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The Institute of Cost Accountants of India would be the preferred source of resources and professionals for the financial leadership of enterprises globally.

Mission Statement

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FOREWORD

Budget 2024-25 has an insightful and long-term transformative implications for the Indian economy. Firstly, it marked a milestone in India's journey towards becoming 'Viksit Bharat' by 2047, with a continued focus on leveraging technology as the backbone of transformation. In the recent past, digital transformation has become a strategic priority for government and businesses, from being a boardroom buzzword. With more than 500 million internet users, the country is among the leading and fastest-growing digital consumer markets. Additionally, being a vibrant start-up market allows India to foster innovation further and standardize new technologies. India is expected to have a digital economy of \$1 trillion by 2025.

Among several noteworthy steps, the budget's emphasis on the central role of research and innovation in catalysing growth, employment and development is commendable. The establishment of large numbers of new institutions of higher learning reinforces the focus on higher education in this technology-driven epoch. The establishment of a corpus of INR 1 lakh crore (with a fifty-year interest free loan) to provide long-term financing/refinancing with long tenors and low or nil interest rates is certainly a welcome move. The decision to extend existing tax benefits to startups for another year will also be highly beneficial. The scheme to fortify application of deep-tech in the defence sector will also provide a much-needed impetus to self-reliance for the country.

The government's continued emphasis on sustainable growth, with technology, once again takes centre-stage. The steps expand and augment the Electric Vehicles ecosystem, through bolstering manufacturing and charging infrastructure, as well as increased adoption of e-buses, is a step towards greater clean mobility, both from the public and the private sector perspective. These measures, coupled with consistent policy support, certainly marks a significant step towards achievement of India's ambitious target of Net-Zero by 2070. The provisions of Budget 2024, with a strong emphasis on sustainable and technology-driven growth, will undoubtedly serve as a powerful catalyst for the realization of our collective dream of a prosperous and self-reliant *Viksit Bharat*.

It gives me an immense pleasure to present esteemed Research Bulletin of the Institute, Vol.49, Nos. II & III, July & October 2023 issue. I hope the articles on Digital transformation, ESG, Capital Market, Finance, etc. hit on areas that resonate with you, and provide you valuable insights to enrich your knowledge base.

CMA Ashwin G. Dalwadi

President

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CHAIRMAN'S COMMUNIQUÉ

Innovation has often been a significant aspect that distinguishes entities across the world. A business that keeps innovating sustain and succeed. A country that instils innovation in its society doesn't only keep the economy roaring but also empowers entrepreneurship and keeps its businesses growing. India, in the past few years, has started this journey, and the trajectory of becoming a \$10 trillion economy by 2034 and a developed nation hinges significantly on its transformation to a scientifically advanced country and a global leader in innovation. Government initiatives aimed at fostering creativity in education and incentivising careers in science underscore India's steadfast commitment towards nurturing its innovation ecosystem. India's ancient history is full of innovators and researchers who were constantly contributing to research and innovation that has withstood the test of time.

India's remarkable rise in the Global Innovation Index (GII), reflects its resolute dedication to promoting innovation. In a landmark move, Government of India outlined a bold vision for India's technological future as she presented the interim Budget 2024. Central Government's announcement was the allocation of a substantial INR 1 trillion corpus to bolster technology research, signalling a transformative leap towards fostering innovation and self-reliance. This monumental corpus aims to catalyse private sector engagement in research and innovation across emerging sectors. It would amplify their technological pursuits, particularly in burgeoning domains.

The government's innovation stimulus holds immense promise for startups, offering a pathway towards sustainable growth, competitiveness, and global relevance. As India embarks on a journey towards becoming a powerhouse of innovation and entrepreneurship, startups stand to benefit from the unprecedented opportunities from such government's initiatives, paving the way for a future defined by creativity, ingenuity, and technological excellence.

Efforts made to publish this volume are sincerely appreciated and thankfully acknowledged.

The readers are requested to put forward their valued suggestion towards enrichment of Research Bulletin.

CMA (Dr.) K Ch. A V S N Murthy
Chairman
Journal & Publications Committee
The Institute of Cost Accountants of India

EDITOR'S NOTE

Greetings!!!

With the unveiling of the Interim Budget 2024 the spotlight on its implications for the education sector has intensified. Hon'ble Finance Minister of India, in her Budget 2024 speech, emphasized accomplishments such as the Skill India Mission's training of 1.4 crore youth and the establishment of various institutions of higher learning, including IITs, IIITs, IIMs, AIIMS, and universities. However, despite this progress, experts stress the need for a continued focus on expanding the number of institutions and enhancing educational quality. Budgetary allocations for World Class Institutions for Institutions of Eminence (IoE) increased to Rs 1,800 crore in 2024-25, with a rise in funds for research and innovation from Rs 210.61 crore to Rs 355 crore.

While the rise in higher education institutions is favourable, experts claim for an increased emphasis on both quantity and quality. The need for continued investment and strategic allocation remains paramount to shape a resilient and forward-thinking education ecosystem. At the forefront is the National Education Policy (NEP) 2020, introducing transformative measures to impart entrepreneurial mind-set in students. The Budget's commitment reflects a progressive approach towards creating an environment where young minds actively contribute to the nation's growth and sustainability.

The emphasis on skill development and creating job-ready youth opens substantial opportunities, particularly in the financial/management education sector. Being a part of a premier Professional body, we firmly believe professional education would stand to witness significant growth. We're hopeful about the future, thanks to the Government of India for framing such economic policies fostering inclusive and sustainable development. We wish the upcoming generation of finance and management professionals would thrive in an efficient ecosystem, enhancing their capabilities and contributing significantly to the nation-building activities while accomplishing their personal goals.

Our present volume of Research Bulletin, Vol.49, Nos. II & III issue comprises of various blazing topics like, Digital Transformation, Financial Management, Capital Markets, Banking & ESG, etc. would surely improve the knowledge base of readers.

We are extremely happy to convey that our next issue of *Research Bulletin, Vol.49 No. IV* would be a non-theme one and the subtopics are - Green Entrepreneurship and Circular Economy, Capital Market Volatility, Corporate Governance, CSR, Financial Risk: Modelling, Analytics, and Management, Derivatives, Insurtech and Regtech, Blockchain and Decentralized Finance (DeFi).

We look forward to constructive feedback from our readers on the articles and overall development of the Research Bulletin. Please send your mails at *research.bulletin@icmai.in*.

We express our sincere gratitude to all the contributors and reviewers of this important issue and wish our readers get requisite insight from the articles.

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DIGITAL DISRUPTION AND SOCIETAL EMPOWERMENT: FOSTERING COMMUNITY ADVANCEMENT

*Sudesh Kumar Sahu
Oscar Kujur*

Abstract

This article explores the dynamic relationship between digital disruption and societal empowerment, illuminating the transformative potential and challenges within the context of community advancement. It delves into key areas, including digital inclusion and accessibility, e-governance, education outreach, digital financial inclusion, and community empowerment through social media. By examining these facets, the article elucidates the profound impact of digital technologies on society while underscoring the pressing need to address issues such as the digital divide, privacy concerns, and ethical considerations. Ultimately, the article advocates for a holistic approach that prioritizes digital literacy, inclusivity, and ethical standards to ensure that technology genuinely empowers all communities, leaving no one behind.

Keywords:

Digital Disruption, Societal Empowerment, E-governance, Digital Financial Inclusion, Digital Literacy, Microfinance, Remote Learning



Introduction

The concept of “digital disruption” refers to the transformative impact of digital technologies on markets, businesses, and individuals. These technologies can challenge established business models and introduce new opportunities. For example, the music industry was disrupted by services like Spotify and Apple Music, which enabled easy online listening without the need for downloads.

Digital disruption involves the emergence of novel business models, products, and services that leverage digital capabilities to create competitive advantage and reshape industries. This trend has far-reaching implications for the social impact sector, encompassing diverse actors and initiatives aimed at addressing societal and environmental issues. This article introduces the intersection of digital disruption and social impact, focusing on the potential and obstacles presented by digital transformation. It examines innovation, inclusivity, empowerment, and accountability within the social impact context. The article explores how digital technologies are being harnessed to drive positive societal change in areas like healthcare, education, poverty reduction, environmental conservation, and human rights. It concludes by delving into the ethical, legal, and policy considerations essential for ensuring a fair and sustainable digital disruption that benefits all.

Digital Inclusion and Accessibility:

Digital inclusion is defined as “equitable,

meaningful, and safe access to the use, leadership, and design of digital technologies, services, and associated opportunities for everyone, everywhere”. It covers not only the availability of digital devices and internet connections but also the skills and knowledge to use them effectively and safely. Digital inclusion is important because it enables people to access information, services, opportunities, and rights that are essential for their well-being and empowerment. Digital inclusion also contributes to social, economic, and political development and reduces inequalities.

However, achieving digital inclusion is not without challenges. One of the major challenges is digital accessibility, which refers to the extent to which all individuals can access digital content and technology, especially those with disabilities. According to the World Health Organization, there are approximately one billion people with disabilities in the global population, but many of them face barriers to accessing the digital world. Some of these barriers are:

1. **Affordability:** Many people with disabilities live in poverty and cannot afford internet service or digital devices. In some countries, internet data is very expensive and consumes a large portion of income.
2. **Connectivity:** Some areas lack the infrastructure or coverage to provide reliable internet access. This affects rural or remote communities disproportionately. Even in developed countries like the United States, more than one in five people living in rural areas lack



access to broadband coverage.

3. Digital literacy: To make the most out of the internet, people need to have the skills and knowledge to use their devices and navigate online safely and effectively. This includes protecting their privacy, avoiding scams, finding and evaluating information, and communicating online. However, many people lack these skills or face language or cultural barriers that limit their online participation.

To overcome these challenges, there is a need for more awareness, education, collaboration, innovation, and regulation. Businesses, governments, civil society, and individuals all have a role to play in making digital accessibility a reality for everyone. Some of the possible solutions are:

1. Adopting and implementing web accessibility standards such as WCAG or Section 508 that provide guidelines for creating accessible websites and applications.
2. Providing subsidies or incentives for low-income individuals or communities to access internet service or digital devices.
3. Investing in infrastructure development and maintenance to expand internet coverage and speed.
4. Developing and promoting digital skills training programs for people with disabilities or other marginalized groups.
5. Designing and testing digital products and services with diverse users in mind, ensuring they are inclusive, useful, and trustworthy.

6. Advocating for digital rights and policies that protect the privacy, security, and dignity of all online users.

Literature Review

Christensen (1997) introduced the concept of “disruptive innovation,” highlighting how emerging technologies disrupt established markets and business models. Disruptive innovations often begin as simpler, more affordable solutions that appeal to niche markets but eventually challenge incumbent players. Digital inclusion and accessibility are not only ethical imperatives but also strategic opportunities. By ensuring that everyone can access and use the digital world, we can create a more inclusive, equitable, and sustainable society. (Bharadwaj et al., 2013) further discussed disruptive innovation as a process that reshapes industries by offering novel value propositions through technological advancements. Digital disruption is inextricably linked to digital transformation, which entails integrating digital technologies into all elements of an organization (Vial 2019c). Digital inclusion, defined as equitable access to digital technologies and skills, is crucial for community advancement. Research by Warschauer (2004) has shown that the digital divide disproportionately affects marginalized communities. Digital inclusion, defined as equitable access to digital technologies and skills, is crucial for community advancement. Research by Warschauer (2004) has shown that the digital divide disproportionately affects marginalized communities.



DiMaggio et al. (2004) emphasize socioeconomic factors in the digital divide, highlighting disparities in access and digital literacy. E-governance, which leverages digital technologies for governance and public service delivery, plays a pivotal role in empowering communities. (Moon 2002) discusses how e-governance enhances government efficiency and transparency. The role of social media platforms in citizen engagement and mobilization has also been extensively studied (Gil de Zúñiga et al., 2012). Digital financial inclusion, facilitated by technologies such as mobile banking and digital wallets, is instrumental in promoting economic empowerment and reducing poverty (Suri & Jack, 2016). Social media platforms offer communities opportunities to amplify their voices, mobilize for collective action, and influence social change (Aarts, 2013). Digital technologies, including geographic information systems (GIS) and remote sensing, have empowered communities to engage in environmental conservation and sustainable resource management (McKinley et al., 2017). The persistent digital divide and its implications for social inequality remain a central concern in the literature (Warschauer, 2003).

E-Governance and Citizen Engagement:

A. E-governance is the use of information and communication technologies (ICTs) by governments to improve the quality, efficiency, and effectiveness of public services, policies, and processes. E-governance also aims to enhance the interaction and collaboration

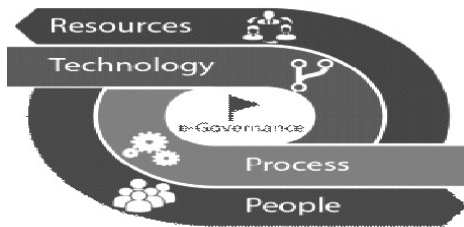
between governments, citizens, civil society, and other stakeholders.

B. Citizen engagement is the process of including citizens in the creation, execution, monitoring, and assessment of governmental policies and services. Consultation, teamwork, co-creation, and co-delivery are a few examples of the different ways that citizens can be involved. The legitimacy, responsiveness, accountability, and openness of governance can all be improved through more citizen engagement.

C. E-governance and citizen engagement are closely related concepts that mutually reinforce each other. E-governance can enable more inclusive, participatory, and deliberative forms of citizen engagement by providing various channels, platforms, tools, and data for communication and feedback. E-governance can also empower citizens to access information, voice their opinions, influence decisions, and hold governments accountable. On the other hand, citizen engagement can enhance the relevance, quality, and impact of e-governance initiatives by providing valuable inputs, insights, perspectives, and feedback from diverse stakeholders. Citizen engagement can also foster trust, ownership, and satisfaction among citizens towards e-governance services and policies.



Figure: 1



Source: bigdatabigbrotherbigboon.wordpress.com

Some examples of e-governance and citizen engagement initiatives are:

- a) Online portals or mobile applications that allow citizens to access public information, request services, report issues, or pay taxes.
- b) Online platforms or social media that enable citizens to participate in public consultations, surveys, polls, or discussions on various policy issues or proposals.
- c) Online tools or dashboards that allow citizens to monitor the performance, budget, or outcomes of public projects or programs.
- d) Online mechanisms or systems that allow citizens to submit complaints, suggestions, or feedback on public services or officials.
- e) Online networks or communities that facilitate collaboration or co-creation among citizens and governments on various public problems or solutions.

Education Outreach and Remote Learning:

The COVID-19 pandemic has disturbed the educational system around the world, requiring children to stay at home and schools to close. It has also drawn attention to the flexibility and resilience that remote learning, distance learning, and online learning may bring to the educational system, particularly for individuals who are marginalized or disadvantaged by geographic, socioeconomic, or other considerations. Remote learning is the process of delivering educational materials and supporting learning activities outside of the traditional classroom. Setting. Radio, television, tablets, smartphones, computers, the internet, social media, and interactive platforms and applications are some of these technologies and media.

Remote learning can offer several benefits for education outreach and access, such as:

- Expanding the reach of quality education to remote, rural, or conflict-affected areas where schools may be scarce, unsafe, or inadequate
- Reducing the barriers of cost, distance and time for learners who cannot afford or access regular schooling, such as girls, refugees, migrants, working children, or persons with disabilities
- Enhancing the diversity and relevance of educational content and pedagogy, by allowing learners to choose from a variety of courses, languages, formats and styles that suit their needs, interests and preferences
- Promoting learner autonomy,



engagement and motivation, by enabling learners to learn at their own pace, place and time, and to interact with peers and teachers through online communities and networks.

Some examples of successful online education initiatives that have demonstrated positive impact on education outreach and access are:

- The UNICEF Learning Passport, a digital platform that provides curriculum-aligned learning resources for displaced and marginalized children in various contexts. The platform has been used by over 325,000 learners in 11 countries since its launch in 2019.
- Khan Academy, a non-profit organization that provides free online courses, lectures, and practice tasks for students of all ages and skill levels. The Khan Academy has over 120 million registered users in 190 countries, and 46 languages are supported.

These initiatives show how remote learning can be a powerful tool for extending educational opportunities to communities with limited access to traditional resources. However, remote learning also faces many challenges and limitations, such as:

- a) The digital divide is the difference between people who have access to digital devices, internet connectivity, and digital literacy abilities and those who do not.

According to UNICEF data, at least 463 million kids worldwide were unable to access remote learning due to a lack of remote learning rules or equipment during school closures.

- b) Quality assurance refers to the need to ensure that remote learning content, delivery, and assessment meet the standards and expectations of learners, teachers, parents, and employers. This requires adequate policies, regulations, accreditation systems, and quality assurance mechanisms.
- c) social-emotional support, which refers to the need to provide emotional, psychological, and social care for learners who may face isolation, stress, or anxiety due to remote learning. This requires effective communication, feedback, and counselling strategies from teachers, parents, and peers.

Therefore, distance learning is not a replacement for in-person instruction but rather a supplement or alternative that, in some circumstances, can improve education outreach and access. Addressing the difficulties and restrictions outlined above, as well as promoting cooperation and coordination among various stakeholders in the educational system, is necessary to make remote learning more efficient and equitable.

Digital Financial Inclusion:

Digital financial inclusion is the use of cost-saving digital technologies to provide



formal financial services to excluded and underserved populations, such as the poor, women, and rural dwellers. Digital financial inclusion can promote financial inclusion and economic empowerment by enabling access to payments, transfers, savings, credit, insurance, and other financial products that are suited to the needs and preferences of customers. Digital financial inclusion can also reduce the costs and risks of cash transactions, increase the efficiency and transparency of financial systems, and foster innovation and competition among financial service providers.

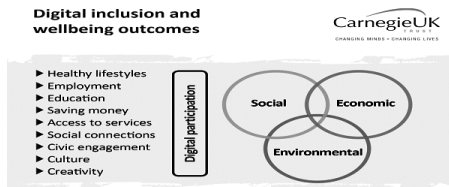
One of the key drivers of digital financial inclusion is mobile banking, which allows customers to use their mobile phones to access and manage their money. Mobile banking can overcome the physical barriers of distance and infrastructure that limit the reach of traditional banking services. Mobile banking can also leverage existing networks of mobile money agents, who act as intermediaries between customers and service providers, to facilitate cash-in and cash-out transactions. Mobile banking can offer a range of services, such as person-to-person transfers, bill payments, remittances, savings, credit, and insurance. Another driver of digital financial inclusion is digital wallets, which are electronic accounts that store money in digital form and can be accessed through various devices, such as mobile phones, cards, or point-of-sale terminals. Digital wallets can enable customers to store money securely, make payments conveniently, and access other financial services easily. Digital wallets can also link customers to other platforms, such as e-commerce, social

media, or government services, that can offer additional benefits and opportunities. A third driver of digital financial inclusion is microfinance platforms, which are online platforms that connect borrowers and lenders directly or through intermediaries. Microfinance platforms can expand the availability and affordability of credit for low-income customers who lack collateral or credit history. Microfinance platforms can also reduce the operational costs and risks of lending by using digital technologies to verify identities, assess creditworthiness, disburse loans, collect repayments, and enforce contracts. Microfinance platforms can offer various types of loans, such as peer-to-peer lending, crowdfunding, or marketplace lending.

Digital financial inclusion has the potential to transform the lives of millions of people who are currently excluded or underserved by formal financial services. However, digital financial inclusion also poses some challenges and risks that need to be addressed by policy makers, regulators, service providers, and customers. Some of these challenges and risks include ensuring the quality and reliability of digital infrastructure and services; protecting the privacy and security of customer data and transactions; enhancing the digital literacy and financial capability of customers; ensuring the fair and responsible treatment of customers; promoting the interoperability and integration of digital platforms; and fostering a conducive and inclusive regulatory environment.



Figure: 2



Source: www.onedigitaluk.com

Community Empowerment through social media:

Community empowerment through social media is the process of using online platforms to amplify local voices, mobilize communities, and drive social change. Social media can enable citizens to participate in planning practices, share information and opinions, and interact with governments and planning professionals. Social media can also enhance social inclusion by engaging diverse groups of people who may not have access to traditional participation methods. Furthermore, social media can facilitate different levels of citizen power, such as collective participation, shared identification, and collaborative control in the community. However, social media also pose some challenges, such as potential political and social bias, lack of transparency, and ethical issues. Therefore, a combination of online and offline participation methods may be necessary to achieve effective and inclusive community empowerment.

Environmental Sustainability and Conservation Efforts:

Digital technologies are increasingly being used to support community-led initiatives for environmental protection, conservation, and sustainable resource management. These technologies can help collect, analyze, and share data on environmental conditions, raise awareness and mobilize action among citizens, and facilitate collaboration and innovation among different stakeholders. Some examples of digital technologies that support community-led initiatives are:

- The Small Grants Program (SGP), a fund that gives grants of up to \$50,000 to local communities, including indigenous peoples, community-based organizations, and other non-governmental organizations, for environmental sustainability and climate change projects. The UN Development Program (UNDP) implements the SGP in 127 countries and has sponsored over 25,000 projects since 1992.
- The Coalition for Digital Environmental Sustainability (CODES), a network of partners from the public and private sectors, civil society, academia, and international organizations, that aims to leverage digital technologies to accelerate global environmental action and achieve the Sustainable Development Goals (SDGs). CODES was co-championed by UNEP and the International Telecommunication Union (ITU) as part of the Secretary-General’s Digital Cooperation Roadmap.



These examples show how digital technologies can play a vital role in enhancing environmental sustainability and conservation efforts at the community level. However, these technologies also pose challenges and risks, such as privacy, security, inequality, and digital divide. Therefore, it is important to ensure that digital technologies are used in an ethical, inclusive, and responsible manner, with respect for human rights and environmental justice.

Challenges and Considerations:

Digital empowerment is the process of using digital technologies to enable people and communities to access knowledge, tools, and resources that improve their quality of life and enhance their participation in society. However, digital empowerment also faces some challenges and limitations, such as:

1. Digital divides: The unequal access to digital infrastructure, services, and resources among different segments of society, especially the underprivileged or marginalized groups. This can create gaps in information, opportunities, and skills among people.
2. Privacy concerns: The risks of data breach, cyberattacks, identity theft, and surveillance that threaten the security and confidentiality of personal and sensitive information of individuals and organizations in the digital space.
3. Ethical considerations: The moral and social implications of using

digital technologies for various purposes, such as governance, education, health, commerce, etc. This can raise issues of accountability, transparency, fairness, inclusivity, and human rights in the digital domain.

Therefore, there is a need for sustainable and inclusive digital solutions that prioritize the interests of communities and address the challenges and limitations of digital empowerment. Such solutions should aim to provide affordable, accessible, reliable, and secure digital services and resources to all people, especially those who are digitally excluded or disadvantaged. Moreover, such solutions should also promote digital literacy, skill development, digital entrepreneurship, and civic engagement among people to empower them to use digital technologies effectively and responsibly.

Conclusion

In conclusion, the dynamic interplay between digital disruption and social impact is reshaping the landscape of community empowerment. The transformative potential of digital technologies is undeniable, offering opportunities to bridge gaps, amplify voices, and drive positive change. From digital inclusion and accessibility, e-governance and citizen engagement, to education outreach, financial inclusion, and environmental conservation, the realms of possibility are expanding. However, these possibilities are not without challenges. The digital divide remains a stark reality, threatening to leave marginalized communities further behind.



Privacy concerns, ethical considerations, and the need for sustainable and inclusive solutions underscore the complexities of the digital empowerment journey. To harness the full potential of digital disruption for community empowerment, a holistic approach is essential.

It is imperative that efforts focus not only on technological advancement but also on education, regulation, and collaboration. By fostering digital literacy, ensuring inclusivity, and upholding ethical standards, we can navigate the path toward a future where digital empowerment is a force for equitable and sustainable change. As we stand at the intersection of digital transformation and community impact, the imperative is clear – to ensure that the power of technology truly empowers every community, leaving no one behind.

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DIGITAL TRANSFORMATION: UNLOCKING INNOVATION AND EXCELLENCE THROUGH CASE STUDIES

Dipra Bhattacharya

Abstract

The article accentuates the profound impact of Digital Transformation in the dynamic realms of business and technology. It is a potent force driving change and innovation in industries and organizations. Drawing insights from compelling global and Indian case studies, it demonstrates how technology and data are being harnessed to fuel innovation and efficiency. From data analytics for informed decision-making to process automation and personalized customer experiences, digital transformation is revolutionizing operations and stakeholder engagement. Beyond technology, it fosters a culture of transparency, accountability, and ethical corporate governance. Embracing this transformative shift is not a choice but a necessity. It equips us to make informed decisions, bridge gaps, and create a future where data-driven excellence and human well-being coexist harmoniously. This article dives into digital transformation potentials, with case studies showcasing the path toward a more innovative future, free from boundaries or limits marking a new era of digital empowerment.

Keywords:

Digital Transformation, Innovation, Ethical AI, Corporate Governance, Data-driven Decision-Making, Process Automation, Operational Excellence, Future of Business

Introduction:

Digital transformation is a powerful shift transcending industries, enabling organizations to unleash their full potential. It encompasses technological enhancements, improved efficiency, and transparent governance. This process integrates digital tech across an organization, reshaping its operations and value delivery. With technology, data, and human creativity, it promises smarter decision-making, personalized customer

experiences and trust-building with stakeholders.

Market Outlook

India ranks as the second fastest-growing digital economy among 17 major world economies, as indicated by the Country Digital Index report. This index uses 30 different measures to gauge how well digital technologies are being adopted in both mature and emerging digital economies, such as Brazil, China, Indonesia, Russia, South Korea, Sweden, and the United States.

Table 1 – India’s digital footprint in the global arena

Category	India	Global
Internet users (2022)	1.5 billion	5.22 billion
Internet penetration rate (2022)	47%	67%
Social media users (2022)	448 million	4.39 billion
Mobile phone users (2022)	1.3 billion	5.27 billion
Mobile phone penetration rate (2022)	98%	67%

- The global market for AI in big data and IoT is expected to reach \$27.3 billion by 2026, with Asia Pacific leading the market followed by North America.
- The AI services market is set to lead the overall AI market growth in India by 2025 at a CAGR of 35.8%. The India AI software market is expected to grow from USD 2,767.5 million in 2020 to USD 6,358.8 million in 2025, at a CAGR of 18.1%.
- The India internet of things (IoT) market size reached US\$ 1.0 Billion in 2022. Expectations are that the market to reach US\$ 2.2 Billion by 2028, exhibiting a growth rate (CAGR) of

- 14.23% during 2023-2028.
- The net worth of market share of Digital Transformation is predicted to reach from US\$ 930.73 billion in 2023 to over US \$ 10,401.77 billion by 2033. The market is expected to register a CAGR of 27.3 % from 2023 to 2033.

Key Components and Characteristics of Digital Transformation:

Digital transformation is driven by competition, customer demands, efficiency, and revenue growth across industries. Success requires a holistic approach aligning with overarching goals, guided by vision, leadership, and adaptability.



1. **Technological Integration:** Companies are embracing state-of-the-art technologies like artificial intelligence, machine learning, big data analysis, the Internet of Things (IoT), cloud computing, and automation to make their operations better, help them make smarter choices, and develop new abilities.
2. **Customer-Centric Approach:** The main goal here is to make the customer’s experience even better by using digital tools and data to offer them personalized and easy interactions.
3. **Data-Driven Decision-Making:** Employing data analysis to gather valuable insights, make well-informed choices, and consistently enhance performance is a vital aspect of the digital transformation process.
4. **Agility and Flexibility:** Adopting a flexible and responsive company culture that can effectively adapt to evolving market trends and technological advancements is crucial.
5. **Process Optimization:** Simplifying

and automating business procedures to boost productivity and cut down on operational expenses are the key objectives.

6. **Innovation:** Promoting creativity across the entire organization to craft novel products, services, and business approaches that make the most of digital tools.
7. **Security and Compliance:** It’s vital to make sure that when we’re making digital changes in a company, we still meet all the security and rules we need to follow, especially when it comes to safeguarding data and respecting privacy laws.
8. **Workforce Development:** Getting our employees ready for the digital era by offering them training and the chance to learn new skills, ensuring they can confidently use digital tools and keep up with the latest technologies.

Case Study: Amazon’s Technology Integration through Robotic Fulfillment Centers

Background: Amazon, a global tech and e-commerce leader, pioneers innovation and efficiency. It deploys robotics in fulfillment centers for streamlined operations.

Key Data Points & Outcome:

1. **Robotic Workforce:** Amazon has made substantial investments in deploying robots across its fulfillment centers. They employ a staggering 200,000+ mobile robots within their facilities.
2. **Efficiency Boost:** The introduction of robots has led to remarkable improvements in operational efficiency. Robots can swiftly transport products



and shelving units to human workers, reducing the time required to process orders. This translates to faster order fulfillment and shipping.

3. **Error Minimization:** The automation facilitated by robotics has significantly reduced the likelihood of human errors during order picking and packaging. This has a direct, positive impact on customer satisfaction by minimizing shipping mistakes and resulting in fewer returns.
4. **Cost-Effective Operations:** The adoption of robots has translated into substantial cost savings for Amazon. Through task automation, the company can efficiently manage its workforce, resulting in labor cost reductions.
5. **Scalability:** The utilization of robotics provides Amazon with the flexibility to swiftly expand its operations during peak shopping periods, such as the holiday season or events like Prime Day.

Case Study: Netflix's Customer Centric Recommendation Algorithm

Background: Netflix, a top global streaming service, thrives with its vast content library and personalized recommendations powered by an advanced algorithm.

Key Data Points & Outcome:

1. **Viewer Data:** Netflix gathers extensive information on viewer behavior, including their watch history, viewing times, duration of viewing, and how they rate content.
2. **Advanced Machine Learning:** Netflix utilizes advanced machine learning

algorithms to process and analyze viewer data. These algorithms consider a wide array of factors, from genre preferences to past viewing habits.

3. **Precision of Recommendations:** Netflix continually evaluates the precision of its recommendations by monitoring how often users click on suggested content and how long they engage with it.
4. **Personalization:** The recommendation algorithm customizes content suggestions for each viewer, ensuring that users encounter content that matches their tastes and interests.
5. **Content Exploration:** Netflix also employs content discovery algorithms to aid users in discovering new and specialized content they might not have found on their own.
6. **Elevated Viewer Engagement:** Netflix's viewer-focused strategy with personalized recommendations keeps users engaged and reduces subscriber turnover. This results in longer subscription periods and higher customer value over time.
7. **Enhanced Customer Retention:** The personalized approach, aligning content with viewer preferences, results in higher customer retention rates. Subscribers are less likely to cancel when consistently provided with content they enjoy.
8. **Data-Informed Content Creation:** Netflix utilizes viewer data to guide its content creation decisions, producing original series and movies that connect with its audience.



Case Study: Walmart's Data-Driven Decision-Making

Background: Walmart, a global retail giant, excels in data-driven decision-making. It leverages big data analytics to improve operations and create personalized shopping experiences.

Key Data Points & Outcome:

1. **Handling Massive Data:** Walmart processes an immense amount of data daily, estimated at over 2.5 petabytes every hour. This data encompasses transactions, inventory details, and interactions with customers.
2. **Streamlined Supply Chain:** Walmart utilizes data analytics to optimize its supply chain. Through the analysis of factors such as inventory levels, demand patterns, and weather data, the company enhances the efficiency of its supply chain operations.
3. **Effective Inventory Management:** Big data analytics assist Walmart in managing its inventory efficiently. For instance, it employs predictive analytics to determine the right stock levels for each store, reducing both overstock and understock situations.
4. **Dynamic Pricing Strategies:** The company adjusts prices in real-time based on market data and competitor pricing, ensuring competitive prices while maximizing profitability. This dynamic pricing approach results in improved sales and margins.
5. **Tailored Customer Experience:** Walmart employs data analytics to personalize the shopping journey. This includes providing personalized product recommendations and launching

targeted marketing campaigns based on customer behavior and preferences.

6. **Operational Excellence:** By analyzing data related to customer traffic, employee schedules, and store layout, Walmart can optimize store operations and enhance the overall shopping experience.

Case Study: Spotify's Agile Software Development

Background: Spotify, a music streaming leader, is known for its agile software development, swiftly adapting to changing customer demands and market dynamics.

Key Data Points & Outcome:

1. **Spotify Squads:** Spotify organizes its development teams into "squads." Each squad typically consists of a diverse group of members, including engineers, designers, and product managers. Impressively, there are over 400 squads at Spotify.
2. **Frequent Releases:** Spotify frequently deploys new software updates and features. They release updates for their mobile apps approximately every two weeks. This rapid cycle enables Spotify to promptly respond to user feedback and changing technology.
3. **Continuous Integration and Delivery (CI/CD):** Spotify uses CI/CD pipelines to automate testing and deployment. This approach ensures that code changes can be swiftly integrated and delivered to users.
4. **Team Flexibility:** Spotify's agile approach allows teams to adapt their structures and priorities as necessary. Teams can be reconfigured, scaled up, or



down to tackle emerging opportunities or challenges.

5. **User Feedback Loop:** Spotify places a strong emphasis on maintaining a feedback loop with users. Features are often introduced incrementally, and user feedback plays a crucial role in shaping the development process.
6. **Encouragement of Innovation:** Spotify's agile culture encourages innovation. Teams can experiment with new features and ideas, resulting in the introduction of distinctive and attractive features.
7. **Reduced Time to Market:** Agile methodologies help Spotify bring new features and improvements to its users more swiftly, giving the company a competitive edge.
8. **High Employee Engagement:** The company's squad-based structure and emphasis on collaboration and autonomy contribute to high levels of employee engagement and job satisfaction.

Case Study: General Electric's Digital Twin Technology for Process Optimization

Background: General Electric, a renowned multinational, gains praise for innovative use of digital twin technology, creating virtual replicas for assets like aircraft engines and power plants.

Key Data Points & Outcome:

1. **Wide Digital Twin Adoption:** General Electric has embraced digital twin technology extensively throughout its operations, applying it to various industrial use cases.

2. **Virtual Replicas:** GE fabricates digital twins of tangible assets like aircraft engines and gas turbines. These digital clones amalgamate real-time data from sensors and IoT devices to mimic the actual performance of the physical asset.
3. **Predictive Maintenance:** Digital twins facilitate predictive maintenance. By continuously monitoring the performance of physical assets, GE can spot anomalies and wear-and-tear early, enabling timely maintenance and minimizing downtime.
4. **Efficiency Gains:** GE harnesses digital twins to optimize the functioning of power plants and industrial machinery, leading to energy savings, reduced operational costs, and heightened overall efficiency.
5. **Remote Monitoring:** GE's digital twin technology enables remote asset monitoring. Engineers and technicians can evaluate equipment status from a distance, reducing the need for on-site inspections.
6. **Reduced Downtime:** Predictive maintenance via digital twins has resulted in substantial reductions in equipment downtime, directly boosting productivity and operational efficiency.
7. **Cost Savings:** Through process optimization and enhanced asset performance, GE has achieved cost savings in maintenance, energy consumption, and operational expenses.
8. **Enhanced Safety:** Remote monitoring and predictive maintenance practices have contributed to increased safety for workers and the environment.



9. **Sustainability:** By optimizing power plants and industrial operations, GE has lowered energy consumption, making a notable contribution to sustainability and environmentally responsible practices.

Case Study: Tesla's Innovation in the Electric Vehicle Industry

Background: Tesla, the renowned EV and clean energy firm, is hailed for its unwavering innovation in the automotive industry.

Key Data Points & Outcome:

1. **Electric Vehicle Range:** Tesla's vehicles have set new benchmarks for electric vehicle range. The Tesla Model S Plaid boasts an impressive claimed range of over 390 miles on a single charge.
2. **Autopilot and Full Self-Driving:** Tesla is a pioneer in advanced driver-assistance systems (ADAS) and self-driving technology. The company has installed Autopilot hardware in over 1.3 million vehicles.
3. **Supercharger Network:** Tesla has established a vast network of Supercharger stations, with thousands of charging points worldwide. This network not only facilitates long-distance travel for Tesla owners but also reduces charging times.
4. **Battery Technology:** Tesla continually advances battery technology, achieving higher energy density and reducing costs. The company has announced plans to develop an affordable \$25,000 electric vehicle with a new, cost-effective battery.

5. **Energy Products:** Tesla's innovation extends beyond vehicles to encompass clean energy solutions, including solar panels, solar roofs, and energy storage products like the Powerwall.
6. **Sustainable Energy Solutions:** Tesla's innovation in energy products promotes sustainable energy generation and storage, contributing to a more environmentally friendly future.
7. **Competitive Pressure:** Tesla's success has ignited competition and innovation in the automotive industry, prompting other manufacturers to heavily invest in electric vehicle technology.

Case Study: Mayo Clinic's Healthcare Data Security

Background: Mayo Clinic, a prominent healthcare institution, prioritizes data security and HIPAA compliance.

Key Data Points & Outcome:

1. **Protected Health Information (PHI):** Mayo Clinic manages a substantial volume of patient health data, encompassing electronic health records (EHRs) and personal medical information.
2. **HIPAA Compliance:** Mayo Clinic adheres rigorously to HIPAA regulations, which establish stringent standards for safeguarding the security and privacy of patient data. Non-compliance can lead to severe financial penalties.
3. **Security Measures:** Mayo Clinic deploys an array of security measures, including encryption, access controls, and regular security audits, to fortify the protection of patient data.



4. **Data Breach Incident Response:** The clinic has well-defined incident response procedures in place to swiftly and effectively address any data breaches.
5. **Training and Awareness:** Mayo Clinic invests in staff training and awareness initiatives to enhance knowledge and adherence to data security and privacy practices.
6. **Patient Trust:** Mayo Clinic's firm commitment to healthcare data security fosters patient trust. Patients are more inclined to seek care at an institution they believe will prioritize the safeguarding of their sensitive medical information.
7. **Reputation Management:** Effective security measures and compliance contribute to maintaining Mayo Clinic's reputation as a trusted healthcare provider.

Case Study: Google's Workforce Development Initiatives

Background: Google, a top global tech company, prioritizes workforce development with diverse training programs, keeping employees at the forefront of tech and innovation.

Key Data Points & Outcome:

1. **Learning and Development Budget:** Google commits a substantial budget to learning and development, with an annual investment of over \$1 billion in employee training and development.
2. **Internal Learning Platforms:** Google has established a range of internal learning platforms, including "Google University" and "Googler-to-

Googler," offering employees access to an extensive array of educational resources and courses.

3. **Technical Skills:** Google offers a multitude of technical training programs covering areas such as machine learning, artificial intelligence, cloud computing, and software development.
4. **Soft Skills and Leadership Development:** In addition to technical skills, Google places a strong emphasis on soft skills and leadership development, including courses on communication, teamwork, and management. This results in robust pipeline of future leaders.
5. **Certification Programs:** Google provides certification programs for specific skills and technologies, allowing employees to earn certifications that showcase their expertise.
6. **Innovation and Competitiveness:** Workforce development programs at Google ensure that employees possess the skills and knowledge necessary to drive innovation and maintain the company's competitive edge.
7. **Employee Retention:** Google's investment in employee development contributes to higher job satisfaction and retention rates, reducing turnover and associated costs.
8. **Talent Attraction:** Google's reputation for workforce development draws top talent, as potential employees are enticed by the opportunity for continuous learning and professional growth.
9. **Adaptability:** Well-trained and adaptable employees can more



effectively respond to technological advancements and industry changes, ensuring that Google remains at the forefront of the tech industry.

Digital Transformation and Sectoral Analysis:

Digital transformation has revolutionized

sectors, enhancing operations, transparency, sustainability, risk management, efficient decision-making, customer trust, regulatory compliance, and ethical reputations. Here’s a comparative glance through the global and Indian data points followed by a transformative analysis of these changes across different sectors:

Table 2 – Sectoral digital transformation Market size (2023-24), CAGR (2019-2024)

Sector	Market Size (2023-2024)	CAGR (2019-2024)
Healthcare	\$22.8 billion (India) vis-a-vis \$509.2 billion (Global)	23.6% (India) vis-a-vis 22.9% (Global)
Finance	\$10.5 billion (India) vis-a-vis \$1,128.3 billion (Global)	75.6% (India) vis-a-vis 23.7% (Global)
Retail	\$1.5 billion (India) vis-a-vis \$1,915.0 billion (Global)	74.7% (India) vis-a-vis 22.7% (Global)
Manufacturing	\$3.8 billion (India) vis-a-vis \$1,197.0 billion (Global)	75.6% (India) vis-a-vis 22.7% (Global)
Education	\$2.0 billion (India) vis-a-vis \$252.8 billion (Global)	68.8% (India) vis-a-vis 22.7% (Global)
Energy	\$1.5 billion (India) vis-a-vis \$1,111.0 billion (Global)	74.7% (India) vis-a-vis 22.7% (Global)
Government	\$1.0 billion (India) vis-a-vis \$1,012.0 billion (Global)	70.9% (India) vis-a-vis 22.7% (Global)

Healthcare:

- **Operations:** Electronic Health Records (EHRs) have made managing patient data more efficient, improving patient care and reducing administrative burdens.
- **Sustainability:** Telemedicine has reduced the need for patients to travel for physical visits, resulting in fewer carbon emissions.
- **Efficient Decision-Making:** Big data

analytics identify disease trends and help with data-driven clinical decisions.

- **Regulatory Compliance:** Digital records enhance HIPAA compliance, ensuring patient data security.
- **Ethical Reputation:** Transparent data handling builds patient trust and reinforces ethical healthcare practices.

Finance:

- **Operations:** Automated trading



systems optimize stock transactions, reducing trading delays.

- **Transparency:** Blockchain technology provides transparent, unchangeable transaction records.
- **Risk Management:** AI-driven algorithms monitor market risks and detect fraud in real-time.
- **Customer Trust:** Secure online banking and fraud protection boost customer trust.
- **Ethical Reputation:** Ethical financial practices enhance the reputation of financial institutions.

Retail:

- **Operations:** Inventory management systems reduce issues with overstock and understock.
- **Sustainability:** Digital storefronts reduce the need for physical retail space, decreasing environmental impact.
- **Customer Trust:** Data-driven personalization enhances customer experiences and trust.
- **Regulatory Compliance:** Payment security measures protect against data breaches and comply with PCI DSS.
- **Ethical Reputation:** Ethical sourcing practices build a positive public image.

Manufacturing:

- **Operations:** IoT devices and sensors enable predictive maintenance, reducing downtime.
- **Transparency:** Supply chain transparency enhances tracking and traceability of products.
- **Sustainability:** IoT and data analytics minimize energy consumption and waste.

- **Efficient Decision-Making:** Real-time production data guides manufacturing processes.
- **Customer Trust:** Quality control and tracking build trust in product safety.

Education:

- **Methodologies:** Online learning platforms and digital resources provide flexibility.
- **Sustainability:** E-books and e-learning reduce paper usage and carbon footprint.
- **Efficient Decision-Making:** Data analytics optimize curriculum and resource allocation.
- **Customer Trust:** Secure online platforms enhance trust in data privacy.
- **Ethical Reputation:** Ethical handling of student data and transparent grading practices are vital.

Energy:

- **Operations:** Smart grids optimize energy distribution and reduce wastage.
- **Sustainability:** Renewable energy sources are integrated using digital technologies.
- **Risk Management:** Predictive analytics assess equipment health and prevent failures.
- **Efficient Decision-Making:** Real-time data guides energy production and distribution.
- **Regulatory Compliance:** Digital records help utilities meet environmental and safety regulations.

Government:

- **Methodologies:** E-government



services improve citizen interactions and service delivery.

- **Transparency:** Open data initiatives increase government accountability.
 - **Efficient Decision-Making:** Data analytics inform policy decisions and resource allocation.
 - **Customer Trust:** Secure online services build trust in government data handling.
 - **Ethical Reputation:** Ethical data use and transparent governance enhance public perception.
- Digital transformation is driven by technology and data, fundamentally changing the way organizations operate and interact with their stakeholders.

Indian Case studies

In the context of India, Industry 4.0 is at a pivotal stage. More than two-thirds of Indian industries are expected to fully embrace digital transformation by 2025. This widespread adoption will play a significant role in achieving the target of increasing India's GDP. It reflects the substantial progress and commitment in integrating digital technologies and processes within the various sectors of India. The following case studies for the discussed sectors will showcase the digital transformation impacts on operational excellence and other governance factors.

Healthcare - Case Study: Apollo Telehealth Services

- **Operations:** Apollo Telehealth Services, part of India's Apollo Hospitals Group, revolutionizes healthcare with telemedicine, connecting remote

patients to specialists.

- **Sustainability:** Reduced travel to urban centers cuts carbon emissions.
 - **Efficient Decision-Making:** Telemedicine allows quicker diagnoses and treatments by remote specialists.
 - **Customer Trust:** Patients in rural areas trust Apollo for quality healthcare.
 - **Regulatory Compliance:** Apollo adheres to Indian telemedicine guidelines, ensuring data privacy.
- Finance - Case Study: Paytm*
- **Operations:** Paytm, a digital payments and financial platform in India, transforms payments with mobile wallets and QR code transactions.
 - **Transparency:** Paytm's blockchain platform offers secure cross-border remittances.
 - **Risk Management:** AI detects and prevents fraudulent transactions, enhancing safety.
 - **Customer Trust:** Security features and digital wallets earn user trust.
 - **Ethical Reputation:** Paytm's data security commitment reinforces its ethical reputation.

Retail - Case Study: Flipkart

- **Operations:** Flipkart, a top Indian e-commerce platform, optimizes inventory with real-time analytics.
- **Sustainability:** Online retail minimizes environmental impact.
- **Customer Trust:** Data-driven personalization builds trust and loyalty.
- **Regulatory Compliance:** Flipkart ensures payment security and data protection adherence.
- **Ethical Reputation:** Ethical sourcing



and transparent customer policies are emphasized.

Manufacturing - Case Study: Mahindra & Mahindra (M&M)

- **Operations:** M&M, a major Indian auto manufacturer, uses IoT and data analytics for efficient production and supply chain operations.
- **Transparency:** Supply chain transparency enhances tracking of vehicle components.
- **Sustainability:** IoT and data analytics reduce energy consumption in manufacturing.
- **Efficient Decision-Making:** Real-time data guides manufacturing processes, reducing downtime.
- **Customer Trust:** Quality control and tracking build trust in product safety.

Education - Case Study: Byju's

- **Methodologies:** Byju's, an Indian edtech company, offers online learning resources, transforming traditional education.
- **Sustainability:** E-learning reduces paper usage and carbon footprint.
- **Efficient Decision-Making:** Data analytics optimize content delivery and curriculum design.
- **Customer Trust:** Secure online platforms protect student data, building trust in data privacy.
- **Ethical Reputation:** Ethical data handling and transparent grading enhance Byju's reputation.

Energy - Case Study: Tata Power

- **Operations:** Tata Power, a major Indian utility, uses smart grids for efficient

energy distribution.

- **Sustainability:** Tata Power integrates renewable energy with digital tech.
- **Risk Management:** Predictive analytics assess equipment health, ensuring reliable power supply.
- **Efficient Decision-Making:** Real-time data guides energy production and distribution.
- **Regulatory Compliance:** Digital records help Tata Power meet environmental and safety regulations.

Government - Case Study: DigiLocker

- **Methodologies:** DigiLocker, a government initiative, offers a secure platform for citizens to store and access digital documents, transforming interactions and services.
- **Transparency:** DigiLocker increases government transparency, providing citizens easy access to official documents.
- **Efficient Decision-Making:** Data analytics inform policy decisions and resource allocation.
- **Customer Trust:** Secure online services and data privacy protection build trust in government data handling.
- **Ethical Reputation:** Ethical data use and transparent governance enhance public perception of government services.

These case studies exemplify how digital transformation has impacted various sectors in India, leading to improved operations, transparency, sustainability, risk management, customer trust, regulatory compliance, and ethical reputations. Digital technologies and data-driven



approaches continue to shape and enhance these sectors.

Bottlenecks of Digital Transformation and Measures to tackle them:

Digital transformation has faced several bottlenecks that hinder its smooth implementation. These bottlenecks varied depending on the organization and its specific goals. Here are some of the bottlenecks that corporations are facing and suggested measures to tackle them:

1. Resistance to Change:

- *Challenge:* Employees resisting new technologies and processes.
- *Solutions:* Implement a robust change management strategy, including effective communication, training, and leadership support.

2. Legacy Systems and Infrastructure:

- *Challenge:* Outdated IT systems incompatible with new technologies.
- *Solutions:* Invest in integration tools to bridge old and new systems. Plan a gradual migration to minimize disruption and costs.

3. Data Security and Privacy Concerns:

- *Challenge:* Worries about data breaches and privacy during the transition.
- *Solutions:* Implement robust cybersecurity measures, encryption, and access controls. Ensure compliance with data protection regulations and establish a data governance framework.

4. Lack of Skilled Workforce:

- *Challenge:* Shortage of employees with the necessary digital skills.

- *Solutions:* Invest in training and upskilling programs for employees. Recruit individuals with the required digital expertise.

5. Cost and Budget Constraints:

- *Challenge:* Limited budgets hindering technology investments.
- *Solutions:* Conduct a comprehensive cost-benefit analysis. Implement digital transformation in manageable phases to spread costs.

6. Lack of Clear Strategy:

- *Challenge:* Unclear digital transformation objectives and strategies.
- *Solutions:* Develop a comprehensive digital transformation strategy with well-defined objectives. Ensure alignment with broader business goals.

7. Integration Challenges:

- *Challenge:* Difficulty integrating new digital tools with existing systems.
- *Solutions:* Use APIs and middleware to facilitate integration. Establish common data and communication standards for seamless integration.

8. Lack of Customer-Centric Approach:

- *Challenge:* Focusing excessively on technology, neglecting customer experience.
- *Solutions:* Actively seek and incorporate customer feedback. Design digital solutions with users' needs and preferences in mind.

9. Regulatory and Compliance Hurdles:

- *Challenge:* Navigating complex and evolving regulatory requirements.
- *Solutions:* Establish compliance teams or experts. Conduct regular



audits to identify and address compliance gaps.

10. Scalability and Performance Issues:

- *Challenge:* Digital systems may not perform optimally as the organization grows.
- *Solutions:* Implement scalable architecture and continuously monitor and optimize system performance.

Addressing these challenges requires strategic planning, effective change management, continuous monitoring, and an agile adaptation approach. Digital transformation is an ongoing journey, and overcoming these obstacles is an integral part of the process.

Role of Ethics in Digital Transformation

Ethics is critical in digital transformation, ensuring responsible use of technology and data and preserving individuals' rights and societal values. It's not just compliance but a commitment to improving society and building trust. We'll explore its aspects with examples.

1. Data Privacy and Security:

Ethical considerations require organizations to protect the privacy and security of personal data and sensitive information. **The European Union's General Data Protection Regulation (GDPR)** sets stringent data protection and privacy standards, encouraging companies to implement ethical data handling practices. Non-compliance can result in significant fines.

2. Transparency and Accountability:

Ethical organizations prioritize transparency in how they collect, use, and share data, and they hold themselves

accountable for their actions. **OpenAI**, a research organization, emphasizes transparency in its development of artificial intelligence. It seeks to provide explanations for AI decisions and actively addresses biases in AI systems.

3. Algorithmic Fairness and Bias Mitigation:

Ethical AI and data analytics demand that algorithms are developed and used in ways that avoid bias and discrimination. **IBM's AI Fairness 360 toolkit** helps organizations identify and mitigate biases in their AI models, promoting fairness and ethical AI.

4. Responsible AI Development:

Ethical considerations guide the responsible development of AI and emerging technologies, emphasizing safety and compliance with ethical frameworks. **Microsoft** has established an AI ethics board to ensure that AI research adheres to ethical principles. It aims to avoid the development of AI systems that could harm humanity or concentrate power unfairly.

5. Ethical Decision-Making in AI:

Ethical AI systems are designed to make decisions that align with human values and ethical standards. **Google's AI for Social Good program** focuses on using AI to address societal challenges in a manner consistent with ethical principles, such as improving healthcare and addressing environmental issues.

6. Consent and User Control:

Ethical digital transformation practices prioritize obtaining informed consent from individuals and giving them control over their data. **Apple's App Tracking Transparency (ATT)** feature requires apps



to obtain user consent before tracking their data across other apps and websites.

7. **Accessibility and Inclusivity:**

Ethical digital transformation aims to make technology accessible and inclusive for all individuals, regardless of their abilities or backgrounds. **Microsoft's Accessibility Insights tool** helps developers create more inclusive digital experiences by identifying accessibility issues and providing guidance for improvements.

8. **Environmental Responsibility:**

Ethical digital transformation includes considerations for the environmental impact of technology and data centers. Companies like **Google and Amazon** have made commitments to use renewable energy for their data centers, reducing their carbon footprint and addressing environmental concerns.

9. **Human-Centric Design:**

Ethical digital transformation prioritizes human-centric design, focusing on creating technology that enhances human well-being. **The "Center for Humane Technology"** advocates for designing technology with ethical principles that protect individuals from technology addiction and manipulation.

10. **Social Responsibility:**

Ethical digital transformation encourages organizations to consider the broader societal impact of their technology and data practices. **Salesforce's 1-1-1 model** commits the company to donating 1% of its equity, product, and employees' time to the community, reflecting a broader ethical responsibility.

Digital Transformation impacting Corporate Governance

Digital transformation can significantly impact corporate governance by influencing the way companies are managed, ensuring transparency, accountability, and ethical behavior. Digital transformation impacts business operations and corporate governance, promoting transparency, data-driven decisions, and accountability. In the digital age, effective governance includes a focus on data ethics, cybersecurity, and responsible tech usage. Businesses that embrace digital tools for governance gain an advantage in today's complex landscape.

1. Enhanced Transparency:

Using blockchain technology in supply chains has increased transparency by allowing all parties involved to access and verify the same set of records. Companies like **IBM and Walmart** use blockchain to enhance the transparency and traceability of products.

2. Data-Driven Decision-Making:

Data helps in informed decision-making. **Tesla's** use of data from its electric vehicles, collected through IoT sensors, helps the board and management make decisions about vehicle design, performance, and updates, contributing to effective corporate governance.

3. Real-time Reporting and Compliance:

Automation and digital tools ensure timely and accurate financial reporting and regulatory compliance. Financial softwares like **Intuit's QuickBooks** simplifies financial reporting and tax compliance, ensuring that companies adhere to governance regulations.



4. Improved Communication and Collaboration:

Digital platforms and tools facilitate communication and collaboration. **Microsoft Teams & Google Meet** is used for virtual board meetings, helping members communicate securely and make decisions regardless of their physical locations. This ensures efficient governance in times of remote work and global collaboration.

5. Shareholder Engagement:

Digital tools enhance shareholder engagement and allow for more transparent communication between companies and investors. Online shareholder meetings and voting platforms, such as those offered by **Broadridge**, enable shareholders to participate in governance discussions and decisions, promoting transparency and engagement.

6. Risk Management and Cybersecurity:

Digital transformation demands robust risk management and cybersecurity to safeguard data and reputation. **Equifax's** 2017 breach led to include cybersecurity strategies in corporate governance, prompting governance structure changes.

7. Ethical AI and Automation:

Ethical AI and automation solutions require governance to ensure responsible and ethical use of technology. **Google's AI Ethics Board** was disbanded due to concerns about the ethical implications of AI technologies. This case illustrates the importance of governance in guiding the development and use of AI.

8. Remote Board Meetings:

Digital tools facilitate remote board meetings, ensuring continuity during unforeseen events. The COVID-19

pandemic forced many organizations, including **Airbnb**, to conduct remote board meetings, highlighting the importance of having digital infrastructure for maintaining governance activities during crises.

So it is evident that digital transformation has a profound impact on various aspects of business performance, including operational excellence, customer relationship management, and stakeholder satisfaction. Companies worldwide, including in India, use digital transformation to gain a competitive edge. The following Global and Indian examples showcase how digital technologies drive such improvements in business.

1. Business Performance:

Digital transformation boosts business performance through process optimization, efficiency, and data-driven decisions. **Amazon**, a global e-commerce leader, utilizes sophisticated supply chains, recommendation algorithms, and cloud services to achieve substantial growth and profitability. Similarly, **Flipkart**, a major Indian e-commerce firm, leverages digital tech to enhance inventory management, customer experiences, and logistics, fostering business success.

2. Operational Excellence:

Digital tools boost efficiency and reduce errors in manufacturing. **Siemens** uses IoT and digital twins to enhance operational excellence, reduce downtime, and improve product quality. **Tata Motors** employs IoT and data analytics, resulting in enhanced production efficiency and better quality control.



3. Customer Relationship Management (CRM):

Digital tools like **Salesforce** enhance customer interactions and relationships. They provide insights, personalization, and efficient communication. Indian travel company **MakeMyTrip** uses digital transformation to recommend personalized travel and streamline bookings, increasing customer satisfaction and loyalty.

4. Stakeholder Satisfaction:

Digital transformation enhances stakeholder satisfaction by improving transparency, accessibility, and communication. **Microsoft's Azure and Office 365** improve collaboration, communication, and security, enhancing stakeholder satisfaction. The **State Bank of India's** digital banking services boost accessibility and efficiency, increasing stakeholder satisfaction.

Government of India encouraging Digital Transformations

The Government of India has introduced several incentives and benefits to promote and popularize digital transformation in the country. These initiatives aim to drive economic growth, enhance digital infrastructure, and facilitate the adoption of emerging technologies.

1. Digital India Program:

- *Objective:* Promotes digital literacy, e-governance, and government digitization.
- *Benefits:* Empowers citizens with digital tools and efficient government services.

2. Make in India:

- *Objective:* Encourages domestic manufacturing, including electronics.

- *Benefits:* Offers incentives and tax breaks, fostering digital manufacturing.

3. Startup India:

- *Objective:* Fosters startups, including digital technology.
- *Benefits:* Grants tax exemptions, funding opportunities, and simplified regulations.

4. Electronics Manufacturing:

- *Objective:* Promotes electronics manufacturing.
- *Benefits:* PLI scheme provides incentives for competitive production.

5. STPI Scheme:

- *Objective:* Supports software and IT services export.
- *Benefits:* Provides tax benefits to IT and software companies.

6. National Policy on Software Products:

- *Objective:* Promotes software product development.
- *Benefits:* Supports research, market access, and incentives.

7. National Digital Communications Policy 2018:

- *Objective:* Provides affordable digital communication.
- *Benefits:* Expands telecom and broadband infrastructure for nationwide access.

8. Cybersecurity Initiatives:

- *Objective:* Enhances digital security.
- *Benefits:* Ensures secure transactions and data protection.

9. BharatNet:

- *Objective:* Expands rural broadband connectivity.
- *Benefits:* Bridges the digital divide, providing digital access to rural areas.



10. Skill India Programme:

- *Objective:* Enhances digital skills and employability.
- *Benefits:* Offers training and certification, increasing workforce competitiveness.

11. R&D and Innovation Initiatives:

- *Objective:* Promotes research in emerging tech.
- *Benefits:* Supports R&D through various schemes.

12. Tax Incentives:

- *Objective:* Encourages tech investments.
- *Benefits:* Provides tax deductions for digital infrastructure investments.

Several other Indian government initiatives leverage digital technologies to bring a new paradigm of changes in the Indian economic perspective. **Aadhaar** provides a 12-digit identity number for residents, simplifying access to government services. **GSTN** streamlines taxation and improves transparency. **e-NAM** facilitates online agricultural commodity trading. **PMJDY** promotes financial inclusion with bank accounts and digital services. **BHIM** encourages cashless transactions via a mobile app. **SBM** uses digital tools for tracking and monitoring sanitation projects. These projects collectively represent India's commitment to leveraging digital technology for enhancing public services, promoting financial inclusion, improving tax administration, and achieving broader governance and social development goals. They have not only transformed the delivery of government services but have also boosted digital literacy and access across the country.

Conclusion

As our exploration into the realm of digital transformation draws to a close, it is evident that the disruptive forces of technology have converged to create a paradigm shift that transcends industries, reshaping the very fabric of our operations and interactions.

From the management strategies to the ethical foundations of AI, from transparency in corporate governance to the art of personalized customer engagement, it is clear that the road ahead is illuminated by the guiding principles of data-driven excellence and an unwavering commitment to sustainability.

In a world where the only constant is change, digital transformation is not just a choice; it is the imperative that will define our collective future. As we embrace the transformative power of technology, we stand at the cliff of a new age, one in which innovation and progress thrive on the fusion of the digital and the human. This era invites us to boldly step forward into a landscape where endless possibilities await those who embark on the journey of digital transformation.

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EFFECT OF FIRM-SPECIFIC AND MACRO-ECONOMIC FACTORS ON IPOs IN INDIAN CAPITAL MARKET: USING ECONOMETRIC MODEL

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Abstract

The aim of this paper is to examine the impact of firm-specific and macro-economic factors on initial public offerings (IPOs) in Indian Capital Market. The study shows that in the first method, number of IPO issues, the model 5 suggests that firm size from firm-specific factors and HCI from macro-economic factors have significant impact. Second method-MAARO of model 7, depicts that only employment rate and the human capital index as macro-economic factors have significant negative impact. In third method, model 7 of the level of underpricing is influenced significantly negative by the issue price as a firm-specific factor and positively by the balance of payment as a macro-economic factor during the study period. Finally, study concludes that, they are considered to be the good fit models since its significance level of predictive model, the highest performance score, least difference between R^2 and adjusted R^2 , the lowest sigma and satisfaction of all diagnostic tests among the calculated models of three different methods.

Keywords:

Firm-Specific Factors, Initial Public Offerings, MAARO, Macro-Economic Factors, Underpricing

Introduction:

Companies worldwide choose for going public to access capital markets and secure funding for their future development. The influence of macro-economic conditions on IPO activities and the extent to which each condition affects new equity issuance are of great interest to individual investors, investment banks, and firms considering going public. Existing literature on IPOs has predominantly focused on specific corporate-level factors that elucidate the reasons behind companies going public. Recent studies by Tran & Jeon (2011), Chen (2009, 2007), Jovanovic & Rousseau (2004), and Campbell, Lettau, Malkiel, & Xu (2001) have established a strong correlation between macro-economic factors and the dynamics of IPO markets. These studies argue that changes in macro-economic conditions have a direct impact on the cash flow of many companies and exert influence over risk-adjusted discount

rates. The level of underpricing had decreased over the year, with listing delays driving the mechanism, while marketing had no effect on the underpricing, Pandey and Vaidyanathan's (2007). Businesses that went public in nations with more advanced legal systems lost less money, Englen and Van Essen (2010). The over-subscription rate had a greater impact on the level of underpricing than other firm-specific variables (firm age, firm size, and issue size), according to Zouari et al.'s (2011). Chaturvedi et al. (2006) and Bansal and Khanna (2013) found that firm-related factors like issue size, firm age, and pricing mechanism had a negative effect on underpricing.

After thorough review of literature, we come to know that the impact of firm-specific and macro-economic factors on IPOs is relatively under-researched in the India. As a result, an effort is made to the effects of firm-specific and macro-economic variables on initial public offerings (IPOs) in Indian capital market, India.

Empirical Literature:

S. No	Authors Name	Variables	Methods	Results
1	Aprajita Pandey and J. K. Pattanayak (2018)	Dependent Variables; Underpricing and MAAR. Independent Variables; age, issue size, issue price lead time, nifty50 index, GDP, inflation, 91 days t-bill and 10 year bond-yield	Multiple and Vector Auto Regression Method	According to the study, among firm-specific variables, issue price and firm age had a significant impact on the degree of underpricing, but inflation, market volatility, market returns, and economic activity had a stronger explanatory power other than macro-economic variables.



2	Dr. Wilaiporn Laohakosol, Ayush Sharma and Arhan Sthapit (2018)	Dependent Variables; number of IPOs, total amount IPOs proceeds raised and average amount of IPOs proceeds raised. Independent Variables; GDP, inflation, interest rate, stock market index and remittance	Multiple Regression Method	The study found that the interest rate, stock market index, and remittance inflows are some of the most significant macro-economic factors influencing the movements of IPO activities in the context of Nepal. The number of IPOs issued, the total amount of IPO proceeds raised, and the average amount of IPO proceeds raised are all positively impacted statistically by the stock market index and the inflow of remittances. It is discovered that there is a significant positive causal relationship between the stock market index and the number of initial public offerings (IPOs), while the gross domestic product showed no significant relationship with the dependent variable.
3	Kedhar M Phadke and Dr Manoj S Kamat (2018)	Dependent Variable; MAAR. Independent Variables; Issue Type, issue Size, Subscription Rate, Repo Rate and Exchange Rate	Multiple Regression Method	Study concluded that, subscription rate and repo rate to MAARO are found to be positively correlated. The only exception is the exchange rate, where we are unable to establish a statistically significant correlation between the exchange rate and the degree of underpricing in the Indian context from 2000 to 2014.
4	Poonam Rani and Veerpaul Kaurmann (2017)	Dependent Variable; Number of IPO issues. Independent Variables; issue size, interest rate and GDP	Granger Causality Tests and Johenson Co-Integration test	It was discovered that the interest rate has a co integration relationship with the number of IPO issues and the size of the IPO, but not a causal one. GDP showed a causal relationship that was significant for issue size but not for issue number. Finally, it is determined that only GDP has a causal connection between IPO size and GDP.



5	Dayaratne DAI and Wijethunga AWGCN (2015)	<p>Dependent Variable; number of IPOs per issues, total IPOs proceeds and average IPOs proceeds.</p> <p>Independent Variables; GDP, 91 days interest rate, colombo consumer price index and exchange rate</p>	Johansen cointegration test and Granger causality test	Showed that cointegration analysis is long-term correlation between macro-economic variables and Total Proceeds and Average Proceeds. Insignificant causality between macro-economic variables and IPO activities is suggested by the Granger causality test results.
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Research Gap:

Researchers from all over the world have mainly concentrated their efforts in the last few decades on examining the relationship between specific company variables and underpricing (Bansal & Khanna, 2013; Chaturvedi, Pandey, & Ghosh, 2005; Gupta, 2011; Jaitly, 2004; Jain & Padmavathi, 2012; Singh & Sastry, 2014; Pu & Wang, 2015). Previous studies have shown that macro-economic factors have an impact on the volume of initial public offerings (IPOs) (Brau & Fawcett, 2006; Jovanovic & Rousseau, 2004), and it has also been noted that the volume of IPOs has a direct impact on the degree of underpricing (Derrien & Kecskés, 2009; Lowry & Schwert, 2002). From the literature review, we got a dimension that IPO activity implicitly have some relation with the total economy activity and financial market condition. The same fact motivated us to explore the same phenomenon in Indian capital market settings. Hence, the present study aim is to analyze how firm-specific and macro-economic factors impact on the initial public offerings (IPOs) in Indian capital market.

Objective of the Study:

The main objective of the present study is

- To examine the impact of firm-specific and macro-economic factors on initial public offerings (IPOs) in Indian Capital Market

Hypothesis:

The study assumes that firm-specific and macro-economic factors and the level of underpricing of IPOs. Number of IPO issues, MAARO method and the Underpricing has an indirect relationship, so we propose to test the hypotheses, (A Pandey and J. K. Pattanayak 2018);

- H₁:** There is no significant effect of firm-specific and macro-economic factors on number of IPO issues;
- H₂:** There is no significant influence of firm-specific and macro-economic factors on Marginal Adjusted Average Abnormal Return on Opening (MAARO).
- H₃:** There is no significant impact of firm-specific and macro-economic factors on the level of underpricing of IPOs;

Research Methodology:

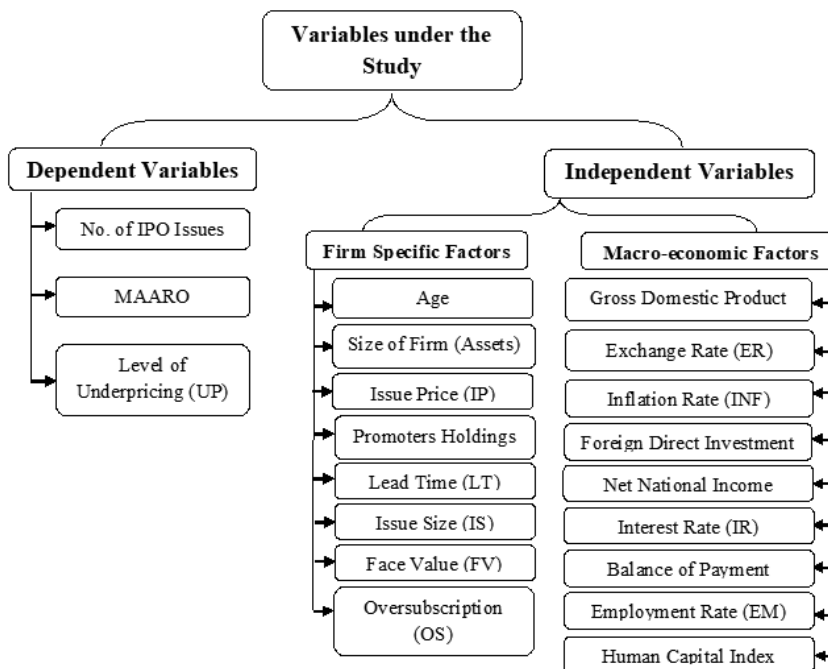
The present study is exclusively based on secondary data which has been sourced from NSE (nseindia.com), prospectus of SEBI (sebi.gov.in), RBI (rbi.gov.in) and worldbank.org have been referred to

collect market, firm-specific factors and macro-economic factors related data. The study considered the firms went for IPOs on National Stock Exchange during the period from 2011 to 2023. The sample for the study consists of 348 IPOs. Out of seventeen independent variables, ten variables are used since they are free from the problem of multicollinearity. Three methods namely level of underpricing, number of IPO issues and marginal adjusted abnormal return on opening (MAARO) are considered as dependent variables independently for identifying its firm-specific and macro-economic determinants. In each method, different models have been developed to find out

the best model based on the significance level, the highest performance score, highest adjusted R^2 as against its sigma. Descriptive and inferential statistical tools are used to describe the variables. Further, bi-variate and multivariate data analysis are extensively used. Performance package of R program is used for multiple regression analysis.

The Variables Consideration under the Study

To ascertain the major determinants of level of underpricing, number of IPO issues method and MAARO method, the following explanatory variables are chosen for the econometric model;





II. Determinants of the level of Underpricing:

Each IPO is subject to the computation of two underpricing indicators. First, there is the **raw underpricing**, which is the difference between the offer price and the official share prices on the first trading day. Second, the **adjusted underpricing** is defined as the difference between the raw underpricing and the market index return computed between the start of the initial public offering and the first trade of the following day. The market index used in this analysis is the Nifty50 historical market index.

The Marginal Adjusted Abnormal Return on Opening (MAARO)

is calculated in three phases, beginning with step 1. The percentage difference between the offer price and the listing price. The percentage difference on an index price is computed in step 2. Step 3 involves calculating the difference between steps 1 and 2. This is done to account for any market volatility between the offer date and the listing date in the raw return calculations (A Pandey and J. K. Pattanayak 2018).

- 1. Stock Return (S_R) = $((P_1 - P_0) / P_0) * 100$ (1)
Where, S= Stock Raw Return. P_1 = Closing price of the stock on day of listing (day 1). P_0 = Offer Price
- 2. Market Return (M_R) = $((I_1 - I_0) / I_0) * 100$ (2)
Where, I_1 = Closing Index on day 1 of listing. I_0 = Closing Index on day of offer.
- 3. Marginal Adjusted Abnormal Return on Opening (MAARO) = $((1 + S_R) / (1 + M_R) - 1) * 100$... (3)

4. Econometric Models (Multiple Regression Analysis):

To comprehend how the level of underpricing method, number of IPO issues method and MAARO method are affected by changes in firm-specific and macro-economic variables. Multiple regression analysis is applied. The study used

endogenous variables (such as the level/ degree of underpricing, MAARO and the number of IPO issues methods) to estimate these methods along with exogenous variables (such as firma-specific and macro-economic factors). The regression equation is as under:

A. Number of IPO Issues Method:

Model 1: $a + \beta_1(ass) + \beta_2(IP) + \beta_3(HCI) + \beta_4(LT) + \beta_5(IS) + \beta_6(EM) + \beta_7(FV) + \beta_8(FDI) + \beta_9(OS) + \beta_{10}(BP) + \epsilon_t$ (4)

Model 2: $a + \beta_1(ass) + \beta_2(IP) + \beta_3(HCI) + \beta_4(LT) + \beta_5(IS) + \beta_6(EM) + \beta_7(FV) + \beta_8(FDI) + \beta_9(OS) + \epsilon_t$ (5)

Model 3: $a + \beta_1(ass) + \beta_2(IP) + \beta_3(HCI) + \beta_4(LT) + \beta_5(IS) + \beta_6(EM) + \beta_7(FV) + \beta_8(FDI) + \epsilon_t$ (6)

Model 4: $a + \beta_1(ass) + \beta_2(IP) + \beta_3(HCI) + \beta_4(LT) + \beta_5(IS) + \beta_6(EM) + \beta_7(FV) + \epsilon_t$ (7)



Model 5: $a + \beta_1(ass) + \beta_2(IP) + \beta_3(HCI) + \beta_4(LT) + \beta_5(IS) + \beta_6(EM) + \epsilon_t$ (8)

Model 6: $a + \beta_1(ass) + \beta_2(IP) + \beta_3(HCI) + \beta_4(LT) + \beta_5(IS) + \epsilon_t$ (9)

Model 7: $a + \beta_1(ass) + \beta_2(IP) + \beta_3(HCI) + \beta_4(LT) + \epsilon_t$ (10)

Model 8: $a + \beta_1(ass) + \beta_2(IP) + \beta_3(HCI) + \epsilon_t$ (11)

B. MAARO Method:

Model 1: $a + \beta_1(EM) + \beta_2(HCI) + \beta_3(IP) + \beta_4(LT) + \beta_5(IS) + \beta_6(FV) + \beta_7(FDI) + \beta_8(BP) + \beta_9(Ass) + \beta_{10}(OS) + \epsilon_t$ (12)

Model 2: $a + \beta_1(EM) + \beta_2(HCI) + \beta_3(IP) + \beta_4(LT) + \beta_5(IS) + \beta_6(FV) + \beta_7(FDI) + \beta_8(BP) + \beta_9(Ass) + \epsilon_t$ (13)

Model 3: $a + \beta_1(EM) + \beta_2(HCI) + \beta_3(IP) + \beta_4(LT) + \beta_5(IS) + \beta_6(FV) + \beta_7(FDI) + \beta_8(BP) + \epsilon_t$ (14)

Model 4: $a + \beta_1(EM) + \beta_2(HCI) + \beta_3(IP) + \beta_4(LT) + \beta_5(IS) + \beta_6(FV) + \beta_7(FDI) + \epsilon_t$ (15)

Model 5: $a + \beta_1(EM) + \beta_2(HCI) + \beta_3(IP) + \beta_4(LT) + \beta_5(IS) + \beta_6(FV) + \epsilon_t$ (16)

Model 6: $a + \beta_1(EM) + \beta_2(HCI) + \beta_3(IP) + \beta_4(LT) + \beta_5(IS) + \epsilon_t$ (17)

Model 7: $a + \beta_1(EM) + \beta_2(HCI) + \beta_3(IP) + \beta_4(LT) + \epsilon_t$ (18)

Model 8: $a + \beta_1(EM) + \beta_2(HCI) + \beta_3(IP) + \epsilon_t$ (19)

C. Underpricing Method:

Model 1: $a + \beta_1(IP) + \beta_2(BP) + \beta_3(Ass) + \beta_4(FDI) + \beta_5(EM) + \beta_6(HCI) + \beta_7(OS) + \beta_8(LT) + \beta_9(FV) + \beta_{10}(IS) + \epsilon_t$ (20)

Model 2: $a + \beta_1(IP) + \beta_2(BP) + \beta_3(Ass) + \beta_4(FDI) + \beta_5(EM) + \beta_6(HCI) + \beta_7(OS) + \beta_8(LT) + \beta_9(FV) + \epsilon_t$ (21)

Model 3: $a + \beta_1(IP) + \beta_2(BP) + \beta_3(Ass) + \beta_4(FDI) + \beta_5(EM) + \beta_6(HCI) + \beta_7(OS) + \beta_8(LT) + \epsilon_t$ (22)

Model 4: $a + \beta_1(IP) + \beta_2(BP) + \beta_3(Ass) + \beta_4(FDI) + \beta_5(EM) + \beta_6(HCI) + \beta_7(OS) + \epsilon_t$ (23)

Model 5: $a + \beta_1(IP) + \beta_2(BP) + \beta_3(Ass) + \beta_4(FDI) + \beta_5(EM) + \beta_6(HCI) + \epsilon_t$ (24)

Model 6: $a + \beta_1(IP) + \beta_2(BP) + \beta_3(Ass) + \beta_4(FDI) + \beta_5(EM) + \epsilon_t$ (25)

Model 7: $a + \beta_1(IP) + \beta_2(BP) + \beta_3(Ass) + \beta_4(FDI) + \epsilon_t$ (26)

Model 8: $a + \beta_1(IP) + \beta_2(BP) + \beta_3(Ass) + \epsilon_t$ (27)

Where, *a* is the alpha, *β* is the beta, *IP* is issue price, *BP* is balance of payment, *Ass* is assets (size), *FDI* is foreign direct investment, *EM* is employment rate,

HCI human development index, *OS* is oversubscription, *LT* is lead time, *FV* is face value and *IS* is issue size. ϵ_t is the error term.

Empirical Results:

Table No 1: Descriptive Statistics of the Selected Variables

Variables	Min	Max	Mean	Median	SD	CV	Kurt	Skew
Dependent Variables:								
Underpricing	13.085	58.366	30.325	32.588	13.181	0.435	0.358	0.603
MAARO	-2219.925	13323.513	2219.435	1255.720	3994.033	1.800	5.735	2.107
No. of IPO Issues	1.149	26.724	8.333	6.609	7.216	0.866	3.192	1.665
Independent Variables:								
A. Firm-Specific Factors								
Size	481.860	211833.011	46002.609	34623.426	58093.950	1.263	6.642	2.364
Issue Price	115.053	540.548	354.793	364.494	142.920	0.403	-1.140	-0.093
Lead Time	8.750	14.952	11.441	9.667	2.774	0.242	-2.172	0.375
Issue Size	240.188	2603.649	1102.864	924.332	696.943	0.632	0.391	0.803
Face Value	6.750	10.000	8.991	8.969	1.035	0.115	0.514	-0.948
Oversubscription	3.880	67.144	32.727	31.581	18.903	0.578	-0.655	0.242
B. Macro-economic Factors								
FDI	159650.000	591856.000	279869.167	233416.000	129724.287	0.464	2.024	1.496
BP	-1413934.000	-753065.000	-1006571.417	-971928.000	204182.146	-0.203	-0.260	-0.616
EMP	44.000	51.600	48.617	49.500	2.580	0.053	-1.000	-0.730
HCI	44.200	68.600	49.542	45.850	7.949	0.160	2.710	1.927

Note: UP is underpricing, MAARO is marginal adjusted abnormal return on opening, FDI is foreign direct investment, BP is balance of payment, EM is Employment rate and HCI is human capital index.

Annual average underpricing, MAARO and number of IPO issues are 30.325%, 2219.435% and 8.333% during the study period. Almost all the variables are consistent. More than half of the variables

are rightly skewed and hence their mean value is more than that of median. Majority of the independent variables are platykurtic during the study period.

Table No 2: Variance Inflation Factor (VIF) of Independent Variables

Multicollinearity	Factors	VIF	Trace Test
Low Correlation	Ass	4.210	0.238
	IP	3.150	0.317
	FDI	2.260	0.442
	BP	2.680	0.373
	HCI	4.280	0.234
Moderate Correlation	LT	5.120	0.195
	IS	6.830	0.146
	FV	7.170	0.139
	OS	6.870	0.146
	EM	5.430	0.184



Multicollinearity test is conducted to test whether there is a correlation or relationship among independent variables in the related regression model. In this instance, the presence or absence of multicollinearity symptoms in regression model is assessed using the VIF values and trace test of each independent variable. age of the company

(age), promoter’s holdings (PH), gross domestic product (GDP) and net national income (NNI), exchange rate (ER), inflation rate (INF), and interest rate (IR) have high levels of collinearity with the other variables. Therefore, those variables are excluded from the study.

Table No 3: Multiple Regression Analysis on the Number of IPO Issues Method

Dependent Variable: Number of IPO Issues Method																
	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	-63.22	0.653	-64.59	0.464	-71.32	0.233	-69.29	0.171	-54.34	0.129	-17.88	0.064	-14.90	0.128	-22.31	0.005
Ass	0.000	0.393	0.000	0.185	0.000	0.086	0.000	0.045	0.000	0.022	0.000	0.020	0.000	0.036	0.000	0.021
IP	-0.014	0.582	-0.014	0.391	-0.013	0.280	-0.014	0.151	-0.015	0.104	-0.014	0.110	-0.009	0.289	-1.321	0.016
HCI	0.974	0.231	0.966	0.059	0.990	0.009	0.978	0.002	0.976	0.001	0.927	0.000	0.914	0.000	0.968	0.000
LT	-1.077	0.523	-1.091	0.307	-1.041	0.185	-1.056	0.117	-0.996	0.094	-1.367	0.014	-1.475	0.013	-	-
IS	0.004	0.560	0.004	0.340	0.004	0.227	0.004	0.165	0.004	0.139	0.004	0.143	-	-	-	-
EM	0.698	0.683	0.705	0.518	0.767	0.337	0.767	0.263	0.615	0.264	-	-	-	-	-	-
FV	0.778	0.867	0.880	0.738	1.000	0.613	0.847	0.600	-	-	-	-	-	-	-	-
FDI	0.000	0.906	0.000	0.806	0.000	0.793	-	-	-	-	-	-	-	-	-	-
OS	-0.022	0.929	-0.022	0.888	-	-	-	-	-	-	-	-	-	-	-	-
BP	0.000	0.963	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F-stat	2.4820		5.4960		9.1530		13.5600		18.2300		19.6600		18.9100		23.8400	
P-value	0.4601		0.1634		0.0477		0.0120		0.0030		0.0012		0.0007		0.0000	
R2	0.9613		0.9611		0.9606		0.9596		0.9563		0.9425		0.9153		0.8994	
Adj R2	0.5740		0.7863		0.8557		0.8888		0.9038		0.8945		0.8669		0.8617	
RMSE	1.3590		1.3620		1.3700		1.3890		1.4440		1.6570		2.0100		2.1910	
Sigma	4.7090		3.3350		2.7410		2.4060		2.2370		2.3430		2.6320		2.6830	
AIC W	0.0140		0.0360		0.0910		0.2110		0.3600		0.1880		0.0500		0.0490	
AICc W	1.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
BIC W	0.0050		0.0170		0.0550		0.1610		0.3500		0.2340		0.0800		0.0980	
PS	42.86%		47.07%		57.09%		69.23%		83.10%		63.33%		36.06%		29.46%	

Note: RMSE is Root Mean Square Error; AIC is Akaike Information Criterion Weights, AICc is corrected version of AIC weights, BIC is Bayesian Information Criterion Weights and PS is Performance Score.

$$\text{Number of IPO Issues} = -54.34 + \beta_1(0.000) + \beta_2(-0.015) + \beta_3(0.976) + \beta_4(-0.996) + \beta_5(0.004) + \beta_6(0.615) + E_t$$

In the number of IPO issues method, model 5 is the best effective model, having 95.63% the highest explanatory power (R^2) and 90.38% adjusted R^2 as against the its sigma. It suggests that firm size from firm-specific factors and HCI from macro-economic factors have significant impact. While, Issue price and lead time have negative influence, and issue size and employment rate have positive insignificant impact on number of IPO issues.

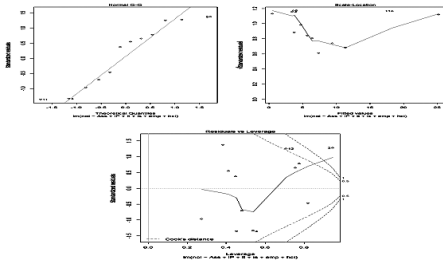


Figure No 1: Graphical Representation of Diagnostic Tests

Multicollinearity	P-value
Normality	0.133
Heteroscedasticity	0.775
Autocorrelation	0.726

The above plot depicts that Q Q Plot of residual can be used to visually check the normality assumptions. The normal probability plot of residuals approximately followed the straight line. Since its prob. value is 0.133, null hypothesis is accepted and normally distributed. The homogeneity of variance can be checked by examining the scale location plot. It can be seen that the variability of residual points lies along with value of the fitted outcome variable suggesting constant variance in the residual errors or homoscedasticity. With its prob. value is 0.775 and hence there is no heteroscedasticity. The outliers and high leverage point can be identified by inspecting residual v/s leverage plot. The plot highlights the top 3 most extremes (#3, #4 and #12) with a standard residuals. There is no autocorrelation as its p value is more than 0.05.

It the best predictive model due to the significance of the p-value of F statistics, substantial increase in adjusted R^2 as against sigma, the highest performance score of 83.10% and satisfaction of the diagnostic tests.

Table No 4: Multiple Regression Analysis on the MAARO Method
Dependent Variable: MAARO Method

	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	167200	0.331	160000	0.104	161200	0.039	168300	0.014	161242.86	0.011	128247.79	0.009	126191.688	0.008	97528.94	0.005
EM	-2176	0.316	-2109	0.109	-2123	0.042	-2157	0.019	-2155.47	0.014	-1822.26	0.016	-1825.95	0.013	-1386.18	0.014
HCI	-562.4	0.345	-536.6	0.113	-533.3	0.046	-496.6	0.021	-455.669	0.020	-447.213	0.020	-450.573	0.016	-474.00	0.012
IP	-16.01	0.504	-15.47	0.300	-15.90	0.176	-16.20	0.119	-12.278	0.175	-11.575	0.205	-15.238	0.080	-12.500	0.127
LT	-848.5	0.571	-793.9	0.374	-795.8	0.261	-726.4	0.228	-673.851	0.259	-813.117	0.185	-653.096	0.255	-	-

Contd...

	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
IS	-2.767	0.672	-2.926	0.478	-2.485	0.306	-2.970	0.146	-2.603	0.183	-1.696	0.331	-	-	-	-
FV	-1923	0.671	-1796	0.519	-1873	0.392	-2393	0.180	-1859.78	0.258	-	-	-	-	-	-
FDI	0.005	0.803	0.006	0.638	0.006	0.551	0.008	0.302	-	-	-	-	-	-	-	
BP	-0.003	0.797	-0.003	0.690	-0.003	0.620	-	-	-	-	-	-	-	-	-	
Ass	0.007	0.898	0.006	0.867	-	-	-	-	-	-	-	-	-	-	-	
OS	-23.94	0.916	-	-	-	-	-	-	-	-	-	-	-	-	-	
F-stat	0.840		1.830		3.027		4.135		4.248		4.322		5.040		5.815	
p-value	0.699		0.403		0.196		0.094		0.067		0.052		0.031		0.021	
R2	0.8936,		0.892		0.890		0.879		0.836		0.783		0.742		0.686	
Adj R2	-0.171		0.404		0.596		0.666		0.639		0.602		0.595		0.568	
RMSE	1247.455		1258.350		1269.601		1332.384		1548.547		1782.561		1941.354		2144.202	
Sigma	4321.310		3082.315		2539.202		2307.757		2398.999		2520.922		2541.829		2626.100	
AIC W	0.034		0.084		0.206		0.314		0.141		0.071		0.069		0.057	
AICc W	1.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
BIC W	0.014		0.043		0.134		0.259		0.148		0.095		0.118		0.124	
PS	43.37%		51.64%		69.82%		84.08%		63.60%		50.52%		47.92%		41.79%	

Note: RMSE is Root Mean Square Error, AIC is Akaike Information Criterion Weight, AICc is corrected version of AIC weight, BIC is Bayesian Information Criterion Weight and PS is Performance Score.

$$MAARO = 126191.688 + \beta_1(-1825.95) + \beta_2(-450.573) + \beta_3(-15.238) + \beta_4(-653.096) + \epsilon_t$$

In the method of MAAR, model 7 shows that only the employment rate and the human capital index as macro-economic factors have negatively significant impact; the issue price and lead time from firm-specific factors have negatively insignificant coefficients on MAARO method. With the highest R² of 74.20% and its adjusted R² of 59.50% and the lowest sigma among all models.

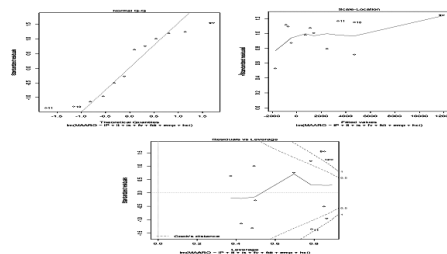


Figure No 2: Graphical Representation of Diagnostic Tests



Multicollinearity	P-value
Normality	0.100
Heteroscedasticity	0.639
Autocorrelation	0.850

It evident that from Q Q plot and prob value of 0.100, it is normally distributed. Prob value of 0.639 is evident that there is no heteroscedasticity. The top three most extremes with standard residuals are shown

on the residual v/s leverage plot as #9, #11, and #12, respectively. Considering that the p-value is 0.850, there is no correlation. Hence, all diagnostic tests are satisfied by this method.

It is considered to be the best fit predictive model since the significance of the p-value of F statistics; the highest of adjusted R² is against to the sigma and acceptance of null hypothesis for all the diagnostic tests.

Table No 5: Multiple Regression Analysis on the Level of Underpricing of IPOs Method
Dependent Variable: Level of Underpricing Method

	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Constant	238.30	0.663	238.70	0.495	219.1	0.283	155.5	0.208	143.5	0.169	123.2	0.114	92.17	0.001	87.9	0.001
IP	-0.076	0.468	-0.075	0.244	-0.074	0.127	-0.069	0.0877	-0.070	0.055	-0.066	0.035	-0.072	0.008	-0.06	0.014
BP	0.000	0.552	0.000	0.334	0.000	0.194	0.000	0.120	0.000	0.081	0.000	0.031	0.000	0.022	0.00	0.049
Ass	0.000	0.826	0.000	0.690	0.000	0.619	0.000	0.531	0.000	0.237	0.000	0.183	0.000	0.130	0.00	0.143
FDI	0.000	0.796	0.000	0.661	0.000	0.583	0.000	0.490	0.000	0.314	0.000	0.282	0.000	0.172	-	-
EM	-1.921	0.767	-1.916	0.643	-1.74	0.537	-0.91	0.627	-0.88	0.599	-0.65	0.647	-	-	-	-
HCI	-0.464	0.802	-0.456	0.695	-0.44	0.624	-0.35	0.651	-0.22	0.716	-	-	-	-	-	-
OS	-0.236	0.810	-0.230	0.705	-0.21	0.636	-0.12	0.735	-	-	-	-	-	-	-	-
LT	-1.325	0.819	-1.315	0.720	-1.34	0.641	-	-	-	-	-	-	-	-	-	-
FV	-0.878	0.961	-0.967	0.932	-	-	-	-	-	-	-	-	-	-	-	-
IS	0.001	0.980	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F stat	0.465		1.031		1.731		2.375		3.326		4.617		6.417		6.684	
P-value	0.827		0.584		0.354		0.211		0.104		0.045		0.017		0.014	
R2	0.823		0.823		0.822		0.806		0.800		0.794		0.786		0.715	
Adj R2	-0.948		0.025		0.347		0.467		0.559		0.622		0.663		0.608	
RMSE	5.310		5.313		5.326		5.558		5.649		5.732		5.842		6.739	
Sigma	18.396		13.015		10.651		9.627		8.751		8.106		7.649		8.254	
AIC W	0.002		0.006		0.015		0.025		0.055		0.126		0.273		0.134	

Contd...

	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
AICc W	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BIC W	0.000	0.002	0.006	0.012	0.033	0.096	0.266	0.166								
PS	42.86%	44.59%	51.21%	52.96%	57.12%	65.12%	82.24%	61.98%								

Note: RMSE is Root Mean Square Error, AIC is Akaike Information Criterion Weight, AICc is corrected version of AIC weight, BIC is Bayesian Information Criterion Weight and PS is Performance Score.

$$\text{Level of Underpricing} = 92.17 + \beta_1(-0.072) + \beta_2(0.000) + \beta_3(0.000) + \beta_4(0.000) + t$$

In model 7, majority of the independent variables coefficient are positive. The level of underpricing is influenced significantly negative by the issue price as a firm-specific factor and positively by the balance of payment as a macro-economic factor. Firm size as firm-specific factor and FDI as macro-economic factor are insignificant impact on the level of underpricing. Contribution of independent variables to the dependent variable is 78% while adjusted R² is closer to its R² and the sigma is the lowest.

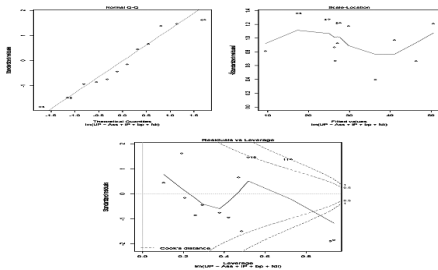


Figure No 3: Graphical Representation of Diagnostic Tests

Multicollinearity	P-value
Normality	0.280
Heteroscedasticity	0.926
Autocorrelation	0.468

The plots and table represents, the reference line is approximately followed by the residuals of Q Q Plot. Hence, normality can be assumed. This is confirmed with prob. value of 0.280. There is a variability of residual points lying along with value of the fitted outcome variable suggesting constant variance in the residual errors or homoscedasticity. This is substantiated with test of heteroscedasticity that there is prob. value 0.926 indicating there is no heteroscedasticity. The residuals v/s fitted plot identifies the top 3 most extremes (#3, #10 and #11) with a standard residuals. Presence of autocorrelation is visible through its prob. value 0.448.

Overall the model is good fit since its p-value is significant; the highest performance score is 82.24%; adjusted R² is the highest as contrary to its sigma. All diagnostic tests are satisfied.



Conclusion:

Methods are classified into three categories based on different individual dependents namely the level of underpricing of IPOs, number of IPO issues, and MAARO method.

The study shows that in the first method, **number of IPO issues**, the model 5 suggests that firm size from firm-specific factors and HCI from macro-economic factors have significant impact. While, Issue price and lead time have negative influence, and issue size and employment rate have positive insignificant impact on number of IPO issues.

Second method **MAARO** of model 7 depicts that only employment rate and the human capital index as macro-economic factors have negatively significant impact; the issue price and lead time from firm-specific factors have negatively insignificant coefficients on MAARO method.

In third method, model 7 of the **level of underpricing**, majority of the independent variables coefficient are positive. The level of underpricing is influenced significantly negative by the issue price as a firm-specific factor and positively by the balance of payment as a macro-economic factor. Firm size as firm-specific factor and FDI as macro-economic factor are insignificant impact on the level of underpricing.

Finally, study concludes that, they are considered to be the good fit models since its significance level of predictive model, the highest performance score, least difference between R^2 and adjusted R^2 , the lowest sigma and satisfaction of all diagnostic tests among the calculated

models of three different methods.

Implications and Further Scope of the Study:

Stakeholders, encompassing investors, governments, and academicians, can leverage these insights. Investors may refine strategies by considering both firm-specific and macroeconomic factors. Governments might tailor policies based on macroeconomic indicators, while academicians could use these findings as a foundation for further research. Future studies could expand the scope through extended analyses, comparative studies, and longitudinal examinations to enhance the understanding and applicability in the dynamic field of IPOs. These data may make it possible to use more complex econometric models, such as non-linear models and panel models etc. Other dependent variables like oversubscription and issue price of IPOs may be taken for further research.

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Appendix

I. Hypotheses Testing of Independent Variables in each Models

Table No 1: Dependent Variable as a Number of IPO Issues Method

Hypothesis Testing	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
H ₁ : Assets	0	0.39	0	0.19	0	0.09	0	0.05	0	0.02	0	0.02	0	0.04	0	0.02
	Accepted		Accepted		Accepted		Rejected		Rejected		Rejected		Rejected		Rejected	
H ₂ : issue Price	-0.01	0.58	-0.01	0.39	-0.01	0.28	-0.01	0.15	-0.01	0.1	-0.01	0.11	-0.01	0.29	-1.32	0.02
	Accepted		Accepted		Accepted		Accepted		Accepted		Accepted		Accepted		Rejected	
H ₃ : HCl	0.97	0.23	0.97	0.06	0.99	0.01	0.98	0	0.98	0	0.93	0	0.91	0	0.97	0
	Accepted		Accepted		Rejected		Rejected		Rejected		Rejected		Rejected		Rejected	
H ₄ : Lead Time	-1.08	0.52	-1.09	0.31	-1.04	0.18	-1.06	0.12	-1	0.09	-1.37	0.01	-1.48	0.01		
	Accepted		Accepted		Accepted		Accepted		Accepted		Rejected		Rejected			

Contd...



Hypothesis Testing	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
H_3 : Issue Size	0	0.56	0	0.34	0	0.23	0	0.17	0	0.14	0	0.14				
	Accepted		Accepted		Accepted		Accepted		Accepted		Accepted					
H_4 : Employment Rate	0.7	0.68	0.7	0.52	0.77	0.34	0.77	0.26	0.61	0.26						
	Accepted		Accepted		Accepted		Accepted		Accepted							
H_7 : Face Value	0.78	0.87	0.88	0.74	1	0.61	0.85	0.6								
	Accepted		Accepted		Accepted		Accepted									
H_8 : FDI	0	0.91	0	0.81	0	0.79										
	Accepted		Accepted		Accepted											
H_9 : versubscription	-0.02	0.93	-0.02	0.89												
	Accepted		Accepted													
H_{10} : Balance of Payment	0	0.96														
	Accepted															

H_0 : There is no significant impact of firm-specific and macro-economic factors on number of IPO issues method.

Table No 2: Dependent Variable as a MAARO Method

Hypothesis Testing	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
H_1 : Employment Rate	-2176.00	0.32	-2109.00	0.11	-2123.00	0.04	-2157.00	0.02	-2155.47	0.01	-1822.26	0.02	-1825.95	0.01	-1386.18	0.01
	Accepted		Accepted		Rejected		Rejected		Rejected		Rejected		Rejected		Rejected	
H_2 : HCI	-562.40	0.35	-536.60	0.11	-533.30	0.05	-496.60	0.02	-455.67	0.02	-447.21	0.02	-450.57	0.02	-474.00	0.01
	Accepted		Accepted		Rejected		Rejected		Rejected		Rejected		Rejected		Rejected	
H_3 : Issue Price	-16.01	0.50	-15.47	0.30	-15.90	0.18	-16.20	0.12	-12.28	0.18	-11.58	0.21	-15.24	0.08	-12.50	0.13
	Accepted		Accepted		Accepted		Accepted		Accepted		Accepted		Accepted		Accepted	
H_4 : Lead Time	-848.50	0.57	-793.90	0.37	-795.80	0.26	-726.40	0.23	-673.85	0.26	-813.12	0.19	-653.10	0.25		
	Accepted		Accepted		Accepted		Accepted		Accepted		Accepted		Accepted			
H_5 : Issue Size	-2.77	0.67	-2.93	0.48	-2.49	0.31	-2.97	0.15	-2.60	0.18	-1.70	0.33				
	Accepted		Accepted		Accepted		Accepted		Accepted		Accepted					
H_6 : Face Value	-1923.00	0.67	-1796.00	0.52	-1873.00	0.39	-2393.00	0.18	-1859.78	0.26						
	Accepted		Accepted		Accepted		Accepted		Accepted							
H_7 : FDI	0.00	0.80	0.01	0.64	0.01	0.55	0.01	0.30								
	Accepted		Accepted		Accepted		Accepted									
H_8 : Balance of Payment	0.00	0.80	0.00	0.69	0.00	0.62										
	Accepted		Accepted		Accepted											

Contd...



Hypothesis Testing	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
H_5 : Assets	0.01	0.90	0.01	0.87												
	Accepted		Accepted													
H_{10} : Oversubscription	-23.94	0.92														
	Accepted															

H_0 : There is no significant impact of firm-specific and macro-economic factors on MAARO method.

Table No 3: Dependent Variable as a Level of Underpricing

Hypothesis Testing	Model-1		Model-2		Model-3		Model-4		Model-5		Model-6		Model-7		Model-8	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
H_1 : Issue Price	-0.08	0.47	-0.08	0.24	-0.07	0.13	-0.07	0.0877	-0.07	0.05	-0.07	0.03	-0.07	0.01	-0.06	0.01
	Accepted		Accepted		Accepted		Accepted		Rejected		Rejected		Rejected		Rejected	
H_2 : Balance of Payment	0.00	0.55	0.00	0.33	0.00	0.19	0.00	0.12	0.00	0.08	0.00	0.03	0.00	0.02	0.00	0.05
	Accepted		Accepted		Accepted		Accepted		Accepted		Rejected		Rejected		Rejected	
H_3 : Assets	0.00	0.83	0.00	0.69	0.00	0.62	0.00	0.53	0.00	0.24	0.00	0.18	0.00	0.13	0.00	0.14
	Accepted		Accepted		Accepted		Accepted		Accepted		Accepted		Accepted		Accepted	
H_4 : FDI	0.00	0.80	0.00	0.66	0.00	0.58	0.00	0.49	0.00	0.31	0.00	0.28	0.00	0.17		
	Accepted		Accepted		Accepted		Accepted		Accepted		Accepted		Accepted			
H_5 : Employment Rate	-1.92	0.77	-1.92	0.64	-1.74	0.54	-0.91	0.63	-0.88	0.60	-0.65	0.65				
	Accepted		Accepted		Accepted		Accepted		Accepted		Accepted					
H_6 : HCl	-0.46	0.80	-0.46	0.70	-0.45	0.62	-0.35	0.65	-0.21	0.72						
	Accepted		Accepted		Accepted		Accepted		Accepted							
H_7 : Oversubscription	-0.24	0.81	-0.23	0.71	-0.21	0.64	-0.12	0.73								
	Accepted		Accepted		Accepted		Accepted									
H_8 : Lead Time	-1.33	0.82	-1.32	0.72	-1.35	0.64										
	Accepted		Accepted		Accepted											
H_9 : Face Value	-0.88	0.96	-0.97	0.93												
	Accepted		Accepted													
H_{10} : Issue Size	0.00	0.98														
	Accepted															

H_0 : There is no significant impact of firm-specific and macro-economic factors on the level of Underpricing method.



EMPOWERING KARNATAKA: E-GOVERNANCE AND TRANSFORMATIVE PUBLIC ADMINISTRATION

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Abstract

The e-governance services in Karnataka are emphasized in this study. Information and communication technologies (ICTs) are used in e-governance to improve governmental operations and services, efficiency, transparency, and accountability. Offering citizens internet services involves digitizing government activities. Karnataka scored 5.11 on the Good Governance Index in 2020–21 compared to 5.10 in 2019–20. The Department of Personnel & Administrative Reforms, a unique e-governance Division in Karnataka, was established in 2003 to hasten the adoption of IT-enabled governance procedures for increased administrative efficiency and transparency. Several national e-governance and e-governance projects are being started and carried out by the Karnataka government to enhance the delivery of public services. Digi locker, e-janma, e-Office, Direct Benefit Transfer, Kutumba, etc., are a few examples of efforts. These programs and services greatly impact how accessible and good services citizens can access. These all indicate good governance administration in the state.

Keywords:

Digital Services, e-Governance, Good Governance, Information Communication Technology, Public Administration



Introduction

Utilizing information and communication technologies is known as electronic government. (ICT) to carry out transactions, share information, and provide government services. It also refers to the integration of already existing services and information portals. E-Governance is information and communication technologies (ICTs) to enhance government processes and services' efficiency, effectiveness, transparency, and accountabilities. It involves the digitization of government operations, the provision of online services to citizens, and the use of data analytics for decision-making. Let's dive into the world of E-Governance and understand its significance in today's digital age. It is a paradigm shift in how governments operate and interact with their citizens. Traditionally, government processes and services were paper-based, time-consuming, and often bureaucratic. With the advent of ICTs, governments can streamline their operations, reduce administrative burdens, and provide faster and more accessible services to citizens. One of the key aspects of E-Governance is The digitization of government operations. It involves using digital technologies to automate and digitize various government processes, such as record-keeping, document management, and workflow management. By digitizing these processes, governments can eliminate manual errors, reduce paperwork, and improve the overall efficiency of their operations. Karnataka's Good Governance Index score was 5.11 in 2020-21 compared to

5.10 in 2019-20, with an improvement in Agriculture and allied Sectors, Public Infrastructure and utilities, and Social Welfare and development. The Department of Personnel & Administrative Reforms, a unique e-Governance Division in Karnataka, was established in 2003 to hasten the adoption of IT-enabled governance procedures for increased administrative efficiency and transparency. The Department has developed the essential framework for implementing e-governance projects in the state. Speed the implementation of IT-enabled governance procedures for greater administrative efficiency and transparency, The Department of Personnel & Administrative Reforms was founded in 2003. It is a distinctive e-Governance Division in Karnataka. The Department has created the crucial foundation for the state's e-governance initiatives. Karnataka has improved its position from 17th position to the Top Achiever. EoDB is also part of the India Innovation Index, where Karnataka ranks first with a score of 18.01 as of 2021. Ease of Doing Business, which is part of the Good Governance Index, as per 2022, Karnataka emerged as a top performer in Ease of Doing Business rankings, along with six States (Telangana, Andhra Pradesh, Gujarat, Haryana, Punjab and Tamil Nadu). Karnataka has improved its position from 17th position to the Top Achiever. EoDB is also part of the India Innovation Index, where Karnataka ranks first with a score of 18.01 as of 2021. The study objectives are To know the government E-governance services and initiatives in Karnataka. To explain the

strengths and weaknesses of E-governance services in public administration. To achieve the objectives, reviewed some relevant works of literature. The capacity of the government to provide strategic change based on vision in consultation with the larger parts of society and effective communication to the stakeholders and public about the need for reform and expected benefits from it are crucial to the success of administrative reform. (Sangita, 2002). The public sector uses information and communication technology to enhance information and provide services to the entire population. It aids them in making decisions that will increase the government’s accountability, transparency, and efficiency. (Singh, 2014). The emerging nations confront two major challenges. Getting six preconditions for e-governance ready is the first strategic challenge of e-readiness. Adopting best practices in e-governance initiatives to prevent failure and create success is the second tactical issue of addressing design-reality gaps. (Malik et al., 2014). Interaction between official institutions and the people of civil society is necessary for effective governance. The term “governance” refers to the process through which people of society exercise control over matters of public interest and social advancement. (Barthwal, 2003). There are insights to be learned from the effective adoption of e-governance in Karnataka, which enhances service delivery. Last but not least, argue that while optimism about using technology in service-delivery tasks is necessary, the total digitalization of the economy may be qualitatively different. (Vaddiraju &

Manasi, 2019). The government of India has set a high goal: to convert all citizen interactions with the government via electronic channels. By doing this, the government can guarantee more openness and improved administration. (Bhatia & Kiran, 2016). There are four types of Interaction in e-governance: One is G2G, i.e., Government to Government. Second is G2C, i.e., Government to Citizen. Third is G2B, i.e., Government to Business. Fourth is G2E, i.e., Government to Employees.



Figure 1. Goals of e-Governance

Materials and Methods

To fulfill the study objective, mainly focused on secondary data sources because Karnataka’s capital city, Bengaluru, is a silicon wally of India. Therefore, the government of Karnataka introduced many e-governance platforms to achieve better and easier service to the citizens. Sources are collected from state and union government annual reports, like the Department of Personnel and Administrative Reforms, Centre for e-Governance government of Karnataka,

and published unpublished sources. This study explained a straightforward discussion for a better understanding of e-governance services in Karnataka.

Result and Discussion

The government of Karnataka is at the forefront of initiating and implementing several national e-governance and e-governance projects to improve public service delivery. Some of the initiatives like, Digilocker, e-janma, e-Office,

Kannada Computing, State Scholarship Portal, Direct Benefit Transfer, Kutumba, Karnataka Open Data Initiative, MyGov, RTI Online, Crop Survey, Karnataka State Web Portal, KAVERI Property Registration using Blockchain, Suvidha, National Academic Depository, Mahiti Kanaja, FRUITS, Integrated Public Grievances Redressal System, E-Sahamathi, Sakala, Bhoomi and K-GIS. Some important e-governance services are explained in the table.

Table 1. Major e-Governance Initiatives and Services of Karnataka state

Sl. No	Initiatives	Details
1	FRUITS software	developed by e-governance in cooperative societies: To avoid the farmers visiting the Sub-registrar office to create charge /mortgage on RTCs at the time of availing agricultural loans and releasing deeds at the time of repayment of loans in PACS, DCC banks, and PCARD banks, has been completely made online from 1-4-2022 through FRUITS software. Till December 2022, more than 83.12 lakh farmers registered in FRUITS. Banks and Co-Operation institutes are also using FRUITS for extending Agriculture loans. More than 20,000 Branch including more than 5,000 PACs are using FRUITS data
2	Direct Benefit Transfer (DBT)	309 schemes on the DBT Platform now represent 42 departments. Scholarship Programmes, Minimum Price Support Programmes, PM-Kisan State programs, CM-Relief Fund, Housing Programmes, and Milk Incentive Programmes are among the Major Schemes that have been On-boarded. This platform distributed Rs. 11,925.11 crores to 1.80 crore recipients during 2021–2022.
3	KAVERI (Property Registration using Blockchain)	The Project is implemented on the lines of the National Block Chain Project, a Govt. of India scheme. The issues & observations recorded during the pilot phase were discussed in the meeting of the Secretary, DPAR (e-Gov), Secretary, Revenue, IGR, Stamps and Registration Dept and Commissioner, SSLR held on March 24, 2022, wherein it was decided to explore an alternative to physical KAVERI cards and redevelop the application for its roll-out across the state.

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4	Suvidha	Suvidha is a one-stop solution for all Citizens for Scheme Discovery, Eligibility Check, and Service Delivery for all schemes and Services from various Departments of the Government of Karnataka. The Centre monitors this Project for e-Governance, Government of Karnataka.
5	Bapuji Seva Kendra	The Bapuji Seva Kendra Initiative was introduced on July 1, 2016, by the Karnataka government's RDPR division. Karnataka's Grama Panchayats have Bapuji Seva Kendras, which provide services mostly from the RDPR, Revenue, and other departments.
6	Kutumba	The Kutumba Project aims to provide a unique identity to residents. The Department of e-Governance has implemented the "Kutumba" project, a centralized data repository of families in Karnataka consisting of individual and family attributes. The PDS data has been used as a base, and other department databases have been integrated. 5.5 Crore residents of Karnataka, i.e., nearly 90% of the state population (as per the 2011 census), have become part of the Kutumba system. Kutumba is an Entitlement Management System that allows the government to identify eligible residents for welfare benefits and suo-moto deliver the benefits without the resident having to apply.
7	Bhoomi	Bhoomi is an online land records management system implemented by the Government of Karnataka. It aims to provide access to land records to citizens transparently and efficiently. The system digitizes land records and provides online access to them, making it easier for citizens to obtain various certificates related to land ownership, including RTC (Record of Rights, Tenancy, and Crop Information) and Mutation Certificates. The system has significantly reduced the time and effort required for obtaining land-related documents and has improved the overall transparency of the land records management process.
8	Karnataka One	The Government of Karnataka implemented the Karnataka One Project to replicate Bangalore One to other cities of Karnataka for delivering services to multiple Government Organizations and Private Companies under one roof in a citizen-friendly manner. Currently, Karnataka One is operational in 24 cities.
9	Sakala	Sakala is a unique initiative of the Government of Karnataka that aims to provide time-bound delivery of government services to citizens. The program provides a list of government services that citizens can avail of and specifies the time limit for the service. The program covers over 600 services from different government departments, including issuing certificates, licenses, and permits.

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10	E-Belaku	e-Belaku is an Online Utility Bill Payment (OUBP) system developed by the Rural Development and Panchayat Raj Department Government of Karnataka to facilitate the Gram Panchayats to pay electricity bills online to respective Electricity Supply Companies such as BESCOM, GESCOM, HESCOM, CESCO and MESCOM. This application will help Gram Panchayat to handle the electricity dues, defunct RR numbers, and disconnection of RR numbers.
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A. Important aspects of e-Governance

This provision of online services to citizens. Through online portals and platforms, citizens can access government services, such as applying for passports, paying taxes, or registering businesses. It saves citizens time and effort and reduces the need for physical interactions with government offices, especially in remote areas.

- Digital Service Delivery: E-governance involves providing government services online through digital platforms. This can include services like applying for licenses, permits, and passports and accessing government information and resources without needing physical visits.
- Citizen Engagement: E-governance encourages the active participation of citizens in decision-making processes. Online platforms can facilitate public consultations, surveys, and feedback mechanisms, allowing citizens to express their opinions on policies and projects.
- Transparency and Accountability: Digital platforms enable governments to share information about their activities, budgets, expenditures, and performance with citizens. This transparency helps hold public officials accountable for

their actions and promotes trust in government institutions.

- Efficiency and Cost Savings: E-governance can streamline administrative processes, reducing paperwork and bureaucracy. This leads to cost savings for the government and citizens by minimizing the time and resources required for various transactions.
- Accessibility and Inclusivity: Online services make government information and services accessible to a wider population, including people with disabilities, those in remote areas, and those facing barriers to traditional service channels.
- Data-Driven Decision Making: E-governance generates a wealth of data that can be analyzed to gain insights into citizen preferences, needs, and behavior. This data can inform policy decisions and help governments effectively tailor their services.
- Cybersecurity and Data Privacy: As e-governance involves collecting and storing sensitive citizen data, robust cybersecurity measures and strict data protection regulations are essential to prevent data breaches and unauthorized access.
- Interoperability: Different government



departments and agencies often use various systems and databases. Interoperability ensures these systems can communicate and share information seamlessly, improving coordination and service delivery.

- **Capacity Building:** E-governance requires training government officials to use digital tools and manage online services effectively. Capacity building ensures government employees and citizens can navigate the digital landscape confidently.
- **Legal and Regulatory Frameworks:** Governments must establish legal and regulatory frameworks that govern e-governance activities, ensuring that digital services adhere to privacy, security, and accessibility standards.
- **Digital Identity:** Establishing reliable digital identity systems is crucial for secure online transactions and interactions between citizens and government services.
- **Mobile Governance (m-governance):** With the proliferation of smartphones, m-governance focuses on delivering government services and information through mobile apps, making them accessible to a broader population.
- **Rural and Remote Connectivity:** Ensuring internet connectivity in rural and remote areas is essential to prevent a digital divide and enable all citizens to benefit from e-governance initiatives.
- **Disaster Management and Emergency Response:** E-governance can coordinate disaster response efforts and disseminate critical information to citizens during emergencies.

- **Economic Development:** E-governance can contribute to economic growth by enabling easier business registration, licensing, and access to government procurement opportunities.

Overall, e-governance aims to transform traditional government processes by leveraging technology to create more efficient, responsive, and citizen-centric services while fostering transparency and accountability in governance.

B. Challenges and issues of e-Governance:

E-governance in Karnataka has made significant progress over the years. However, it still faces several challenges and issues that must be addressed to ensure its effectiveness and widespread adoption. Some major challenges include:

- **Digital Divide:** India's population is diverse regarding socio-economic status, education, and digital literacy. The digital divide between urban and rural areas and among different social groups creates barriers to accessing online government services. Many citizens, especially in rural and remote areas, lack the necessary infrastructure and skills to participate in e-governance initiatives.
- **Digital Literacy:** A significant portion of the Indian population still lacks basic digital literacy skills, which hampers their ability to navigate and use online platforms for government services. There is a need for comprehensive digital literacy programs to empower citizens to engage with e-governance systems effectively.
- **Language Diversity:** India is home



to many languages and dialects. E-governance platforms need to be available in multiple languages to cater to the linguistic diversity of the population, ensuring that citizens can access and understand services in their preferred language.

- **Cybersecurity and Privacy Concerns:** As e-governance systems involve collecting and storing sensitive citizen data, ensuring robust cybersecurity measures and data privacy protections is crucial. Instances of data breaches and privacy violations can erode public trust in e-governance initiatives.
- **Infrastructure Challenges:** Reliable internet connectivity and electricity supply are essential for accessing e-governance services. Many rural and remote areas still lack adequate infrastructure, hindering the seamless adoption of digital platforms.
- **Interoperability:** Various government departments and agencies often operate their e-governance systems, which might not be fully interoperable. This lack of integration can lead to inefficiencies and duplication of efforts. A unified and standardized approach to e-governance systems is necessary for streamlined service delivery.
- **Resistance to Change:** Bureaucratic resistance to adopting new technologies and processes can slow the implementation of e-governance initiatives. Training and capacity-building efforts are needed to help government officials adapt to and embrace digital transformation.
- **Lack of Awareness:** Many citizens,

especially in rural areas, might not be aware of the availability and benefits of e-governance services. Awareness campaigns are required to inform citizens about the existence and advantages of online government services.

- **Accessibility and Usability:** E-governance platforms must be designed with user-friendly interfaces accessible to people with disabilities. Ensuring the elderly and differently-abled citizens can use these platforms is essential for inclusivity.
- **Maintenance and Sustainability:** E-governance systems require continuous maintenance, updates, and improvements to remain effective and secure. To sustain these initiatives, adequate funding, technical expertise, and long-term planning are necessary.
- **Legal and Regulatory Challenges:** E-governance often involves legal and regulatory complexities, including issues related to digital signatures, electronic records, and electronic transactions. Ensuring legal validity and compliance with existing laws is essential.

Addressing these challenges requires a multi-faceted approach involving government collaboration, technological innovation, policy reforms, capacity building, and public awareness campaigns.

Conclusion

Karnataka state has many nicknames like IT Hub, the Silicon Valley of India, and IT Park because so many software MNCs work there. The state



government has effectively utilized all these resources to facilitate e-services to the citizens. Many Mobile Apps, web portals, and programs are introduced to achieve good governance administration. E-Governance is revolutionizing the way governments operate and deliver services. It leverages ICTs to enhance government processes' efficiency, transparency, and accountability. By digitizing operations, providing online services, and using data analytics, governments can transform governance and create a more citizen-centric and responsive administration. As we progress through this course, we will delve deeper into the various aspects of E-Governance and explore its potential for driving positive change in society. But still, e-governance is going inactive because of the lack of infrastructure facilities, so the government needs to focus on improving the facilities and public awareness drives.

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ESG FUNDS- A WAY FORWARD TO ENHANCE THE SUSTAINABLE BUSINESS PRACTICES

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Abstract

Environmental, Social and Governance (ESG) investing symbolizes a set of guidelines which the companies have to follow to avoid unethical practices which harms the environment and since the investors are socially awakened they screen the ESG investing to invest in the potential investments. ESG investing is also known to be as sustainable investing. ESG funds are invested in those organizations which aims to have a sustainable and societal impact in the globe like those organizations with tiny carbon footprint or diverse leadership boards. In this article the researcher tried to study how about the importance of ESG funds and how it helps to improvise the sustainable business practices.

Keywords:

ESG Score, ESG Funds, ESG Investing, Screening, Thematic Investing



Introduction

Environmental, Social and Governance (ESG) investing denotes a set of standard for the organizational behavior since the socially conscious investors use them to screen the potential investments. The environmental criteria consider how the company protects the environment including corporate policies which addresses the climate change, etc., the social criteria studies how the company maintains the relationship with its employees, suppliers, customers and the communities where it functions, governance examines the organization's leadership, audits, etc. On the basis of the corporate policies the ESG investing are screened so that the companies get a motivation to act responsibly. The ESG investing aid the portfolios to ignore the holding companies which are engaged in unethical practices. The investment product which employs the principles of ESG are now offered by most of the mutual funds, brokerage firms and rob-advisors.

Investors look forward to invest in those companies which has been built on sustainability especially in day-to-day conscious investing. The investors have the thrust to learn about various aspects which contributes to the stability of the companies where they wish to invest. The demand is greater for those organizations which is able to withstand the impact of any kind of crisis and which frequents incorporate the factors of the environment, social and governance in the day to day functioning.

Meaning of ESG Investing

Environmental social and governance

(ESG) investing is otherwise known to be as the sustainable investing. It is a comprehensive term for investments made in the organization which adopt the moral practices to enhance their profits. Financial risks and non- financial risk create hazard to the organization. The aim of ESG investing is to avoid the non-financial risk which is substantial in the long-term.

ESG investors won't invest in the companies which do not follow the ESG standards. For example, if at all any organization is causing hazard to the environment by means of pollution or those firms which have poor labor practices. Many investment funds have started to adopt the model of ESG investing since it slowly started to gain popularity across the globe.

What is an ESG Score?

ESG score is used for estimating the company's environment and socially sustainable action. The score ranges between 0 to 100 and it weighs the average performance based on the three elements Environment, Social and Governance. The company performance is good considering the suitable measure of the three key components if the ESG Score of that company is high. On the other hand, a lower score indicates that the company is not able to take proper actions on the ESG factors and there is a chance of loss due to regulatory punishments, environment crises and so on.

The need and importance of ESG Investing

In the world of investing there are various strategies, models, systems and most of



the originated in the development markets Recently the fund investors came to know about the 'ESG' funds that is being launched by several fund houses.

ESG investing ensures that the investment decisions are not only based on the profitability of the company but it also depends upon the three key areas of ESG. In reality the ESG investing examines how the how companies approach the environmental challenges like climate crisis and pollution, social challenges such as the workers right and the impact of the organization on the local community, corporate governance and so on. ESG criteria have been integrated by most of the pension company in the recent times. It has been frequently observed that those organizations violating the principles of ESG performs less likely in the long-term due to the fact that they face pressure from the consumers as well as the governments to stop the pollution and to take care of their employees and be sure that the business performs well.

What is an ESG fund?

In General, ESG funds is used to state any investment vehicle for which the ESG criteria is used by the fund manager to enlighten its composition and asset allocation strategy. The ESG funds are invested in those organizations which aims to have a sustainable and societal impact in the globe like those organizations with tiny carbon footprint or diverse leadership boards. ESG funds avoids investing in those organizations where the unethical practices is being adopted like tobacco, alcohol and gambling.

The various types of investment strategies are used by the ESG fund managers which comprises of negative screening, thematic investing or ESG integration. Commonly there are three types of ESG funds they are ESG mutual funds, ESG ETFs and ESG index funds.

ESG equity funds are the mutual funds which invest in those organization which follows a strong ESG practices. These funds attempts to promote sustainable business practices and aids the organization to do good things for the society. ESG funds helps to screen out the companies which does harm for the environment or society like producing tobacco products or nuclear weapons.

Sustainable investing is made ease for the investors because of the ESG ETFs. Two investment strategies are covered by these funds.

ESG index fund is a kind of ESG mutual fund which passively tracks the ESG centric companies which trades on the index such as the S&P 500.

Regulatory Landscape of ESG Funds in India: Progress and Future Prospects

India's ESG investing landscape is undergoing a metamorphosis, marked by both promising regulatory advancements and potential areas for improvement. Here's a detailed breakdown:

Current Regulatory Framework:

- ❖ SEBI's ESG Reporting Framework (2023): This mandate applies to the top 1,000 listed companies, requiring comprehensive Business Responsibility and Sustainability



Reporting (BRSR) aligned with GRI standards. This enhances transparency and comparability.

- ❖ SEBI's ESG Mutual Fund Regulations (2022): These regulations introduce specific requirements for ESG-labeled funds, including:
- ❖ 80% minimum investment in ESG-aligned securities.
- ❖ Monthly ESG score disclosure for holdings.
- ❖ Expanded ESG scheme categories for flexibility.
- ❖ Focus on green financing through enhanced disclosures.

Other Regulations: Existing regulations like Companies Act, 2013, and environmental laws indirectly touch upon ESG aspects like corporate governance and environmental responsibility.

Construction of ESG Funds

The techniques of ESG investing are as follows:

Negative Screening

At times the negative screening is known by the name exclusion. This technique helps to find out the undesirable features which does not match the sustainability criteria and apart from that a stock screener is run to exclude the investments which doesn't qualify.

Positive screening

At times the positive screening is known by the name inclusion. It is just opposite to that of the negative screening here the analysts and the fund managers runs screen

to find out the top performers which is being measured against the ESG criteria.

Thematic Investing

It is a fund where the ESG fund manager ascertains the long term trends in macroeconomic and at the same time it should contribute to better E, S or G outcomes. Thematic ESG funds might use the screening tools however most of them employ the proprietary models and criteria to achieve the objectives of the investment.

Types of ESG Funds

ESG Funds comes in various shapes and sizes. The common types of ESG Funds have been listed below:

- ❖ **Green Funds:** These types of funds are invested in those organizations dedicated to environment sustainability.
- ❖ **Social Impact Funds:** It is invested in the companies who have positive social impact especially those organizations which works to improve the education or healthcare.
- ❖ **Ethical Funds:** It is invested in the organization which follows high ethical standards like neglecting child welfare or environmental pollution.
- ❖ **Sustainable Development Goals (SDG) Funds:** These funds are invested in organizations which work towards the 17 Sustainable Goals of United Nations and it includes fighting against the climate and achieving gender equality.

Benefits of ESG Funds

Many benefits are offered by ESG funds and state a few example these ESG funds can



aid to diversify the portfolio and provides a protection against the risks. Moreover, the ESG funds tends to outperform the traditional counterparts in the long term. It also provides benefits to the environment and social as well. Investing in companies which are market leaders in practising the ESG can help to bring out the positive changes in the world. Furthermore, the investors and the organization can be assured that the investment supports the sustainable business practices.

Why should one invest in ESG funds?

Few of the prime reasons for investing in the ESG funds have been highlighted below:

➤ **Reduced Risk**

The risks related to environmental and social issues can be managed by the companies which has strong ESG practices and it helps to reduce the risk.

➤ **Long-term returns potential**

Certain ESG funds have performed well in the long-term which symbolizes that companies with strong ESG practices can manage the weather risk.

➤ **Increasing Demand**

Across the world and in India the demand of ESG investment is growing and hence the value of these funds could drive in the future since many of the investors will invest in these ESG funds.

➤ **Alignment with Personal values**

Investing in ESG funds will provide an opportunity for the investors to align with the investments with their own beliefs and values and at the same time by providing support to those

companies with positive environmental and social impacts.

➤ **Improved Corporate Behaviour**

The corporates do understand the investors behaviour relating to the environmental and social performance which motivates them to invest in ESG funds and hence the corporates take it as a motivation as a result the behaviour of the corporates gets improved over the period.

The difference between ESG mutual Funds and traditional Mutual funds

At some scenarios the ESG mutual funds varies from the traditional mutual funds. The main focus of the ESG funds is on those investments which are good for the environment, society. Not only that various screening process have been involved to select the investments and it may have various weighing scheme. In traditional mutual funds the factors of ESG is not considered. In this case there is a chance of investing the funds in those organization which may cause harm to the society.

Top 5 ESG Funds in India

❖ **SBI Magnum Equity ESG Fund**

It is one of the oldest fund in the ESG segment. The size of the fund is Rs.4411.66 Cr as of 9th may 2023. The top 10 stock in the portfolio of this funds are Infosys Ltd, Tata Consultancy Services Ltd, ICICI Bank Ltd, Housing Development Finance Corporation Ltd, Axis bank Ltd, Larsen & Toubro Ltd, Ultratech Cement Ltd, State Bank of India, Britannia Industries Ltd and ABB India Ltd.



❖ **Axis EDG Equity Fund**

It was started on 22nd January 2020. The size of the fund is Rs.1460.59 Cr as of 9th may 2023. The top 10 stock in the portfolio of this funds are Nestle India Ltd, Avenue Supermarts Ltd, Bajaj Finance Ltd, Tata Consultancy Services Ltd, Info Edge India Ltd, Torrent Power Ltd, Housing Development Finance Corporation Ltd, Kotak Mahindra Bank Ltd, ICICI Bank Ltd and HDFC Ltd.

❖ **ICICI Prudential ESG Fund**

It was started on 21st September 2020. The size of the fund is Rs.1216.54 Cr as of 9th may 2023. The top 10 stock in the portfolio of this funds are Infosys Ltd, Bharti Airtel Ltd, HDFC Bank Ltd, Sundaram Finance Limited, Wipro Ltd, Sun Pharmaceutical Industries Ltd, HCL Technologies Limited, SBI Life Insurance Co Ltd, ICICI Bank Ltd, Jyothy Laboratories Ltd.

❖ **Quantum India ESG Equity Fund**

It has been launched by Quantum mutual funds and it came into existence on 21st June 2019. The size of the fund is Rs.61.2 Cr as of 9th may 2023. The top 10 stock in the portfolio of this funds are HDFC Bank Ltd, Housing Development Finance Corporation Ltd, Tata Consultancy Services Ltd, TVS Motor Company Ltd, Infosys Ltd, Axis Bank Ltd, Tata Chemicals Ltd, Indian Hotels Company Limited, Tata Communications Ltd and ICICI Bank Ltd.

❖ **Kotak ESG Opportunity Fund**

This scheme comes under the Kotak Mahindra mutual funds and it came into existence on 20th November 2020.

The size of the fund is Rs.1100.46 Cr as of 9th may 2023. The top 10 stock in the portfolio of this funds are State bank of India, ICICI Banks Ltd, Infosys Ltd, Tata Consultancy Services Ltd, Larsen & Toubro Ltd, HDFC Bank Ltd, Housing Development Finance Corporation Ltd, Bajaj Finance Ltd, Hindalco Industries Ltd and Axis Bank Ltd.

How to select the right ESG Funds?

To find the right ESG funds the research has to be carried so that it aligns with the financial goals and the values. The investor has to consider the following factors while choosing the ESG fund

- ❖ The investment thesis of the funds.
- ❖ Fundamentals of the fund's portfolio composition which includes the types of investments and sector weightings.
- ❖ Fees of the fund management and performance fees.
- ❖ ESG facts which have an influence on the returns and risk related with that specific fund.
- ❖ Research available on the ESG features and fund's performance.
- ❖ Consider the risk level of the funds which one invests. Even though the companies may align with the value of the investors they do have highly volatile stock performance. Hence the risk tolerance should be properly examined by the investor before investing in the ESG funds.
- ❖ An investor has to consider the investment returns especially in the past few years so that they can select the right ESG funds because there is chance



that some funds may underperform.

Merits of ESG funds

- ❖ These funds help the investors align their values with the investments.
- ❖ It can possibly provide greater risk-adjusted returns.
- ❖ It aids the investors to diversify the portfolios so that the risk diminishes.

Demerits of ESG funds

- ❖ The ESG funds performance relies on the organization where the investors desires to invest.
- ❖ Most of the ESG funds fees are high while compared to the returns derived from those funds.
- ❖ It is really hard to find out the truly “green” investments since majority of the companies have some level of issues related to the environmental or society.

Risk associated in ESG mutual funds investing

Various factors have to be considering before investing in the ESG mutual funds since there both risk and returns associated with these funds. The following are some of the risk associated with the ESG mutual funds:

- ❖ **Lack of Diversification:** Compared to the other types of funds the ESG funds have less diversification since the ESG mutual funds focuses only on the single form of investment. The volatility of the portfolio may be increased because of it and at the same time risk may also rise because of it.
- ❖ **Limited options in Investment:** The investors should be aware of the investment options in the ESG mutual

funds since there are only limited options available for investing in these funds. It can be harder to find out the ideal investments for the portfolio.

- ❖ **High fees:** The fees for the ESG mutual funds is comparatively high and because of their specialized characteristic most often it will result in high operational costs. So the investors have to consider the fees before investing in this fund.

Suggestions for Further Development:

- ❖ **Mandatory ESG Reporting for All Companies:** Expanding BRSR mandates beyond the top 1,000 companies would promote broader ESG adoption and awareness.
- ❖ **Standardized ESG Rating Systems:** Implementing a unified national ESG rating system would ensure data consistency and comparability across companies and funds.
- ❖ **Integration of ESG Factors into Investment Fiduciary Duty:** Encouraging investors to consider ESG factors when making investment decisions could accelerate mainstream adoption.
- ❖ **Strengthening Greenwashing Controls:** Robust enforcement mechanisms and stricter definitions of “green” activities are crucial to curb misleading practices.
- ❖ **Capacity Building and Awareness:** Enhancing investor education and training financial professionals on ESG integration are essential for informed decision-making.



Conclusion

The ESG funds are gaining its popularity since the investors are ready to invest in these funds. Although there are many ways to invest in the ESG funds it is suggested that one needs to do research so that they are aware of the fees, diversifications of the funds, etc so that the right funds can be chosen. Generally, the companies which does harm to the three pillars of Environment, Social and Governance are ignored by the ESG funds.

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FINANCIAL RATIO ANALYSIS OF TOP 10 MANUFACTURING COMPANIES OF INDIA

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Abstract

Financial ratio analysis has always been an important tool for many years. It is used for determining a company's financial performance, valuing a company's stock, determining a company's systemic risk (beta risk) exposure, assessing a company's credit rating, financial health prediction, trend analysis, making comparisons with other firms etc. This study is making an attempt to analyse the performance of top 10 BSE listed manufacturing companies based on key financial ratios. Ratios are selected based on Review of literature. The top 10 manufacturing companies in the country have been instrumental in driving the industrial revolution that has taken place over the last few decades. Each of these companies has played a significant part in India's economy and job creation across various sectors. Looking at its financial parameters are instrumental from investment point of view also.

Keywords:

Financial Ratio, Financial Performance, Investment, Beta Risk, Manufacturing Companies

**Introduction:**

Over the past few years, the manufacturing industry in India has experienced consistent growth. The top 10 companies within the sector have been significant contributors to the country's GDP. With around 17% of total economic output providing direct or indirect employment for millions, this sector plays crucial role in our country's development. The rise of manufacturing companies has transformed India's economy, with the introduction of new technologies, processes, and employee training and development initiatives that have kept them competitive, despite the challenging economic climate.

These companies have also successfully developed value-based products that meet the needs of Indian consumers (ceoreviewmagazine.com,2023).

Research Methodology

For the purpose of this study, key financial ratios of top 10 BSE listed manufacturing companies are taken. The data of financial ratios for 5-year period from 2018 to 2022 has been collected from CMIE Prowess Database. The latest data available on Prowess was for the period of march 2022. The list of the companies considered for the present research, arranged in descending order of sales for 2022, is furnished as table 1. Company 1 is the company with the highest sales in year 2022.

Table 1 Top 10 large companies based on Sales for the year 2022

Top	Company Name (Abbreviations)*	Sales (INR CR)
1	Indian Oil Corpn. Ltd. (IOCL)	740655.45
2	Reliance Industries Ltd. (RIL)	465045.00
3	Bharat Petroleum Corpn. Ltd. (BPCL)	433406.48
4	Hindustan Petroleum Corpn. Ltd. (HPCL)	376654.21
5	Tata Steel Ltd. (TSL)	129006.62
6	J S W Steel Ltd. (JSWSL)	130288.00
7	Steel Authority of India Ltd. (SAIL)	103155.35
8	Maruti Suzuki India Ltd. (MSIL)	86148.10
9	Mangalore Refinery & Petrochemicals Ltd. (MRPL)	86064.00
10	Tata Motors Ltd. (TML)	79877.17

*These abbreviations are used to denote the company

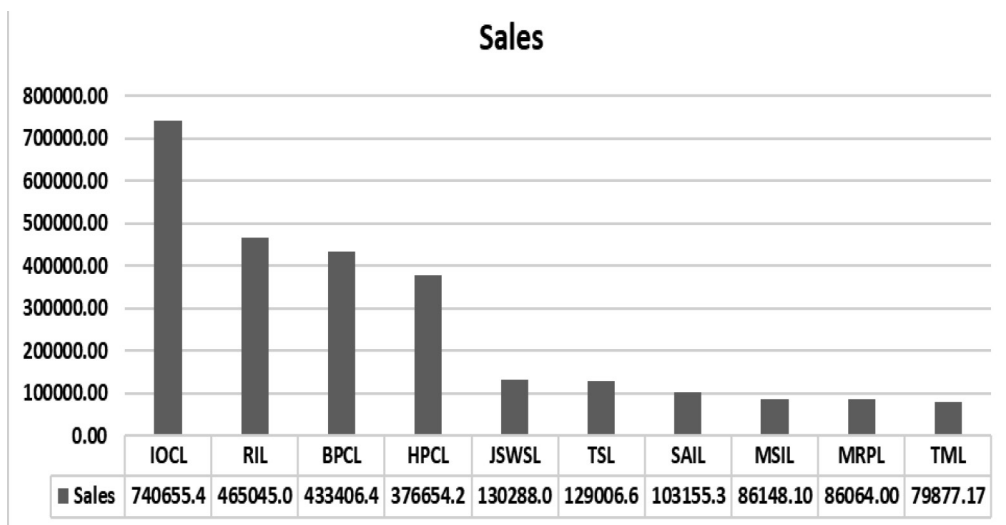


Figure 1 Comparative analysis of top 10 companies based on sales

The key financial ratios selected are:

1. Liquidity Ratios
 - 1.1. Quick Ratio
 - 1.2. Current Ratio
2. Profitability Ratios
 - 2.1. Net Profit Margin
 - 2.2. Return on Capital Employed
 - 2.3. Return on Net Worth (RONW)
 - 2.4. Return on Total Assets (ROTA)
3. Market-Based Ratios
 - 3.1. Earnings per Share (EPS)
 - 3.2. Price Earnings (PE) Ratio
4. Leverage Ratios
 - 4.1. Debt to Equity
 - 4.2. Interest Coverage Ratio

1. Liquidity Ratios

1.1. Quick Ratio (QR): This ratio aims to show the more liquid current assets available to make payment for more

immediately payable liabilities. With reference to current assets, the results are not significantly affected since only inventories are not considered here (Bansal, 2015) a financial statement analysis should be made of all companies. The objective of the present paper is to measure the financial and accounting performances of leading Indian IT companies for the period 2010-2014. Financial statements and income statements of Tata Consultancy Services (TCS. Ratio of 1:1 is considered to be the ideal quick ratio which indicates that the business has in its possession sufficient assets which could be immediately liquidated for paying off the current liabilities (tradesmartonline.in, 2022).

Table 2 provides the trend of the QR of the companies under reference for the period of research and also the average.



Table 2 Quick Ratio of Top 10 large Company

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	0.34	0.45	0.29	0.41	0.23	0.34
Hindustan Petroleum Corpn. Ltd.	0.26	0.2	0.18	0.24	0.19	0.21
Indian Oil Corpn. Ltd.	0.16	0.18	0.16	0.2	0.19	0.18
J S W Steel Ltd.	0.23	0.43	0.52	0.47	0.49	0.43
Mangalore Refinery & Petrochemicals Ltd.	0.31	0.23	0.23	0.21	0.28	0.25
Maruti Suzuki India Ltd.	0.24	0.66	0.46	0.97	0.79	0.62
Reliance Industries Ltd.	0.39	0.38	0.31	0.56	0.78	0.48
Steel Authority of India Ltd.	0.17	0.17	0.26	0.23	0.18	0.20
Tata Motors Ltd.	0.31	0.3	0.33	0.39	0.41	0.35
Tata Steel Ltd.	0.87	0.16	0.21	0.48	0.15	0.37

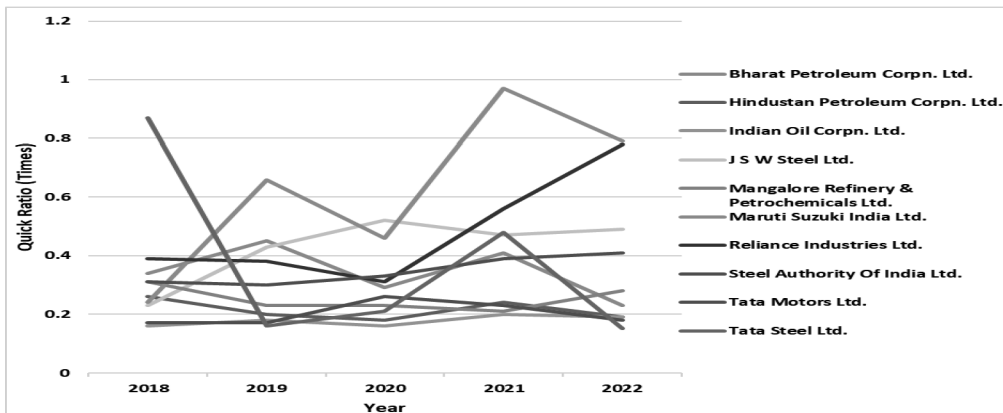


Figure 2 A Comparative Analysis of Quick Ratio of Top 10 Large Companies

As may be observed from table 2, QR of all the companies are falling below the benchmark of 1, which indicates that companies are lacking liquid assets to meet the current liabilities. On 5-year average, Maruti Suzuki have the highest QR of 0.62. In 2020, quick ratio of most of the companies fell, possible reason being

covid. In 2018 Tata Steel had the highest QR but in 2019 it had the lowest ratio. Tata steel showed lot of fluctuation in these 5 years. However, in 2021, all the companies showed improvement with Maruti Suzuki having the best ratio of 0.97. Reliance is second best as it showed increasing QR with average of 0.48 times.



1.2. Current Ratio (CR): This ratio shows the current assets available to cover current liabilities at the balance sheet date. Current asset over current liability is an indication

of the ability of the firm to pay its debts as and when they fall due (Bansal,2015). Table 3 presents the Current ratio of companies from 2018 to 2022.

Table 3 Current Ratio of Top 10 Large Companies

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	0.83	0.98	0.69	0.91	0.76	0.83
Hindustan Petroleum Corpn. Ltd.	0.66	0.58	0.53	0.71	0.7	0.64
Indian Oil Corpn. Ltd.	0.6	0.68	0.6	0.72	0.75	0.67
J S W Steel Ltd.	0.71	0.76	0.82	0.79	0.98	0.81
Mangalore Refinery & Petrochemicals Ltd.	0.68	0.73	0.66	0.71	0.85	0.73
Maruti Suzuki India Ltd.	0.51	0.91	0.77	1.16	1.01	0.87
Reliance Industries Ltd.	0.6	0.6	0.43	0.74	1.01	0.68
Steel Authority of India Ltd.	0.6	0.68	0.83	0.61	0.73	0.69
Tata Motors Ltd.	0.62	0.56	0.52	0.61	0.58	0.58
Tata Steel Ltd.	1.37	0.68	0.61	0.95	0.56	0.83

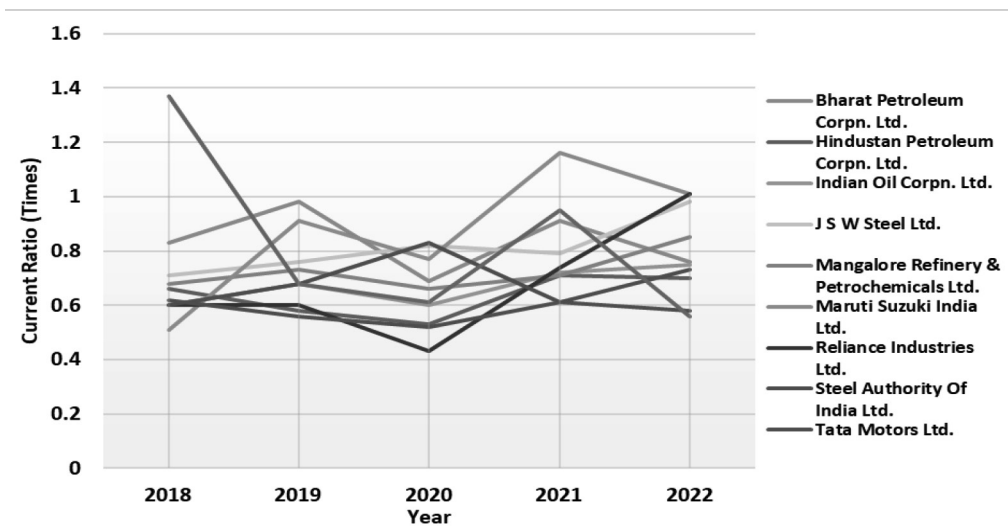


Figure 3 A Comparative Analysis of Current Ratio of Top 10 Large Companies



The general rule of thumb is that Current ratio (CR) should lie between 1.2 and 2.0. This would indicate that the company has sufficient assets to pay off its liabilities. In 2018 Tata Steel Ltd. had highest CR of 1.37 times, which indicates that it is a healthy business that earns profit. But, in the same year CR of all the other companies are lower than 1, which indicates that their current assets are not sufficient to meet short term liabilities. However, there can be seen consistency in other companies. In 2019, apart from Tata Steel Ltd., all the other companies showed consistency in their CR. While CR of Tata Steel fall from 1.37 to 0.68. In 2020, CR of all except JSW steel and Steel Authority of India of Ltd. has deteriorated. Reliance industries showed lowest fall of ratio to just 0.43. This could be the impact of Covid. In 2021, CR of all the companies improved. Maruti Suzuki had highest ratio of 1.16 in this year. While in 2022, highest ratio was that of Maruti Suzuki as well as Reliance industries. The major fluctuation in CR from 2018 to 2022 is visible in 2 companies, which are Tata Steel and Maruti Suzuki. While Tata steel saw a major fall of CR from 1.37 in 2018 to 0.56 in 2022. Maruti Suzuki saw a major rise of CR from 0.51 in 2018 to 1.01 in 2022. As is visible in figure 3, Tata steel had highest CR and Maruti Suzuki had lowest CR in 2018. The situation reversed to Maruti Suzuki with highest CR and Tata Steel with lowest CR in 2022. **On average of 5 years, Maruti Suzuki has**

best CR of 0.87 times. Although it is low if compared with Standard CR but it is better than other top 9 companies. While tata motors had lowest average CR of 0.58 times.

Inference:

From 2018 to 2022, the liquidity ratios of all the 10 companies have been lower than the benchmark. However, lower Liquidity ratio is not always a sign of financial trouble. A company can consistently have a lower current ratio, and still be viable, if it has other sources of funding, such as long-term debt or equity financing. It could also be a sign that a company is very good at managing its working capital by keeping its receivables and inventory low, and its payables high. Hence it can be inferred that lower QR and CR in comparison to the benchmark can be the result of efficient management of working capital.

2. Profitability Ratios

2.1. Net Profit Margin: Net profit margin (NPM) is the percentage of revenue left after all expenses have been deducted from sales. The net profit margin is intended to be a measure of the overall success of a business. A high NPM indicates that a business is pricing its products correctly and is exercising good cost control. As a rule of thumb, a higher operating margin is preferred as lower profit margin may mean higher accounting costs (Bansal,2015).



Table 4 Net Profit Margin of Top 10 Large Company

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	2.68	2.05	0.6	3.4	2	2.15
Hindustan Petroleum Corpn. Ltd.	2.5	2.01	0.37	3.9	1.43	2.04
Indian Oil Corpn. Ltd.	3.63	2.46	-0.19	4.31	3.16	2.67
J S W Steel Ltd.	7.17	10.17	7.61	11.54	13.86	10.07
Mangalore Refinery & Petrochemicals Ltd.	3.46	0.47	-4.34	-1.53	3.45	0.30
Maruti Suzuki India Ltd.	9.09	8.3	7.09	5.85	4.23	6.91
Reliance Industries Ltd.	10.72	8.58	9.3	10.71	8.16	9.49
Steel Authority of India Ltd.	-2.32	3.11	2.68	4.93	11.56	3.99
Tata Motors Ltd.	-0.3	3.09	-10.65	-6.73	-3.28	-3.57
Tata Steel Ltd.	6.78	14.38	11.01	18.25	25.08	15.10

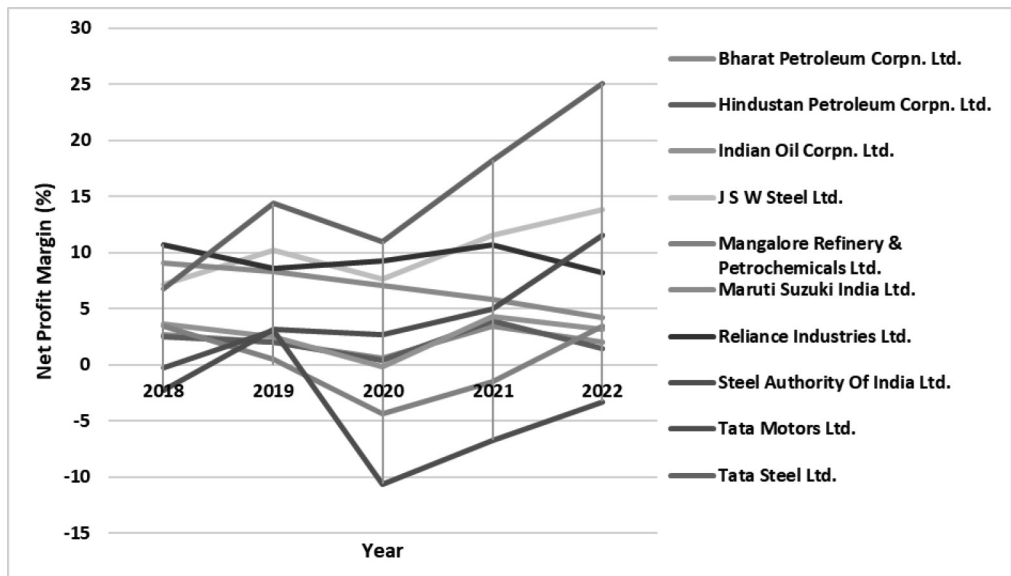


Figure 4 A Comparative Analysis of Net Profit Margin of Top 10 large company



The highest NPM in 2018 was of Reliance Industries of 10.72%. 2 companies had negative NPM which were Steel authority of India and Tata motors. In 2019, all the companies had positive NPM with JSW Steel highest with 10.17%.

In year 2020 NPM of all the companies fell, apart from Reliance Industries. It can be inferred that even at the time of covid, RIL was in good position. Tata motors had highest negative NPM of 10.65%. In 2021, NPM of all the companies improved with Tata steel leading with 18.25%. In 2022, NPM of JSW Ltd., SAIL and Tata Steel increased extraordinarily. Tata Steel had the highest NPM of 25.08%. **On average of these 5 years, Tata Steel had highest NPM while Tata Motors had lowest NPM.**

2.2. Return on capital employed (ROCE):

It is a profitability metric that indicates a company's efficiency in earning profits from its capital employed with respect to its net operating profit. Hence, ROCE indicates how much profit investors are generating for every rupee of capital employed. It reflects long-term prospects for a company as it shows asset performance while taking long-term financing into account. This makes the ratio more useful than the return on equity ratio when it comes to assessing the long-term performance and overall longevity of a business. Higher ROCE is preferable as compared to lower ROCE. As it shows a higher percentage of profits are being generated for each rupee of capital employed.

Table 5 Return on Capital employed of Top 10 Large Company

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	13.61	11.34	2.7	12.27	10.21	10.03
Hindustan Petroleum Corpn. Ltd.	14.37	12.04	1.68	14.21	6.59	9.78
Indian Oil Corpn. Ltd.	12.9	9.3	-0.59	11.29	10.84	8.75
J S W Steel Ltd.	7.76	11.09	5.76	8.51	15.5	9.72
Mangalore Refinery & Petrochemicals Ltd.	11.65	1.76	-13.29	-3.26	10.46	1.46
Maruti Suzuki India Ltd.	19.8	17.02	11.97	8.65	7.31	12.95
Reliance Industries Ltd.	8.13	7.05	5.61	4.74	5.9	6.29
Steel Authority of India Ltd.	-1.73	2.55	1.88	3.93	15.97	4.52
Tata Motors Ltd.	-0.46	5.59	-13.6	-5.7	-4.51	-3.74
Tata Steel Ltd.	4.99	10.85	6.11	12.57	22.52	11.41

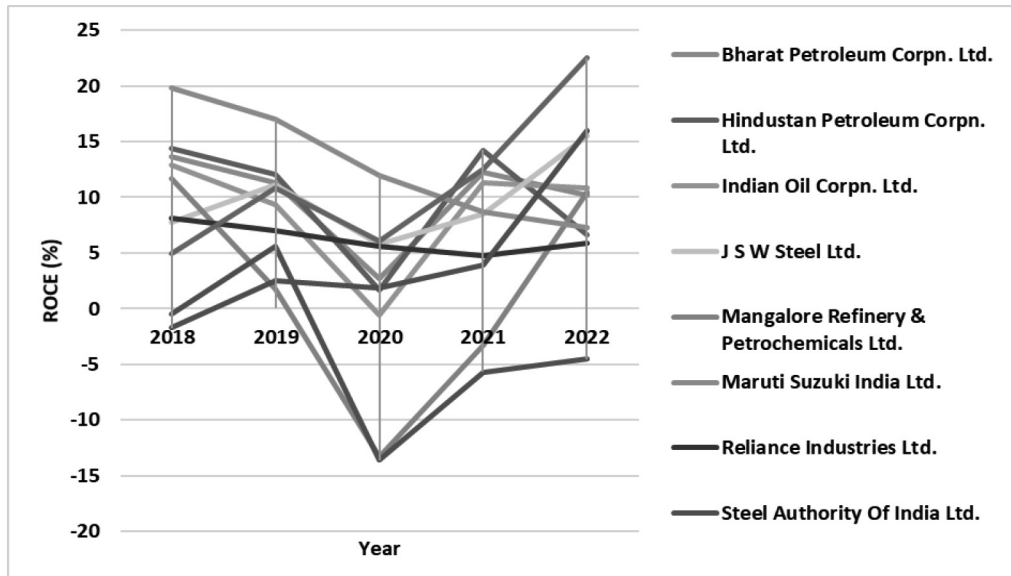


Figure 5 A Comparative Analysis of Return on Capital employed of Top 10 Large Company

From 2018 to 2020, Maruti Suzuki had the highest ROCE but it was showing regressing trend. It further deteriorates in 2021 and 2022. From 19.8% in 2018 to 7.31% in 2022. However, its average of 5 years stands highest 12.95%. While Tata Steel showed progressive trend from 4.99% in 2018 to 22.52% in 2022 and its average of 5 years stands second highest with 11.41%.

2.3. Return on Net worth (RONW) – It is a profitability ratio that measures the ability of a firm to generate profits

from its shareholders' investments in the company (Bansal,2015). An increase in net income will increase this ratio, which will eventually determine the company's efficiency in earning higher profits with the same level of capital. Similarly, a decrease in net income will decrease the return on net worth ratio, and this indicates the inefficiency of the company to generate higher profits or generate profits at the same level. Therefore, a higher return on net worth is always better and preferable (efinancemanagement.com, 2022).

Table 6 Return on Net Worth of Top 10 Large Company

Companies	2018	2019	2020	2021	2022	Average
Hindustan Petroleum Corpn. Ltd.	28.08	23.18	3.75	32.95	14.49	20.49
Bharat Petroleum Corpn. Ltd.	23.55	19.74	5.66	23.74	16.78	17.89
Indian Oil Corpn. Ltd.	21.37	16.64	-1.27	24.57	22.15	16.69
J S W Steel Ltd.	19.21	25.55	13.66	19.68	31.26	21.87
Mangalore Refinery & Petrochemicals Ltd.	20.76	3.14	-28.56	-13.07	51.94	6.84
Maruti Suzuki India Ltd.	19.99	17.1	12.03	8.72	7.38	13.04
Reliance Industries Ltd.	11.15	9.78	8.87	7.77	8.65	9.24
Steel Authority of India Ltd.	-3.84	5.69	4.28	8.28	25.26	7.93
Tata Motors Ltd.	-0.88	10.51	-28.62	-13.13	-9.95	-8.41
Tata Steel Ltd.	7.51	15.45	9.02	18.31	30.06	16.07

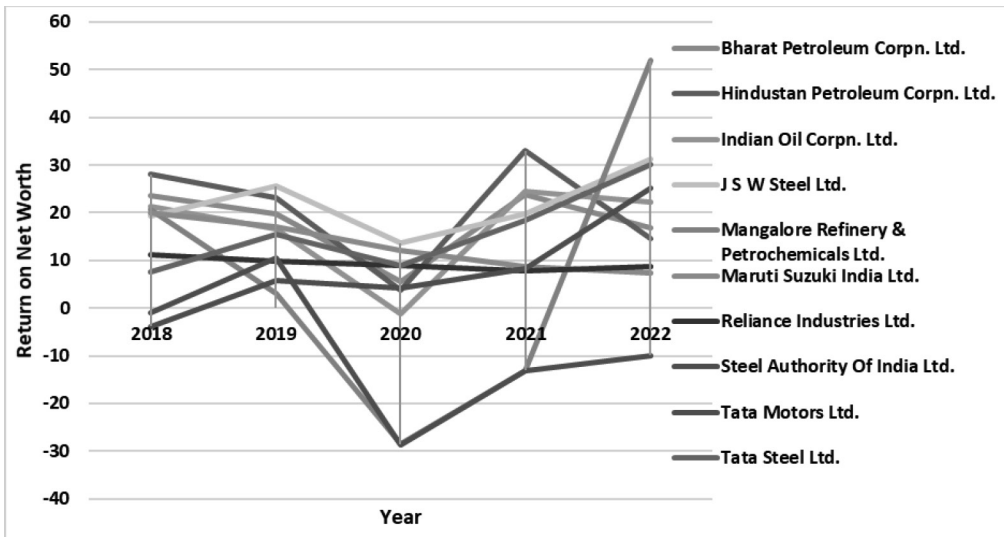


Figure 6



In year 2018, HPCL had the highest RONW of 28.08%, while SAIL had lowest RONW with negative 3.84%. In year 2019, all the companies had positive RONW with JSW steel having highest RONW of 25.55%. In 2020, all the companies had major downfall in RONW, with Tata motors and Mangalore Refinery & Petrochemicals Ltd., affected adversely. In 2020, RONW of all the companies improved from covid impact. HPCL had the highest 32.95%. Year 2022, turned quite unpredictable as the companies that were having good RONW declined while the Mangalore Refinery & Petrochemicals, which had the worst

ratio for past 4 years show extraordinary improvement with RONW 51.94%. **On an average the best ratio from 2018 to 2022 is of HPCL with 20.49% while Tata motors had the worst ratio with negative 8.41%.**

2.4. Return on Total Assets (ROTA):

Generally, the higher this ratio, the more effective it is. This ratio indicates the effectiveness of using assets to generate revenues. As a rule of thumb, it should be at least 0.30 times to be considered effective (Bansal,2015).

Table 7 Return on Total Assets of Top 10 Large Company

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	7.63	6.34	1.6	7.63	5.89	5.82
Hindustan Petroleum Corpn. Ltd.	7.42	6.27	0.97	8.63	3.8	5.42
Indian Oil Corpn. Ltd.	6.17	4.78	-0.34	6.67	6.32	4.72
J S W Steel Ltd.	5.35	7.54	4.01	6.09	10.85	6.77
Mangalore Refinery & Petrochemicals Ltd.	6.62	1.01	-8.23	-2.25	6.93	0.82
Maruti Suzuki India Ltd.	13.91	12.15	8.99	6.49	5.35	9.38
Reliance Industries Ltd.	5.77	5.05	4.04	3.54	4.56	4.59
Steel Authority of India Ltd.	-1.15	1.67	1.26	2.65	9.89	2.86
Tata Motors Ltd.	-0.28	3.34	-8.49	-3.48	-2.73	-2.33
Tata Steel Ltd.	3.38	7.59	4.48	9.14	15.81	8.08

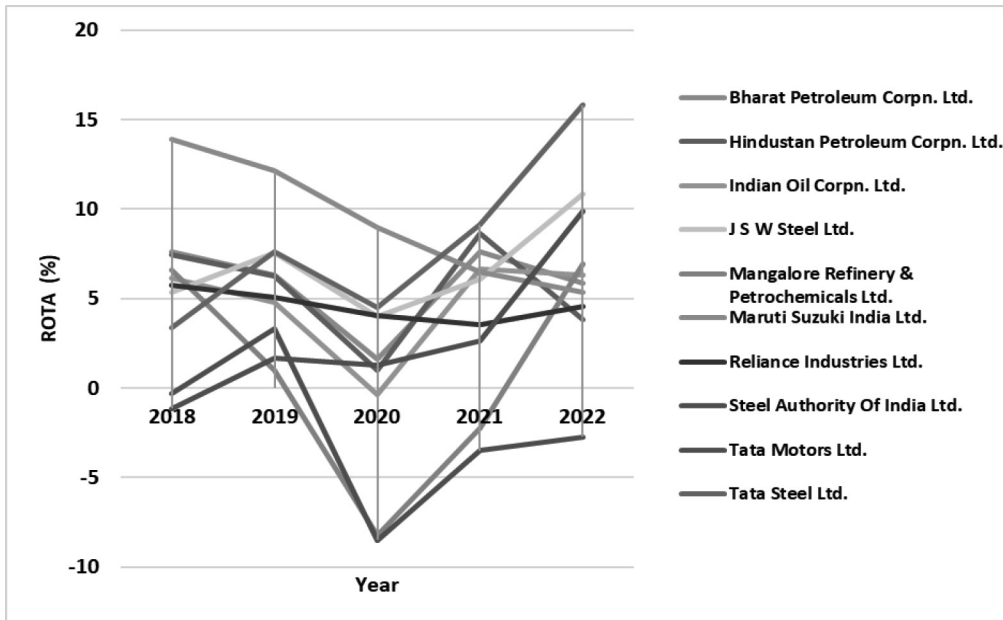


Figure 7 A Comparative Analysis of Return on Total Assets Top 10 large company

Tata Motors had the lowest ratio consistently in all these 5 years which indicates it is not using its assets effectively enough to generate profitable return.

A company can only have a negative ROTA metric when costs are overweighing revenues which leads the company to report negative earnings. Since the net income plays its role in the denominator of the calculation, any negative number will consequently result in a negative ROTA. Negative earnings can also be a strong sign of financial distress within a company. Businesses that are consistently unprofitable, while not being able to show adequate revenue growth, can quickly go out of favour to investors (cliffcore.com,

2023). On 5 years average the highest ROTA is of Maruti Suzuki however it is showing downfall trend, while second highest ratio is of Tata Steel however with rising trend.

3. Market based Ratio

3.1. Earnings Per Share (EPS): This ratio indicates the ability of the firm’s assets to generate operating income. As a rule of thumb, the higher this ratio, the better it is. It is important to realize that this ratio shows the return that shareholders are actually obtaining on their investment, using current market value for listed shares (Bansal,2015).



Table 8 Earnings Per Share of Top 10 large companies

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	31.98	29.08	9.13	48.02	40.24	31.69
Hindustan Petroleum Corpn. Ltd.	41.84	30.6	7.03	73.91	38.18	38.31
Indian Oil Corpn. Ltd.	20.56	13.85	-1.2	24.27	24.99	16.49
J S W Steel Ltd.	3.02	4	1.87	3.84	7.15	3.98
Mangalore Refinery & Petrochemicals Ltd.	11.71	2.37	-15.07	-4.47	16.94	2.30
Maruti Suzuki India Ltd.	251.59	248.51	185.61	141.99	126.19	190.78
Reliance Industries Ltd.	52.31	55.72	55.75	47.42	57.9	53.82
Steel Authority of India Ltd.	-4.86	3.99	4.03	8.33	29.15	8.13
Tata Motors Ltd.	-5.98	9.55	-18.76	-7.35	-5.71	-5.65
Tata Steel Ltd.	37.22	75.47	56.02	130.6	270.1	113.88

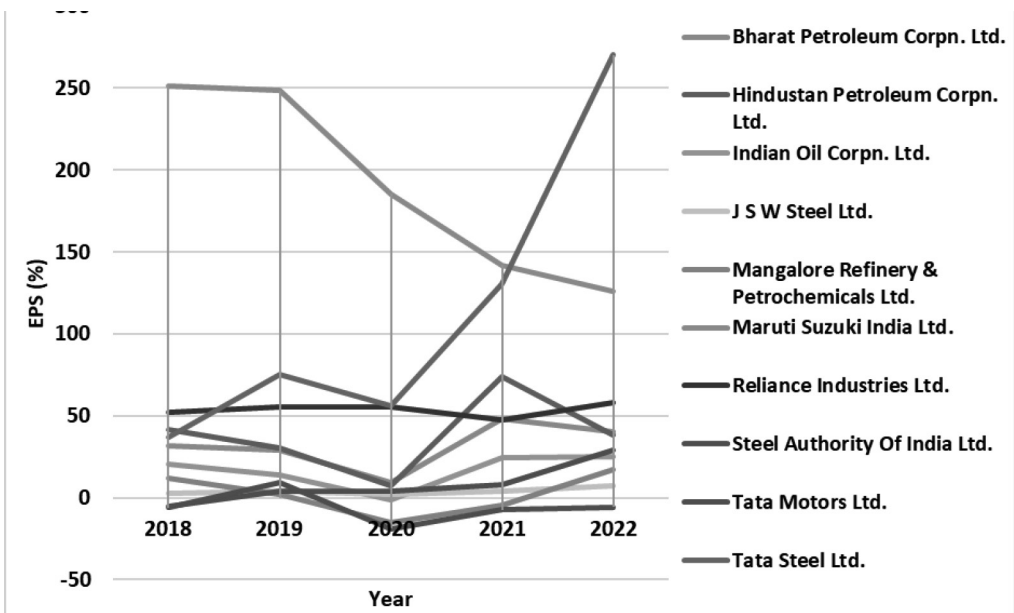


Figure 8 A Comparative Analysis of Earnings Per Share of Top 10 Large Company



Table 8 showed that from 2018 to 2021, Maruti Suzuki had the highest EPS, but it showed declining trend. In 2022 it declined further reaching to 50% of what it was in 2018. While Tata Steel had the highest jump of 600% in 2022 when compared with its EPS in 2018. While, other company had steady growth or fall in EPS in 2022. A company with a steady EPS growth would act as a reliable long-term investment (www.marketbeat.com).

Inference

In terms of Consistency and steady growth, Reliance industries is performing best. While Maruti Suzuki and Tata Steel are showing major regressive and progressive trend respectively. **Considering the**

criteria of long-term investment, Reliance industries is the best option. While Tata motors is showing Negative EPS for 4 years, only in 2019 it had positive EPS. Hence for investment, it is not a good option.

3.2. Price-to-earnings ratio (P/E ratio): This ratio compares the price of a company's stock to the earnings the company generates. This comparison helps to understand whether markets are overvaluing or undervaluing a stock. The higher the ratio, the more expensive a stock is relative to its earnings. The lower the ratio, the less expensive the stock (www.forbes.com,2023).

Table 9 Price Earnings Ratio of Top 10 Large Company

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	13.38	13.63	34.62	8.91	8.93	15.89
Hindustan Petroleum Corpn. Ltd.	8.22	9.27	27.05	3.17	7.05	10.95
Indian Oil Corpn. Ltd.	8.58	11.74	NA	3.78	4.76	7.22
J S W Steel Ltd.	18.62	8.08	7.18	13.67	10.59	11.63
Mangalore Refinery & Petrochemicals Ltd.	9.35	31.48	NA	NA	2.45	14.43
Maruti Suzuki India Ltd.	35.23	26.85	23.1	48.31	59.91	38.68
Reliance Industries Ltd.	16.88	24.46	19.95	42.24	45.49	29.80
Steel Authority of India Ltd.	NA	13.46	5.72	9.46	3.38	8.01
Tata Motors Ltd.	NA	18.25	NA	NA	NA	18.25
Tata Steel Ltd.	15.34	6.9	4.82	6.22	4.84	7.62

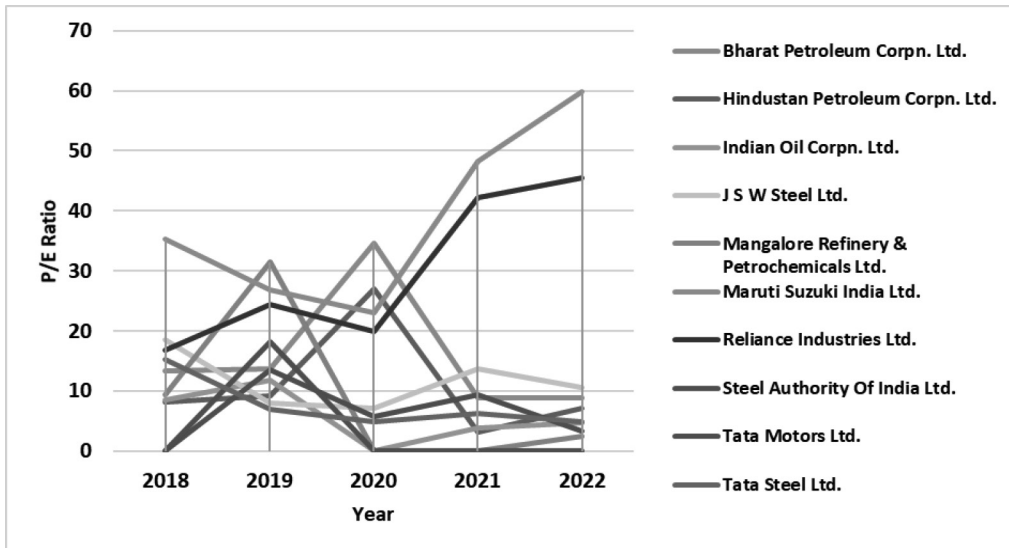


Figure 9 A Comparative Analysis of Price Earnings Ratio of Top 10 Large Company

Maruti Suzuki and Reliance Industries have shown rising trend. Only in 2020, P/E ratio fell which could be the impact of covid. While the ratio of all the companies notice downfall in 2020, 2 companies, BPCL and HPCL increased extra ordinarily. Tata Steel showed downfall trend. Rest of the other companies are showing fluctuations. **The best PE ratio is of Maruti Suzuki as it has the highest average for these 5 years and also it is a growth stock, showing rising trend. Reliance is second best. While for others it is difficult to draw any inference as there is high fluctuation.**

PE ratio is directly proportional to share price and inversely proportional to EPS, which means that a higher share price will

lead to higher PE ratio or vice-versa and a higher EPS will lead to lower PE ratio or vice-versa.

Since, PE ratio of Tata motors is available for only year 2019. It is difficult to draw any inference but it has shown poor performance in terms of other financial ratios.

4. Leverage Ratios

4.1. Debt Equity Ratio: As a rule of thumb, ideal debt equity ratio is considered to be 2:1. This means that at no given point of time should the debt be more than twice the equity because it becomes riskier to pay back which further increase the risk of bankruptcy (cleartax.in, 2022).



Table 10 Debt Equity ratio of Top 10 Large Company

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	0.69	0.79	1.44	0.63	0.66	0.84
Hindustan Petroleum Corpn. Ltd.	0.88	0.97	1.49	1.19	1.21	1.15
Indian Oil Corpn. Ltd.	0.64	0.94	1.34	1.03	1.06	1.00
J S W Steel Ltd.	1.33	1.28	1.45	1.2	0.88	1.23
Mangalore Refinery & Petrochemicals Ltd.	0.72	0.85	1.56	5.68	2.96	2.35
Maruti Suzuki India Ltd.	0	0.01	0	0.01	0.01	0.01
Reliance Industries Ltd.	0.37	0.4	0.77	0.52	0.42	0.50
Steel Authority of India Ltd.	1.28	1.19	1.37	0.87	0.34	1.01
Tata Motors Ltd.	0.92	0.84	1.42	1.2	1.22	1.12
Tata Steel Ltd.	0.44	0.41	0.54	0.39	0.29	0.41

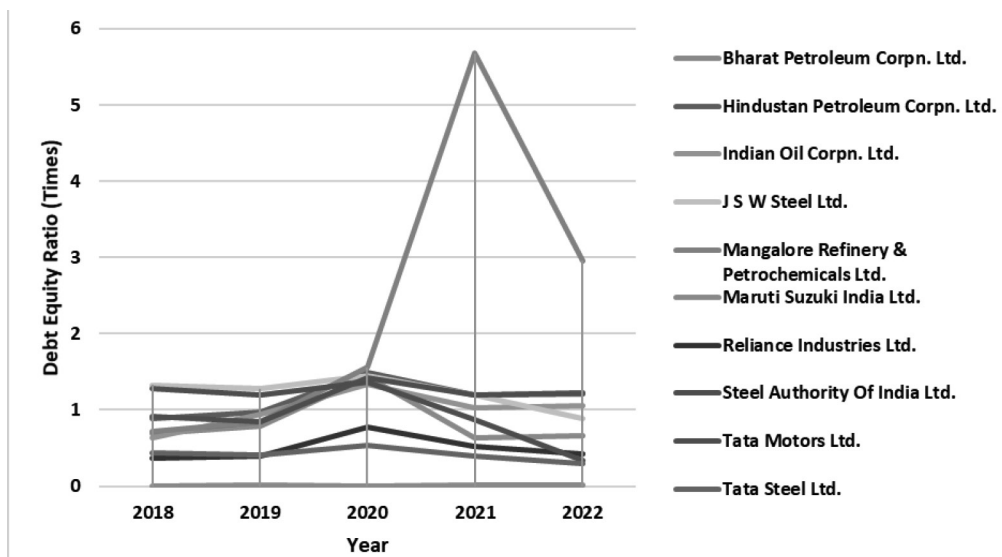


Figure 10 Comparative Analysis of Debt Equity Ratio of Top 10 large company



This ratio shows the dependence on debt finance as compared to equity funding. The greater is the reliance on debt financing, the greater is the level of interest and the greater the risk from exposure to rising interest rates (Bansal,2015). D/E Ratio of Maruti Suzuki Ltd., has been consistently 0 from 2018 to 2022. Hence, it can be inferred that it is the best investment option among the four owing to its null debt record and its consistently good EPS, P/E ratio and Return on Equity. In 2020, ratio of all the companies rose. But in 2021, ratio of all the companies fall except Mangalore Refinery & Petrochemicals Ltd., which increased exceptionally high to 5.68. But in 2022 it falls again to 2.96. Apart from Mangalore refinery & Petrochemicals Ltd., the debt content in all the other 9 companies is low, making them less risky and a good business to make an investment in.

Inference

From the average of these 5 years, it can be inferred that Mangalore Refinery & Petrochemicals Ltd., has high debt content of 2.35 times which makes it less attractive for investment while Maruti Suzuki has lowest debt content of 0.01 times making it better for investment.

4.2. Interest Coverage Ratio (ICR):

This ratio is a measure of the number of times a company could make the interest payments on its debt with its earnings before interest and tax (EBIT). A higher ratio indicates a better financial health as it means that the company is more capable to meet its interest obligations from operating earnings. However, if a firm is generating high profits, but there is no cash flow from operations, this ratio is misleading (Bansal,2015).

Table 11 Interest Coverage ratio of top 10 Large companies

Companies	2018	2019	2020	2021	2022	Average
Bharat Petroleum Corpn. Ltd.	8.96	9.57	2.37	8.1	7.12	7.22
Hindustan Petroleum Corpn. Ltd.	15.91	12.67	2.04	9.79	4.71	9.02
Indian Oil Corpn. Ltd.	10.07	7.65	NA	7.31	7.53	8.14
J S W Steel Ltd.	3.02	4	1.87	3.84	7.15	3.98
Mangalore Refinery & Petrochemicals Ltd.	10.79	2.61	NA	NA	4.11	5.84
Maruti Suzuki India Ltd.	32.65	139.04	54.24	52.77	37.76	63.29
Reliance Industries Ltd.	7.35	5.16	4.18	2.78	5.53	5.00
Steel Authority of India Ltd.	0.53	1.85	1.71	2.93	9.92	3.39
Tata Motors Ltd.	0.96	2.18	NA	NA	0.2	1.11
Tata Steel Ltd.	3.31	6.57	3.11	4.97	15.88	6.77

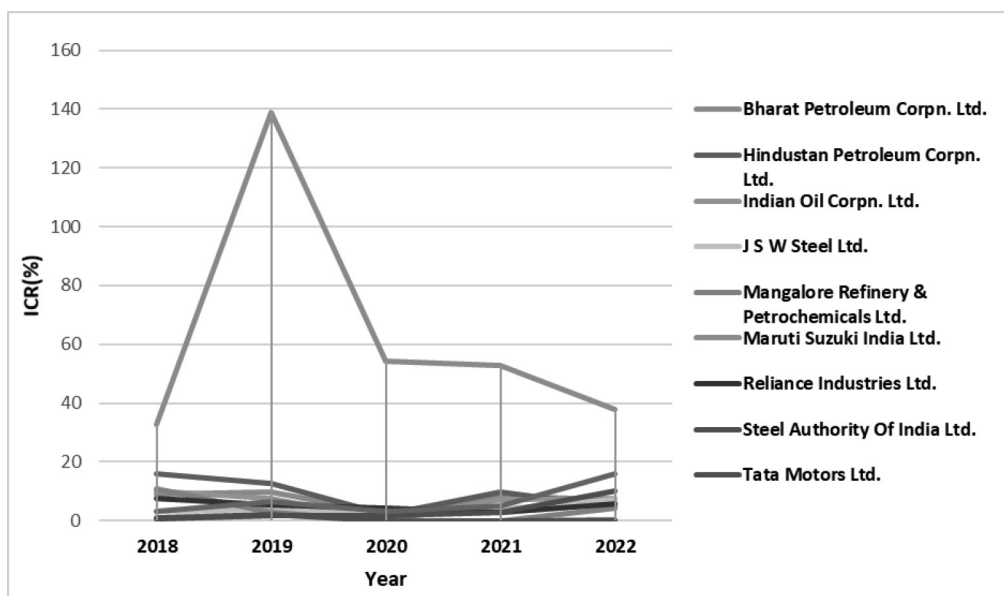


Figure 11 A Comparative Analysis of Interest Coverage Ratio of Top 10 Large Company

As is clearly visible in Figure 11, from 2018 to 2022, **Maruti Suzuki consistently had the highest ICR with an average of 63.29%**. In year 2019, its ratio increased extra ordinarily to 139 %. While average ICR of all the other companies are lying between 1% to 9%. **The lowest average ICR is of Tata Motors of 1.11% for 3**

years as its data was not available for 2020 and 2021.

Table 12 presents the average of 5 years of 10 financial ratios including Liquidity, Profitability, Market based and Leverage of top 10 BSE listed manufacturing large companies.

Table 12 Financial ratios of average 5 years of top 10 large companies

	Ratios	BPCL	HPCL	IOCL	JSWSL	MRPL	MZIL	RIL	SAIL	TML	TSL
1	QR	0.34	0.21	0.18	0.43	0.25	0.62	0.48	0.20	0.35	0.37
2	CR	0.83	0.64	0.67	0.81	0.73	0.87	0.68	0.69	0.58	0.83
3	NPM	2.15	2.04	2.67	10.07	0.30	6.91	9.49	3.99	-3.57	15.10
4	RNW	17.89	20.49	16.69	21.87	6.84	13.04	9.24	7.93	-8.41	16.07



5	RCE	10.03	9.78	8.75	9.72	1.46	12.95	6.29	4.52	-3.74	11.41
6	ROTA	5.82	5.42	4.72	6.77	0.82	9.38	4.59	2.86	-2.33	8.08
7	D/E	0.84	1.15	1.00	1.23	2.35	0.01	0.50	1.01	1.12	0.41
8	ICR	7.22	9.02	8.14	3.98	5.84	63.29	5.00	3.39	1.11	6.77
9	EPS	31.69	38.31	16.49	35.10	2.30	190.78	53.82	8.13	-5.65	113.88
10	P/E	15.89	10.95	7.22	11.63	14.43	38.68	29.80	8.01	18.25	7.62

Conclusion

Financial ratios play a very important role in determining financial standing of the company. It is a good indicator for investment purpose however cannot be solely used to invest in the company. The top 10 companies showed a lot of variation or disparity in terms of these ratios. Based on the average of 5 years, Maruti Suzuki has been outperforming in most of the ratios. Although, its sales are not so high but it is financially strong company. This makes it ideal for investors to make long term investments as it has null debt and high earnings per share and return on equity. Second best company in terms of financial parameters is Tata Steel Ltd. It is also a good investment for investors on long term basis. Tata motors Ltd, so far has been worst performing based on financial factors. It has also been observed that liquidity ratios of all the top 10 companies has been lower than the set benchmark. Also, these companies are performing well and the possible reason for lower CR and QR could be efficient management of working capital. Hence, these standards should be revised again. Further, these ratios can sometimes give misleading results. So, before investing, it is essential to look at the whole picture.

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IMPACT OF CLIMATE CHANGE ON INFLATION: AN EMPIRICAL EVIDENCE FROM INDIA BASED ON VECTOR ERROR CORRECTION MODEL

Egurla Kishan

Abstract:

Climate change is a major issue not only in terms of environmental dimension but it is worsening the social and economic developments at all the levels in the world. The world economic growth is hardly hitting by the multifaced climate events, climate shocks and leads to climatic economic crisis. The present study is an attempt to examines the impacts of climate change indicators i.e., temperature, precipitation, carbon dioxide emissions, carbon intensity on the India's consumer prices from 1990-2020 by applying vector error correction model. The study outcome has proved that there is a statistically significant positive long-run association between the temperature, precipitation, CO₂ emissions and the consumer price index in India and it also confirms that insignificant short-run association between the climate change variables and the Inflation during the study period. These results will provide an important contribution to the macro-economic climate change and climate monetary policies.

Keywords:

Climate Change, Inflation, VECM, CO₂ emissions

Introduction:

The climate change is one of the severe impacting areas, where it influences the entire sphere of development i.e., Social, Environmental, and overall economic development across the world. India is not an odd man out of extreme climate disasters like heat waves, global warming, floods, peak emissions, heatflation scenarios, temperature, abnormal precipitation. The recent heatwaves around the world will impact around 0.6% GDP cost in 2023, the net macroeconomic losses are negative worldwide but developed economies will face small damages and those impacts are more hurt the low-income countries and the relationship between the GDP growth and climate change has found a non-linear trend (Allianz, 2023).

Climateflation and heatflation are one of the direct results of climate change economic crisis over the world, the in 2012 the world bank reported severe droughts drives the global food prices higher and the European Central Bank (ECB) has proved that the droughts increases the headline inflation, and the ECB has also pointed out fossilflation, greenflation, Climateflation which will impacts the food prices (Bank, 2012), (ECB, 2016), (Speer, 2023). According to the research done by European central bank, the weather and climate shocks have asymmetrical and non-linear impact on the inflation, the increased average temperature affects inflation via food and service prices (Matteo Ciccarelli, 2023). The climate change is increasingly effecting the monetary policy aspects that

central banks to forecast and take policy decisions and also said no single climate model to modelling in the hands of central banks, many central banks announced to take policy agenda to understand the climate impacts on economic aspects and suggested that the central banks should follow the multidimensions approach with different domains to tackle the damages (Lena Boneva, 2022).

India has witnessed the critical climate change events, that dampens the India's development agenda. According to the World Bank data, Indian Temperature changes have seen extreme volatility and in 2009 (25.48°C), 2010 (25.42°C) India have recorded highest mean temperatures and followed by the years in 2016, 2017, latest in 2021 are the record mean temperature periods. The precipitation in India has recorded highest in the last 30 years in 2019 about 1321 mm, then following in 2013 (1254.63 mm), 2010 (1249 mm), 2020 (1232 mm), 2021 (1210 mm) (Worldbankgroup, 2023). The CO₂ emissions in India in 1990 were about 341.19 MtCO₂^e and it has been increased to 2165.20 MtCO₂^e in 2020, the carbon emissions in India have continuously upward moving till 2019 and slightly down in 2020 by 223.12 MtCO₂^e (Climatewatch, 2023).

Literature Review:

According to the European central bank research (Maximilian Kotz, 2023) the food inflation increases by 0.92-3.23% and the headline inflation will rose by 0.32-1.18% per year till 2035 and also found that the 2022 summer heats in Europe increased



food inflation by 0.67% and it has projected by around 50% by 2035.

Rise in climate change reduces the real output (Iliyasu, 2023) and increases the food as well as general consumer price levels in African countries during 2002 to 2020. The South Africa and Nigerian countries have shown highest and Egypt have shown least impact on output and inflation and also found that the climate change have severe impact on food price inflation, following by consumer general price inflation.

According to the RBI report on greener cleaner India in 2023 (RBI, 2023) highlighted that the climate change has shown significant impacts on inflation volatility and leads to price stability issues. The climate events and climate shocks adversely affect the supply shocks and leads to raise prices and reduce the economic output.

The research done by (Yusifzada, 2023) discusses the climate change impact on inflation by using Climate Condition Index (CCI) in 153 countries between 1901-2021 and found that the climate change has a significant impact on agricultural prices globally and it has negatively impacted on 142 countries prices.

As per (Odongo, 2022) the climate change indicators have shown implications on food prices in eastern and southern African countries during the period of 2001-2020. The rainfall variability and temperature volatility have significant impacts on food and overall inflation. Mean monthly rainfall has negative significant effect and rainfall variability has positive significant effect on both the food inflation and overall

inflation during the study period.

The (Moessner, 2022) study focuses on the impact of climate variables and climate policies on inflation in 55 countries found that the better climate policy countries show lower inflation issues and the higher carbon dioxide emissions are associated with higher inflation levels.

The study (Kousar, 2022) between 1972 to 2021 in Pakistan by using VAR model have found the twin deficit and exchange rate have a significant positive relationship with the energy inflation and also the urbanisation, climate change, energy production from oil and gas has significant positive long-run association with the energy prices.

According to the (Mukherjee, 2021) temperature shocks will influence the inflationary pressures during 1961-2014 and the developing countries will receive more persistent inflationary impact from these variability in temperature shocks.

According to the National Bureau of Economic Research (NBER) (Matthew E. Kahn, 2019) working paper 26167, the per capita real output growth adversely impacts by temperature changes and they have not shown statistically significant changes by precipitation in 174 countries from 1960 to 2014. The GDP will push down by 7.22% by 2100 due to increase in global average temperature by 0.04°C per year.

According to the European Central Bank working paper (Parker, 2016) research on impact of disasters on inflation in 212 countries found that the heterogeneous impact of disasters on the inflation. They found the insignificant results of disasters impact on inflation in developed countries



and significant impact in the less developed countries. They also found earthquakes did not influence significantly on the headline inflation, storms cause immediate effect on food price inflation, floods increase headline inflation in middle- and low-income countries but not in advanced countries and droughts increases the headline inflation.

As per the author (Bandara, 2014) research on impact of climate change on food productivity, food prices have revealed that significant negative impact on food production and food prices due to climate change in Bangladesh, India, Nepal, Pakistan and Sri Lanka.

The present study examines India's climate change impact on the consumer price inflation. The climate change impacts of inflation in India are one of the least focused areas in the literature and this study addresses the current issue. The section one of the paper has made an introductory overview of the climate change inflation, then the literature study on climate change economy and inflation have presented in section two, the section three has taken a look on the data and methodology part, section four demonstrates the empirical results and discussion on climate change inflation and finally the study concluded with significant outcomes have presented in section five.

3. Data and Methodology:

3.1: Data

The paper rightly investigating to analyse the variability in the Inflation by the climate change factors i.e., Temperature measured

in degree Celsius, Precipitation measured in mm, carbon emissions (CO₂) measured in MtCO₂, carbon intensity to GDP measured in tCO₂/Million US \$GDP, and the Gross Domestic Product (GDP) US\$ at constant price as a control variable during 1990-2020 in India. The CPI data and GDP data retrieved from the World Bank Data database, IMF (WorldBank, 2023), (IMF, 2023), the Temperature and Precipitation data have taken from the World Bank Climate Change Knowledge Portal (CCKP) (Worldbankgroup, 2023), the CO₂ emissions and CO₂ intensity to GDP data have been collected from the Climate Watch database of World Recourses Institute (WRI) (WRIClimatwatch, 2023). The collected raw data, then converted into natural algorithmic values, then analysed by applying the descriptive statistics, Unit root tests, Johansen's Cointegration test, Vector Error Correction Model (VECM), Impulse response functions (IRF), and Variance Decomposition methods.

3.2: Econometric Model Specification

The collected raw data of CPI, Temperature, Precipitation, CO₂ emissions, CO₂ intensity and GDP are converted into natural logarithmic values by using the following formula:

$$RC_t = \ln P_t / P_{t-1} = \ln P_t - \ln P_{t-1} \quad (1)$$

Where, P_t, P_{t-1} represents CPI, Temperature, Precipitation, CO₂ emissions, CO₂ intensity, GDP at time t and at time t-1 respectively. The variables under study have tested the stationarity based on ADF unit root, PP unit root, KPSS unit root test at level as well as



first difference. To check the connectedness among the CPI, Temperature, Precipitation,

CO₂, CO₂ intensity, GDP the following simple linear model has specified.

$$CPI_t = \alpha + \beta_1 Temperature_t + \beta_2 Precipitation_t + \beta_3 CO_{2t} + \beta_4 CO_2 Intensity_t + \beta_5 GDP_t + \varepsilon_t \quad (2)$$

$$\ln CPI_t = \alpha + \beta_1 \ln Temperature_t + \beta_2 \ln Precipitation_t + \beta_3 \ln CO_{2t} + \beta_4 \ln CO_2 Intensity_t + \beta_5 \ln GDP_t + \varepsilon_t \quad (3)$$

Where, CPI is dependent variable, Temperature, Precipitation, CO₂ are independent variables, CO₂ intensity and GDP are the control variables, β₁, β₂, β₃, β₄, β₅ are the coefficients to be estimated.

To analyse the relationship among the CPI, Temperature, Precipitation, CO₂, CO₂ intensity, GDP the Johansen's cointegration, vector error correction model

(Engle, 1987), (Johansen, 1988) has been applied. The optimum lag criterion has been chosen based on Akaike Information Criterion (AIC). The following VECM cointegration equation has been presented in equation-3, to establish the linkages among CPI, Temperature, Precipitation, CO₂, CO₂ intensity, GDP.

$$ECM_{t-1} = CPI_{t-1} - \beta_1 Temperature_{t-1} - \beta_2 Precipitation_{t-1} - \beta_3 CO_{2t-1} - \beta_4 CO_2 Intensity_{t-1} - \beta_5 GDP_{t-1} - \varepsilon_t \quad (4)$$

Where, the CPI is targeting variable, Temperature, Precipitation, CO₂, CO₂ intensity, GDP are the explanatory variables in VECM ECM model and the error term

measured by ε. The error correction equations have presented in equation-5, 6, 7, 8, 9, and 10.

$$D(CPI_{t-1}) = \varphi_1 ECT_{t-1} + \sum_{i=1}^n \alpha_{1i} D(CPI_{t-i}) + \sum_{i=1}^n \delta_{1i} D(Temperature_{t-i}) + \sum_{i=1}^n \theta_{1i} D(Precipitation_{t-i}) + \sum_{i=1}^n \omega_{1i} D(CO_{2t-i}) + \sum_{i=1}^n \beta_i X_i + \varepsilon_t \quad (5)$$

$$D(Temperature_{t-1}) = \varphi_2 ECT_{t-1} + \sum_{i=1}^n \alpha_{2i} D(CPI_{t-i}) + \sum_{i=1}^n \delta_{2i} D(Temperature_{t-i}) + \sum_{i=1}^n \theta_{2i} D(Precipitation_{t-i}) + \sum_{i=1}^n \omega_{2i} D(CO_{2t-i}) + \sum_{i=1}^n \beta_i X_i + \varepsilon_t \quad (6)$$

$$D(Precipitation_{t-1}) = \varphi_3 ECT_{t-1} + \sum_{i=1}^n \alpha_{3i} D(CPI_{t-i}) + \sum_{i=1}^n \delta_{3i} D(Temperature_{t-i}) + \sum_{i=1}^n \theta_{3i} D(Precipitation_{t-i}) + \sum_{i=1}^n \omega_{3i} D(CO_{2t-i}) + \sum_{i=1}^n \beta_i X_i + \varepsilon_t \quad (7)$$

$$D(CO_{2t-1}) = \varphi_4 ECT_{t-1} + \sum_{i=1}^n \alpha_{4i} D(CPI_{t-i}) + \sum_{i=1}^n \delta_{4i} D(Temperature_{t-i}) + \sum_{i=1}^n \theta_{4i} D(Precipitation_{t-i}) + \sum_{i=1}^n \omega_{4i} D(CO_{2t-i}) + \sum_{i=1}^n \beta_i X_i + \varepsilon_t \quad (8)$$

$$D(CO_2 Intensity_{t-1}) = \varphi_5 ECT_{t-1} + \sum_{i=1}^n \alpha_{5i} D(CPI_{t-i}) + \sum_{i=1}^n \delta_{5i} D(Temperature_{t-i}) + \sum_{i=1}^n \theta_{5i} D(Precipitation_{t-i}) + \sum_{i=1}^n \omega_{5i} D(CO_{2t-i}) + \sum_{i=1}^n \beta_i X_i + \varepsilon_t \quad (9)$$

$$D(GDP_{t-1}) = \varphi_6 ECT_{t-1} + \sum_{i=1}^n \alpha_{6i} D(CPI_{t-i}) + \sum_{i=1}^n \delta_{6i} D(Temperature_{t-i}) + \sum_{i=1}^n \theta_{6i} D(Precipitation_{t-i}) + \sum_{i=1}^n \omega_{6i} D(CO_{2t-i}) + \sum_{i=1}^n \beta_i X_i + \varepsilon_t \quad (10)$$

Where, ECT is error correction term of VECM model, $D(CPI_{t-1})$ is inflation value at lag difference, $D(Temperature_{t-1})$ is temperature value at lag difference, $D(Precipitation_{t-1})$ is precipitation value at lag difference, $D(CO_{2t-1})$ is CO₂ emissions value at lag difference, $D(CO_2Intensity_{t-1})$ is CO₂ intensity value at lag difference, and $D(GDP_{t-1})$ is GDP value at lag difference.

$\varphi_1, \varphi_2, \varphi_3, \varphi_4, \varphi_5, \varphi_6$ are the ECT coefficients of each target variable $\theta_i, \omega_i, \beta_i$, are parameters each respective model variable to be estimated.

The following figure depicts the variability in the CPI, Temperature, Precipitation, CO₂ emissions, CO₂ Intensity to GDP, and GDP.

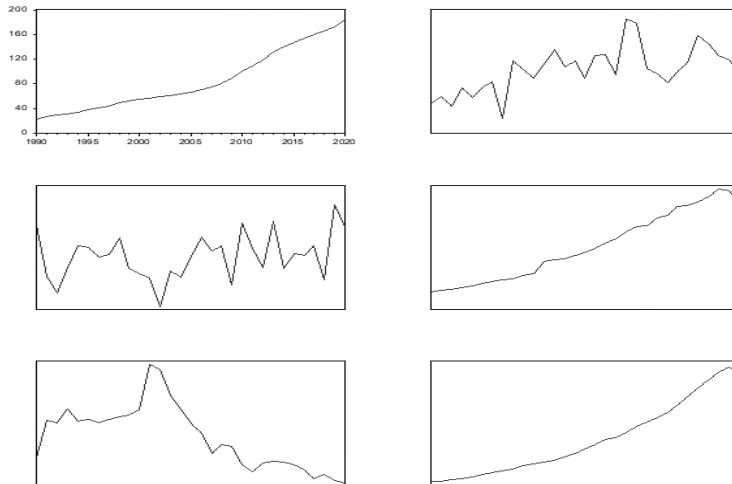


Figure-1: Changes in Variables from 1990 to 2020.

4. Empirical Results and Discussion:

4.1: *Descriptive Statistical Analysis:* The descriptive summary statistics i.e., mean, median, maximum, minimum, standard deviation, skewness, kurtosis and Jarque-Bera statistic value of variables are displayed in table-1. The CPI is highest with the mean value and followed by CO₂, GDP, Temperature, Precipitation, CO₂ intensity. The precipitation (0.1104) shows highest deviation from its mean

value, then CO₂ intensity with 0.1016, CO₂ with 0.06, CPI with 0.0297, GDP with 0.0285, Temperature with 0.0115. The asymmetrical distribution is high with GDP, CO₂ intensity, CO₂, then followed by other variables. The Temperature, CO₂, CO₂ intensity, GDP variables have shown a leptokurtic distribution and the CPI, Precipitation shown platykurtic distribution during the study period.

Table-1: Descriptive Statistics of CPI, Temperature, Precipitation, CO₂ emissions, CO₂ Intensity, and GDP.

Variable	CPI	TEM	PRE	CO ₂	CO ₂ In	GDP
Mean	0.069	0.00056	-0.000275	0.06159	-0.00899	0.0565
Median	0.063	-0.00238	-0.0126	0.0617	-0.0188	0.0635
Maximum	0.129	0.0305	0.259	0.2911	0.2929	0.0847
Minimum	0.0327	-0.02348	-0.184	-0.098	-0.163	-0.06008
S.D.	0.0297	0.01153	0.1104	0.0604	0.1016	0.0285
Skewness	0.482	0.6549	0.483	1.2119	1.2167	-2.4319
Kurtosis	1.96	4.093	2.779	9.3766	5.0414	10.38
Jarque-Bera	2.515	3.638	1.229	58.17	12.6114	97.72

Note: TEM=Temperature, PRE=Precipitation, CO₂ In= carbon intensity, S.D. = Standard Deviation.

4.2: Unit Root Analysis of ADF, PP, KPSS

Table-2: Unit root test of Variables

Variable	ADF I(0)	PP I(0)	KPSS I(0)	ADF I(1)	PP I(1)	KPSS I(1)
CPI	-6.429**	-3.046*	0.19**	-6.72**	-6.8**	0.147**
Temperature	-7.38**	-11.34**	0.108**	-8.36**	-14.25**	0.058**
Precipitation	-9.15**	-10.53**	0.18**	-8.40**	-11.8**	0.118**
CO ₂	-4.56**	-4.55**	0.56**	-9.25**	-16.27**	0.50**
CO ₂ Intensity	-5.81**	-5.85**	0.38*	-5.4**	-25.24**	0.35*
GDP	-2.21	-2.214	0.14*	-4.59**	-4.578**	0.338*

Note: **, * denotes statistical significance at 1% and 5% respectively.

The unit root test results of CPI, Temperature, Precipitation, CO₂, CO₂ intensity, GDP have depicted in table-2 in order of I (0) and I (1) and the test has been done through Augmented Dickey-Fuller

(ADF) unit root test, Phillips-Perron (PP) unit root test, and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test at order I (0) and I (1) and proved significance.

4.3: Johansen's Cointegration Analysis

Table-3: Johansen's Cointegration Test Results:

Series: CPI, TEMPERATURE, PRECIPITATION, CO₂, CO₂ Intensity, GDP

Unrestricted Cointegration Rank Test (Trace)

Hypothesis	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.881206	131.3890	95.75366	0.0000
At most 1 *	0.704717	71.73893	69.81889	0.0349
At most 2	0.466292	37.58390	47.85613	0.3205
At most 3	0.375844	20.00251	29.79707	0.4227
At most 4	0.204538	6.804586	15.49471	0.6005
At most 5	0.014088	0.397274	3.841466	0.5285

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesis	Eigenvalue	Max-eigen Statistic	0.05 Critical Value	Prob.**
None *	0.881206	59.65011	40.07757	0.0001
At most 1 *	0.704717	34.15503	33.87687	0.0463
At most 2	0.466292	17.58139	27.58434	0.5303
At most 3	0.375844	13.19792	21.13162	0.4342
At most 4	0.204538	6.407312	14.26460	0.5615
At most 5	0.014088	0.397274	3.841466	0.5285

Note: * denotes statistical significance and ** MacKinnon-Haug-Michelis (1999) p-values

H0 = Null Hypothesis: No Cointegration exists between the variables.

H1 = Alternative Hypothesis: Cointegration exists between the variables.

The Johansen's cointegration test results have presented in table-3, which describes the cointegrating equations among the CPI, Temperature, Precipitation, CO₂ emissions, CO₂ intensity and GDP. The test confirms two cointegrating equation among the variables. The trace statistic and maximum eigen statistic values of significant null

hypothesis are greater than their respective critical values i.e., 131.3890, 71.73893, 59.65011, 34.15503 and confirms two cointegrating equations at 1% and 5% level of significance. The remaining null hypothesis of Johansen's cointegrating analysis trace and maximum eigen statistic values are less than their respective critical values at 5% level of significance, hence those were failed to reject null hypothesis and found only two cointegrating equations.



4.4: VECM Analysis:

Table-4: Vector Error Correction Estimates:

Vector Error Correction Estimates
Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1
CPI ₍₋₁₎	1.000000
TEMPERATURE ₍₋₁₎	-164.0397*** (33.4393) [-4.90560]
PRECIPITATION ₍₋₁₎	-31.47441*** (3.54082) [-8.88903]
CO ₂ ₍₋₁₎	-16.59650** (6.95087) [-2.38769]
CO ₂ INTENSITY ₍₋₁₎	6.513202 (5.02135) [1.29710]
GDP ₍₋₁₎	36.44995 (23.8211) [1.53015]
C	-0.743476

Error Correction:	D (CPI)	D (TEM)	D (PRE)	D (CO ₂)	D (CO ₂ Intensity)	D (GDP)
CointEq1	1.11E-06 (0.00254) [0.00044]	0.004332*** (0.00150) [2.88010]	0.050284*** (0.01075) [4.67965]	0.003367 (0.00847) [0.39769]	0.007418 (0.01072) [0.69187]	0.002019 (0.00303) [0.66751]
D (CPI ₍₋₁₎)	-0.191860 (0.22079) [-0.86895]	0.184920 (0.13058) [1.41610]	-0.153472 (0.93297) [-0.16450]	0.212798 (0.73509) [0.28949]	0.850945 (0.93097) [0.91404]	0.316247 (0.26268) [1.20392]

Cont...



D (TEMPERATURE ₍₋₁₎)	-0.058236 (0.34489) [-0.16885]	-0.353880* (0.20398) [-1.73489]	5.168296*** (1.45734) [3.54639]	0.306777 (1.14824) [0.26717]	-1.793673 (1.45421) [-1.23343]	0.124646 (0.41032) [0.30378]
D (PRECIPITATION ₍₋₁₎)	0.009278 (0.04805) [0.19309]	0.072789** (0.02842) [2.56148]	0.054391 (0.20302) [0.26791]	0.058017 (0.15996) [0.36269]	0.046380 (0.20259) [0.22894]	-0.004439 (0.05716) [-0.07766]
D (CO ₂ ₍₋₁₎)	0.112426 (0.09881) [1.13778]	0.046612 (0.05844) [0.79760]	0.333515 (0.41753) [0.79878]	-0.475328 (0.32897) [-1.44489]	0.452368 (0.41663) [1.08577]	-0.168237 (0.11756) [-1.43111]
D (CO ₂ INTENSITY ₍₋₁₎)	-0.019742 (0.06628) [-0.29784]	0.022901 (0.03920) [0.58419]	-0.431946 (0.28008) [-1.54223]	-0.000470 (0.22068) [-0.00213]	-0.655172** (0.27948) [-2.34427]	0.109513 (0.07886) [1.38874]
D (GDP ₍₋₁₎)	-0.660868** (0.30611) [-2.15890]	-0.184680 (0.18104) [-1.02008]	0.218847 (1.29349) [0.16919]	-0.552654 (1.01914) [-0.54227]	-2.339862* (1.29071) [-1.81285]	0.260203 (0.36419) [0.71448]
C	-0.001549 (0.00453) [-0.34176]	4.00E-05 (0.00268) [0.01493]	-0.004372 (0.01915) [-0.22835]	-0.007123 (0.01509) [-0.47215]	-0.002880 (0.01910) [-0.15072]	-0.002582 (0.00539) [-0.47896]

Note: ***, ** and * denotes statistical significance at 1%, 5%, and 10%. TEM = Temperature, PRE = Precipitation.

The VECM cointegration equation as written as:

$$ECM_{t-1} = 1.0000CPI_{(-1)} - 164.039Temperature_{(-1)} - 31.47441Precipitation_{(-1)} - 16.5965CO_{2(-1)} + 6.513202CO_2Intensity_{(-1)} + 36.4499GDP_{(-1)} - 0.743476 \quad (11)$$

The VECM error correction equations can be written as:

$$D(CPI_{t-1}) = 1.11E - 06ECT_{t-1} - 0.19186D(CPI_{(-1)}) - 0.0582D(Temperature_{(-1)}) + 0.00927D(Precipitation_{(-1)}) + 0.112426D(CO_{2(-1)}) - 0.019742D(CO_2Intensity_{(-1)}) - 0.660868D(GDP_{(-1)}) - 0.001549 \quad (12)$$

$$D(Temperature_{t-1}) = 0.00433ECT_{t-1} + 0.185D(CPI_{(-1)}) - 0.353D(Temperature_{(-1)}) + 0.0727D(Precipitation_{(-1)}) + 0.0466D(CO_{2(-1)}) + 0.0229D(CO_2Intensity_{(-1)}) - 0.18468D(GDP_{(-1)}) + 4.00E - 05 \quad (13)$$

$$D(Temperature_{t-1}) = 0.00433ECT_{t-1} + 0.185D(CPI_{(-1)}) - 0.353D(Temperature_{(-1)}) + 0.0727D(Precipitation_{(-1)}) + 0.0466D(CO_{2(-1)}) + 0.0229D(CO_2Intensity_{(-1)}) - 0.18468D(GDP_{(-1)}) + 4.00E - 05 \quad (14)$$



$$D(CO_{2t-1}) = 0.003367ECT_{t-1} + 0.21279D(CPI_{(-1)}) + 0.3067D(Temperature_{(-1)}) + 0.058D(Precipitation_{(-1)}) - 0.475D(CO_{2(-1)}) - 0.00047D(CO_2Intensity_{(-1)}) - 0.5526D(GDP_{(-1)}) - 0.007123 \quad (15)$$

$$D(CO_2Intensity_{t-1}) = 0.0074ECT_{t-1} + 0.850945D(CPI_{(-1)}) - 1.7936D(Temperature_{(-1)}) + 0.04638D(Precipitation_{(-1)}) + 0.452368D(CO_{2(-1)}) - 0.655D(CO_2Intensity_{(-1)}) - 2.3398D(GDP_{(-1)}) - 0.00288 \quad (16)$$

$$D(GDP_{t-1}) = 0.002019ECT_{t-1} + 0.3162D(CPI_{(-1)}) + 0.124646D(Temperature_{(-1)}) - 0.0044D(Precipitation_{(-1)}) + 0.168D(CO_{2(-1)}) + 0.1095D(CO_2Intensity_{(-1)}) + 0.2602D(GDP_{(-1)}) - 0.002582 \quad (17)$$

It has found from the VECM results, that a significant positive long-run relationship of CPI with Temperature, Precipitation, and CO₂ emissions during the study period. The Increase in Temperature, Precipitation and CO₂ emissions led to increase in the

CPI. The GDP at lag difference showed significant negative short-run relationship with CPI and all other variables shows insignificant short-run connectedness with the CPI during the study period.

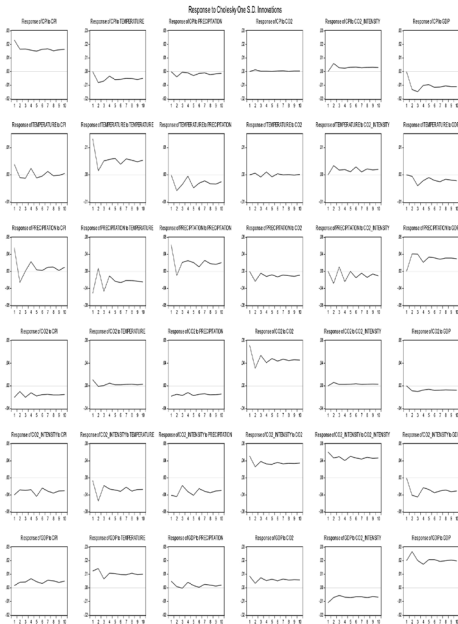


Figure-2: Impulse response of Cholesky of CPI, Temperature, Precipitation, CO₂ emissions, CO₂ Intensity, GDP.

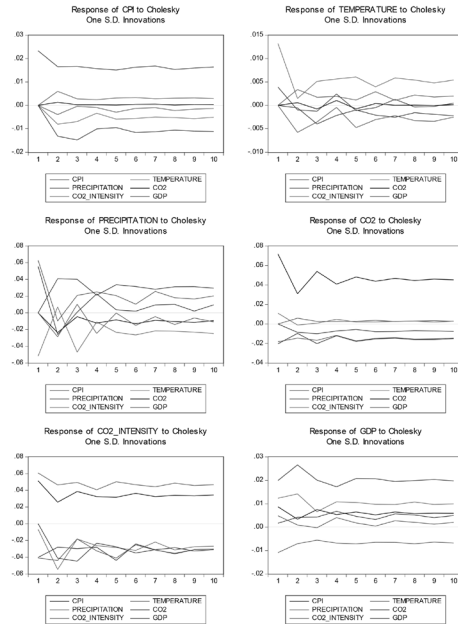


Figure-3: Impulse response of Cholesky of CPI, Temperature, Precipitation, CO₂ emissions, CO₂ Intensity, GDP.

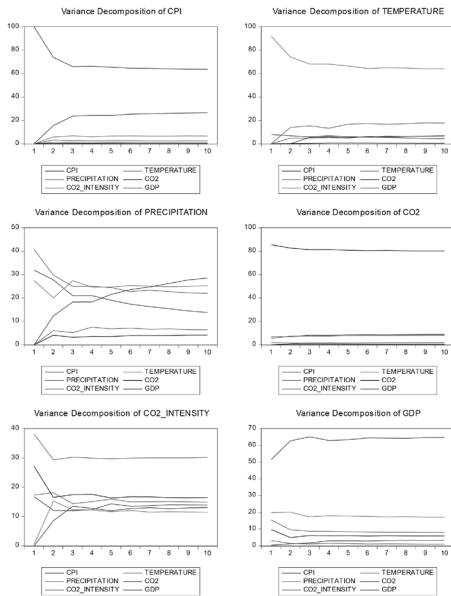


Figure-4: Variance Decomposition of CPI, Temperature, Precipitation, CO₂, CO₂ intensity, GDP.

4.5: Impulse Responses and Variance Decomposition Analysis:

The impulse response analysis has done to examine the effect of one standard innovations on the CPI and other variables under study and presented in figure-2 and 3. The horizontal axis of each impulse response function depicts number of impulse response time periods, the vertical axis represents the impulse intensity of variable. As per the impulse response function of CPI, it has confirmed that the negative response of CPI from one standard deviation shocks in Temperature as well as Precipitation, and GDP. One standard deviation innovation in CO₂ emissions and

CO₂ intensity have shown positive impulse on the CPI. The Variance decomposition analysis method have used to examine the extent of impact of explaining variables on the CPI. The variance decomposition analysis results have shown in figure-4. The CPI has caused about 63% of impact in its variability, the temperature impact on CPI has shown increasing trend up to ten periods and peaked at time period three, the impact of precipitation on CPI have peaked at time period two and five, the CO₂ emissions have shown nominal impact on CPI variability, the CO₂ intensity impact peaked at time period two and then decreased over the time period, the GDP has shown upward impact trend on CPI during the study period.

Model Robustness and Stability Check:

The model stability has checked by the inverse roots of AR characteristic polynomial, presented in figure-5. All the inverse roots of the model are within the stable range and inside the circle and confirms that the model is stable and reliable during the study period.

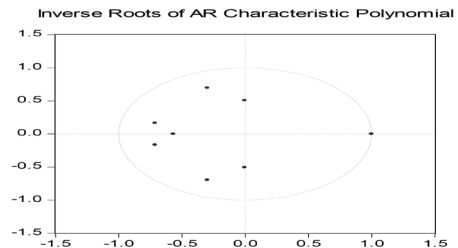


Figure-5: Inverse roots of AR characteristic polynomial plot



5. Conclusion:

Climate changes in record temperatures, abnormal precipitation, severe heatwaves, flash floods, results into impacts on productivity, rising price level and dampen economic growth. Many research studies proves that the abnormality in climate variables are dragging down the entire economy in many folds. The present study examines the impacts of climate change on the consumer price index in India based on the econometric analysis. The average temperature, precipitation levels, CO₂ emissions, CO₂ intensity are considered as climate change variables.

The VECM cointegration results revealed a significant positive relationship of Inflation with the average temperature, precipitation, and CO₂ emissions in the long-run. The increase in temperature, precipitation and CO₂ emissions will push the consumer price index levels higher. The variance decomposition shows the temperature have upward trend of influence on CPI, the precipitation also has increasing impact on CPI but the CO₂ shows nominal impact on the CPI levels during the study period. The outcomes further confirmed that there is no short-run significant association among the CPI, temperature, precipitation, and CO₂ emissions. The results will be helpful to consider to take the relevant climate change monetary policy decisions in India.

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IMPACT OF MERGER ON ASSET QUALITY AND PROFITABILITY OF STATE BANK OF INDIA

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Abstract

In recent years, the merger of five erstwhile associate banks of the State Bank of India (SBI) and Bharatiya Mahila Bank with the SBI has been a massive merger. This paper attempts to evaluate and compare the profitability and asset quality of SBI during the pre-and post-merger period. The data from the last ten years are analysed with the help of a few parameters and descriptive statistics, as well as a paired t-test to test the hypothesis. The study found Statistically significant improvement in Gross Non-performing Assets and no significant in Gross NPA Ratio, Net NPAs, and Net NPA Ratio and Net Profit Margin, Return on Equity (ROE), and Return on Assets (ROA) during the post-merger period compared to the pre-merger period.

Keywords:

Merger, Pre-and Post-Merger Performance, Profitability, Assets Quality

Introduction

Merger and acquisition (M&A) activity is widely used by organizations all over the world to seek expansion. The purpose of this action is to meet the organization's strategic goals (Ashfaq et al., 2014) return on assets (ROA. The banking industry is vital to the formation of capital in the country. However, various impediments to excellent progress in the banking industry exist, including managing risks, efficiency in bank operations, loan portfolio management, etc (Veena & Pathi, 2018). Bank mergers have increased globally to enhance the banking industry's structure and operational efficiency. In India, bank mergers are a relatively new phenomenon. Mergers have become increasingly important due to globalization, increased competition, technological advancements, and other factors. The reasons for mergers are to seek specialized partners for the growth and expertise of a large firm's diversification. India is gradually transitioning from a large number of small banks regime to a small number of large banks regime. The SBI is India's largest public-sector bank regarding assets, profitability, deposits, branch network, and customers. SBI is also among the top 50 worldwide banks, with a balance sheet of more than Rs 30 lakh billion. It also has more than 24,000 branches and 59,000 ATMs, serving 42 million customers. SBI has a global presence with over 195 operations abroad in 36 countries. Therefore, this paper attempts to evaluate and compare the profitability and asset quality of the SBI before and after the

merger with the help of GNPA's, Gross NPA Ratio, Net NPAs, and Net NPA Ratio as a measurement of assets quality. On the other hand, Net Profit Margin, ROE, and ROA measure profitability.

Review of Literature

1. **S Sasikala (2022)** evaluated the performance of the SBI after the merger from 2016-17 to 2020-21. The study utilised secondary data, and the data is analyzed by using the mean, annual growth rate, and compound annual growth rates. Based on the analysis of the performance of SBI, it is found that deposits, advances, and investments increased after the merger. Finally, it was discovered that the SBI performance was better after the merger.
2. **Sanjana S and Shailashri (2021)** examined the operational performance and human resource efficiency of the SBI after the merger by using ratio analysis during a period from 2014-15 to 2019-20. The study utilised secondary data and a t-test to analyze the data. Finally, it concluded that there were no improvements in market performance, asset quality, and there is an improvement in liquidity and business per employee as per the study results.
3. **Sai Kishore and Hema Divya (2021)** studied the factors affected by public sector banks' mergers and financial indicators. Banks, namely, Bank of Baroda, Vijaya Bank, and Dena Banks, have been selected as a sample for their study. This research



paper used secondary data, which is analyzed through ratio and trend analysis. Hence, tremendous changes occurred in the Bank of Baroda after the merger.

4. **Meenakshi Sundaram and Kannan (2020)** tried to assess the performance of the Bank of Baroda during 2008-09 to 2016-17. The variables for data analysis include ROA, Net-Interest margin, credit-Deposit Ratio, and ROE. The analysis discovered that there was a greater NPA and a lower ROA during the pre-merger period. Finally, it concluded that the Bank of Baroda must improve its ROA and reduce NPAs.
5. **Anitha M (2019)** evaluated the performance of SBI using the CAMEL Model from 2007-08 to 2017-18. Ratio analysis was used in this study. The study concluded that the efficiency of recovering debt, and ROA, has shown a negative trend and that the performance of the *SBI* was better in pre-merger than post-merger.
6. **Ravi Agarwal (2019)** analysed the performance of nationalised banks from 2013–2014 to 2017–2018 using the CAMEL model. The results showed that in overall performance rating, Indian Bank took the top with an outstanding performance, followed by Andhra Bank. Union Bank of India was a poor-performing bank as per result.
7. **Devarajappa S (2018)** concluded that the performance of all three banks improved after the merger in terms of greater advances, deposits, number of

branches, etc. However, it has been proven that the performance of the banks before and after the merger differed significantly.

8. **Ritesh Patel (2018)** evaluated the performance of PSBs (Public Sector Banks) assessed during pre-and post-merger for 11 years, from 2003–2004 to 2013–2014. They took the Bank of Baroda, IDBI, Oriental Bank of Commerce, and SBI banks as a sample for their study. The ROE, ROA, net profit margin, loan return, and investment yield decreased after the merger. However, EPS and profit per employee grew post-merger.
9. **Anshuja Tiwari and Rakhi Tiwari (2018)** using indicators such as business per employee and earnings per employee, they investigated how the merger affected the productivity of SBI's employees after the merger. The data were analysed using the paired t-test. The study revealed that employee productivity changed dramatically after the merger.
10. **Muhammad Usman (2011)** examined the profitability performance of the Royal Bank of Scotland from 2005-06 to 2008-09 by using ratio analysis. It is found that pre-merger profitability, liquidity, and solvency ratios are higher than post-merger ratios. It concluded that the merger had not improved the Royal Bank of Scotland's performance.

Need and Objective of the Study

Many researchers have worked on different dimensions of banking companies, including mergers and acquisitions, and



the findings show mixed results. But no researcher has worked on the profitability and asset quality of the SBI merger. So, this study focused to fill this gap. Hence, the study evaluates and compares the profitability and asset quality of the SBI before and after the merger.

Hypotheses

- Ho₁: no significant difference in asset quality of the SBI before and after the merger period.
- Ho₂: no significant difference in the profitability of the SBI before and after the merger period.

Research Methodology

The current study is to evaluate and compare the profitability and asset quality of the SBI before and after the merger period. The above hypothesis is tested from the point of view of all seven measures/ variables used. (See Table 1). The measures are supported by mean, standard deviation, and compounded annual growth rates (CAGR). Besides, the paired t-test is carried out to test the hypothesis. The study period is ten years covering five years of pre-merger period (2012-13 to 2016-17) and five years of post-merger period (2017-18 to 2021-22).

Discussion and Analysis

Table 1: Parameters/ Measures for Comparison

Assets Quality	Profitability
❖ Gross NPAs (Crores)	❖ Net Profit Margin
❖ Gross NPA Ratio	❖ Return on Equity
❖ Net NPAs (Crores)	❖ Return on Assets
❖ Net NPA Ratio	

Table 2: Asset Quality-Descriptive Statistics and Paired t-test results

Years	GNPAs (Crores)		GNPA Ratio (%)		NNPAs (Crores)		NNPA Ratio (%)	
	Pre-Merger	Post-Merger	Pre-Merger	Post-Merger	Pre-Merger	Post-Merger	Pre-Merger	Post-Merger
2013/2018	51189.39	223427.46	5.00	11.00	21956.48	110854.70	2.10	5.73
2014/2019	61605.35	172750.36	5.00	8.00	31096.07	65894.74	2.57	3.01
2015/2020	56725.34	149091.85	4.00	6.00	27590.58	51871.30	2.12	2.23
2016/2021	98172.80	126389.00	7.00	5.00	55807.02	36809.72	3.81	1.50
2017/2022	112342.99	112023.00	7.00	4.00	58277.38	27965.71	3.71	1.02
CAGR (%)	17.02	-12.90	6.96	-18.32	21.56	-24.08	12.05	-29.19
Mean	76007.17	156736.33	5.600	6.800	38945.50	58679.23	2.862	2.698



Years	GNPAs (Crores)		GNPA Ratio (%)		NNPAs (Crores)		NNPA Ratio (%)	
	Pre-Merger	Post-Merger	Pre-Merger	Post-Merger	Pre-Merger	Post-Merger	Pre-Merger	Post-Merger
SD	27416.83	43825.89	1.341	2.774	16861.24	32566.42	0.841	1.854
Sig-Value	0.058		0.509		0.406		0.892	
Hypothesis	Reject null hypothesis		Accept null hypothesis		Accept null hypothesis		Accept null hypothesis	

Source: computed through SPSS at a 5% level of Significance.

Gross NPAs: It is observed from the above table 2, during the pre-merger period, the amount of GNPAs of the State Bank of India increased from ₹ 51,189.39 crores (31 March 2013) to ₹ 1,12,342.99 crores by 31 March 2017 with an annual average of ₹ 76,007.17 crores. Consequently, CAGR is positive at 17.02 percent, which is not desirable. Although the amount of GNPAs of SBI increased in the first year of the post-merger period (2017-18), it reduced continuously during the last four years. It reduced from ₹ 2,23,427.46 crores (31 March 2018) to ₹ 1,12,023.00 crores by the end of the post-merger period. In spite of this reduction, the five-year annual average in the post-merger period (₹ 1,56,736.33 Crores). And the CAGR for the post-merger period is -12.90 percent which is desirable as it reflects the improvement in the asset quality leading to a reduction in GNPAs.

Gross NPA Ratio: In the pre-merger period, the simple average of GNPA Ratios of the SBI increased from 5.00 percent during 2012-13 to 7.00 percent in the last of the pre-merger period with an annual average of 5.60%. And the CAGR is also positive at 6.96 percent. Even in the first year of the post-merger period, the GNPA Ratio of

SBI increased to 11.00 percent. However, during the last four years, it declined continuously from 11.00% to 4.00% after the merger. Due to the reduction in the ratio, CAGR is negative at -18.32 percent, which is appreciable.

Net NPAs: During the pre-merger period, the amount of Net NPAs of the SBI recorded a continuous increase from ₹ 21,956.48 crores (31 March 2013) to ₹ 58,277.38 crores by 31 March 2017 with an annual average of ₹ 38,945.50 crores and CAGR of 21.56 percent. The amount of Net NPAs of SBI increased even during the first year of the post-merger period to ₹ 1,10,854.70 crores but declined to ₹ 27,965.71 crores by 31 March 2022. The annual average for the post-merger period works out to 58,679.23 crores, and due to continuous reduction in the amount of NNPA, the CAGR is negative (-24.08 percent).

Net NPA Ratio: It can be observed from Table 2 that NNPA Ratio moved in both directions during the study period. The NNPA Ratio of SBI increased from 2.10 percent in 2012-13 to 3.81 percent in 2015-16, followed by its decline to 3.71 percent in the last year of the pre-merger period. The annual average works out to 2.86 percent, and CAGR in the NNPA



Ratio is positive at 12.05 percent, which is not desirable. Although the NNPA Ratio further increased in the first year of the post-merger period to 5.73 percent, it

declined continuously in the last four years and to 1.02 percent in the last year with an annual average of 2.69 percent. Therefore, the CAGR is negative at -29.19 percent.

Table 3: Profitability- Descriptive Statistics and Paired t-test results

Years	Net Profit Margin (%)		ROE (%)		ROA (%)	
	Pre-Merger	Post-Merger	Pre-Merger	Post-Merger	Pre-Merger	Post-Merger
2013/2018	11.78	-1.82	14.26	-2.21	0.90	-0.12
2014/2019	7.98	1.21	9.20	0.98	0.60	0.05
2015/2020	8.59	6.73	10.20	8.69	0.63	0.47
2016/2021	6.06	8.73	6.89	8.89	0.42	0.46
2017/2022	5.97	12.53	6.69	12.53	0.38	0.65
CAGR (%)	-12.71	79.39	-14.05	89.10	-15.84	89.88
Mean	8.076	5.476	9.448	5.776	0.586	0.302
SD	2.371	5.773	3.079	6.135	0.206	0.322
Sig-Value	0.503		0.405		0.281	
Hypothesis	Accept null Hypothesis		Accept null Hypothesis		Accept null Hypothesis	

Source: computed through SPSS at a 5% level of Significance.

Note:

- (1) Net profit margin for 2017-18 is negative. Therefore, only the last four years of the post-merger period are considered for calculating CAGR.
- (2) ROE and ROA for 2017-18 are negative. Therefore, only the last four years of the post-merger period are considered for calculating CAGR.

Net Profit Margin: For the year 2012-13, the net profit margin of 11.78% declined continuously to 5.97% in 2016-17. And the five-year average net profit margin is 8.076 percent, and the CAGR is -12.71 percent. The poor performance continued

even during the first year after the merger period. The net profit margin of -1.82 percent in 2017-18. However, the bank was able to transform the loss situation into a profit situation in the next year, 2018-19, as it reported a net profit margin of 1.21%, which improved to 12.53 % in the last year of the post-merger period. However, the five-year annual average of 5.47 percent is much lower than that for the pre-merger period of 8.076 percent. Due to the continuous increase in the net profit margin during the last four years, CAGR is positive (79.39%), which is appreciable. **ROE:** During the pre-merger period, a continuous reduction in the ROE declined



from 14.26% for 2012-13 to 6.69% in 2016-17 with a five-year annual average of 9.44 percent. Therefore, the CAGR is negative at -14.05 percent. During 2017-18, the ROE of SBI was negative at -2.21%, and the bank improved it to report 0.98% in 2018-19, which improved further to 12.53 percent in the last year of the post-merger period. Therefore, the five-year annual average works out to 5.77 percent against 9.44 percent for the pre-merger period. However, CAGR is positive at 89.10 percent.

Return on Assets: During the pre-merger period, the ROA of the SBI declined from 0.90 percent (2012-13) to 0.38 percent (2016-17) with a five-year annual average of 0.58 percent. And the CAGR is negative at -15.84% after the merger period. It declined further in the initial year after to -0.12%. However, in the next four years, the State Bank of India reported a positive ROA (0.05 percent for 2018-19 to 0.65 percent for 2021-22) with a five-year annual average of 0.30 percent. Therefore, the CAGR works out to 89.88 percent.

Findings of the Study

The above analysis shows some improvements after the merger in the form of a reduction in NPAs (gross and net, and the absolute amount and relative share as reflected by CAGR) and profitability variables. But the five-year annual averages after the merger period are greater than before the merger. Therefore, it is still being determined whether the improvement is significant or not significant. Hence, to ascertain whether there is any significant difference in the performance of SBI in terms of asset quality and profitability

parameters, the Paired t-test is used to test the hypothesis. The findings are as under:

1. Table 2 shows a significant impact of the merger on the Gross Non-Performing Assets of SBI as the significance value is less than 0.05, and it is also found that the merger has no significant impact on GNPA Ratio, Net Non-performing Assets, and NNPA Ratio. After the merger, the percentage of GNPA Ratio was reduced from 11.00% to 4.00%, Net NPAs also reduced from 1,10,854.70 to 27,965.71 crores, and Net NPA Ratio also reduced from 5.73% to 1.02% as per the results.
2. Table 3 found no significant impact of the merger on the NPM, ROE, and ROA. However, it is observed that NPM has improved after the merger, i.e., from -1.82 (2017-18) to 12.53 (2021-22) percent which signifies greater profitability for the bank, and it is also observed that ROE and ROA have also improved after the merger as per the study results.

Conclusion

Based on the above findings, it is evident that the SBI has improved regarding assets quality and profitability performance after the merger. The improvement is insignificant in terms of Asset quality and profitability of SBI. However, the rate of improvement differs from one set of parameters to another. It emphasizes the necessity for SBI to improve these areas by focusing on early warning signals that a standard loan is going into the NPA category, enhancing credit appraisal, and managing new accretion to NPAs.



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PROFITABILITY TRENDS IN SELECT PHARMACEUTICAL COMPANIES IN INDIA: A CROSS SECTIONAL ANALYSIS

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Abstract

The pharmaceutical sector plays a pivotal role in India's economic landscape, serving as a significant driver of growth and development. As of 2021, the Indian pharmaceutical market was valued at approximately \$41 billion, ranking third in terms of volume and 13th in terms of value globally. This sector's substantial contribution to India's Gross Domestic Product (GDP) is apparent, with a consistent contribution ranging from approximately 1.5% to 2% of the country's GDP, as indicated by India Brand Equity Foundation (IBEF's) reports. Furthermore, the pharmaceutical industry in India is a major employer, directly providing livelihoods to a staggering 2.7 million individuals, with additional indirect employment opportunities spanning various skill levels (PwC India). Remarkably, India's pharmaceutical sector has made substantial progress in manufacturing affordable generic medications, resulting in improved healthcare accessibility, not only within the nation but also in global markets. This endeavor has earned India the recognition as the "pharmacy of the developing world," exerting a significant influence on the affordability of healthcare worldwide. Moreover, the sector's substantial pharmaceutical exports, reaching \$24.44 billion in 2020, have played a crucial role in balancing India's trade, underscoring its positive contribution to the nation's economic stability. Additionally, the industry's emphasis on research and development has not only driven innovation but has also attracted foreign investments, bolstering India's technological capabilities. Therefore, it can be said that the multifaceted contributions of the Indian pharmaceutical sector have been instrumental in advancing India's economic prosperity and global reputation. Profitability analysis plays a pivotal role for the stakeholders of a company in shaping their decisions, perspectives, and engagements with the company. It acts as a crucial measure of the company's financial well-being and steadiness, influencing the dynamics between the company and its investors, employees, customers, and management. In essence, it serves as a fundamental yardstick that defines the interconnections and associations among various stakeholders and the company itself. Being so, the present study aims to examine the profitability trends of ten selected companies in India's pharmaceutical sector from 2004-05 to 2022-23, encompassing the post-reform era.

Keywords:

Profitability Analysis, Pharmaceutical Market, GDP, Indian Economy, Post-reform era



I. Introduction

A robustly healthy population stands as an irreplaceable driver of economic development within a nation. It serves as an unequivocal engine for productivity. Physically and mentally fit individuals not only contribute more effectively to the workforce but also display heightened levels of creativity and innovation, acting as powerful catalysts for economic expansion through increased efficiency and output. A population in good health significantly diminishes the economic burdens arising from illness. Reduced healthcare expenses equate to a wealth of resources that can be strategically allocated to vital sectors such as education, infrastructure, and technology, thereby nurturing sustained economic sustainability. A healthy population is a cornerstone for the cultivation of human capital, characterized by higher education and skill levels. This, in turn, enhances a nation's economic potential, making it more appealing to investors and fostering an environment conducive to entrepreneurship. Therefore, it can be said that a thriving population represents more than just a barometer of societal well-being; it constitutes an investment in a nation's economic prosperity. It profoundly influences productivity, resource allocation, human capital development, poverty reduction, stability, foreign investments, and innovation - all of which are pivotal for the sustenance of enduring economic development.

The pharmaceutical sector in India occupies a central role in the nation's economic

structure, acting as a crucial driver for growth and advancement. In the year 2021, the valuation of the Indian pharmaceutical market reached approximately \$41 billion, securing the sector's third position globally in terms of volume and 13th in value. This industry consistently makes a significant contribution to India's Gross Domestic Product (GDP), representing a share of about 1.5% to 2% of the nation's GDP, as indicated by IBEF reports. Noteworthy is the sector's role as a major employer, directly sustaining 2.7 million individuals and generating additional employment opportunities across diverse skill levels, as highlighted by PwC India. Internationally, India's pharmaceutical industry has garnered acclaim for its production of cost-effective generic medications, improving healthcare accessibility not only within the country but also on a global scale, earning the title of the "pharmacy of the developing world." Additionally, the sector's substantial exports of pharmaceuticals, reaching \$24.44 billion in 2020, play a crucial role in stabilizing India's trade balance and contributing positively to its economic robustness. The industry's emphasis on research and development has not only driven innovation but has also attracted foreign investments, bolstering India's technological prowess. In summary, the varied contributions of the Indian pharmaceutical sector have been instrumental in propelling the nation's economic prosperity and enhancing its global standing. The analysis of a company's profitability is crucial in navigating the intricate relationships with its stakeholders, including investors,



employees, customers, and management. This scrutiny, guided by profitability metrics, not only assists investors in making informed decisions by evaluating financial viability and stability but also shapes expectations regarding dividends. A financially robust company has a positive impact on employees, ensuring job stability, competitive salaries, and growth opportunities. Profitability metrics extend their influence to shaping performance incentives for the workforce. Customers, in turn, benefit from improved product and service quality, a direct result of profitability supporting research, development, and innovation. The revealed financial stability and longevity through profitability analysis inculcate confidence among customers. For management, profitability analysis serves as a compass for strategic decision-making, effective resource allocation, and growth planning. Additionally, strong profitability acts as a magnet, enhancing the company's reputation and attracting investors and partners. Since July 1991, India's pharmaceutical industry has undergone significant economic changes due to liberalization and shifts in patent regulations. These shifts have compelled Indian pharmaceutical companies to intensify their research and development efforts, leading to increased production, sales, revenue, and exports. Consequently, more Indian pharmaceutical firms are venturing into new regions and exploring listings on foreign stock exchanges. The globalization of the industry has notably impacted the earnings capacity of India's pharmaceutical sector. Against this backdrop, the present paper seeks to analyse

the profitability trends of ten selected companies in India's pharmaceutical sector from 2004-05 to 2022-23, encompassing the post-reform era.

The subsequent sections of this paper are organized as follows: A brief description of the review of related literature is provided in section II. Section III outlines the study's objectives. Section IV delineates the methodology employed. Section V is dedicated to the presentation of empirical findings. Lastly, Section VI offers concluding observations.

II. Literature review

Prior to formulating study objectives, it would be useful to assess existing literature on the subject. The forthcoming paragraphs in this section provide notable research conducted recently in India and abroad concerning the subject matter explored in this current study.

Singh and Sur (2022) in their study aimed to investigate the relationship between advertising expenditure and profitability growth in fifty selected companies. These companies were meticulously chosen, representing the top five from each of the ten industries in the Indian manufacturing sector spanning from 2002 to 2016. The study employed return on capital employed (ROCE) as a comprehensive measure of overall profitability. To dissect the variations in ROCE and advertising expenditure, a recursive simultaneous equation framework was utilized, guided by the results of the endogeneity test. The research highlighted a gradual increase in inter-industry variation in advertisement expenditure over the specified timeframe.



Notably, the overall regression findings underscored that efficiency in fixed asset management, efficiency in inventory management, efficiency in debtors' management and capital and efficiency in cash management exhibited a noteworthy positive impact on profitability, while market share and estimated ROCE significantly influenced advertising expenditure.

The study conducted by **Singh and Sur (2020)** aimed to assess the profitability of 'Maharatna' CPSEs in India through a panel data analysis approach spanning from 2002 to 2014. Profitability was measured using Return on Capital Employed (ROCE). The findings of the study highlighted considerable variations in the profitability levels among the Maharatna companies. To ascertain the stationarity of ROCE, four different panel unit root tests were employed, and the results uniformly indicated that the ROCE data for all Maharatna companies exhibited a stationary nature. Additionally, a fixed effect regression model was utilized to explore the factors influencing the profitability of the Maharatna companies.

Adekola et al. (2017) in their study investigated the impact of working capital management on the profitability of 50 selected non-financial services companies listed in Nigeria. The study, conducted between 2002 and 2011, found that the current ratio (CR) and both gross and net operating profits exhibited a positive correlation in certain sectors, reinforcing each other. However, in other sectors, trade-offs were observed between these variables. The study further highlighted

that the association between profitability and liquidity was not consistently concave or linear. Instead, this relationship was found to be influenced by the specific sector within which the company operated, indicating varying dynamics across different industry segments.

Singh and Sur (2016) conducted a study to evaluate the profitability of Maharatna CPSEs (Central Public Sector Enterprises) using data envelopment analysis. The research aimed to compare the consistency of profitability among these enterprises by employing the ratio of mean to standard deviation (SD) of the technical efficiency score. Linear trend equations were fitted to identify the trend in the efficiency scores of each company over the study period. The findings highlighted significant variations in the technical efficiency scores across the Maharatna CPSEs during the study duration. ONGC and BHEL emerged as the most consistent performers in terms of profitability, as indicated by the consistency coefficient of the technical efficiency score, while NTPC and SAIL occupied the last two ranks during the study period.

Jahfer (2015) conducted a study to analyze the impact of working capital management on the profitability of thirty-two chosen manufacturing companies in Sri Lanka from 2008 to 2013, with a focus on gross operating profitability. The analysis employed both pooled ordinary least squares model and fixed-effects regression model to investigate the influence of working capital management on the profitability of the selected manufacturing companies. The findings indicated that sales growth, firm size, and



current liabilities positively influenced the firm's profitability. Conversely, the number of days accounts receivables, net trading cycle, and current assets were negatively associated with profitability according to the study.

Rahaman and Sur (2014) conducted a study where they examined the financial performance of 22 Indian textile companies over the period 2002-03 to 2011-12. They focused on various profitability indicators. Their research showed that effective management of fixed assets and working capital significantly improved the overall profitability of these companies during the study period. Additionally, the study observed that the selected profitability measures had consistent and similar values across the sample companies during the same timeframe.

Sur and Rahaman (2013) conducted an extensive examination of how effectively 22 companies in the Indian pharmaceutical industry managed their liquidity. They considered both quantitative and qualitative aspects of liquidity for the years 2001-02 to 2010-11. One key finding from their study was a robust and positive connection between a company's liquidity and its profitability throughout the research period. Furthermore, their findings indicated that efficient management of receivables played a significant role in boosting the overall profitability of the chosen companies during the studied time frame.

Owolabi and Obida (2012) conducted research that focused on how the management of liquidity affected the profitability of twelve manufacturing companies listed on the Nigerian Stock

Exchange. The study spanned from 2005 to 2009. Their findings revealed that the effectiveness of liquidity management within these selected companies had a notable impact on improving their profitability throughout the studied duration.

Sur and Chakraborty (2011) empirically investigated the correlation between working capital management and profitability within the Indian pharmaceutical sector. They focused on ten multinational companies and studied the timeframe from 1996-97 to 2007-08. A notable finding from their research was that effective management of liquidity, inventory, and credit had a positive impact on enhancing corporate profitability over the duration of the study.

Parasuraman (2004) conducted a cross-sectional analysis of how prominent pharmaceutical companies in India managed their working capital. Additionally, the study aimed to explore the connection between the credit policies employed by these companies and their profitability. The research findings suggested that companies that embraced a more lenient credit policy enjoyed greater profitability during the observed period.

III. Objectives

The major focus of the present study is on analysing the profitability-status of the selected companies belonging to the Indian pharmaceutical sector by taking into consideration the average as well as the consistency dimensions of profitability during the study period. The study also investigates internal factors that wield the

greatest impact on the overall profitability of the sample companies during the same period. In more specific terms, the study is designed to achieve the following objectives:

- i. To assess the comparative profitability-status of the sample companies by using comprehensive rank approach based on some selected profitability parameters taking into consideration their average values as well as the consistency dimension individually and jointly.
- ii. To investigate the correlation between the overall profitability of the selected companies and their effectiveness in the management of fixed assets.
- iii. To measure the degree of association between the overall profitability of the companies under study and the efficiency in managing various components of their working capital.
- iv. To explore how the combined influence of effectively managing fixed assets and various aspects of working capital management affects the overall profitability of the chosen companies.

IV. Methodology

The present study is based on ten selected companies belonging to Pharmaceutical Industry in India, the list of which is presented in Appendix-1. Market capitalization is determined by multiplying the market price per share by the total number of outstanding equity shares of a company. As such, it serves as a comprehensive indicator, encapsulating both the size and financial performance of the company. Consequently, market capitalization stands out as a pivotal metric employed by

investors and analysts to assess the market value and overall financial well-being of a company. Therefore, the companies in this study were selected following the purposive sampling procedure i.e. top 10 NSE listed pharmaceutical companies based on their market capitalization as on 01.07.2023. The data for the period 2003-2004 to 2022-2023, which were used in this study, were collected from secondary sources such as Moneycontrol.com and Capitaline Corporate Database of Capital Market Publisher (I) Ltd., Mumbai. In order to assess the profitability of the selected companies the simple average values of some suitable profitability parameters such as operating profit ratio (OPR), net profit ratio (NPR), return on capital employed (ROCE), return on net worth (RONW) and earnings per share (EPS) were used. Besides the degree of consistency of the each of the selected parameters was measured using consistency coefficient (CC) which is equal to the mean value of the parameter divided by its standard deviation.

In order to measure the efficiency in managing fixed assets and different components of working capital, their respective turnover ratios, such as fixed assets turnover ratio (FATR), inventory turnover ratio (ITR), receivables turnover ratio (RTR), cash turnover ratio (CTR) and loan and advances turnover ratio (LATR) were calculated.

For analyzing the data, simple statistical tools like arithmetic mean, standard deviation, statistical techniques like Pearson's simple correlation analysis, Kendall's correlation analysis, Spearman's rank correlation analysis, multiple regression analysis and

multiple correlation analysis were used. In order to check the uniformity among the selected profitability parameters, Kendall's coefficient of concordance was calculated. Statistical tests such as t-test, Chi-square (χ^2) and F-test we applied at appropriate places.

V. Empirical Analysis

A. To assess the profitability of the selected companies in India pharmaceutical Sector during the period under study relevant data has been presented in Table 1. In order to make the analysis of the profitability, some major profitability indicators such as operating profit ratio (OPR), net profit ratio (NPR), return on Capital employed (ROCE), return on net worth (RONW) and earnings per share (EPS) were used.

OPR: it is one of the most important measures of profitability. It is the ratio between operating profit and net sales. It indicates the firm's ability to earn profit from its operations. Table 1 depicts that in respect of average OPR, Aurobindo Pharma (53.83 %) captured the top most position which was followed by Divis Labs (37.78%), Sun Pharma (30.88), Torrent Pharma (29.34), Zydus Life (28.39), Dr Reddys Labs (24.87%), Cipla Ltd. (24.25%), Lupin Ltd (23.03), Alkem Lab (21.13) and Abbott India (18.56%) respectively in that order during the period under study. This table also shows that, the OPR of four out of ten selected companies were placed in the category of 'OPR above the Indian pharmaceutical industry average' while the OPR of remaining

six companies were placed in the category of 'OPR below the Indian pharmaceutical industry average'.

NPR: It indicates the firm's ability to generate net earnings. The higher the value of NPR, the greater the firm's net earnings capability. Table 1 displays a broad range of average NPRs among the selected companies, varying from 24.43 (Divis Labs) to 12.16 (Abbott India) during the study period. Divis Labs holds the highest position with an average NPR of 24.43, followed by Zydus Life (18.56), Alkem Lab (16.79%), Cipla Ltd. (16.17%), Torrent Pharma (16.06%), Sun Pharma (15.45%), Dr. Reddy's Labs (15.27%), Lupin Ltd. (14.57%), Aurobindo Pharma (12.20%), and Abbott India (12.016%) in sequential order. Additionally, the table indicates that three out of the ten sample companies have an NPR above the average of the Indian pharmaceutical industry, while the remaining seven companies fall below the industry average.

ROCE: It is most important and widely used measure of profitability. It measures the overall performance of a firm in terms of profitability. The higher the value of ROCE, the greater is the overall profitability of the firm. According to Table 1, Abbott India secured the first position with a profitability rate of 29.13%, and Divis Labs followed closely in the second position with 24.66%. On the other hand, Dr. Reddy's Labs (13.55%) and Sun Pharma (9.97%) occupied the second-to-last and last positions, respectively,



in terms of their overall profitability during the study period. Notably, two companies among the selected ones exhibited overall profitability higher than the industry average, while the remaining eight companies fell below the industry average in terms of their overall profitability.

RONW: The profitability of a firm, from the view point of its owners is judged with the help of RONW. The higher the value of RONW, the greater is the firm's ability to compensate its owners. It is evident from Table 1 that the average RONW was the highest in Abbott India (27.34%) which was followed by Divis Labs (25.58%), Torrent Pharma (22.70%), Zydus Life (20.37%) Lupin Ltd. (19.92%), Alkem Lab (17.57%), Aurobindo Pharma (16.93%), Cipla Ltd. (15.93%), Dr Reddys Labs (13.06%) and Sun Pharma (10.59%) respectively in that order during the study period. This table also reveals that in respect of RONW, five out of ten selected companies found place in 'above the Indian pharmaceutical industry average' class while remaining five companies were placed in 'below the Indian pharmaceutical industry average' class during the concerned period.

EPS: This ratio also indicates the profitability performance of a firm from the view point of its owners. The higher the value of EPS, the higher is the firm's earning capability from owners' view point. According to Table 1, Abbott India (Rs. 138.71) and Alkem Lab (Rs. 75.71) secured the most favorable positions, ranking first and

second, respectively. Conversely, Cipla Ltd (Rs. 19.98) and Sun Pharma (Rs. 17.42) were positioned less favorably. The average Earnings Per Share (EPS) of four out of the ten companies exceeded the 'Indian pharmaceutical industry average,' while the EPS of the remaining six companies fell below the industry average during the study period.

The ultimate profitability status of the selected companies based on average values was also ascertained in Table 1 more rigorously with the help of composite profitability score. The composite profitability score of a company was ascertained on the basis of sum of the individual ranks of the firm in respect of mean values of the selected profitability parameters. The composite rank was done following the principle that the lower the sum of individual ranks, the higher the profitability. Table 1 reveals that in respect of composite profitability score, Divis Labs captured the top most position and was followed by Torrent Pharma, Abbott India, Alkem Lab, Zydus Life, Lupin Ltd., Aurobindo Pharma, Dr Reddys Labs, Cipla Ltd. and Sun Pharma respectively in that order. It was also evident from Table 1 that Abbott India occupied top most rank in respect of three parameters of profitability, namely ROCE, RONW and EPS whereas Divis Labs was placed in second position with respect to three parameters of the profitability, namely OPR, ROCE and RONW during the period under study. Similarly, Torrent Pharma captured the



fifth position in respect of mean NPR, ROCE and EPS while Sun Pharma found place in the worst position with respect to ROCE, RONW and EPS. At a glance, the uniformity among the selected profitability indicators of the companies under study was observed during the study period. Therefore, in order to examine whether there was any association among the average values of the five selected profitability parameters, the analysis of Kendall's coefficient of concordance (W) was made in Table 1 and to test the significance of W, Chi-square (χ^2) test was applied. The computed value of W was 0.036, which was not found to be statistically significant even at 10 per cent level of significance. It implies that no strong evidence of uniformity among the mean values of the five selected profitability measures was observed during the study period.

- B.** The analysis of the degree of consistency in varied profitability parameters of the selected companies during the period under study was made in Table 2 by using the CC. The higher the value of CC of any of the profitability measures of a firm, the greater is the degree of stability in maintaining the profitability of the firm. Table 2 discloses that the degree of consistency in OPR was the highest in Divis Labs (9.13) whereas it was least in Aurobindo Pharma (1.74) during the study period. This table also depicts that out of ten selected companies, the CC of OPR of four companies found place in the category of 'above the Indian

pharmaceutical industry average' while in the CC of OPR of the remaining six companies placed in the category of 'below the Indian pharmaceutical industry average' indicating them as the 'inconsistent performer' in this respect. The CC of NPR was highest in Divis Labs (5.21) which was followed by Cipla Ltd. (5.03), Alkem Lab (5.00), Zydus Life (3.49), Torrent Pharma (3.29), Abbott India (2.95), Dr Reddys Labs (2.62), Aurobindo Pharma (2.14), Lupin Ltd. (2.05) and Sun Pharma (0.46) respectively in that order during the period under study. In respect of CC of NPR, five out of ten companies found place in the category of 'CC above the Indian pharmaceutical industry average' whereas in remaining five companies the CC of NPR was lower than the 'industry average' (3.22) during the period under study.

The consistency coefficient of ROCE ranged between Divis Labs (5.56) and Sun Pharma (0.83). The second-best position in respect of CC of ROCE was occupied by CL (4.44) while Aurobindo Pharma (1.88) captured the place of second most 'inconsistent performer' during the study period. Five out of ten sample companies found place in the category 'consistent performer' whereas the remaining five companies were placed in 'inconsistent performer' class in terms of their consistency in overall profitability (ROCE).

Alkem Lab (4.06) proved itself as the most 'consistent performer' in respect of RONW while Sun Pharma (0.64) was considered as the most



'inconsistent performer' in earning return for its owners during the study period. Six companies out of ten selected companies, could maintain consistency in generating profit for their shareholders during the study period whereas in the remaining four companies the CC of RONW was below the 'industry average' (2.62).

Divis Labs (2.20) captured the top most position in respect of EPS, also ranked first in maintaining its EPS stable in comparison to the other companies in the sample during the study period while Sun Pharma (1.00) proved itself as the most inconsistent in that respect during the study period. The consistency in EPS of six companies was found to be higher than the 'industry average' (1.63) while remaining four companies found place in the category of 'inconsistent performer' in that respect during the study period.

However, the above analysis failed to provide any definite picture of the profitability –status of the companies under the study based on individual level of consistency for selected indicators. Therefore, an effort was made in Table 2 to access the profitability-status of each of the selected companies more precisely by applying composite consistency scores. Table 2 discloses that Divis Labs occupied the top most position in respect of composite score of consistency, followed by Cipla Ltd., Alkem Lab, Zydus Life, Torrent Pharma, Abbott India, Dr Reddys Labs, Lupin Ltd., Aurobindo Pharma and Sun Pharma respectively. In Table

2 an effort was also made to ascertain whether there was any uniformity among the CC of the selected measures of the profitability of the selected companies during the study period. In order to achieve this objective, an analysis of Kendall's coefficient of concordance (W) was made in this study. The significance of W was tested by Chi-square (χ^2) test. The computed value of W, which was 0.097, was found to be statistically significant at 1 per cent level. It confirms that a strong uniformity among the CC of the selected profitability parameters was noticed during the study period.

C. When assessing the profitability of selected companies, two critical dimensions were examined: the average profitability and the consistency of profitability over the study period. The analysis revealed that Divis Labs secured the top rank in both average profitability and the consistency of profitability among the chosen companies. In contrast, Torrent Pharma claimed the second position in terms of average profitability, but it did not maintain the same rank when considering the consistency of profitability over the same period. This situation underscores the importance of evaluating company profitability from both perspectives: average and consistency. In Table 3 the overall profitability positions of the sampled companies by factoring in both these dimensions was presented. According to this table, Divis Labs emerged as the most efficient performer in terms of



ultimate profitability during the study period, followed by Torrent Pharma & Alkem Lab, Abbott India & Zydus Life, Cipla Ltd., Lupin Ltd., Dr Reddys Labs, Aurobindo Pharma, and Sun Pharma, in that order.

- D.** The analysis of relationship between overall profitability and efficiency of fixed assets management and that between overall profitability and varied components of working capital of the selected companies were made in tables 4.1, 4.2, 4.3, 4.4 and 4.5. The overall profitability of the sample companies was measured in terms of average ROCE while the efficiency in managing fixed assets and different components of working capital was ascertained on the basis of their respective turnover ratios. For the purpose of making the analysis three types of correlation coefficients were computed by taking into account: magnitudes of the variable (by Pearson's simple correlation coefficient), rankings of their magnitudes (by Spearman's rank correlation), and the nature of their associated changes (by Kendall's correlation coefficient). In order to examine whether these coefficients were statistically significant or not, the t-test was applied in the study.

In Table 4.1, an effort was made to analyse the relationship between overall profitability and efficiency of fixed assets management of the selected companies during the study period. This table reveals that out of thirty correlations coefficients between ROCE and FATR, twenty-seven were positive, of which eleven coefficients were found

to be statistically significant at 1 per cent level, whereas remaining three coefficients were negative which was not found to be statistically significant during the period under study. The outcome of Table 4.1 confirms the theoretical argument that there should be positive association between ROCE and FATR of the selected companies.

Table 4.2 attempts to analyze the association between the inventory management practices of the chosen companies and their overall profitability. The table reveals that among the thirty correlation coefficients, twenty-seven are positive, with fifteen of them being statistically significant. Conversely, the remaining three correlation coefficients are negative and lack statistical significance even at the 10 percent level. The overall result obtained from this analysis supports the theoretical proposition of a positive relationship between the profitability and the efficiency of inventory management in these companies.

Table 4.3 focuses on the relationship between receivables management and overall profitability of the selected companies during the study period. It is shown in Table 4.3 that out of thirty correlation coefficients seventeen coefficients were negative, of which five coefficients were found to be statistically significant while the remaining thirteen were positive and none of them were found to be statistically significant. The findings of this study did not conform to the theoretical argument i.e., effective and



efficient management of receivable of the firms did not able to enhance its overall profitability.

In Table 4.4, an attempt was made to make analysis of the relationship between CTR and ROCE. This table reveals that out of thirty correlation coefficients, eighteen were positive which were not found to be significant while remain twelve were negative, of which two were found to be statistically significant. Only a negligible 16 per cent of negative correlation coefficients were significant which confirms the negative relationship between profitability and efficiency in cash management. Therefore, it can be concluded that the findings of the study did not provide any strong evidence of negative relationship between ROCE and CTR during the study period.

Table 4.5 sought to examine the relation between the overall profitability of the selected companies and their effectiveness in handling short-term loans and advances during the study period. The table illustrates that among the thirty correlation coefficients, eighteen were positive, but none of them were deemed statistically significant. In contrast, the remaining twelve coefficients were negative, with only one of them reaching statistical significance. Consequently, the findings from the study do not offer compelling evidence regarding the precise nature of the relationship between profitability and the proficient management of loans and advances by the sample companies during the study period. An in-depth

analysis of the joint influence of the efficiency in managing fixed assets and in different components of working capital on the overall profitability of the selected companies during the study period was made in Table 5. The multiple regression equation which was fitted for the purpose is $ROCE: b_0 + b_1.FATR + b_2.ITR + b_3.RTR + b_4.CTR + b_5.LATR$, where b_0 is the intercept on the regression surface and b_1, b_2, b_3, b_4 and b_5 are the partial regression coefficients. In Table 5, the results demonstrate that an increase of one unit in FATR led to a rise in ROCE for nine out of the ten selected companies. This increase was statistically significant for one company, whereas for one company (Aurobindo Pharma), the decrease in ROCE due to the same change was not statistically significant. Likewise, when ITR increased by one unit, ROCE increased in seven companies and decreased in three. This increase in ROCE was statistically significant for one company (Lupin Ltd.), while the decrease was not statistically significant for any. For a one-unit increase in RTR, ROCE increased in nine companies, with only one being statistically significant. As for CTR, a one-unit increase resulted in a ROCE increase for seven companies, two of which were statistically significant. However, in three companies, a one-unit increase in CTR led to a ROCE decrease, with none of these decreases being statistically significant. When LATR increased by one unit, ROCE increased in six companies and



decreased in four. Neither the increase nor the decrease in ROCE due to LATR was statistically significant for any of these companies. Table 5 also reveals that the multiple correlation coefficients (R) of ROCE on FATR, ITR, RTR, CTR and LATR in the selected companies varied between 0.420 (Torrent Pharma) and 0.849 (Cipla Ltd.) during the study period. The multiple correlation coefficients in Alkem Lab, Cipla Ltd., Dr Reddys Labs and Lupin Ltd. were found to be statistically significant at 1 per cent level of significance while the same in Sun Pharma was found to be statistically significant at 10 per cent level of significance. This indicates that in 50 percent of the cases, these coefficients were statistically significant, implying that the efficiency in managing fixed assets and various working capital components had a notably positive impact on enhancing ROCE in five companies over the study period. Additionally, Table 5 highlights that the coefficient of determination (R-squared) for Alkem Lab, Cipla Ltd., Dr Reddys Labs, Lupin Ltd., and Sun Pharma were 0.65, 0.720, 0.674, 0.639, and 0.475, respectively. This indicates that approximately 65 percent, 72 percent, 67.4 percent, 63.9 percent, and 47.5 percent of the variation in ROCE could be explained by the combination of the selected efficiency measures (FATR, ITR, RTR, and LATR) during the study period.

VI. Concluding observations

1. Divis Labs emerges as the standout

performer, leading both in composite profitability scores and consistency among the selected companies. The comparative profitability analysis further underscores Divis Labs as the most efficient performer. Cipla Ltd., Alkem Lab, Zydus Life, and Torrent Pharma also demonstrate efficiency, securing positions in the 'top five' category. However, Aurobindo Pharma and Sun Pharma stand out as the 'most inconsistent companies' in terms of their ultimate rankings. The analysis, supported by Kendall's coefficient of concordance, highlights the distinctive performance patterns observed among the companies during the study period.

2. The analysis of correlation between efficiency in fixed assets management and overall profitability disclosed that the relationship between these two was found to be positive in 90 per cent of cases and found to be significant positive in 37 per cent of the cases during the period under study. Therefore, the outcome derived from the analysis of the association between fixed assets management of the selected companies and their profitability reflects that fixed asset management of the companies made notable contribution towards improving their overall profitability during the study period.

3. The positive correlation between overall profitability and efficiency in inventory management of the selected companies was observed in 90 per cent cases and the same was significant in 50 per cent cases, whereas the relationship between them was not at



- all significantly negative in any case. Therefore, the findings of this study confirm the theoretical arguments that the effective and efficient management of inventory of the firms can make their profit curve soaring upward.
4. The analysis of association between overall profitability and receivable management of the companies under study shows that in 16.67 per cent cases the relationship was significantly negative while the same was significantly positive in none of the cases. It reflects that the receivables management made negative contribution in enhancing the overall profitability of the sample companies.
 5. Only in 6.67 per cent cases correlation between overall profitability and cash management of the selected companies was significantly negative while in not a single case the same was significantly positive. It implied that efficient cash management of the companies was failed make any positive impact on the overall profitability of the selected companies during the period under study.
 6. The analysis of association between overall profitability and management of loans and advances reveals that the correlation coefficient between them was significantly negative in only 3.33 per cent cases while none were significantly positive during the period under study. Therefore, the results obtained from the analysis of the correlation between LATR and ROCE failed to provide any strong evidence of positive or negative relationship

between profitability and efficiency of managing loans and advances.

Therefore, the findings of the study indicate that the effective handling of fixed assets, inventory, and receivables significantly boosted the overall profitability of the studied companies over the concerned period. Consequently, Indian pharmaceutical firms should not only prioritize efficient management of these aspects but also pay close attention to cash management and handling loans and advances. This holistic approach is essential for enhancing their profit-generating capacity. Furthermore, given the current intense competition in the global market, these companies should regularly reassess and adapt their strategies. This adaptability is crucial for pursuing their goal of maximizing value in the post-liberalization era.

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Table 1: Analysis of the Comparative Profitability Status of the Selected Indian Pharmaceutical Companies based on Profitability Parameters from 2004-05 to 2022-23

Company	Mean OPR	Rank R1	Mean NPR	Rank R2	Mean ROCE	Rank R3	Mean RONW	Rank R4	Mean EPS	Rank R5	Sum of Ranks	Composite Rank
Abbott India (AI)	18.56	10	12.16	10	29.13	1	27.34	1	138.71	1	23	3
Alkem Lab (AL)	21.13	9	16.79	3	17.13	4	17.57	6	75.71	2	24	4
Aurobindo Pharma (AP)	53.83	1	12.20	9	14.87	8	16.93	7	31.83	7	32	7
Cipla Ltd. (CL)	24.25	7	16.17	4	15.96	7	15.93	8	19.98	9	35	9
Divis Labs (DL)	38.78	2	27.43	1	24.66	2	24.58	2	55.43	4	11	1
Dr Reddys Labs (DRL)	24.87	6	15.27	7	13.55	9	13.06	9	74.28	3	34	8
Lupin Ltd. (LL)	23.03	8	14.57	8	17.44	3	19.92	5	36.32	6	30	6
Sun Pharma (SP)	30.88	3	15.45	6	9.97	10	10.59	10	17.42	10	39	10
Torrent Pharma (TP)	29.34	4	16.06	5	16.80	5	22.70	3	39.87	5	22	2
Zydus Life (ZL)	28.39	5	18.56	2	16.23	6	20.37	4	22.78	8	25	5
Industry Average	29.31		16.46		17.57		18.90		51.23			

Kendall's coefficient of concordance (W) among the mean values of the selected profitability measures is 0.036 and the Chi-square (χ^2) value of W is not significant even at 10 per cent level of significance.

Table 2: Analysis of the Comparative Consistency Levels of the Selected Indian Pharmaceutical Companies in respect of the selected Profitability Parameters from 2003-2004 to 2022-2023

Company	CC of OPR	Rank R1	CC of NPR	Rank R2	CC of ROCE	Rank R3	CC of RONW	Rank R4	CC of EPS	Rank R5	Sum of Ranks	Composite Rank
Abbott India (AI)	3.52	7	2.95	6	3.14	5	3.33	3	1.11	9	30	6
Alkem Lab (AL)	4.97	3	5.00	3	4.15	3	4.06	1	1.58	7	17	3
Aurobindo Pharma (AP)	1.74	10	2.14	8	1.88	9	2.03	8	1.55	8	43	9
Cipla Ltd. (CL)	6.87	2	5.03	2	4.44	2	2.71	6	1.91	2	14	2
Divis Labs (DL)	9.13	1	5.21	1	5.56	1	3.66	2	2.20	1	6	1
Dr Reddys Labs (DRL)	3.99	5	2.62	7	2.75	7	2.46	7	1.65	6	32	7
Lupin Ltd. (LL)	2.58	8	2.05	9	2.15	8	1.83	9	1.80	3	37	8
Sun Pharma (SP)	1.78	9	0.46	10	0.83	10	0.64	10	1.00	10	49	10
Torrent Pharma (TP)	3.55	6	3.29	5	3.03	6	2.76	4	1.79	4	25	5
Zydus Life (ZL)	4.91	4	3.49	4	3.34	4	2.72	5	1.72	5	22	4
Industry Average	4.30		3.22		3.13		2.62		1.63			

Kendall's coefficient of concordance (W) among the coefficients of consistency of the selected profitability measures during the study period is 0.097 and the Chi-square (χ^2) value of W is being significant at 0.01 level.

Table 3: Final Profitability Ranks of the Selected Pharmaceuticals Companies in India based on Average- Consistency Combination, from 2003-2004 to 2022-2023

Company	Composite Rank based on average	Composite Rank based on Consistency Coefficient	Sum of Ranks	Final Profitability Rank
Abbott India (AI)	3	6	9	4
Alkem Lab (AL)	4	3	7	2
Aurobindo Pharma (AP)	7	9	16	9
Cipla Ltd. (CL)	9	2	11	6
Divis Labs (DL)	1	1	2	1
Dr Reddys Labs (DRL)	8	7	15	8
Lupin Ltd. (LL)	6	8	14	7
Sun Pharma (SP)	10	10	20	10
Torrent Pharma (TP)	2	5	7	2
Zydus Life (ZL)	5	4	9	4

Source: Authors Calculation

Table 4.1: Analysis of Relationship between Efficiency of Fixed Assets Management and Overall Profitability of the Selected Pharmaceutical Companies in India for the period 2004-05 to 2022-23.

Company	Correlation coefficients between ROCE and FATR		
	Pearson	Kendall	Spearman
Abbott India (AI)	-.304	-.311	-.447
Alkem Lab (AL)	.031	.174	.220
Aurobindo Pharma (AP)	.540**	.421**	.540**
Cipla Ltd. (CL)	.208	.127	.226
Divis Labs (DL)	.160	.101	.127
Dr Reddys Labs (DRL)	.429	.148	.207
Lupin Ltd. (LL)	.727**	.646**	.802**
Sun Pharma (SP)	.684**	.691**	.860**
Torrent Pharma (TP)	.300	.216	.250
Zydus Life (ZL)	.821**	.512**	.654

Note: ** Indicates significant at 1 percent level, * indicates at 5 percent level

Source: Authors Calculation

Table 4.2: Analysis of Relationship between Efficiency of Inventory Management and Overall Profitability of the Selected Pharmaceutical Companies in India for the period 2004-05 to 2022-23.

Company	Correlation coefficients between ROCE and ITR		
	Pearson	Kendall	Spearman
Abbott India (AI)	.721**	.375*	.517*
Alkem Lab (AL)	.381	.232	.383
Aurobindo Pharma (AP)	.113	.011	.058
Cipla Ltd. (CL)	-.140	-.201	-.242
Divis Labs (DL)	.689**	.522**	.663**
Dr Reddys Labs (DRL)	.159	.168	.251
Lupin Ltd. (LL)	.710**	.611**	.747**
Sun Pharma (SP)	.486*	.501**	.672**
Torrent Pharma (TP)	.073	.048	.053
Zydus Life (ZL)	.678**	.354*	.481*
Note: ** Indicates significant at 1 percent level, * indicates at 5 percent level			
Source: Authors Calculation			

Table 4.3: Analysis of Relationship between Efficiency of Receivables Management and Overall Profitability of the Selected Pharmaceutical Companies in India for the period 2004-05 to 2022-23.

Company	Correlation coefficients between ROCE and RTR		
	Pearson	Kendall	Spearman
Abbott India (AI)	.328	.263	.395
Alkem Lab (AL)	-.356	-.242	-.341
Aurobindo Pharma (AP)	-.475*	-.343*	-.494*
Cipla Ltd. (CL)	-.559*	-.495**	-.669
Divis Labs (DL)	.143	.042	.105
Dr Reddys Labs (DRL)	.020	-.021	-.048
Lupin Ltd. (LL)	-.234	-.216	-.279
Sun Pharma (SP)	-.064	.168	.218
Torrent Pharma (TP)	.300	.216	.250
Zydus Life (ZL)	.029	-.005	-.026
Note: ** Indicates significant at 1 percent level, * indicates at 5 percent level			
Source: Authors Calculation			



Table 4.4: Analysis of Relationship between Efficiency of Cash Management and Overall Profitability of the Selected Pharmaceutical Companies in India for the period 2004-05 to 2022-23.

Company	Correlation coefficients between ROCE and CTR		
	Pearson	Kendall	Spearman
Abbott India (AI)	.303	-.026	-.086
Alkem Lab (AL)	.211	.242	.347
Aurobindo Pharma (AP)	.341	.200	.268
Cipla Ltd. (CL)	-.129	-.126	-.203
Divis Labs (DL)	.368	.211	.343
Dr Reddys Labs (DRL)	.144	.232	.329
Lupin Ltd. (LL)	.192	.116	.170
Sun Pharma (SP)	-.382	-.368*	-.564**
Torrent Pharma (TP)	-.100	-.037	-.069
Zydus Life (ZL)	-.173	.147	.245
Note: ** Indicates significant at 1 percent level, * indicates at 5 percent level			
Source: Authors Calculation			

Table 4.5: Analysis of Relationship between Efficiency of Loan and Advances Management and Overall Profitability of the Selected Pharmaceutical Companies in India for the period 2004-05 to 2022-23.

Company	Correlation coefficients between ROCE and LATR		
	Pearson	Kendall	Spearman
Abbott India (AI)	-.131	-.179	-.238
Alkem Lab (AL)	.025	.095	.131
Aurobindo Pharma (AP)	.406	.253	.343
Cipla Ltd. (CL)	-.016	-.042	-.045
Divis Labs (DL)	-.211	-.063	-.123
Dr Reddys Labs (DRL)	.316	.126	.159
Lupin Ltd. (LL)	-.502*	-.253	-.362
Sun Pharma (SP)	.043	.126	.230
Torrent Pharma (TP)	.046	.301	.419
Zydus Life (ZL)	.096	.021	.045
Note: ** Indicates significant at 1 percent level, * indicates at 5 percent level			
Source: Authors Calculation			



Table 5: Analysis of Multiple Regression and Multiple Correlation of Overall Profitability on the Fixed Assets Management and the Selected Components of Working Capital Management of the Selected Pharmaceutical Companies in India for the period 2004-05 to 2022-23.

Company	Partial Regression Coefficient						Multiple Correlation Coefficient (R)	Coefficient of Determination (R ²)	F-Value
	b ₀	b ₁	b ₂	b ₃	b ₄	b ₅			
Abbott India (AI)	6.334 (.370)	.050 (.132)	1.410 (1.138)	.344 (.471)	.049 (.220)	.024 (1.427)	.550	.303	1.216
Alkem Lab (AL)	7.582 (1.605)	1.720 (1.417)	-.032 (.054)	.695* (2.859)	-.070 (.704)	-.024 (1.427)	.811***	.658	5.389
Aurobindo Pharma (AP)	-2.410 (.095)	-6.359 (1.762)	2.984 (1.213)	8.175 (1.336)	.002 (.212)	-.006 (1.728)	.657	.432	2.130
Cipla Ltd. (CL)	2.629 (.338)	4.237 (1.982)	.575 (.541)	.208 (.356)	-.012 (1.206)	-.003 (.268)	.849***	.720	7.212
Divis Labs (DL)	17.713 (1.359)	5.563 (1.027)	.360 (.193)	1.492 (.568)	-.006 (.120)	.010 (.842)	.510	.260	.983
Dr Reddys Labs (DRL)	-5.090 (.726)	6.916** (3.479)	-.739 (.725)	1.243 (.812)	.050** (4.06)	.030 (1.533)	.821***	.674	5.794
Lupin Ltd. (LL)	24.520* (2.074)	2.991 (.948)	.432** (2.910)	-5.274 (1.605)	.022 (.653)	.003 (.857)	.799***	.639	4.951
Sun Pharma (SP)	-23.135 (1.252)	1.726 (.298)	2.212 (.787)	2.081 (.921)	.533** (2.910)	-7.410 1.336	.689*	.475	2.533
Torrent Pharma (TP)	13.273** (2.387)	4.330 (1.677)	-1.093 (.900)	.008 (.010)	.004 (.377)	.001 (1.336)	.420	.176	.598
Zydus Life (ZL)	1.981 (.258)	4.224 (.969)	.362 (.386)	3.498 (.770)	.002 (.183)	.004 (.828)	.494	.244	.905

Note: ** Indicates significant at 1 percent level, * indicates at 5 percent level
Source: Authors Calculation



THE EVOLVING ROLE OF MANAGEMENT ACCOUNTANTS IN ESG REPORTING AND PERFORMANCE

Dileep Kumar S. D.

Abstract:

In the recent years ESG has attracted a great deal of public interest because of its apparent importance for the economic health of corporations and society in large. As businesses increasingly recognize the importance of sustainability and responsible corporate practices, the traditional functions of management accountants have expanded to encompass ESG considerations. In this backdrop, this paper makes an attempt to study the evolution of the management accountant's role, the integration of ESG metrics into management accounting practices, and the challenges and opportunities associated with this transformation. Further, the study provides insights into how management accountants contribute to enhancing ESG reporting and driving sustainable business performance.

Keywords:

Environmental, Social, Governance, Management Accountants, ESG Reporting, Sustainable Business Performance

Introduction:

In today’s dynamic and interconnected business landscape, the concept of sustainability has transcended its status as a mere buzzword to become a core driver of corporate strategies and practices. Businesses, regardless of size or sector, are increasingly acknowledging their role in addressing pressing global challenges, including environmental degradation, social inequalities, and governance deficiencies. This paradigm shift has propelled Environmental, Social, and Governance (ESG) considerations to the forefront of corporate decision-making, reshaping traditional notions of business success. At the heart of this transformation lies the evolving role of management accountants – individuals once primarily tasked with financial analysis, budgeting, and cost control. The boundaries of their responsibilities have expanded significantly, reflecting the urgent need for organizations to integrate ESG principles into their operations and disclosures. It is obvious from the above, there has been a renewed and special emphasis on the study of the intricate journey of the evolution of management accounting within the realm of ESG reporting, shedding light on the motivations, challenges, and opportunities that have driven this metamorphosis and the roles of the management accountants in nurturing morality and values in the modern business era.

ESG: A Holistic Perspective

ESG represents a comprehensive framework that evaluates an organization’s

performance across three interconnected dimensions: environmental impact, social responsibility, and governance practices. This holistic perspective underscores the multifaceted nature of modern business and the imperative to balance economic success with ethical, social, and environmental considerations and they are identified below (Figure –1) followed by a brief analysis of the same.

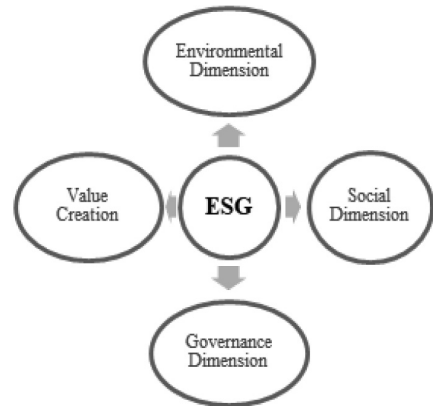


Figure - 1: ESG Framework

1) Environmental Dimension

The environmental dimension of ESG encompasses an organization’s impact on the natural world. This includes evaluating resource usage, emissions, waste management, energy efficiency, and contributions to climate change. A holistic approach to environmental sustainability involves not only compliance with environmental regulations but also proactive initiatives to reduce the carbon footprint, conserve resources, and protect biodiversity. By integrating environmental



considerations, businesses acknowledge their role as stewards of the planet and recognize the intrinsic link between ecological health and long-term business viability.

2) **Social Dimension**

The social dimension of ESG examines a company's relationships with its employees, customers, communities, and other stakeholders. It encompasses fair labor practices, diversity and inclusion, human rights, supply chain ethics, community engagement, and product safety. A holistic perspective on social responsibility extends beyond legal requirements to foster positive social impact. This may involve initiatives such as investing in employee well-being, supporting local communities, and addressing societal challenges through innovative solutions. By prioritizing the social dimension, businesses contribute to social cohesion and build stronger, more resilient relationships with stakeholders.

3) **Governance Dimension**

The governance dimension of ESG focuses on the structures and processes that guide an organization's decision-making and accountability. It includes aspects such as board composition, executive compensation, transparency, anti-corruption measures, and risk management. A holistic approach to governance emphasizes ethical leadership, integrity, and alignment with the interests of shareholders and other stakeholders. Effective governance frameworks ensure that organizations are well-managed, uphold ethical standards, and are positioned

for long-term success.

4) **Interconnectedness and Value Creation**

What distinguishes ESG from traditional business considerations is its emphasis on interconnectedness. Rather than viewing these dimensions in isolation, a holistic perspective recognizes their interdependence. For instance, a focus on environmental sustainability may lead to cost savings, enhance brand reputation, and attract environmentally conscious customers. Similarly, a commitment to social responsibility can lead to improved employee morale, increased consumer loyalty, and enhanced risk management. Effective governance practices underpin these efforts, ensuring that ESG considerations are embedded throughout the organization's operations.

Frameworks and Standards for ESG Reporting

In an era where Environmental, Social, and Governance (ESG) considerations hold increasing sway over corporate decision-making, the need for standardized frameworks to guide ESG reporting has become paramount. These frameworks provide structure, consistency, and comparability to organizations' ESG disclosures, allowing stakeholders to assess performance, make informed decisions, and hold businesses accountable. Some key frameworks and standards that underpin ESG reporting, highlighting their significance and the role they play in shaping responsible corporate practices.



- 1) **Global Reporting Initiative (GRI):** It is one of the most widely adopted ESG reporting frameworks. It offers comprehensive guidelines for organizations to disclose their economic, environmental, social, and governance performance. GRI emphasizes materiality—the principle that organizations should focus on disclosing information that is relevant and impactful to stakeholders. GRI’s framework enables companies to produce standardized reports that encompass a range of topics, from carbon emissions and labor practices to supply chain sustainability.
- 2) **Sustainability Accounting Standards Board (SASB):** focuses on industry-specific materiality, tailoring ESG reporting standards to the unique risks and opportunities faced by different sectors. SASB standards provide specific metrics and key performance indicators (KPIs) that organizations should report on. By aligning with industry norms, SASB enables investors and stakeholders to make sector-specific comparisons and assessments of ESG performance.
- 3) **Task Force on Climate-Related Financial Disclosures (TCFD):** focuses on the integration of climate-related risks and opportunities into financial reporting. TCFD recommendations guide organizations in disclosing information related to the physical, transitional, and financial implications of climate change on their

operations. By addressing climate risks, TCFD helps organizations anticipate challenges and develop strategies for resilience and long-term sustainability.

- 4) **Integrated Reporting Framework:** encourages organizations to provide a holistic view of their value creation process, encompassing financial, social, and environmental dimensions. This approach promotes the integration of financial and non-financial information, fostering a comprehensive understanding of how an organization’s strategy, governance, performance, and prospects lead to value creation over time.
- 5) **United Nations Sustainable Development Goals (SDGs):** While not a reporting framework in itself, the United Nations Sustainable Development Goals (SDGs) provide a set of globally recognized sustainability targets that organizations can align with and report progress toward. Many organizations integrate the SDGs into their reporting to demonstrate their contributions to broader societal goals.

Indian Government’s Commitment and Status towards ESG Regulations and Sustainable Development

It is clear that the world is moving towards a sustainable future, and India is leading the way in this revolutionary process. Environmental, social, and governance (ESG) factors have gained recognition from Indian regulators, who have taken steps to integrate them into the country’s



business environment. ESG factors include social responsibility, environmental sustainability, and good governance. The growing importance of ESG legislation in India is consistent with the country's commitment to promoting sustainable development. The Securities and Exchange Board of India (SEBI) has demonstrated its commitment to ethical and sustainable business practices by playing a key role in the advancement of ESG practices in the nation.

In 2012, SEBI introduced the Business Responsibility Reporting (BRR) framework, which requires publicly traded corporations to disclose their ESG (environment, social responsibility) policies. The principal aim of the BRR framework was to encourage listed companies to transition to sustainable business practices and raise their corporate governance standards. Additionally, the Reserve Bank of India (RBI) has taken the initiative to push for the banking industry to conform to ESG standards. In the meantime, the RBI established guidelines in 2016 to require banks to carry out Environmental and Social Impact Assessments (ESIA) for all new projects, ensuring that environmental and social risks are carefully taken into account when financing new initiatives.

Moreover, SEBI published guidelines in 2018 directing mutual funds to include Environmental, Social, and Governance (ESG) considerations in their investment plans. These regulations required mutual funds to openly reveal the ESG factors that affect their investing choices. Mutual funds are now prioritizing the social responsibility

and sustainability of the businesses they invest in as a result of this programme. Simultaneously, the Indian government has recognized that ESG elements are essential to achieving sustainable development. In 2021, the government unveiled the National Monetization Pipeline (NMP), an initiative aimed at generating revenue from idle assets. The NMP expressly requires that the monetization procedure follow environmentally sound and socially conscious guidelines. It's noteworthy that ESG regulations extend beyond the financial sector, with the Indian government taking proactive measures to foster sustainable practices across various industries.

The *ECO Niwas Samhita, 2020* is a series of rules that the Ministry of Environment, Forests, and Climate Change (MoEFCC) released in 2020 with the goal of promoting energy-efficient residential constructions. The objectives of these recommendations are to reduce greenhouse gas emissions and promote energy efficiency. The implementation of ESG legislation in India is a praiseworthy advancement, demonstrating the country's commitment to sustainable development and ethical corporate practices. That being said, there is still a long road ahead. Businesses must voluntarily adopt sustainable practices, and ESG requirements must be strictly enforced by regulatory agencies. Adopting ESG practices is in line with good business principles and benefits society and the environment. Businesses that use sustainable practices are more likely to draw investors and clients who value social responsibility and sustainability.



The rise of ESG rules in India is consistent with the country's commitment to attaining sustainable growth. The objectives of these legislations are to reduce hazards to the environment and society, improve corporate governance standards, and promote sustainable business practices. Even if there is still a long way to go, including ESG practices is a positive step in the direction of a sustainable future. Businesses that adopt sustainable practices stand to benefit in terms of their influence on society and the environment as well as long-term increased competitiveness.

Government oversight of businesses involved in high-emission industries like energy and industry has gotten stricter. ESG disclosures for the top 1,000 listed companies are also required by the Securities and Exchange Board of India (SEBI) under its Business Responsibility and Sustainability Reporting (BRSR) programme. In India, companies with a net worth of Rs 5 billion, turnover of Rs 10 billion, or net profit of Rs 50 million are subject to a clearly defined mandate for Corporate Social Responsibility (CSR). In an effort to draw funding from international ESG investors and financiers, these businesses must reveal their ESG profiles and commit a minimum of 2% of their net profits to CSR projects.

Following the COVID-19 pandemic, India's banking and non-banking industries quickly shifted their focus to sustainable development. By becoming a member of the Network for Greening the Financial System, the Reserve Bank of India (RBI) has taken an active part in international green finance initiatives (NGFS). The

objective of this strategic partnership is to advance the financial sector in India in terms of policy development and building resilience against climate risks. The RBI has further concentrated on stress testing, strategy formulation, capacity enhancement, and the reinforcement of risk governance structures to effectively address issues related to climate risk.

Additionally, the State Bank of India has taken significant steps by crafting ESG-compliant lending policies for companies. This move encourages businesses to operate in a more responsible and sustainable manner, aligning with the broader objectives of environmental, social, and governance considerations.

ESG Reporting as a Strategic Advantage – Why?

In an era where business success is no longer solely defined by financial metrics, organizations are increasingly recognizing the strategic value of Environmental, Social, and Governance (ESG) reporting. ESG reporting has transcended its role as a mere compliance exercise, emerging as a powerful tool that can confer a competitive edge and drive sustainable growth. In the context of high ethical and moral degradation the concept of ESG reporting has become important, because of the following key reasons and they are identified below (Figure – 2) followed by a brief analysis of the same.

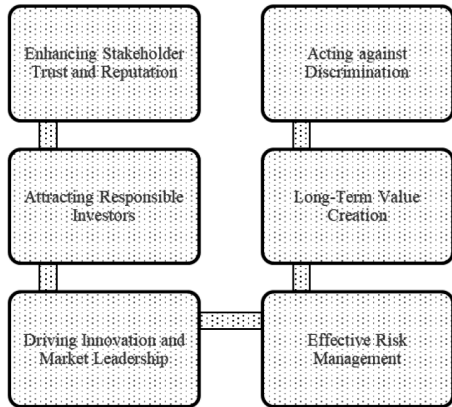


Figure - 2: ESG Reporting as a Strategic Advantage – Why?

- 1) **Enhancing Stakeholder Trust and Reputation:** ESG reporting provides a transparent window into an organization’s commitment to responsible practices. By disclosing ESG performance, organizations build trust among stakeholders, including investors, customers, employees, and communities. Transparent reporting demonstrates accountability, instills confidence, and bolsters the organization’s reputation as a socially and environmentally responsible entity.
- 2) **Attracting Responsible Investors:** Serves as a beacon for responsible investors who seek alignment with their values and risk profiles. Organizations that excel in ESG performance often attract a diverse pool of investors who recognize the potential for long-term value creation. By demonstrating

a robust ESG strategy and tangible outcomes, companies can access a broader investor base and potentially lower the cost of capital.

- 3) **Driving Innovation and Market Leadership:** Companies that proactively address ESG challenges often discover new revenue streams, operational efficiencies, and product/service enhancements. Leveraging ESG considerations as a driver of innovation positions organizations as market leaders and catalysts for positive change within their industries.
- 4) **Effective Risk Management:** It encourages organizations to identify and mitigate potential risks associated with environmental, social, and governance factors. By addressing these risks, companies enhance their resilience to market shifts, regulatory changes, and reputational crises. ESG-informed risk management strategies safeguard business continuity and protect shareholder value.
- 5) **Long-Term Value Creation:** Organizations to adopt a long-term perspective that aligns with sustainable growth. By integrating ESG considerations into strategic decision-making, companies navigate short-term volatility with a focus on enduring success. This approach resonates with stakeholders who value organizations committed to creating value over time.



6) **Differentiating in a Crowded Marketplace:** As ESG awareness grows, organizations that prioritize ESG reporting gain a competitive edge by differentiating themselves in a crowded marketplace. ESG performance becomes a distinguishing factor that influences consumer choices, talent acquisition, and partnerships. Organizations that effectively communicate their ESG initiatives stand out as preferred collaborators and employers of choice.

Challenges and Opportunities for Management Accountants

As the role of management accountants evolves in the realm of Environmental, Social, and Governance (ESG) reporting and performance, they encounter a landscape brimming with both challenges and opportunities. They are:

A Few Challenges:

- Integrating ESG metrics demands reliable and accurate data from various sources. Management accountants grapple with inconsistent data quality, fragmented systems, and varying methodologies for ESG measurement, which can hinder accurate analysis and reporting.
- Determining which ESG metrics are most material to an organization's performance and stakeholders is a complex task. Management accountants must navigate the intricate web of stakeholder expectations, regulatory requirements, and industry norms to prioritize relevant indicators.

- Standardizing ESG reporting practices across industries and geographies remains a challenge. Management accountants face difficulties in achieving consistency and comparability in ESG disclosures, making it challenging for stakeholders to evaluate performance and make informed decisions.
- Leveraging advanced technologies, such as data analytics, artificial intelligence, and blockchain, is crucial for efficient ESG integration. However, management accountants must overcome technological barriers, upskill themselves, and navigate the complexities of integrating these tools into existing practices.
- ESG integration requires a comprehensive understanding of both financial and non-financial aspects. Management accountants must acquire new skillsets related to sustainability principles, social impact assessment, and ethical considerations to effectively contribute to ESG reporting and performance.

Potential Opportunities:

- Management accountants have the opportunity to shape the strategic direction of organizations by embedding ESG considerations into decision-making processes. Their financial expertise combined with ESG insights can guide the formulation of sustainable business strategies that create long-term value.
- ESG integration enables proactive identification and mitigation of risks associated with environmental, social,



and governance factors. Management accountants contribute by conducting scenario analyses and developing risk models that enhance organizational resilience.

- By embracing ESG principles, management accountants can drive innovation and encourage the development of new products, services, and business models that address societal challenges while meeting financial objectives.
- Effective ESG integration can lead to improved brand reputation, stakeholder trust, and access to sustainable financing. Management accountants play a pivotal role in quantifying and communicating the financial benefits derived from ESG initiatives.
- Management accountants facilitate transparent communication with stakeholders by translating complex ESG data into meaningful narratives. This fosters stakeholder engagement, builds relationships, and enhances the organization's social license to operate.

Strategies and Way Forward for Strengthening ESG through Management Accountants

Here are strategies for management accountants to strengthen ESG practices within their organizations:

- Collaborate with cross-functional teams to conduct a thorough materiality assessment. Identify the most relevant ESG factors that impact your organization's operations and stakeholders.
- Management accountants can design

data collection mechanisms that gather both financial and non-financial metrics, enabling comprehensive reporting and strategic decision-making. Develop dashboards and key performance indicators (KPIs) to track ESG performance over time.

- They can quantify the costs associated with implementing ESG practices and measure the potential benefits, such as reduced operational risks, enhanced reputation, and increased stakeholder trust.
- They can assess how different ESG factors, such as regulatory changes or supply chain disruptions, may affect revenue, costs, and profitability. This informs strategic planning and risk mitigation strategies.
- Allocate resources to ESG initiatives, ensuring that responsible practices are adequately funded and integrated into the organization's strategic goals.
- Create reports that communicate the organization's progress in achieving ESG goals and demonstrate the financial and non-financial value derived from responsible practices.
- They can translate complex ESG data into understandable narratives that resonate with investors, customers, employees, and communities, enhancing transparency and building trust.
- Facilitate training sessions to enhance awareness and understanding of ESG principles, ensuring that ESG becomes an integral part of the organizational culture.
- They can analyze ESG data to uncover



areas for optimization, suggest innovative solutions, and contribute to the organization's broader sustainability goals.

Concluding Note: It is obvious from the above factual assessment that the Overall, Management accountants possess a unique set of skills that position them as key enablers of ESG integration within organizations. By leveraging these strategies, management accountants can drive responsible practices, enhance stakeholder value, and contribute to a more sustainable and equitable business future. Their analytical prowess, financial expertise, and commitment to ESG principles make them indispensable advocates for positive change within their organizations and the broader global community.

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THE INFLUENCE OF BEHAVIOURAL BIASES ON INVESTMENT DECISIONS: AN EVIDENCE BASED ON KOLKATA

*Samrat Banerjee
Rishav Mukherjee*

Abstract

Several Researches conducted earlier have substantiated behavioural finance as a catalyst in making investment decisions. The current study focuses on the determinants of investment behaviour for residents of Kolkata. A structured questionnaire has been circulated among 160 residents of Kolkata using convenience sampling technique. Principal Component Analysis was performed using SPSS for the analysis. Findings reveal investors' perception to be the most dominant factor in making investment decisions, while other factors like advertisements, consumer expenditures, risk perception, Covid-19 also influenced decisions regarding investment. Therefore, it can be asserted that majority of the determinants highlighted loss aversion as the prime behavioural bias for making investment decisions. Moreover, it can be concluded that people of Kolkata take into consideration various behavioural biases which influence their investment decisions.

Keywords:

Behavioural Biases, Investment Decisions, Investor's Perception, Advertisements, Consumer Expenditures, Risk Perception, Covid-19



Introduction

Investors need to take into consideration various factors related to the corporate world before they take their decisions to invest in the companies (Banerjee, S. & Dey, S. 2022). Besides, behaviour has a significant role to play in finance. The first concrete proof of the empirical sensitivity of trading volume to psychological influences on people was proved in research conducted in the year 2016 (Dhaoui et al., 2016). A person's decision-making is what influences his investment attitude. The culmination of psychology, economics and finance has given birth to this unique and interesting subject of Behavioural Finance. It has been observed that based on behavioural finance 80% of investment decision is psychological (Meta, R. 2015). It was also observed that the psychology of investors while taking a venture choice was significantly impacted by oneself and firm picture, incident, bookkeeping data, advocate suggestion and individual monetary necessities factors (Pandey et al., 2020). Investor awareness, Investor expectations and Tax Benefits served as three factors pertaining to mutual funds influencing investment behaviour of female residents residing in Howrah (Jain, A. 2021). This served as a motivation for our current research where we focused on the investment behaviour of people residing in Kolkata irrespective of their gender.

Literature Review

Barberis, N. et. al (1998) devised a model to identify investors' expectations regarding their estimated earnings. The

model was developed in such a manner that it justifies the empirical findings.

Baker, K. H. & Nofsinger, R. J. (2002) conducted a detailed study to examine the common mistakes that investors generally make while taking decisions. The mistakes are generally caused by an investor's emotional weakness. The mistakes can be divided into two categories one is how an investor thinks and the other is how he feels.

Zhang, Y. & Zheng, X. (2015) conducted theoretical research where they tried to find solutions to various market abnormalities that could be observed in traditional market theories. While conducting the research the authors took a questionnaire-based approach to find an answer to the problem specifically from the perspective of the Chinese Investors. The results of the research were astounding as they challenged the traditional belief of finance that is people always make rational decisions. It was observed that the investors sometimes took irrational decisions which most of the time were based on individual cognition and prejudices. This problem was also present among institutional investors.

Dickinson, B. and Hu, W. (2015) attempted to investigate into the association between stock related sentiments via tweets and the share price movement. Data was collected from November 2014 to March 2015 from Dow Jones Index for 30 companies. Correlation analysis was employed. Findings reveal that consumer based companies like Walmart and Microsoft



displayed a strong positive association between the two variables, while IT based and finance companies like Goldman Sachs and Cisco forecasted a strong negative association.

Kübilay.B. & Bayrakdaroglu. A. (2016) conducted quantitative research on the impact of investors' cognitive biases on financial decision-making. Along with this they also studied the risk tolerance level and the personality of the person. The constructed hypothesis was tested by logistic regression analysis and Chi-square analysis. They concluded that a significant relationship can be observed between the personality traits of investors and the psychological biases which in turn affected their financial risk tolerances levels.

Seth, R. & Chowdary, B. (2017) discussed about the emergence of behavioural finance. Three experiments were conducted on a group of similar kind of respondents which clearly suggest that students had more biases compared to working professionals.

Praditha et al., (2019) conducted research to see how investors react when various heuristic factors impact their psychology. The people who were considered for the study were accounting and financial management students. The results showed that overreaction was caused by the representativeness heuristic and under-reaction by the anchoring-adjustment heuristic.

Higachi, H. et al.,(2020) explained the theoretical framework of behavioural

finance with respect to stock market parameters like volatility, rate of return and volatility clustering. Findings reveal that heterogeneity in expectations along with adaptability in sentiments are important determinants of describing the role of the aforementioned parameters.

Kiruba. A. & Shanmugam. Y. (2021) conducted research where they studied how the investor's psychology was affected by the Covid-19 pandemic. Their main attempt was to identify the behaviour of the investors when the first wave of the pandemic hit India. A survey was conducted between the month of April and June of 2020, where descriptive analysis and factor analysis were employed. The research analysed the response of a person towards fear, risk, investor anxiety and vaccination updates. The research concluded that during the COVID-19 pandemic fear, risk perception and news on vaccination had a great influence on investors.

Research Gap & Purpose of The Study

Very few empirical researches have been conducted based on behavioural finance, especially in Indian context. Hardly there have been any research regarding the investment behaviour of individuals residing in Kolkata. This is an untapped area that we are trying to unveil in this research. The purpose of the study is to identify the determinants of investment behavior for residents of Kolkata.

RESEARCH METHODOLOGY

This research is based on primary data retrieved with the help of a structured



five Likert-scale questionnaire which was circulated among 160 respondents comprising of students, working professionals, teachers and businessmen residing in Kolkata. Convenience Sampling technique was used for collecting the data. Principal Component Analysis has been employed using SPSS software.

Results and Discussions

Initially, we have tested the reliability of

the questionnaire using Cronbach Alpha. The value of Cronbach's Alpha is 0.723, which indicates that the data is acceptable.

Cronbach's	
Alpha	N of Items
0.723	160

Table 1.1

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.584
Bartlett's Test of Sphericity	Approx. Chi-Square	156.694
	df	78
	Sig.	<.001

Table 1.2

KMO and Bartlett's test is generally performed to check whether the factor analysis can be performed on the given set of data. In the above chart the Kaiser-Meyer-Olkin Measure of Sampling Adequacy is 0.584 and significance level is less than 0.001. In general case for data to be adequate for factor analysis the KMO measure should be more than 0.5 and significance should be less than 0.05. In the above case both the conditions are complied with, thus it can be said that principal component analysis can be performed.

Component	Initial Eigenvalues		Total Variance Explained				Rotation Sum of Squared Loadings			
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	1.991	15.314	15.314	1.991	15.314	15.314	1.956	12.741	12.741	
2	1.555	11.958	27.272	1.555	11.958	27.272	1.618	12.450	25.191	
3	1.309	10.068	37.340	1.309	10.068	37.340	1.453	11.174	36.365	
4	1.235	9.502	46.842	1.235	9.502	46.842	1.280	9.849	46.214	
5	1.049	8.190	55.037	1.049	8.190	55.037	1.147	8.822	55.037	

Table 1.3

Table 1.3 is explaining the total variance. It is the table with the help of which we can derive the key components.

Here we have tried to conduct an analysis to receive the eigenvalues for each component. It can be observed that among the 13 components only five components are found with eigenvalue more than 1, and they together explain 55.037% of the variance. These five components are retained in the final analysis. Five factors can be taken into consideration as for the others, the eigenvalue is less than one.

Rotated Component Matrix*

	Component				
	1	2	3	4	5
Whatwillyouprefer	.749	.059	.047	.063	.094
Investment_philosophy	.501	-.011	-.014	.078	-.074
Investment_attitude	.740	.106	.174	.242	.112
Investment_Withdrawal_Period	-.050	.092	-.026	.787	.088
Security_Preference	-.023	-.719	-.065	.523	.087
Proportion_of_expenditure_on_other_fields	.063	.706	.036	.091	.006
Savings_Investment	.413	.539	.020	.417	-.161
First_Lockdown_impact	-.028	-.060	-.355	-.021	.483
Second_Third_Wave_Impact	-.301	-.190	-.275	.140	.814
Covid19_investmentbehaviour	.087	.379	-.282	.042	.523
Advertisement_Influence_Kind	.009	.001	.750	.001	.144
Advertisement_Influence_Factor	-.150	-.018	.592	-.029	-.394
Advertisement_Influence_Feel	-.007	.327	.524	-.337	.075

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 8 iterations.

Table 1.4

In TABLE 1.4 we have tried to derive the factors by observing the correlation between the item and the components. This is in terms of factor analysis can be said factor loading. In general, it is considered that more the value is above 0.45 the better will be its relationship with the components. Total number of components that could be derived from the above TABLE 1.3 are 5, that is there are exactly five components that has an eigenvalue more than 1.

By observing the values, we can derive the following factors:

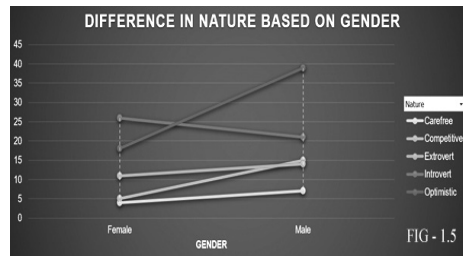
1. The first 3 items in factor 1 which are in bold represents the first factor that is “Investor’s Perception”.
2. The 6th and 7th item is representing the second factor that is “Impact of consumer expenditure on investment behaviour”.
3. The 11th, 12th and 13th item is representing the third factor that is “Impact of advertisement on investment behaviour”.
4. The 4th and 5th item is representing the

- fourth factor that is “Risk perception of an individual”.
5. The 8th, 9th and 10th item is representing the fifth factor that is “impact of covid-19 on investment behaviour”.

Comparative Analysis

Perception of The People Based on Gender and Nature

Gender is one of the most important determinants of the behaviour pattern of a person. Based on gender nature of a person also differs females generally are more introverted than males and males are more extroverted than females. These changes in the nature of a person have a direct impact on investment behaviour.



In the above comparative line chart, we have tried to put forward how based on gender the nature of a person changes. If we consider the females, they are way more introverted than the males as shown by the pink line. On the other hand, the males are way more optimistic than the females. If we take into consideration “being extrovert” an unusual thing can be observed that is more or less both males and females show level. This is quite unusual because in general terms quite the opposite is considered.

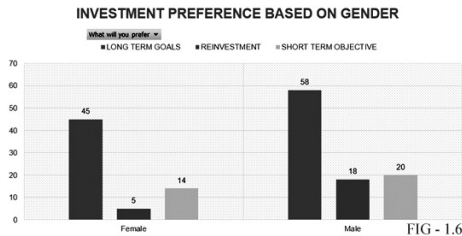


FIG - 1.6

In the above graph, it can be observed that both the males and females have similar kind of preference levels. Both of them are risk averse to some extent and tend to invest long-term so that they can nullify the extent of loss substantially. When considering the option of reinvestment then it can be seen 18.75% of the males that is (18 out of 96) are considering reinvestment whereas only 7.812% of the females that is (5 out of 64) are conserving the option of reinvestment. Thus, it can be said that the males are taking more risks than the females as they are reinvesting whatever they have earned in the hope of earning more. This shows that they are concentrating more towards wealth development than females. Furthermore, the males are investing based on their perception. Perception is playing a major role in investment for males.

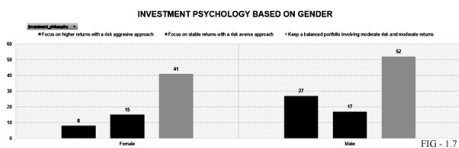


FIG - 1.7

Now if we want to look into the investment psychology of the males and females then it can be seen that both are focusing more on keeping a balanced portfolio so that they can mitigate the loss/she might earn in the

course. But if we consider the males then the males are ready to take more risks to earn more than the females. This is also

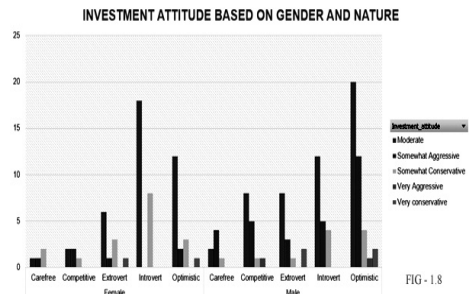


FIG - 1.8

eminent in FIG-1.6.

The above graph further segregates the genders based on their nature and how the investment attitude is changing based on gender and nature. In general terms, it can be observed that the males across the various natures are having a “somewhat aggressive” attitude more than the overall female population which is directly at par with the previous findings although everyone is inclined more towards being a moderate investor.

When we consider the female then it can be seen that among the females those who are introverted, they are either moderate investors or somewhat conservative. This shows that their nature is directly impacting their investment behaviour. A substantial amount of variation can be observed among those who are optimistic. Though a moderate investment attitude is dominant across most of the characters optimistic females are also showing somewhat aggressive, somewhat conservative, and very conservative attitudes. This is quite

natural as in general, females are more risk-averse than males as proved by the earlier graphs.

Now coming to the male population, it can be observed that the males who are optimistic are not only moderate and conservative investors but also to some extents are also considering investing aggressively. This is because males have a tendency to take more risks as they are more optimistic which means they always have a mindset that something good will happen sooner or later. Now among the males who are competitive in nature, they are not at all showing a very conservative approach. They are regarding that they will one way or the other surely will gain a good position and subsequently earn profit through diversification.

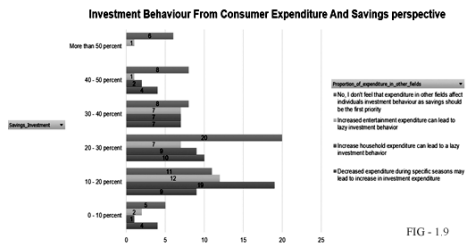
A biasness can also be observed between both genders, an extrovert male who would tend to take more risk is considering a very conservative approach while an introvert who in general is considered to be a risk-averse person is not at all showing a conservative approach and strikingly the percentage of introvert males who are having a somewhat aggressive attitude is more than a conservative risk-averse approach. Similarly, a carefree female is inclined more towards a “Somewhat conservative” approach which is not at all in link with the character of the person.

Thus, it can be said that males invest based on the perception they have created and are generally more risk-takers than females but the overall population if considered at a macro level is inclined towards a risk-averse approach. Biasness and irregularity are quite common because the psychology

of a person is very hard to determine based on their nature or gender.

Consumer Expenditure On Investment Behaviour

Expenditure and savings are one of the most important aspects. These two are the crust on which the entire world of income works. An increase in expenditure will lead to a decrease in savings simultaneously an increase in savings could be observed with a decrease in expenditure. Now coming to savings. Savings are also spent in two ways. One is it is invested to earn from it and the other is kept to fulfil future needs. Now if we can analyse the mindset of the people towards their expenditure then we can see how it is affecting savings which directly links to investment.



In the above bar graph, the first thing which can be observed is that most people have opted to invest 10-20 per cent of their savings followed by 20-30 per cent. This shows that they are willing to take risks but in a measured way. It was also eminent in the investor attitude graph where it was seen that most of the people opt to invest moderately. Now coming back to the above graph, it can be observed that in general most of the people who think investing in other fields does not affect savings

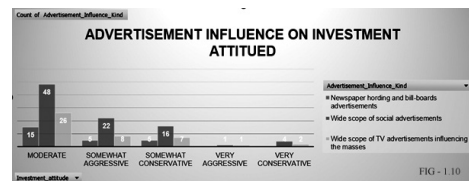
investment are investing 20-30 per cent and more in general but an exception can also be observed amongst the people who are investing 0-10 % of their investment. This might happen due to many other factors other than the dominant mindset. Amongst the people who have opted to invest 10-20 per cent of their investment, household expenditure is the biggest influencer which is standing in the way of investment. It is prohibiting people from investing in assets of various risk classes with returns. This is very natural among moderate investors because they always try to balance every aspect.

Advertisement Impact

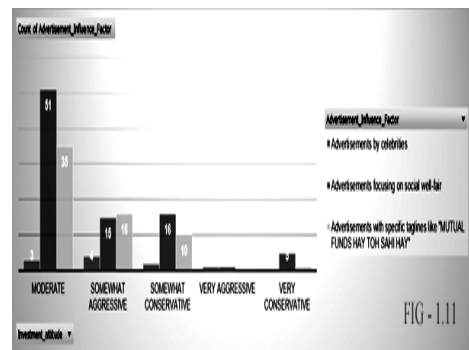
The investment attitude of a person refers to the method in which he or she tends to go forward with their investment like whether to proceed with a moderate approach or invest moderately whenever the environment feels to be safe and prospective based on his/her perception. Then someone can opt for a moderately aggressive way of investing. This means the person might not be daily but frequently indulge in trading and investing activity. Next comes conservatism. This means that the person tries to hold on or stray away from investment. This means that based on his/her risk perception a person can opt to constrict himself/herself to we can say a particular stock of a Blue-Chip company and hold on to it without looking for any other options or ways. This attitude can also be moderate, or it can also be quite stringent.

Now, companies always try to attract more people towards their company, so they start

advertising. Advertisements always have a psychological impact which may be direct or indirect. Thus, there is a very strong chance that these advertisements can have an impact on the investor's psyche. So, to understand that we need to see what type and kind of advertisements have the maximum influence.



In the above column chart, we have considered the various modes of advertisements and their influence on the investment attitude of the people. Now it can be observed that social media advertisements have the most amount of influence. It has a persistent influence across every kind of business attitude from moderate to very conservative. People who moderately invest are impacted the most by social media advertisements which are nearly 48 followed by TV advertisements and lastly billboards. This trend is





persistent across all types of attitudes. It is quite natural due to the rampant rise of smartphones, social media, and technology.

Types Of Advertisements And Their Impact On Investment Attitude

In the above column chart, we have tried to observe which factors of advertising influence investors' attitudes the most. Thus, it can be seen that across all the various kinds of attitudes, the factor that influences the most is social welfare. It can be observed as the most influential factor among the moderate, somewhat conservative, and very conservative people. But a change can be observed among the somewhat aggressive investors. Here it can be seen that catchy taglines are way more influential than social welfare. Lastly, advertisements by celebrities have the least influence. This I guess can be observed because people have been able to develop an understanding of the artificial world from where most celebrities originate and when an advertisement is done by a sports figure it sometimes creates a negative view in the minds of the people.

Thus overall, advertisement has a significant impact on decision making.

Covid-19 Impact

The covid-19 pandemic can be coined as one of the biggest factors in the economic depression. Covid-19 was not only a local problem but was also a global problem which impacted not only the lives of individuals at a micro level but also the companies and government at the macro level. This had a direct impact on the investment behaviour of the people. So,

in this research we have tried to find out how the lockdown impacted the decision-making of the people.

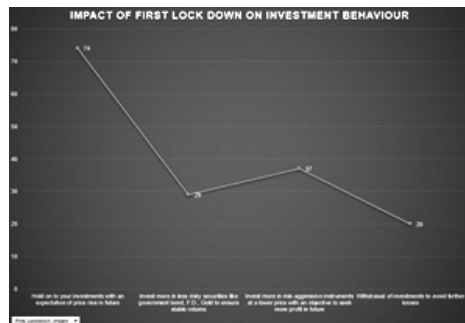


FIG - 1.12

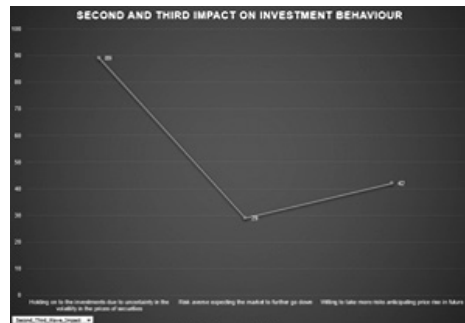
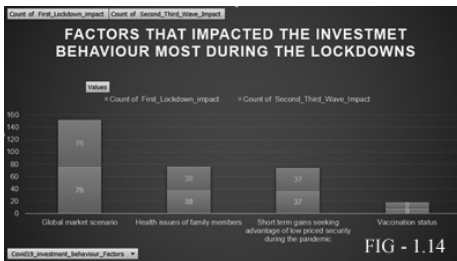


FIG - 1.13

First, Second and Third Lockdown Analised Side By Side

During the first, second and third lockdowns, it was observed that nearly 46% that is (74 out of the 160 people) and 55% that is (89 out of 160 people) are opting to hold on to their investments with the hope that the investment will rise, and Covid-19 is a temporary problem. During the first lockdown, people also considered investing in risk-aggressive instruments which were available at a

low price which was also similar to the second and third lockdowns as well. None of the people wanted to withdraw their investments during the first lockdown and this is because they might have thought that the markets will surely rise in the future. The impacts of the first, second and third lockdowns are quite similar. We believe this is because nearly 35.6% of my overall people are optimistic in nature and they always expected that something good is waiting on the other side of the dark tunnel of the Covid-19 pandemic.



Factors That Impacted The Investment Behaviour Most During The Lockdowns

In this graph, we have tried to check why the people are behaving in a particular manner during the first, second and third lockdowns. The factor which has the most influence is the “Global market Scenario”. When the totality of all the lockdowns is taken into consideration it can be observed that people’s investment behaviour is based on the global market scenario. Then came health issues and Vaccination status had a very low level of impact on the overall investment attitude.

Now,

If we consider the results of the factor analysis, then it can be observed that the overall investment behaviour is affected by five elements. Among them the most impactful factor is: “The perception of a person” followed by “the impact of consumer expenditure” subsequently advertisements, risk involved and lastly the covid 19 pandemic.

From this it can be said that perception of a person is the most important factor and Covid-19, although being a major economic crisis world-wide has a very little impact on the investment behaviour of a person.

Conclusion

On conducting Principal Component Analysis, we can conclude that the people of Kolkata are very much risk averse. They tend to place themselves in a position that would not earn them massive losses. Loss aversion bias came out to be the most dominant bias which can be identified from all the determinants. Their personal expenditure has a substantial impact on their investment decision-making. If you consider TABLE 1.3 then it can be seen that “Consumer expenditure on investment behaviour” has the second highest percentage of variance, which is 11.958. Advertising is the third biggest factor which impacts on the decision-making of individuals. The percentage variance of it is 10.068 as per TABLE 1.3. Though covid-19 had an impact on the investment decision it was not that significant. The most important factor that impacts a person’s decision-making is his/her perception. Though all the other factors have an impact, the factor “Investor’s Perception” is the most



dominant factor, and it has the most impact out of all the other factors. Its percentage variance is 15.314 which is the highest.

Now based on the factors derived and to understand the extent of the impact of the factors at a micro level various comparative charts are taken into consideration. From the charts, it could be observed that the people are risk-averse in nature at a macro level but if we segregate them on basis of gender and nature then it was observed that although both genders are risk-averse, the males are more risk takers than females as they are focusing more on wealth development. People have a very positive attitude towards investment, and they are trying to manage their expenditures in a manner that they could invest at least 20-30 per cent of their savings in various asset classes. Furthermore, with a rise in the use of social media people's investment decisions are mainly impacted by social media advertisements which contain a message of social welfare. This shows that people are very sensitive towards the message that is delivered through advertisements. The fact that people are risk-averse is also eminently visible while taking into consideration the covid-19 pandemic where most people are holding on to their investments not taking any rash decisions and taking the global market scenario into consideration which is the best approach during a worldwide pandemic. This shows that people are very optimistic in general and do not get easily affected, demotivated or lose hope too soon in their decisions. They are confident and know exactly how to balance a particular scenario in the most effective way, which will not only be beneficial but also will be less risky.

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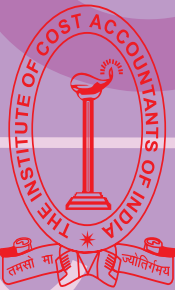
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