14.	1987	L.N.College, Jharsuguda	Prof. (Dr) Pramod Ku. Sahu, Professor , Berhampur University, Berhampur	*	Dr. Ghanashyam Panda, Berhampur University	One Issue
15.	1988	Dhenkanal College, Dhenkanal	Prof. Sambhu Prasad Mishra, Professor of Commerce, G.M. College, Sambalpur	*	Dr. Ghanashyam Panda, Berhampur University	One Issue
16.	1990	Dept. of Commerce, Berhampur University	Sri C. S. Patro, Head, P.G. Department of Commerce, Khalikote College	Dr. Swaroop Ch. Sahoo	Dr. Gunanidhi Sahoo, Principal, Khalikote, Berhampur	One Issue
17.	1994	Bhadrak College, Bhadrak	Prof. (Dr) Gunanidhi Sahu, Principal, Khalikote College, Berhampur	Dr. Jagannath Panda	Dr. Swaroop Ch. Sahoo	One Issue
18.	1995	S.C.S. College, Puri	Prof. (Dr) Girija Prasad Acharya, Professor of Commerce, Ravenshaw College, Cuttack	Dr. Bidhu Bhusan Panigrahi,	Prof. Pramod Ku. Sahu, Berhampur University	One Issue
19.	1997	Womens' College, Jharsuguda	Shri Ayodhya P. Nayak, BJB College, Bhubaneswar	Dr. Damodar Biswal, S.C.S. College, Puri	Prof. Pramod Ku. Sahu, Berhampur University	One Issue
20.	1998	Prananath College, Khurda	Prof. (Dr.) Pradeep Chandra Tripathy, Professor , Utkal University, Bhubaneswar	Prof. Tahalu Sahoo, Principal Womens College, Jharsugara	Prof. Pramod Ku. Sahu, Berhampur University	One Issue
21.	1999	Khalikote (Auto) College, Berhampur	Prof. (Dr) R.P. Choudhury, Principal, Khalikote College (Auto), Berhampur	Malay Kumar Mohanty, Ravenshaw College (Auto)	Prof. Pramod Ku. Sahu, Berhampur University	One Issue
22.	2000	Ispat College, Rourkela	Prof. Minaketan Mohapatra, Principal, Dehenkanal College	Malay Kumar Mohanty, Ravenshaw College (Auto)	Prof. Pramod Ku. Sahu, Berhampur University	One Issue
23.	2001	Maharshi College of Natural Law, Bhubaneswar	Prof. (Dr) Damodar. Biswal, Professor, Ravenshaw College (Auto), Cuttack	Malay Kumar Mohanty, Ravenshaw College (Auto), Cuttack	Prof. Pramod Ku. Sahu, Berhampur University	One Issue
24.	2004	Kendrapara College, Kendrapara	Prof. (Dr) Jagannath Panda, Professor Berhampur University, Berhampur	Prof. Ranjan Kumar Bal, Utkal University	Prof. Pramod Ku. Sahu, Berhampur University	One Issue
25.	2005	V.N.College, Jajpur Road	Prof. (Dr) Umesh Ch. Pattnaik, Professor Berhampur University, Berhampur	Prof. Ranjan Kumar Bal, Utkal University	Prof. Jagannath Panda, Berhampur University	One Issue
26.	2006	Rayagada College, Raygada	Prof. Tahalu Sahu, Principal Belpahar College, Belpahar	Prof. Ranjan Kumar Bal, Utkal University	Prof. Jagannath Panda, Berhampur University	One Issue
27.	2007	P.G. Department of Commerce Utkal University, Bhubaneswar	Prof (Dr) Samson Moharana, Professor Utkal University, Bhubaneswar	Prof. Kishore Ch. Rout, Berhampur University	Prof. Jagannath Panda, Berhampur University	One Issue
28.	2008	Fakir Mohan Autonomous College, Balasore	Dr. Arun Kumar Barik, Head, Department of Commerce, Vyasanagar College, Jajpur Road	Prof. Kishore Ch. Rout, Berhampur University	Prof. Ranjan Kumar Bal, Utkal University	One Issue
29.	2009	Govt. Autonomous College, Angul	Maj (Dr.) Abhay Kumar Panda, Principal, Fakir Mohan Autonomous College, Balasore.	Prof. Kishore Ch. Rout, Berhampur University	Prof. Ranjan Kumar Bal, Utkal University	One Issue

Sl. No	Year	Venue	President	Secretary	Managing Editor of Orissa Journal of Commerce	Number of Issues Published
30.	2010	Department of Commerce, Ravenshaw University	Shri Baladev Kar, Principal, Govt. College (Auto), Angul	Dr. Kshiti Bhusan Das, Utkal University	Prof. Ranjan Kumar Bal, Utkal University	One Issue
31.	2011	P. G. Department of Commerce, Berhampur University	Prof. Malay Kumar Mohanty, Former Registrar, Ravenshaw University, Professor G. M. College, Dean Sambalpur University	Dr. Kshiti Bhusan Das, Utkal University	Prof. Ranjan Kumar Bal, Utkal University	Two Issues
32.	2012	P. G. Department of Commerce, Utkal University	Prof. P. K. Biswasray, Professor , Berhampur University	Dr. Kshiti Bhusan Das, Utkal University	Prof. Ranjan Kumar Bal, Utkal University	One Issue
33.	2013	Choudwar College, Choudwar	Prof. Prasant Kumar Sahu, Vice- Chancellor, Utkal University	Prof. Kshiti Bhusan Das, Utkal University	Prof. Malay Kumar Mohanty	One Issue
34.	2014	P. N. (Auto) College, Khurda	Prof. Ranjan Kumar Bal, Professor, Utkal University	Prof. Kshiti Bhusan Das, Utkal University	Prof. Malay Kumar Mohanty	Two Issue
35.	2014-15	Kendrapada (Auto) College	Prof. Kshiti Bhusan Das, Professor, Utkal University	Dr. G. K. Panigrahi	Prof. Malay Kumar Mohanty	Two Issues
36.	2016	Belpahar College, Belpahar	Prof. Girish Ku. Patra, Kendrapada (Auto) College	Dr. G. K. Panigrahi	Prof. Malay Kumar Mohanty	Two Issues
37.	2017	F. M. University, Balasore	Prof. Jayanta Kumar Parida, Professor, Utkal University	Dr. G. K. Panigrahi	Prof. Malay Kumar Mohanty	Three Issues
38.	2018	Ravenshaw University, Cuttack	Prof. Bhagaban Das, Professor, F. M. University	Major (Dr) S. A. Taher	Prof. Malay Kumar Mohanty	Four Issues
39.	2019	P. G. Department of Commerce, Utkal University	Prof. Sanjay Kumar Satapathy, Professor, Ravenshaw University	Major (Dr) S. A. Taher	Prof. Malay Kumar Mohanty	Four Issues+One Special Issue
40.	2020	KIIT, Deemed to be University,	Prof. P. K. Hota,	Major (Dr) S. A.Taher	Prof. Malay Kumar Mohanty	Four Issues+One Special Issue
41	2021	L.N.College, Jharsuguda	Prof. Sasmita Samanta, Pro-Vice Chancellor, KIIT University, Bhubaneswar	Major (Dr) S. A.Taher	Prof. Malay Kumar Mohanty	Four Issues

* **Information not available:** People concerned are requested to provide the above missing information with proper references. If any error has crept in the above incumbency chart inadvertently, persons are requested to intimate the correction with the required documentation.

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42nd ANNUAL CONFERENCE of ORISSA COMMERCE ASSOCIATION

&

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Organised by

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and

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  2. Digital Transformation and Corporate India
  3. Digital Marketing: The way forward
  4. Digital Disruptions and Existence, Relatedness and Growth (ERG)

- ***Technical Session II: ESG and Sustainable Development***

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  2. ESG and the MSME: Redefining Business Strategy
  3. ESG and Investment Management
  4. ESG and Inclusive Development

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Orissa Journal of Commerce

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b) The title of the paper should be followed by name, designation, affiliation, email and mobile number of the author(s). The surname of the author(s) should be marked in blue colour.

c) The main body of the paper should contain: **1. Introduction, 2. Review of Literature, 3. Objective and Hypothesis of the Study, 4. Research Methodology, 5. Data Analysis, 6. Results and Discussion, and 7. Conclusion.** The conclusion should include research outcomes, implications of research on industry, academia and policy making, Limitation of study if any, and future scope of research if any. The subheadings under each of the main headings should also be numbered accordingly.

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