Impact Factor (GIF:2019) 2.8229 ISSN-L 0972-1754

VOLUME 26 • NUMBER 2 • December 2022

INDIAN ACCOUNTING REVIEW

INDIAN ACCOUNTING ASSOCIATION
RESEARCH FOUNDATION

INDIAN ACCOUNTING REVIEW

Annual Subscription Rates

In India : Individual : ₹800; Institution : ₹1200
Abroad : Individual : US $50; Institution : US $100

INDIAN ACCOUNTING REVIEW

Vol. 26 No. 2 December 2022

CONTENTS

Indian Accounting Review
Vol. 26, No. 2, December 2022

CORPORATE RESPONSES TO ENVIRORNMENTAL CHALLENGES – A THEORETICAL UNDERPINNING[1]

Bhabatosh Banerjee
Formerly of the University of Calcutta
Email: bhabatosh.commerce@gmail.com

ABSTRACT

This paper, based on author's two earlier studies, briefly explains several types of environmental challenges and examines the nature of would-be corporate responses to mitigate the negative impact on environment and improve quality of life. In dealing with the latter, it also gives Social Contract argument and Quality of Life argument. The paper is based on available literature for underpinning the theoretical approach.

Key words: Environmental challenges, Corporate responses, Quality of Life, Social Contract Argument

I. INTRODUCTION

The public debate about business and the environment had been going on since long. The 1970s saw an adversarial relationship between companies and environmental groups. During the 1980s, this relationship began to change as politicians, economists, executives and environmentalists began developing measures for the integration of economic and environmental objectives. Some companies began to view the environment as a business opportunity and proactively pursued a 'green market'. Others placed themselves at the forefront of 'a new form of capitalism' that considers environmental and social concerns while conducting business. This phenomenon came to be known as 'greening the corporations' (Robbins, 2001)[2].

Two important questions arise when we study the responses of corporate sector to the environmental challenges. *First*, what are the environmental challenges faced by companies? *Second*, how do companies respond to such challenges? Accordingly, the objectives of the present paper may be put in a nutshell as follows:

Identifying environmental challenges faced by the companies, and examining the nature of responses of the companies to such responses.

[1]The paper is based on author's UGC major research project, "Accounting for Corporate Environmental Management: A Study of Selected Industries in India" [No.F.5-12/2002 (HRP) dated 07.03.2002] an abridged and edited version of which was published as *Corporate Environmental Management: A Study with Reference to India* by PHI Learning Private Ltd. in 2009.

[2]Greening' or 'going green' has its origin in C. Reich's book, *The Greening of America,* Random House, New York, 1970.

The study is theoretical and is based on the survey of available literature. It therefore suffers from some limitations. One of them may be that in order to measure responses, one has to go through annual reports of companies during a current period. But considering its reasonable volume, it should be subject matter of a separate study for publication. The present study is divided into: Environmental Challenges in Section II and Corporate Responses to such challenges in Section III. Section IV gives summary and conclusions.

II. ENVIRONMENTAL CHALLENGES

The environmental challenges faced by companies can be put under several key categories: (i) Atmosphere, (ii) Toxic chemicals and waste, (iii) Freshwater, (iv) Land, (v) Oceans, (vi) Biotechnology and (vii) Biodiversity. These are briefly explained in the paragraphs that follow.

Atmosphere

Most companies should focus their attention on the atmosphere due to a number of factors. These factors are as follows:

1. There are wide-ranging environmental regulations in the world to regulate air quality and for atmospheric protection. The Clean Air Act, 1970 of the US is such an example. Under the Clean Air Act, the Environmental Protection Agency (EPA) is responsible for regulating airborne toxic emissions.
2. Public awareness of atmospheric issues is much higher now (Rowlands, 1995).
3. The international deliberations on ozone depletion and climatic change suggest that more regulatory changes are likely to come (Susskind, 1994). Again, of all the environmental regulations, regulation of air pollution has received the highest attention.
4. Companies should give priority to issues related to ozone depletion because of consumer pressure combined with competition from chlorofluorocarbon (CFC) alternatives (Porter and Brown, 1991).

Pollution of air is one of the key issues which should be addressed to improve quality of life of citizens. Air quality index (AQI) gives us an idea about the quality of air. The range of AQI is generally given as follows:

AQI Range	Nature of quality
0 – 50	Good
50 – 100	Satisfactory
100 – 200	Moderate
200 – 300	Poor
300 – 400	Very Poor
400 – 500	Severe

The Times of India (ToI) Kolkata published the AQI of five metro cities in India, Bengaluru, Chennai, Delhi, Kolkata and Mumbai, on October 26, 2022 (popularly mentioned as 'Post-Diwali' AQI) which shows the following position:

TABLE 1

Air Quality Index in five Metro Cities in India

City/Time	*1 am*	*3 am*	*6 am*	*9 am*	*12 pm*	*3 pm*	*Average*
Bengaluru	126	128	131	133	132	158	135
Chennai	189	169	244	261	256	261	230
Delhi	317	329	330	329	328	308	323.5
Kolkata	48	47	47	48	49	49	48
Mumbai	106	106	121	128	128	130	120

Source: ToI, Kolkata, October 26, 2022, p.1.

On a post-Diwali day, Kolkata (the City of Joy) shows a remarkably high quality of air (good category) followed by Mumbai (Moderate), Bengaluru (Moderate), Chennai (Poor) and Delhi (very poor). Experts however said that the high wind speeds, due to the effects of cyclone *Sitrang*, along with intermittent rain played a big role in cleaning up Kolkata's air: not only were pollutants disbursed quickly, the rain also ensured suspended particulate matter (SPM) levels were low. Another huge factor was the significant drop in the use of polluting firecrackers, thanks to better awareness of the public and regulatory measures taken by the Government.

Air pollution issues have become important to companies ever since the debate on global environmental change started. This is because about half of all global greenhouse gases[3] are generally related to the activities of the corporate sector. Table 2 shows the corporations' involvement in the generation of greenhouse gases.

TABLE 2

Estimated Involvement of Corporations in the Generation of Human-generated Greenhouse Gases

Important sources	**Amount of gas generated** (Per cent of total amount)	**Measure**
Emissions from automobiles; use of coal, fossil fuel, etc.	50	CO_2
Oil and gas production and use; emissions from coal mines	10–20	CH_4
Use of aerosol sprays, air-conditioners, solvents, foam products and refrigerators	60–70	CFCs
Emissions from automobiles, use of coal, fossil fuel	50	NOx and Q_3

(Adapted from UNTC, *Climate Change and Transnational Corporations: Analysis and trends*, UNO, New York, 1992, p. 15.)

[3]Concentration of greenhouse gases has increased greatly in the atmosphere because of human activities. These gases are believed to contribute to the greenhouse effect and, therefore, may cause global temperatures to rise (Robbins, Peter T., *Greening the Corporation–Management strategy and the environmental challenge,* Earthscan, London, 2001). The most important of these gases is carbon dioxide co_2 that contributes half of the effect of greenhouse gases.

Around 50% of all greenhouse gases can be traced, in one way or the other, to the operations of various companies. This includes half of oil production, production of vehicles in developed countries, most of the CFC production, and a large proportion of electricity production and its use. Companies are also greatly involved in the production and use of toxic materials which include asbestos, dioxins, polychlorinated biphenyls (PCSs), and volatile organic compounds (VOCs) which, when discharged into the air, water and on land, can cause serious health problems (UNTC, 1992).

At present, however, reduction of greenhouse gas emissions is not a priority for most of the companies. Many companies have policies that deal with air quality but not with greenhouse gases *per se*. This is because reduction of some of these emissions does not appear to be cost-effective (Hawken, 1994).

Toxic chemicals and hazardous waste

Chemicals are used to manufacture hundreds and thousands of end-products, many of which are toxic. These toxic chemicals are discharged into the environment, either directly or indirectly. The examples of the toxic chemicals that are discharged directly are fertilizers, pesticides and some solvents. Mining and fuel-burning industries indirectly discharge chemicals into various water bodies. Hazardous chemicals can be released in solid, liquid or gaseous form into the air, water and on land.

Every chemical is toxic to some extent and is harmful to living beings. It can create chronic health problems. Pesticides and herbicides kill between 10,000 and 40,000 people in developing countries every year (Robbins, 2001). Pesticides cause water pollution, soil degradation, insect resistance and their resurgence, and destruction of native flora and fauna. Some pesticides deplete the ozone layer as well.

Pesticides are big business for companies. Companies in developing countries market pesticides on the rationale that they will increase agricultural production, thereby increasing access to food and reducing hunger. Higher production will also boost exports and foreign exchange, thus increasing the country's gross national product (GNP). Fertilizers are marketed on similar grounds. The use of fertilizers is thus increasing rapidly in developing countries. However, the benefits of pesticides and fertilizers are declining due to the law of diminishing returns. Hazardous wastes, e.g., metallic compounds, acids, asbestos, organo-phosphorus compounds and many others, are also produced by industries. Thus, toxic and hazardous chemicals are the most important environmental issues that should concern the corporate sector. There are many instances of unscrupulous dumping of wastes by some companies (Allen, 1992). For example, in 1992 alone, Pepsi Cola Bottling Corporation exported over 7,000 tonnes of plastic waste from California to Chennai and Mumbai (Leonard, 1993).

There have, of late, been some important international agreements on trans-boundary movements of toxic chemicals and hazardous wastes. An example of such a treaty is the Rome IV Convention between the European Union (EU) and the African, Pacific and Caribbean (APC) countries, which bans toxic waste exports from the EU to the APC countries (DESD/TCMD, 1993). Nevertheless, the export of toxic waste to developing countries is continuing and is unlikely to

stop in the near future because companies need to dispose of their wastes, and governments in developing countries need 'the business' (Slaughter, 1996).

Corporate responses to toxic chemicals and hazardous wastes have mostly been brought about as a result of highly publicized accidents in chemical factories. These responses include formulation of policies and programmes, taking measures to assure the public of the safety of the operations, and so on.

Freshwater

A number of countries today are facing water scarcity. If the population of the world reaches 10 billion by 2050 as predicted, the current patterns of freshwater use will become unsustainable (IUCN/UNEP/WWF, 1991).

In developed countries, industry is the largest consumer of freshwater accounting for 50%–80% of the total demand, while in developing countries, it accounts for about 10%–30%. However, in majority of the countries, especially in the developing countries, agriculture is the major consumer of freshwater. Globally, it accounts for about 70% of freshwater use (UN Survey, 1993).

Industries use water mainly for cooling, processing, cleaning and removing industrial wastes. Water thus becomes heavily polluted with chemicals and heavy metals. It is termed as *polluted water* which accounts for 87% of industry's total freshwater use (Robbins, 2001, p. 8). Among various industries, pulp and paper, chemicals, petrochemicals and refining, electricity generation (thermal plant), iron and steel, food processing, textiles, etc., are the major sectors that pollute freshwater. For example, production of one kilogram of paper and that of one tonne of steel may consume up to 700 kgs and 280 tonnes of water, respectively (Postel, 1993).

In developed countries, industrial waste discharges are rigorously controlled. In contrast, in developing countries, the discharges of industrial wastes into the water bodies are mostly uncontrolled; this adversely affects the water quality. In these countries, contamination of water is a common and severe problem, especially in those areas where industrial plants are concentrated. The jute mills located along the banks of the Hooghly river in West Bengal are a prime example of how the 'Ganga Water' gets polluted by discharges of wastewater from industries.

Many developed countries now require industries to meet specific water quality standards before discharging wastewater to the water bodies. The most effective and economic way to comply with these requirements is to treat and recycle water, thereby discharging less polluted water (Postel, 1993). Thus, pollution control laws in many countries have helped in the conservation and efficient use of water by companies.

Land

Land is an important and scarce natural resource. Environmental problems on land are generally created by desertification, soil loss, deforestation and degradation. Hazardous wastes and toxic materials are also dumped on land, which pollute the environment. The loss of forests or deforestation has become an important environmental issue because forests support a variety of plant and animal species and provide a carbon sink that could help counteract global

warming. It also affects biodiversity.

There are many international pacts that deal with some of the above problems. These include Tropical Forestry Action Plan (TFAP) developed by the World Bank to promote sustainable use of tropical forests; the Food and Agriculture Organization (FAO) Code of Conduct on the Distribution and Use of Pesticides to promote preservation of agricultural resources, human health, etc. Companies must support and implement such plans for ensuring sustainable use of land resources. This will benefit the long-term interests of business (UN Survey, 1993). Corporate environmental policies and programmes should focus on desertification, deforestation, and soil degradation. Companies should build *safety zones* around their manufacturing plants[4].

Oceans

Human activities on land and at sea are degrading marine resources in many parts of the world. Most ocean pollution originates on land and ends up in the sea—40% of this pollution enters the sea from rivers, 30% from the atmosphere, and the remaining 30% is the result of shipping, dumping, offshore mining and oil production (Robbins, 2001, p. 11). According to the Group of Experts on the Scientific Aspects of Marine Pollution, the main contaminants of the oceans (UNDP, 1990, p. 184), arranged in descending order, are:

1. nutrients from urban sewage and runoff,
2. microbial contamination from sewage,
3. plastics from land and sea dumping,
4. synthetic organic compounds (e.g., pesticides and industrial chemicals), and
5. oil from transportation and spills.

The corporate sector is the major producer of arsenic, mercury, chlorinated hydrocarbons and other toxic substances. Companies that are active in mining and metal and chemical processing and oil production are responsible for polluting seas and oceans by dumping industrial wastes. Oil exploration and transportation are another important source of sea pollution. Many big petroleum companies have lobbied against tougher international agreements on ocean resources since the 1950s (Porter, Brown, 1991). Compared to other regions, there is little regulation on the use of marine resources. Although there are some corporate efforts to minimize oil and chemical spillage, environmental issues concerning the oceans are not high on the corporate agenda as yet.

Biotechnology and biodiversity

Biotechnology is a relatively new area of scientific research. The application of biological organisms, systems and processes to industrial processes is known as biotechnology. Living organisms have been exploited over centuries for producing food, drugs and other products. Microorganisms have been used to make bread,

[4]A safety zone is a cordoned off area of land surrounding a plant. It can minimize human death and injury in the event of an accident. For example, in Union Carbide's Bhopal accident in which thousands of people died, safety zones were minimal or non-existent (Srivastava, P., Greening Business: *Profiting the corporation and the environment,* Thompson Executive Press, Ohio, 1996).

convert milk to cheese and brew alcoholic beverages. Vinegar and many types of antibiotics and vitamins are manufactured by using microbial organisms. Of late, genetic engineering has allowed an unprecedented degree of flexibility and control in industrial processes (Crump, 1991).

Biodiversity or diversity of biological species is very important for sustaining life on earth. But industrial activities may result in the loss of species due to deforestation, oil and gas drilling, mining and road building, etc. Species are being lost at a faster rate than in any other recent geological time period (Goldsmith & Hildyard, 1988). Twenty-five per cent of the species are expected to be extinct or in serious danger of extinction by 2050 (IUCN/UNEP/WWF, 1991).

Biotechnologies may have devastating environmental effects also. The attempt to develop pesticide tolerant plants by pesticides and seed companies has often led to greater chemical dispersal into the environment leading to its degradation. This is a cause for serious concern, especially for developing countries. Most biotechnology firms are US-based corporations and have successfully lobbied against agreements that may result in restriction in the production of pesticides. Therefore, the first step towards better environment management in this context would be for every company to honestly assess its environmental impact on plants and animals, and try to formulate appropriate environmental management policies.

III. CORPORATE RESPONSES

Companies generally respond to issues which are concrete and easily quantifiable, and where there is pressure on them to change from governments and other regulatory or voluntary groups (UN Survey, 1993). Issues that have a history of regulation are well addressed by the companies. For example, the US led corporations focus their attention on land issues because of Superfund legislation in the US (1980). Issues in developing countries, on the other hand, are normally ignored by many companies based in these countries due to lack of proper legislation. Thus, we need to address the following three questions:

1. Why should corporate management respond to the environmental challenges that affect their operations?
2. Do various users of accounts need environmental information for evaluating corporate environmental performance?
3. Why should management be obliged to provide environmental information in their annual reports?

Corporate environmental responsibility, as a part of broad Corporate Social Responsibility (CSR), has been discussed extensively in various economics and management literature. However, all economists are not fully convinced about the need for CSR. For example, Prof. Milton Friedman (1970) believes that corporate goal is to maximize profits and firms should thus focus on their business activities only. Accordingly, the social and environmental activities do not fall within the purview of the corporate sector. Rather, the government at different levels should deal with such problems. This is, however, a minority viewpoint. The concept of corporate social and environmental responsibility has been widely supported in the literature under social contract argument, and quality of life argument.

3.1 Social Contract Argument

The discussion on social contract argument in favour of corporate social responsibility became prominent in the early 1970s (Dahl, 1972; Votaw, 1973; Shocker and Sethi, 1973). Later, Ramanathan (1976) formalized a general accounting framework. Expanding the ideas of external diseconomies, Ramanathan developed a comprehensive theoretical work on Social Accounting by using the concept of Social Contract (Jaggi, 1997).

The social contract argument is based on the notion that business firms do not exist in a vacuum—they are a part of society that creates and supports them. Also, companies owe their existence to laws which have been developed by the society. Thus, society's support for the existence of the companies depends on their socially desirable performance. In other words, it is the natural expectation of the society that business firms would not engage in socially undesirable activities including pollution of the environment. If they are engaged in such activities, society may be forced to take steps such as boycotting the firm's products and services, taxing the offending activities, shutting down plants, modification of existing laws, development of new laws, etc., to penalize the offenders with a view to bringing them back on the desirable track.

But the validity of the social contract argument has also been challenged by many (Lindblom,1984; Puxty, 1986). It has been argued (Tipgos, 1977) that the social contract argument is based on ambitious corporate legal rights and obligations which are not enforceable by law. The argument is considered to be too narrow to capture the true nature of the relationship between society and firms. The opponents of social contract notion argue that the firm as a social institution exists as a *matter of privilege* and not as a matter of right. It is, therefore, difficult to explain this relationship by the social contract approach. Since this concept is not capable of explaining the true nature of the relationship between society and firms, the concept appears to be inadequate and unrealistic for the development of objectives and reporting format for social and environmental accounting.

In spite of the above, the social contract concept has been found useful in projecting the social and environmental concerns of the society and in emphasizing the need for socially and environmentally desirable behaviour from firms. Nevertheless, to make the social contract argument more desirable and acceptable, it is important that questions with regard to the form it takes and the social accountabilities that might be attached to it need to be properly answered (Gray, *et al.*, 1987).

3.2 Quality of Life Argument

According to Dierkes (1979), the 'quality of life' argument changed both the society's expectations from and attitude towards the corporate sector. Unrestrained economic development increased the social costs to staggering proportions, as is evident from environmental pollution and social ills, and triggered a shift in the society's attitude towards industrialization. Industrialization began to be perceived as maximizing its profits by exploiting environmental and social systems. In order to stop this exploitation, society revalued its attitude towards the corporate sector, and revised its expectation from it. Accordingly, only the

type of economic development that does not adversely affect the quality of life was considered desirable. This shift in society's expectations and attitude was moulded by a number of developments which took place during the last several decades. Some of them are as follows:

1. The power of labour unions resulted in inclusion of the quality of life issues in labour negotiations during the 1970s. Consequently, safety in work environment, among others, is now considered an important factor.
2. The emergence of the consumer movement in many countries led to a greater awareness of corporate social responsibility with regard to the safety of products. This awareness resulted in several legislative actions designed to protect consumers from corporate abuses.
3. Damage to the physical environment in the form of air and water pollution alarmed society and resulted in a movement towards protecting the environment. Consequently, several environment protection laws were passed in many countries.
4. Society recognized that natural resources were limited and their unrestricted use would result in their depletion. Accordingly, conservation of resources and efficiency in the use of resources assumed new importance.

This shift in the attitude of the society led to its expectation that corporate enterprises should behave in a socially and environmentally responsible way. With the passage of time, companies also realized their social and environmental responsibility and recognized the need for greater cooperation with society.

Regarding the question as to why management should be obliged to provide environmental information in the annual reports, first we have to identify the *users* of environmental information and the *purposes* for which they need such information.

Investors are generally considered to be the major users of financial information. It can, therefore, be argued that they would also be the primary users of environmental information. Another group of users would be the public, especially the environmentalists, who represent the society's interest in protecting the environment. Regulating agencies, involved in setting standards for emission of pollutants, would require environmental information to evaluate whether or not the standards are complied with. The concerns for environmental pollution and the need for proper information on the firm's environmental performance has now assumed greater importance at the international level also. We will now elaborate these points.

Environmental information to meet investors' needs

Many studies have analysed the relationship between social information disclosed in financial statements and movement of stock prices (Belkaoui, 1976; Anderson and Frankle, 1980; Jaggi and Freedman, 1982; Shane and Spicer, 1983). The major assumption of these studies was that the movements in stock prices at the time of disclosure of social information would indicate that investors' decisions were influenced by the social information contained

in financial statements. Jaggi and Freedman (1982), in particular, examined the relationship between pollution disclosures and stock price movements. Their results provided evidence that supported the relationship between stock price movements and disclosure of social information in general, and pollution information, in particular, in the financial statements, thereby implying that the investors used social information including environmental information for their investment decisions. Accordingly, investors needed environmental information for their investment decisions. However, the results of the empirical studies need to be interpreted with caution because movement in stock prices could be caused by several factors other than disclosure of social and environmental information. Nevertheless, it is now being increasingly realized that pollution information plays an important role in the investment decisions, especially for investments in firms belonging to polluting industries. Investors would be at a greater risk if the firms were found to be in violation of certain environmental laws and would likely to incur heavy clean up costs to comply with the standards. Accordingly, availability of environmental information would enable the investors to properly evaluate their risks before making their investment decisions.

Society's need for environmental information

There is no doubt that the society is more concerned with a firm's economic health. Information on financial performance of the firm meets the needs of the society. But over time, due to increasing awareness of environmental pollution, the society is increasingly showing its concern on the firm's activities on environmental issues. It is now being recognized that for achieving sustainable growth, economic, social and environmental concerns should be properly balanced. If a firm, especially from polluting industries, achieves economic growth by polluting the environment, the society is ultimately likely to bear the cost of this pollution in terms of medical costs and lower quality of life. Therefore, society needs environmental information for evaluating a firm's environmental performance.

Environmental activists observe the environmental performance of the firms in many countries. There are many non-government organizations (NGOs) also which take active interest in watching economic, social and environmental performance of firms. In India, High Courts of different states and the Supreme Court of India are giving priority to environmental litigations, and with a view to protecting quality of life and environment, 'Green Benches' have been constituted to deal with environmental issues on a priority basis. Consequently, firms can no longer ignore environmental issues and their environmental responsibility. The various environmental groups would, accordingly, need relevant and timely information on the firm's environment related activities for proper evaluation of its environmental performance. Thus, society becomes an important user of environmental information.

Environmental information for regulation

Regulatory bodies watch a firm's environmental performance to ensure that the norms are complied with. Various regulatory bodies have been created in India to protect the quality of environment and life. One of the requirements is

that firms, especially those belonging to polluting industries, should disclose all environment related and social information, either in financial statement and/ or in special reports to be filed with the regulating agencies. The details of the Indian scenario in this context may be subject mattu of a separate study. Thus, regulating agencies need pollution information in order to monitor the firm's environmental performance and ensure compliance with the standards.

Environmental information needs: The international dimension

Many developments have taken place at the international level to deal effectively with concerns for environmental pollution in both developed and developing countries. For example, the World Environmental Congress held in 1992 at Rio de Janeiro had a great impact not only on creating awareness about protecting environment among the member countries of the UN but also in translating this awareness into legislative actions in many countries, including India, to regulate the activities of the corporate sector for better environmental management.[5] In the new globalized economy, the corporate sector needs to be even more environment-conscious and manage their activities properly to enhance their competitive advantages. Firms, especially multinational ones, have to meet the demand of the international community to show that they are controlling the harmful effects of industrialization. To ensure that the corporate enterprises meet these demands, national and international regulating bodies require their environmental information. So, the concern for environment and need for pollution information are now crossing the national boundaries and is assuming greater international importance.

The foregoing discussion emphasizes the need for information on environmental performance to satisfy the needs of various interested parties—the investors, environment activists, regulatory bodies and society at large. How can such information be made available to all of them? Would these information be available in the financial statements of corporate enterprises to comply with legislative requirements? In the absence of legislative requirements, would the management of companies be obliged to publish such information voluntarily?

At present, there is no disclosure format for publishing environmental information even in the developed economies. So long as the regulatory disclosure requirements are not streamlined, users of environmental and pollution information would have to depend on the voluntary efforts of the management to publish such information. So, the key question is—why should the management publish environmental information voluntarily?

Research studies have shown that a variety of considerations motivate management of a company to disclose information voluntarily and not wait for mandatory requirements. Although cost-benefit analysis plays an important role in such a decision, some of the important considerations for voluntary disclosure of information are (Banerjee, 2002) discussed below.

---

[5]Such Summits or Congresses have been followed up by the UNO through periodical Conventions or Conferences of its 196 member-countries to limit global temperature well below 2°C (35.6°F) by 2050. Examples of such efforts are : The Paris Agreement (COP26) in 2016, the Climate Summit in 2022 (known as COP27).

Stock market consideration

The most important reason for voluntary disclosure is the stock market consideration. Gray *et al.* (1990) have argued that companies may be motivated to provide additional information to influence the stock prices. Several studies (Belkaoui, 1976; Andersen and Frankle, 1980; Shane and Spicer, 1983; Jaggi and Freedman, 1982) have been conducted to test the association between stock price movements and environmental disclosures. These studies have shown that management of a company may be motivated to provide environmental disclosures to influence the stock prices.

Political costs consideration

The political cost motive was originally developed by Watts and Zimmerman (1986). Fines, penalties, potential public hostility towards the company are some examples of political costs. It is now recognized that political costs may play an important role in decisions relating to additional disclosure in the form of social and environmental information (Belkaoui and Karpik, 1989). Disclosure of environmental information can be considered to reassure the public, or the regulating agencies, that companies are concerned about the environment and are doing everything possible to reduce the negative impact of their activities on the environment.

Users' needs consideration

Guthrie and Parker (1990) have argued that companies may disclose social and environmental information to meet the stakeholders' demand for such information. The argument is based on Users' Utility Model. This is based on the premise that users need additional information to meet their utilities and companies may respond to such needs based on their perception of utilities of the users. Thus, disclosure of additional information on a voluntary basis depends on the users' needs, and how these needs are perceived by the management of companies.

Ideological goal consideration

It has been argued that companies would be motivated to disclose voluntarily additional information to serve their own political and ideological goals (Guthrie and Parker, 1990). Such disclosure would be guided by companies' agenda, ideologies and goals which are likely to be different for different companies even within the same industry. Consequently, disclosure of such information will vary from one company to another.

So, disclosure of additional information on a voluntary basis by the management of companies cannot be looked upon as something made by management without any purpose.

IV. SUMMARY AND CONCLUSIONS

The available studies on sustainable development underpin the responsibilities of corporate enterprises to manage effectively activities that affect, directly or indirectly, the wholesome environment and hence quality of

life. It is also a welcome development that in the COP27 (2022) final ducument, there has been an inclusion of "Sustainable Life Style". Here, we have examined briefly the nature of environmental challenges faced by companies and how they should respond favourably to the challenges. We have also analysed the concept of corporate social and environmental responsibility on the basis of social contract argument and quality of life argument. Then the need for environmental information for evaluation of corporate environmental performance has been argued from the standpoint of investors, society, and international community. The supply of environmental information in the corporate annual reports for use by stockholders has also been stressed.

Although in the absence of any legal compulsion, the willingness of management of a company to disclose environmental information is heavily influenced by a cost-benefit analysis, research studies have shown that a variety of considerations (e.g., stock market consideration, political costs consideration, user needs consideration and ideological goal consideration) motivate management of a company to disclose environmental information voluntarily without waiting for mandatory requirements. Companies should inculcate an "environmental sense" to contribute to the "quality of life style". The need of the hour is to follow in letter and spirit the slogan: *Be Environment friendly and Enjoy Competitive Advantage.*

References

Allen, R., *Waste Not, Want Not: The production and dumping of toxic waste*, Earthscan WWF, London, 1992.

Anderson, J.C. and Frankle, A.W., "Voluntary Social Reporting: An ISO beta portfolio analysis", *Accounting Review,* 1980, pp. 468–479.

Ashford, N., "Understanding the Technical Responses of Industrial Firms to Environmental Problems: Implications of government policy", in Fischer, K. and Schot, J. (Eds.), *Environmental Strategies for Industry: Inter-national perspectives in research needs and policy implications*, Island Press, Washington D.C., 1993.

Banerjee, B., "Accounting for Corporate Environmental Management in India", *The Management Accountant*, December 2002.

Belkaoui, A., "The Impact of the Disclosure of the Environmental Effects of Organizational Behaviour on the Market", *Financial Management*, April 1976, pp. 26–31.

Belkaoui, A., and I.G. Karpik, "Determinants of the Corporate Decision to Disclose Social Information" *Accounting, Auditing and Accountability Journal*, Vol. 2, No. 1, 1989, pp. 36–51.

Crump, A., *Dictionary of Environment and Development: People, places, ideas, and organizations*, Earthscan, London, 1991.

Dahl, R., "A Prelude to Corporate Reform", *Business and Society Review*, Vol. 12, No. 1, 1972, pp. 17–23.

DESD/TCMD, *International Environment Law: Emerging trends and implications for transnational corporations*, United Nations, New York, 1993.

Dierkes, M., "Corporate Social Reporting in Germany: Conceptual developments and practical experience", *Accounting, Organizations and Society*, Vol. 4, 1979, pp. 87–109.

Friedman, M., "The Social Responsibility of Business is to Increase Its Profits", *New York Times Sunday Magazine, September 13*, 1970, pp. 32–33, 124–126.

Goldsmith, E. and Hildyard, N., *The Earth Report: The essential guide to global ecological issues,*

Price Stern Sloan, New York, 1988.

Gouldson, A. and Murphy, J., *Regulatory Realities: The implementation and impact of industrial environmental regulation,* Earthscan, London, *1998.*

Gray, R., Owen, D. and Maunders, K., *Corporate Social Reporting: Accounting and accountability*, Prentice-Hall Inc., London, 1987.

Hawken, P., *The Ecology of Commerce: A declaration of sustainability*, Harper Business, New York, 1994.

IUCN/UNEP/WWF, *Caring for the Earth: A strategy for sustainable living,* Earthscan, London, 1991.

Jaggi, B. and Freedman, M., "An Analysis of the Information Content of Pollution Disclosures", *Financial Review*, 1982, pp. 142–152.

Jaggi, Bikki, "Environmental Responsibility and Disclosures in Global Business Environment", *Proceedings of the 5th International Accounting Conference,* IAA Research Foundation, January, 1997.

Leonard, A., "South Asia: The new target of international waste traders", *Multinational Monitor*, Vol. XI, No. 2, 1993.

Lindblom, C.E., "The Accountability of Private Enterprise: Private—No. Enterprise—Yes!" in A.M. Tinker (Ed.) *Social Accounting for Corporations*, Manchester University Press, 1984.

Petry, E.S. (Ed.), *Business, Ethics and the Environment: The public policy debate*, Quorum Books, New York, 1990.

Porter, G. and Brown, J. (Eds.), *Global Environmental Politics,* Westview Press, Boulder, Colorado 1991.

Porter, M.E., *Competitive Advantage: Creating and sustaining superior performance,* The Free Press, New York, 1985.

Postel, S., "Facing Water Scarcity", in L. Brown, *et al.* (Eds.), *State of the World 1993: A Worldwatch Institute Report on Progress Towards Sustainable Society*, Earthscan, London, 1993.

Puxty, A.G., "Social Accounting in Immanent Legitimation: A critique of a technicist ideology", in Neimark, M. (Ed.), *Advances in Public Interest Accounting*, Vol. 1, JAI Press, Greenwich, Connecticut, 1986, pp. 95–112.

Ramanathan, K.V., "Toward A Theory of Corporate Social Accounting", *Accounting Review*, 1976, pp. 704–11.

Reich, C., *The Greening of America*, Random House, New York, 1970.

Robbins, Peter T., *Greening the Corporation: Management strategy and the environmental challenge*, Earthscan, London, 2001.

Rowlands, I., *The Politics of Global Atmospheric Change*, MIT Press, Cambridge, 1995.

Shane, P. and Spicer, B., "Market Response to Environmental Information Produced Outside the Firm", *Accounting Review*, 1983, pp. 521–538.

Sharp, M. and Pavitt, K., "Technology Policy in the 1990s: Old trends and new realities", *Journal of Common Market Studies*, Vol. 31, 1993, pp. 129–151.

Shocker, A.D. and Sethi, S.P., "An Approach to Incorporating Societal Preferences in Developing Corporate Social Action", *California Management Review*, Summer 1973, pp. 97–105.

Shrivastava, P., "*Greening Business: Profiting the corporation and the environment*", Thompson Executive Press, Cincinnati, Ohio, 1996.

Slaughter, T., "The Improbability of Third World Government Consent in the Coming North-South International Toxic Waste Trade", in W.M. Hoffmen, R. Frederik and Shrivastava, P., G*reening Business: Profiting the corpora-tion and the environment*, Thompson Executive Press, Cincinnati, Ohio, 1996.

Susskind, L., *Environmental Diplomacy: Negotiating more effective global agreements*, Oxford University Press, New York, 1994.

Tipgos, M.A., "Toward A Theory of Corporate Social Accounting: A comment", *The Accounting Review*, 1977, pp. 977–983.

United Nations Organization, *Global Reporting Initiative–Sustainability Guidelines*, New York, 2002.

UN Survey, 1993.

UNDP, 1990, p. 184.

UNTC, *Climate Change and Transnational Corporations: Analysis and trends*, UNO, New York, 1992.

Votaw, D., "The Nature of Social Responsibility", *Journal of Contemporary Business*, Winter, 1973, pp. 1–20.

Watts, R. and Zimmerman, J.L., *Positive Accounting Theory*, Prentice Hall, Englewood Cliffs, New Jersey, 1986.

Welford, R. and Gouldson, A., *Corporate Environmental Management Systems and Business Strategies*, Pitman Publishing, London, 1993.

Indian Accounting Review
Vol. 26, No. 2, December 2022

The Role of Accounting in Changing Environment: Some Thoughts[1]

M Harunur Rashid
President, Bangladesh Accounting Association
Former Professor of Accounting, Dhaka University
Email: harun@bacbd.org

ABSTRACT

Accounting has always been an essential part of human civilization since antiquity with its many-fold contribution in the management of resources for their beneficial use in economic and social progress and prosperity. In pursuance with societal transformation, Accounting has continuously assumed the transition with every innovation to elevate the practice and profession in harmony with human urge for the discharge of accountability and good governance. In the spree of 4th Industrial Revolution. the accelerated process of digital transformation is a reality that has been thrust upon the accounting world, and everyone else, sooner than expected. Compounding this, human folk are facing some huge challenges: *recovering from two years of intermittent lockdowns, the very real prospect of insolvency, escalating energy prices, tax rises, living with Covid, the cost-of-living crisis and the war in Ukraine* with all its global consequences. As technological innovation continues, human being seemingly leapfrogged ten years in a matter of month. This has thrown before Accounting-a billion dollar question- how can accountants help position their functions and in turn help the economy and business navigate their way toward a more rewarding, sustainable future. Precisely, the call is already afloat for the discipline to navigate through new horizon with a look the bigger picture, to focus on adaptation with appropriate technology and building skill-based human resources for the future. Internet of Things (IoT) driven Cloud Computing, AI, Blokchain, Artificial Intelligence (AI) are some of the key areas of automation that are set to change the face of accounting operations, delivering efficiency, reducing errors, and optimizing workflows, while assisting professionals with real-time economic decision-making based on insights driven by accounting data. This precisely represents the future of accounting at the moment. At this point of digital hype, professionals are eying at what's around the Bend in the World of Accounting education, research and practice? It is really hard to know what lies ahead. These are the trends that are currently being seen, and they could take on entirely new shapes and arcs as time passes. However, one thing is known for sure: Accounting is no longer the cold, stagnant industry that it once was. Academics and professionals are more apt than ever before to embrace change and innovation, opening up opportunities for greater efficiency, increased accuracy, better security, and more cost-effective services.

Key words: Internet of Things (IOT), Artificial Intelligence (AI), Big Data, Block Chain

[1]This is the revised version of G. D. Roy Memorial Lecture (2022) given by the author at EIILM-Kolkata during the national seminar of IAA Research Foundation held on September 3, 2022.

I. INTRODUCTION AND OBJECTIVES

The history of mankind testifies that Accounting has had its origin in antiquity. It is seen as being socially constructed to instill myriad of trust in human behaviour. It is in practice by the people for the people to ensure trust and confidence of the people since the beginning of recorded history. It was more of an art at its origin in terms of people's social relationship wherein the *desire* for information and communication played a very critical role. This is equally true even for today with that *desire* being transformed into an essential service. Accounting has a profound history of service to humanity where it traditionally played a stewardship role. The image of physical resources portrayed in some form or the other in clay tablets, engraved in walls, tree-trunks or stones served as a historical record to demonstrate accounting as an extension of the owner's personal memory. However, with its potent influence in society, Accounting has embraced every sphere of socio-economic life of human being and transformed into an information system to impact individuals in an environment of trust and confidence. Throughout its development trajectory, Accounting has been found to well adapt with changes in its techniques and environment, for example, from *personalized memory* to *book-keeping* to *accounting* to *reporting,* to *accountability* in compliance with regulatory requirement, and so on. On the other hand, in its gradual transformation it has adopted with technology as well, for example, from *pen-paper based manual exercise* to *calculator* to *automation* with *computer-tab-mobile based software and programmes*. Most of us may probably agree with the mode of transformation in the field of accounting and financial management so far. But, the objectives of this paper is to converse on the pace of innovation surrounding accounting and financial management and to envision the road map for adaptation with today's speed in the pursuit of value addition in real life.

II. METHODOLOGY

This paper is the outcome of a desk research carried out to decipher different aspects of accounting and financial management functionalities in the milieu of on-going innovations at an exponential rate impacting the profession in terms of education, training and practice. Relevant information and inputs are captured from various secondary documents and reading materials disseminated through articles, reports, and e-publications in different forms. The future trend of accounting and financial management functions are depicted here highlighting the most common concerns for today's adaptation and to link those with future trend that are reshaping the course of accounting education, research and practice.

III. TECHNOLOGY AND ACCOUNTING

Over the last decade or so, technology has been developing at an exponential rate. It has had a big impact on the way we live and the effect on the ways we work has been even greater. Over the decades, technology has changed how people manage many different aspects of socio-economic functions. Accounting is no exception. Access to faster software within the framework of interconnected technology has made accounting perfect-fit to perform more complex jobs both

easily and more efficiently. Indeed, organizing financial information, analyzing data, dissemination of results and measuring economic impact has never been so much simpler. In fact, the convergence of accounting and information system is so diversified that countless digital arena has now become a reality. The edge of technology in accounting has truly arrived tendering a paramount mark on one of man's oldest industries. It is therefore imperative to underscore here a few of the following biggest impacts in which technology has changed the accounting industry in the last couple of years.

Internet of Things (IOT)

The internet is something which is touching almost all of us in our daily life. Too often, people think of the internet as nothing more than a communication media, an extended postal service, a place for company website and a means of social network. However, there is a momentous change that is currently sweeping across the professional world: **the cloud.** This cloud is a reservoir of information with unlimited diversity, accessible at any point of time from anywhere with unrestricted usability. Accounting is most prone to this cloud-based system (IOT). *In its general term, IOT can be described as a system of interrelated computing devises, mechanical and digital machines capacitated with unique identifiers (UIDs) and the ability to transfer endless data over a network without requiring human-to-computer interaction (Karmanska, 2021).*

Cloud-based systems are now being found popular in all accounting services to streamline all of people's personal, business, and/or corporate information. Wherever they are, at whatever time of the day, all they have to do is log on, and they are able to immediately access data. *What does this mean to accounting as a service or profession? Here are just a few of the many ways it can impact professional and service processes.*

Big data;
Artificial intelligence (AI);
Machine learning, and
Block Chain.

The terms 'big data', 'AI', 'machine learning' and 'block chain' are often used interchangeably but there are subtle differences between the concepts. A commonly used definition of big-data refers to *"high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making"*.

Big data is therefore often described in terms of 'three Vs' where **volume** relates to massive datasets, **velocity** relates to real-time data and **variety** relates to different sources of data. Recently, some have suggested that the three Vs definition has become tired through overuse and that there are multiple forms of big data that do not share the same traits. While there is no unassailable single definition of big data, it may be useful to regard it as data which, due to several varying characteristics, is difficult to analyze using traditional data analysis methods.

Artificial Intelligence (AI) comes here to expose the benefits of big data analytics, where AI is introduced as "*the analysis of data to model some aspect of the world. Inferences from these models are then used to predict and anticipate*

possible future events". This may not sound very different from standard methods of data analysis. But the difference is that AI programmes don't linearly analyze data in the way they were originally programmed. Instead they learn from the data in order to respond intelligently to new data and adapt their outputs accordingly. AI is therefore ultimately about: "…giving machines (computers) behaviour which would be thought intelligent in human beings" (Russell, and Norvig, 2021). It is this unique ability that means AI can cope with the analysis of big data in its varying shapes, sizes and forms. The concept of AI has existed for some time, but rapidly increasing computational power has led to the point at which the application of AI is becoming a practical reality. One of the fastest-growing approaches by which AI has achieved is machine learning.

Machine learning is defined as:"…the set of techniques and tools that allow computers to 'think' by creating mathematical algorithms based on accumulated data." Broadly speaking, machine learning can be separated into two types of learning: supervised and unsupervised. In supervised learning, algorithms are developed based on labeled data sets. In this sense, the algorithms have been trained how to map from input to output by the provision of data with 'correct' values already assigned to them. This initial 'training' phase creates models of the world on which predictions can then be made in the second 'prediction' phase.

In summary, IOT can be subtly referred to as a unique opportunity to exploit big data as an asset where AI can be seen as a key to unlocking the value of big data; and machine learning is one of the technical mechanisms that underpins and facilitates AI. The combination of all three concepts has been called 'big data analytics'. Some of the derivatives from IOT based on big data, AI and machine learning may be articulated as follows:

- **Analyzing data** in real-time is now possible because everyone within the enterprise will enjoy access, by authenticity, to the most recent data. Cloud computing makes e-format documents from the web easier to collect and use.
- **Unlimited data storage** space as one's business grows—no matter how large the accounting files are or how many s/he has. One can synchronize files across multiple platforms. The files are secure and automatically backed up on the cloud.
- **Sharing of accounting information** is made easy and convenient by having records in the digital format, and on one comprehensive system. Management and retrieval of files are more easily done when needed. Distributing accounting information to different branches within the company will also become a breeze. Moreover, using simple and ready-to-go cloud-based systems will significantly reduce information technology and file-keeping expenses. Security, backup, and data retrieval have also benefitted greatly from cloud technology.
- **Accountants' role** in the industry has diversified and elevated with completely different focus. By using accounting software and cloud computing, accountants gathers data and makes computations quickly and easily. They spend the bulk of their time analyzing the data to discover ways for the client to improve their business today and plan

strategically for tomorrow. They are part of the senior management team to facilitate decisions based on industry insights from across the world. IOT empowered Accountants to veer away from time-consuming number crunching and increasingly are being able to expand into more specialized and strategic roles. More specific and value-adding roles are now up for grabs, and skilled accountants can provide more high-level specialty services. These may include data analysis and interpretation, providing financial planning and advice, and more involvement in company's ongoing operations.

- **Staying in the same digital space** with stakeholders including management and clients for the provision of efficient and real-time services with accurate information. Digitizing data and operations is beneficial not only for those working within the ranks for the company but also for wider clients.

Blockchain is a new technology that was introduced more than a decade ago, after financial crisis of 2008, and there is still a long way to being accepted and adopted by everyone in managing their financial record keeping. Blockchain (Ramasamy and Kadry, 2021) can be described as the chronological record of block transactions. To ensure transactions, the cryptography is used, based on a chain of digital signatures. Each block is a group of transactions that are added to the last block by reaching a consensus on its authenticity among users, which is then passed to each network user to update their database. The Blockchain system records all transactions ever made, shared by consensus distributed and shared among each participant's users, and it is very difficult to force it. Since every two-key sign-in and any transactions are cryptographed and simultaneously maintained in distributed ledgers of each Node, which make this almost impossible to be hacked (Simoyama, et el, 2017).

The invention of the blockchain that already found an application in finance through the cryptocurrencies, by many is currently considered as the solution to implement the triple entry. The move to a financial system with a significant blockchain element offered opportunities and new approaches for accountancy area. Nowadays, blockchain can help accountants to gain clarity over the available resources and obligations of their organizations (Faccia and Mosteanul, 2019).

Imagine the typical old-school accountant-client interaction. The accountant and the client both have to make time to meet at a specific time and location. They make their way there so that they can go through documents and discuss the client's financial situation. If the client gets stuck in traffic, it throws off the accountant's schedule. And, if the accountant has some kind of delay, they've wasted the client's valuable time. Then, an important decision-maker may be angry enough to switch another accounting firm.

With the advances in accounting technology, there is no longer a need for on-site consultations. Because accountants and clients alike are able to access real-time data remotely, both parties can simultaneously view, edit, and comment on their statements. Then, they can convene and discuss in whatever manner is most convenient, including web-hosted video conference and to live in the same digital space with real-time information.

What it means for accounting as a profession or an academic pursuit

Clients and accountants are on the same page. One can connect with the other in the most convenient way. Accountant can serve more clients due to faster and more efficient processes and clients can get diverse services on real-time basis. Advantage is living in the same digital space, of course with borders of confidentiality and wisdom (Haque and Islam, 2015).

In addition, software and applications with consumer functionality have allowed non-accounting professionals to understand what is going on with their finances more easily. And, when clients can view and analyze the data on their own, they get excited about their financial situation and are prepped to understand accountant's strategic suggestions. In the end, it means clients can thrive through optimized business operations, so they stay in business, expand their company, and remain your customer.

Mobile Accounting via specialized accounting software

It might be stating the obvious to say that we have become increasingly dependent on our mobile devices. Yet despite their ubiquity, there are many advantages to mobile devices that small businesses have yet to take full advantage of. There are now mobile applications dedicated to accounting functions. Here are just a few of the tasks one can now take care of on one's own mobile device as for example, *Create and send invoices***;** *Capture receipts***;** *Create claims and capture signature; financial settlement; keeping accounts and ledgers;* and so on.

One can accomplish all this with just a couple of swipes on a screen, and transaction data are seamlessly synced in the system and backed up to the cloud. When an issue arises that needs an immediate answer, one will have access to the files and data s/he needs, no matter where they are. One can also use customer management software on his/her devices to improve customer support and communication. Through your CRM software and increased connectivity via mobile devices, you can build better relationships with your clients.

With a smart phone or tablet and mobile device management from professional IT support provider, people can take his/her office with them wherever they go. That means no more waiting until you get back to the office. That's important because clients are as busy as you are. They're going to appreciate your work even more when you can deliver critical answers at the moment when they need them. And, that appreciation drives increased customer loyalty.

One by one, accountants are doing away with the traditional pen, ledger, and desk calculator. More efficient processing tools and specialized accounting software are now available in the digital world that allows quicker input and computation of data. Even the act of manually entering information into software is declining as scanning technology makes it possible to simply photograph a page and let the software complete the relevant fields itself. Technology driven information has drastically improved accuracy and reduced the margin of error. In the process, it has turned one of the most traditional white-collar industries into a fast-paced and dynamic profession. As an accountant in today's world, it is necessary to stay up-to-date with the most recent advances in technologies to remain competitive and increase productivity.

Automated Mind-set

A decade ago, roughly 75% of the work of a finance function was repetitive processing work, while around 25% was intellectual and advisory. Those figures have now flipped as most corporate houses automate processes and systems and look to their accounting function for deeper analysis and forecasts. Now more than ever, it's vital for accounting/finance functions to present themselves as profit generators rather than cost-saving centers. The demands of today's business climate are forcing human being to do more with less. Even the most crucial cost-oriented operational teams are now asked to deliver greater value toward the organisation's bottom line. Automating time-consuming, manual tasks means freeing up accounting staff to focus on more strategic work. Payments processing is still very time-consuming and manual, so it's easy to mess up. But with so many automation tools and payment gateway in the market, real-time data is enabling corporate to have a more accurate, real-time view. With increased automation, the accounting function will have more time to focus on things such as capturing more timely payments and improved collection of other receivables such as deposits, structured payment arrangements, or any other items a business requires.

Accounting and financial management functions were already on a journey of change for sometimes now, albeit slowly. Heads-up was there decades back. What the pandemic did was force corporate and business to accelerate their digital journey. Now accounting and financial management functions must prove they are up to the challenge of adapting. As we navigate through the fog of uncertainty, what is becoming clearer is how intelligent systems can enable better decisions in business and how accountants can harness them to their advantage. What businesses need more than ever is a tech-savvy commercial accountant, rather than one focused purely on technical compliance issues. It is up to them now to seize the opportunity the new era of accounting affords forging with shifting learning, better decision making and superior risk management.

IV. EMERGING TECHNOLOGY IN ACCOUNTING EDUCATION

The rapid pace of technological change continues to disrupt traditional procedures in all spheres, including the accounting profession. It is now the right time to examine the potential effects that disruptive technologies will have on both the profession at large and accounting education, in particular. The suffix like *Information Systems* with Accounting is not enough. Transformation in curricula has to happen to shape convergence in accounting education with continuously evolving technology to meet the needs of the new environment. The robotic process automation (RPA), AI, blockchain, smart contracts, and advanced analytics have reshaped existing business models and facilitated the emergence of new ones wherein repetitive and mundane tasks are becoming less important and the need for high-level skills is increasing. Though it still will be some time before these technologies affect the workplace at a significant scale, the current "entry-level" jobs that require no or low-level cognitive skills may eventually disappear. It has been estimated that at least 50% of the work that accountants and other professionals are paid for is automatable through

currently available technologies, with an additional 15% automatable through forthcoming technologies.

V. CONCLUSION

Both accounting and related functions are experiencing a major wave of automation that most likely will result in substantive reduction of staff. With massive automation as part of adopting IoT, traditional mix of jobs in accounting and financial management, including auditing will change substantially, and professional accountants will need to learn new skills and practice diverse skill-sets to remain relevant in that environment. The technical integration and analytic needs of the accounting work will increase substantively. The need for a major wave of educational change has been emerging with the advent of distance education, various forms of unorthodox training, and a large set of new learning needs.

The emerging technologies create a mismatch between the supply and demand of necessary talents. Students graduating from traditional accounting programmes usually do not have the knowledge and skills required by employers, and this is especially true of workplaces with high-level adoption of automation and AI. To catch up, students must have exposure with new skill sets and the academics should rethink about adapting those in the curricula. So accounting education system needs suitably revamped. The relation between teaching and research is intimate. Research is widely considered as the gateway of a good education system. Taken together, they need to maintain a healthy equation with the professionals and practitioners. The outlook of the profession must also change to help improve accounting education and research. At this juncture of digital hype, professionals are eying at what's around the Bend in the World of Accounting? It is impractical to try knowing what lies ahead. These are the trends that are currently being seen, and they could take on entirely new shapes and arcs as time passes. However, one thing is known for sure: Accounting is no longer the cold, stagnant industry that it once was. Leaders in the space are more willing than ever to embrace change and innovation, opening up opportunities for greater efficiency, increased accuracy, better security, and more cost-effective services.

References

Faccia, A and Mosteanu, N. R., 2019. Accounting and blockchain technology; from double-entry to triple-entry; *The Business and Management Review,* Volume-10, No.-2; April, , Pp-108-115.

Haque, S. and Islam, M. A., 2015. Stakeholder pressures on corporate climate change-related accountability and disclosures: Australian evidence. *Business and Politics,* 17(2), pp.355-390.

Karmanska, A., 2021. Internet of Things in the Accounting: Benefits and Challenges; *Operations Research Decisions,* Vol. 3, DOIs. 10.37190/210302; pp. 23-39

Ramasamy, L. K. and Kadry, S., 2021. *Blockchain in the Industrial Internet of Things, May, http://www.researchgate.net/publication/351554927*

Russell, S.J and Norvig, P, 2021. *Artificial Intelligence: A Modern Approach,* (4th Ed); Hoboken : Pearson (ISBN-10:0-13-461099-7), pp.31-39.

Simoyama, F.D.O., Grigg, I., Bueno, R. L. P., & Oliveira, L.C.D., 2017. Triple-entry Ledgers with Blockchain for Auditing, *International Journal of Auditing Technology,* 3(3), 163-183.

Indian Accounting Review
Vol. 26, No. 2, December 2022

Capturing Financial Volatility of Post-Arab Spring Crisis: Evidence from GCC Nations

Raktim Ghosh*
Department of Commerce, Maharaja Srischandra College
E-mail: raktimghosh19@gmail.com
and
Soumen Saha**
Department of Commerce, University of Gour Banga
E-mail: sahasoumen1993@gmail.com

ABSTRACT

This study measures the financial volatility in the select stock market indices from Gulf Cooperation Council (GCC) nations. Efforts are made to estimate volatility, variability in volatility, and the joint effects of the ARCH and GARCH models considering the Arab Spring crisis. Stock markets from Bahrain, Oman, UAE, Qatar, and Saudi Arabia are considered from the 3rd week of December 2010 up to the 4th week of October 2022 with 618 sample observations. Jarque-Bera (JB) test confirms the normality whereas the breakpoint unit root test confirms the non-existence of the unit root. Significant volatility is noted for all the stock markets whereas variability is noted for all except Bahrain All Share (BAX).

Key words: Arab Spring, Breakpoint unit root, GARCH

I. BACKGROUND OF THE STUDY

The growth of a nation's economy depends heavily on the stock market. They support economic growth and help stabilize the pricing of financial products based on the supply and demand of investors. Additionally, it encourages lingering capital to draw in international investors and permits corporate expansion. They are regarded as the main indications of the conditions prevalent in many countries' politics, economies, and security (El-Chaarani, 2019). The stock market is crucial in acting as the foundation of the economy. Before the Arab nations could fully recover from the crisis of the subprime catastrophe, another shock from the crisis of the Arab Spring struck.

2010 saw a political crisis in various Arab countries in the form of anti-government protests, unrest, and armed rebellions that swept across the middle east. The name "Arab Spring" was initially coined in 2011, during the spring, when these protests began to escalate. The main goal was to enhance democracy and freedom inside the countries, notwithstanding disparities in the aims in

*Corresponding Author
**Recearch Scholar

different countries.

The UAE, Kuwait, Bahrain, Oman, Qatar, and Saudi Arabia are the six oil-exporting nations that make up the Gulf GCC, a financially and ideologically extreme alliance. As far as the GCC countries are concerned, they are now dealing with a low rate of return, a lack of liquidity, and an excess of volatility as a result of the Arab Spring crisis. This may also be referred to as the crisis' aftermath.

The crisis' repercussions can be seen in many stock markets in the Middle East and North Africa (Zaiane, 2018). According to certain research (Abdelbaki, 2013; Acemoglu et al., 2018), the geopolitical conflicts in Syria, Lebanon, Yemen, Iraq, Libya, Tunisia, and Egypt have slowed the recovery of a few stock markets and the economic sector in the Middle Eastern economies (El-Chaarani & Ragab, 2018; El-Chaarani & El-Abiad, 2019; El-Chaarani, 2019). Furthermore, Acemoglu et al. (2018) acknowledged a link between the volume of protests and the undervaluation of Egyptian stock markets.

Following the Arab Spring crisis, the stock markets of the GCC nations must now be assessed while taking into account the volatility of their capital markets along with variance in the volatility of the expectation of their directing influence on the economic and political pronouncements in the Middle East region.

II. PRIOR STUDIES

It is difficult to obtain studies on GCC nations that illustrate the post-Arab Spring environment. The authors also took into account research from Middle Eastern and North African (MENA) nations, where the effects of the Arab Spring were also clearly felt. According to Balcilar et al. (2023), the estimation of financial connectedness and risk spread among MENA economies were studied minutely considering different outlay prospects and reliance under market conditions using 11 sample MENA countries. Daily data during the period from June 30, 2006, to June 30, 2021, were considered. The empirical findings indicate a robust and positive correlation between financial stress co-movements and spillovers in certain MENA nations, especially during long-term and extremely high-stress periods. In addition, the five Gulf nations have stronger financial ties among themselves than with other nations. In contrast to Tunisia, Saudi Arabia is the major source of financial strain and danger for the MENA economy, whereas the risk that North African nations face is often not as severe. Likewise, Korotayev & Khokhlova (2022) studied the stability volume of the MENA countries, where it was maintained between 2011 and 2012 and dramatically rose between 2013 and 2016, which was affected by the Arab Spring. It is also to be noted that the study made by Yousuf and Zhai (2022) revealed that over time, there has been less of a net shock transmission from oil prices to the markets in the GCC. Moreover, in reaction to the worldwide epidemic, connectivity almost doubled. Finally, as they progressively become net transmitters of spillovers to other international equity markets, the Chinese stock markets are also changing. DCC-GARCH models and the Diebold and Yilmaz (2012) approach were used within this study. Moreover, Khondker, H. H. (2019) also analyses long-term scenarios for democratization and growth in the MENA region while concentrating on the short-term relevance of the revolts sweeping through numerous MENA nations. They come to the

conclusion that unconventional outcomes shouldn't also be considered failures though they may be successful in the long run.

According to Aras & Falk (2016), there are several paths for a final resolution in the MENA countries, which are in conflict with both regional and trans-regional efforts for a positive command. Furthermore, Salam, E.A.A. (2015) argues that some of the region's most volatile issues have changed as a result of the Arab Spring.

After closely analyzing previous studies, it is discovered that it is quite challenging to locate studies that analyze the Arab Spring's post-scenario. However, comprehensive studies considering the GCC nations are also hard to find. Furthermore, the influence of any political upheavals on stock markets remains paradoxical and accessible to new methodologies and techniques, as shown by earlier research on the topic.

This study is important in nature as it provides innovative empirical findings on how the volatility occurring due to the advent of the Arab Spring has a long-lasting influence on the select stock markets from GCC nations. Moreover, it was considered in some of the previous studies that the Arab Spring is an inevitable result of people's suffering from unemployment and poverty. But, this study critically evaluates empirical data to capture how that social factors led to public agitations that had an enormous effect on the stock markets which have economic implications too.

III. OBJECTIVES OF THE STUDY

With the intention of examining the volatility and variability in volatility within the stock markets of the GCC nations post-Arab Spring crisis, the study aims at:

- Examing the level of volatility in select stock market indices from Gulf Cooperation Council (GCC) nations following the Arab Spring crisis, and
- Examing the post-Arab Spring crisis variability in the volatility of select stock market indices from GCC nations.

IV. RESEARCH METHODOLOGY

The closing returns of a few stock market indices from GCC nations are used as the basis for this study considering weekly data. All six stock market indices from the GCC nations were initially chosen as the study's sample. The sample size was ultimately set at five, comprising Bahrain All Share (BAX) (Bahrain), Muscat Securities Market (MSM 30) (Oman), Dubai Financial Market (DFM) (United Arab Emirates, UAE), Qatar Stock Market (QEAS) (Qatar), and Saudi Arabia Stock Market (TASI) (Saudi Arabia). Due to the lack of data throughout the study period, the Kuwait stock market index (BKM 50) was excluded. An additional dummy variable is created to measure the Arab Spring where the value of Arab Spring is represented as "1" from the third week of December 2010 to the fourth week of December 2013 and "0" from the first week of January 2014 to the fourth week of October 2022 in addition to stock market indices. Due to the unavailability of any real data, the authors cautiously constructs this dummy for conducting the study (https://www.sciencedirect.com/topics/

computer-science/dummy-variable). The study period is taken into account from the third week of December 2010 and continued up to the fourth week of October 2022. The Arab Spring period is taken into consideration from the third week of December 2010 to the fourth week of December 2013, and the post-Arab Spring period is taken into consideration from the first week of January 2014 to the fourth week of October 2022 in the dummy (El-Chaarani, 2019). The first phase represents a high state of unpredictability at this time, while the second phase represents a low amount of instability. The information for the various stock market indices is gathered from the investing.com database.

In order to achieve the objectives of the study, the GARCH model by Bollerslev 1986 has been applied. Furthermore, descriptive statistics is also applied to study the characteristics of the dataset, and the breakpoint unit root test is applied to study the structural breaks along with the stationarity of the variables. To remove the constraints that come with time-series data, all the data are converted into equivalent log natural returns. The total number of final sample observations for the study has been 618.

V. BREAKPOINT UNIT ROOT TEST

The different unit-root tests are used to interpret the stationarity of the particular series. Applying Perron's (1989, 1997) predicted innovation outlier breakpoints, a thorough Augmented Dickey-Fuller test was conducted. The models below use a method that relies on the correlation function and the innovation (i.e., noise) process and includes a variable for a gradual change in the intercept of the trend function (Perron, 1997).

$$\Delta y_t = \mu + \theta DU_t + \beta_t + \phi D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^{k} z_i \Delta y_{t-i} + \varepsilon_t \text{ .....(1)}$$

$$\Delta y_t = \mu + \theta DU_t + \beta_t + \omega DT_t + \phi D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^{k} z_i \Delta y_{t-i} + \varepsilon_t \text{ .....(2)}$$

It is referred to as the innovation outlier model. As per Perron (1989 & 1997), the breakpoint T_b can be selected such that $t_{\hat{\alpha}}(T_b, k)$ is minimized. The minimized t-statistic is stated as:

$$t^*_{\hat{\alpha}} = \min_{T_{b\in(k+1,T)}} t_{\hat{\alpha}}(T_b, k) \text{.....(3)}$$

Generalized Autoregressive Conditional Heteroscedastic (GARCH) (1,1) Model

A larger variety of behaviour, in particular, more sustained volatility, is allowed by GARCH model. The GARCH (p, q) model is a significant extension of the ARCH (p) model that substitutes the AR (p) with an ARMA (p, q) design which can be written as:

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2 \text{ ....(4)}$$

In order for σ_t^2 >0, it is assumed that ω>0 and the coefficients α_i (i=0,….p) and β_j (j=1,….q) are all non-negative. When q=0, the GARCH (p, q) model moderates to the ARCH (p) model. In general, the GARCH (p, q) model can be represented to be alike to a specific ARCH (∞) model. Typically, the GARCH (1,1)

model is written as:

$$\sigma_t^2 = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-j}^2 \ldots.(5)$$

Undeniably, Hansen and Lund (2004) delivered a convincing indication that is challenging to discover a volatility model that overtakes the simple GARCH (1,1). Henceforth, for numerous commitments, the GARCH (1,1) model is the de-facto volatility model chosen for daily returns.

V. EMPIRICAL RESULTS AND DISCUSSIONS

Descriptive Statistics

TABLE 1

Results of Descriptive Statistics

	DFM	BAX	TASI	MSM 30	QEAS	Arab Spring
Mean	0.041	-0.080	0.087	-0.045	0.053	0.260
Median	0.001	0.004	0.002	-0.096	0.002	0
Maximum	0.224	0.058	0.437	0.223	0.324	1
Minimum	-0.141	-0.218	-0.262	-0.314	-0.218	0
Std. Dev.	0.03	0.013	0.025	0.017	0.023	0.439
Skewness	-0.758	-1.458	-0.819	-0.500	-0.280	1.090
Kurtosis	7.921	14.943	9.285	13.676	7.343	2.188
Jarque-Bera	669.77	3816.534	1065.281	2903.281	484.444	136.643
Probability	0.069	0.071	0.180	0.0689	0.071	0.081
Sum	0.709	0.297	0.620	-0.387	0.850	158
Sum Sq. Dev.	0.564	0.107	0.403	0.182	0.337	116.805
Observations	618	618	618	618	618	618

The table 1 indicates the results of the descriptive statistics of the select variables namely the Dubai Financial Market (DFM), Bahrain All Share (BAX), Saudi Arabia Stock Market (TASI), Muscat Securities Market (MSM 30), and Qatar Stock Market (QEAS) along with the dummy variable, Arab Spring. All the variables are normal as confirmed by the Jarque-Bera (JB) test with 618 sample observations. DFM rises to 0.224 and comes down to -0.141 with an average of 0.041. BAX increases to 0.058 and declines to -0.218 with a mean of -0.080. Similarly, TASI and MSM 30 increased to 0.437 and 0.223 respectively and declined to -0.262 and -0.314 respectively. However, their mean values are 0.087 and -0.045 correspondingly. QEAS increases to 0.324 and declines to -0.218 with a mean of 0.053. The dummy variable Arab Spring has increased to the

highest value of 1 and decreased to the lowest value of 0 with a mean of 0.260.

Skewness in a dataset refers to asymmetries that deviate from the symmetrical bell curve or normal distribution. According to MSM 30 and QEAS, the data is correctly symmetrical. Arab Spring, TASI, and DFM are all marginally skewed. Data for BAX are distorted (Hair et al., 2017).

By examining the tail of the bell-shaped normal curve, kurtosis can be used to determine the normality of a dataset based on the distribution of the data.

Breakpoint Unit Root Test

TABLE 2

Results of Breakpoint Unit Root Test

Trend & Intercept (Innovation Outlier Model)					
	At Level		At First Difference		
Variables	t-statistics	p-value	t-statistics	p-value	Break Date
DFM	-3.3993	0.58	-24.38	0.01*	Aug 25, 2014
BAX	-2.4899	0.19	-27.5071	0.01*	Feb 09, 2020
TASI	-7.0417	0.49	-27.78	0.01*	Jul 12, 2015
MSM 30	-2.3658	0.64	-21.0037	0.01*	Sep 21, 2014
QEAS	-3.0876	0.44	-26.3013	0.01*	Oct 07, 2015
Arab Spring	-21.2576	0.00*	-25.0791	0.01*	Dec 15, 2013

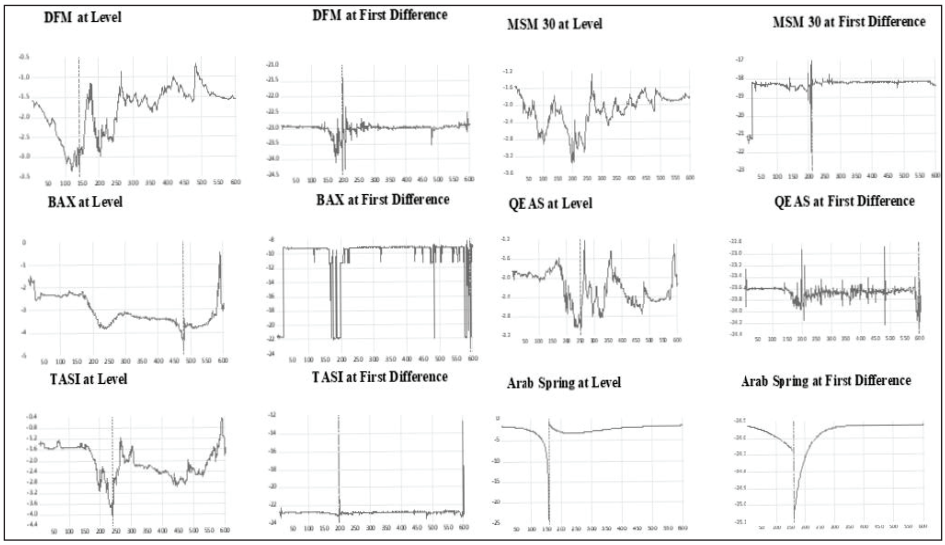
(* indicates significance at 1% level)

The breakpoint unit root test's findings are presented in the table 2, which shows that some stock market indices, including DFM, BAX, TASI, MSM 30, and QEAS, are non-stationary at the level and stationary at the first difference, indicating that there is no unit root at first difference. Arab Spring, however, is stationary at both the level and the first difference. For all of the variables, the confidence interval is 99 per cent. Table 2 which also lists the breakpoint dates for stock market indices and Arab Spring. It can be observed that December 15, 2013, marks the day on which a change in the data's nature in Arab Spring there. However, the dates for the stock market indices are different, indicating a shift in the type of data on that specific date. Additionally, it should be noted that the Arab Spring shock continues to affect the stock markets on the break dates.

Figure 1 shows the breakpoint graphs for the stock market indices and the Arab Spring crisis:

FIGURE 1

Graphical Representation of Breakpoint Unit Root Test



Generalized Autoregressive Conditional Heteroscedastic (GARCH) (1,1) Model

TABLE 3

Results of GARCH (1,1) Model

Dependent Variables	Constant (₹)	p-value	ARCH Effect (α)	p-value	GARCH Effect (β)	p-value	α + β
DFM	0.0083	0.00*	0.1759	0.00*	0.7409	0.00*	0.9168
BAX	0.0001	0.00*	0.4772	0.00*	-0.0161	0.7139	0.4611
TASI	0.0001	0.00*	0.1912	0.00*	0.5769	0.00*	0.7681
MSM 30	0.0001	0.00*	0.2911	0.00*	0.3039	0.00*	0.595
QEAS	0.0059	0.00*	0.2712	0.00*	0.6498	0.00*	0.921

(* indicates significance at 1% level)

The results of the GARCH (1,1) test are shown in the table 3. This test enables us to capture the volatility within the select stock market indices along with variance in the volatility and the joint effect of ARCH and GARCH.

The constant values are seen to be noteworthy for all the stock market indices. In the ARCH impact, all the stock market indices are noteworthy at the 1 per cent level. This shows that there is instability resulting from the crunch of the Arab Spring shock. Thus, it is possible to quantify the risk present in these stock markets. All the stock market indices from GCC nations except BAX are important in terms of GARCH impact at a 1 per cent level enabling to capture of the variance in volatility. This demonstrates the volatility's variability, i.e., how the volatility may increase if the financial crisis worsens or decrease in response to a calm and stable market situation in the wake of an Arab Spring shock. The

α+β term is close to 1 for DFM and QEAS whereas BAX, TASI, and MSM 30 are far away from 1. So, it can be concluded that the conditional variance is much more volatile in DFM and QEAS when compared to the other stock markets.

In view of this, it can be said that even though the Arab Spring came to an end a number of years ago, its profound influence in the form of volatility is still there in the market and is undoubtedly going to have an impact on the decision-making of the interested stakeholders. The residual, actual, and fitted graphs of the GARCH model are demonstrated in figures 2-6:

FIGURE 2

GARCH Graph of DFM

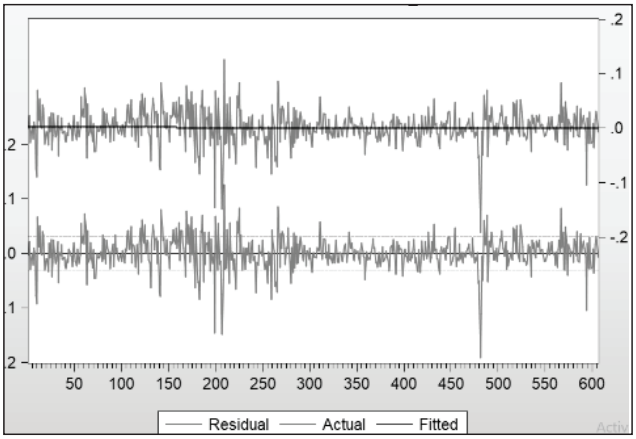


FIGURE 3

GARCH Graph of BAX

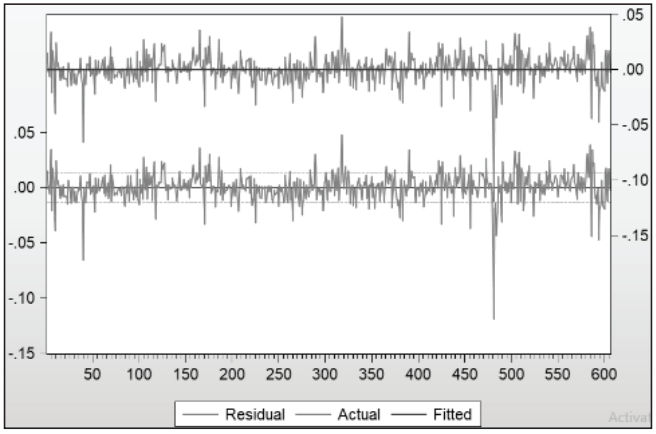


FIGURE 4

GARCH Graph of TASI

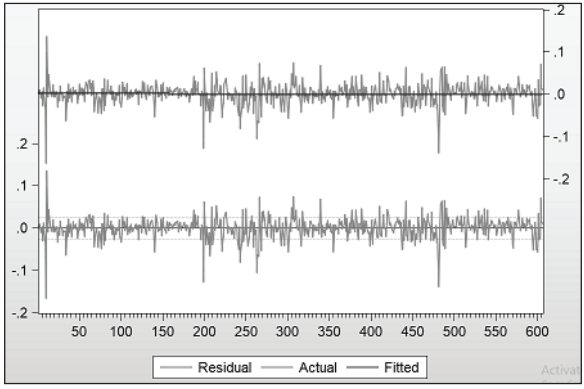


FIGURE 5

GARCH Graph of MSM 30

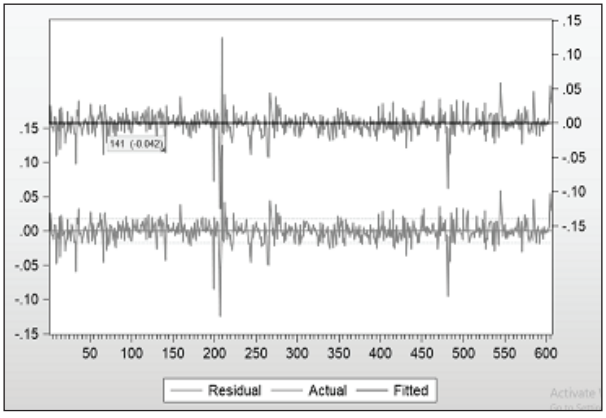
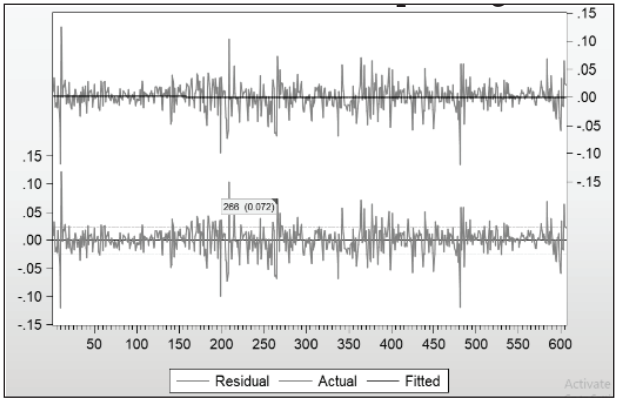


FIGURE 6

GARCH Graph of QEAS



VI. CONCLUDING OBSERVATIONS

Despite the fact that it is difficult to calculate with certainty the costs associated with the Arab Spring crisis, the econometric tools produce intriguing results that allow the authors to draw the conclusion that there was volatility during the study period in all the stock markets from the Gulf Cooperation Council (GCC) countries, as well as variation in volatility brought on by the Arab Spring excepting BAX. The stock markets, however, transitioned from a high volatility condition to a low volatility state as a result of the end of the Arab Spring crisis. Resilience in terms of volatility was not at all witnessed, however, only the Bahrain Stock Market (BAX) demonstrated insensitivity to the GARCH effect. Due to the government's significant investments in social wellness in terms of channelizing funds through higher wages and allotment of more subsidies, welfare grants certainly cushion consumption. Moreover, the GCC development package of USD 1bn provided a safeguard during the medium term as it streamed directly into public outlay projects including domestic housing, transport, power generation, and distribution, water treatment and sewerage, education, and industrial infrastructures. Thus, with the exception of BAX, it can be said that the stock markets are more sensitive to adverse news in the context of political unpredictability brought on by the Arab Spring. Finally, we can say that while most of the GCC stock market indices have endured the post-Arab Spring crisis, the effects of the crisis are still felt, albeit to a somewhat lesser extent.

References

Abdelbaki, H. (2013), The impact of Arab spring on stock market performance. *British Journal of Economics, Management and Trade,* 3(3), pp. 169-185.

Acemoglu, D., Hassan, T.A., & Tahoun, A. (2018), The power of the street: Evidence form Egypt's Arab spring. The Review of Financial Studies, 31(1), pp. 1-42.

Aras, B., & Falk, R. (2016). Five years after the Arab Spring: a critical evaluation. *Third World Quarterly,* 37(12), pp. 2252-2258.

Arouri, M.E., Jouini, J., & Nguyen, D.K. (2011), Volatility spillovers between oil prices and stock sector returns: Implications for portfolio management. *Journal of International Money and Finance,* 30(7), pp. 1387-1405.

Baillie, R. T., Bollerslev, T., & Mikkelsen, H. O. (1996). Fractionally integrated generalized autoregressive conditional heteroscedasticity. *Journal of Econometrics,* 74(1), pp. 3-30.

Balcilar, M., Elsayed, A. H., & Hammoudeh, S. (2023). Financial connectedness and risk transmission among MENA countries: Evidence from connectedness network and clustering analysis. Journal of International Financial Markets, Institutions and Money, 82, 101656.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroscedasticity. *Journal of econometrics,* 31(3), pp. 307-327.

Dacorogna, M. M., Ulrich, A. M., Robert, J. N., Richard, B. O., & Olivier, V. P. (1993). A geographical model for the daily and weekly seasonal volatility in the foreign exchange market. *Journal of International Money and Finance,* 12: pp. 413–38.

Davidson, J. (2004). Moment and memory properties of linear conditional heteroscedasticity models, and a new model. *Journal of Business and Economic Statistics,* 22, pp. 16-190.

El-Chaarani, H. (2019). The impact of oil prices on stocks markets: New evidence during and after the Arab spring in gulf cooperation council economies. *International Journal of Energy Economics and Policy*, *9*(4), pp. 214-223.

El-Chaarani, H., & El-Abiad, Z. (2019), Analysis of capital structure and performance of banking sector in Middle East countries. *International Journal of Economics and Financial Issues,* 9(2), pp. 1-11.

El-Chaarani, H., & Ragab, N.S. (2018), Financial resistance of Islamic banks in Middle East region: A comparative study with conventional banks during the Arab crises. International *Journal of Economics and Financial Issues,* 8(3), pp. 1-12.

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica: Journal of the econometric society,* pp. 987-1007.

Engle, R. F., & Bollerslev, T. (1986). Modelling the persistence of conditional variances. Econometric Reviews, 5(1), pp. 1-50.

Granger, C. W.J., & Zhuanxin, D. (1996). Varieties of long memory models. *Journal of Econometrics* 73: pp. 61–77

Hair, J. F., Babin, B. J., & Krey, N. (2017). Covariance-Based Structural Equation Modeling in the Journal of Advertising: Review and Recommendations. *Journal of Advertising,* 46(1), pp. 163–177. https://doi.org/10.1080/00913367.2017.1281777

Hamilton, J.D. (1988). Rational-expectations econometric analysis of changes in regimes: An investigation of the term structure of interest rates, *Journal of Economic Dynamics and Control,* 12, 385-423

Hamilton, J.D. (1989). A new approach to the economic analysis of non-stationary time series and the business cycle, *Econometrica*, 57, pp. 357-384.

Hamilton, J.D. (1990). Analysis of time series subject to changes in regime, *Journal of Econometrics,* 45, pp. 39-70.

Hamilton, J.D. & R. Susmel. (1994). Autoregressive conditional heteroscedasticity and changes in regime, *Journal of Econometrics,* 64, pp. 307-333

Khondker, H. H. (2019). The impact of the Arab Spring on democracy and development in the MENA region. *Sociology Compass,* 13(9), e12726.

Korotayev, A. V., & Khokhlova, A. A. (2022). Effect of the Arab Spring on stabilization capacity of the MENA monarchies. *Journal of Asian and African Studies,* 57(2), pp. 289-307.

Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica: journal of the Econometric Society,* pp. 1361-1401.

Perron, P. (1997). Further evidence on breaking trend functions in macroeconomic variables. *Journal of Econometrics*, *80*(2), pp. 355-385.

Salam, E. A. A. (2015). The Arab spring: Its origins, evolution and consequences. four years on. *Intellectual Discourse*, *23*(1), pp. 119-139.

Teterin, P., Brooks, R., & Enders, W. (2016). Smooth volatility shifts and spillovers in US crude oil and corn futures markets. *Journal of Empirical Finance*, *38*, pp. 22-36.

Yousuf, M., & Zhai, J. (2022). The financial interconnectedness between global equity markets and crude oil: evidence from the GCC. Journal of Chinese Economic and Business Studies, 20(2), 183-206.

Zaiane, S. (2018). The impact of political instability driven by the Tunisian revolution on stock market volatility: Evidence from sectorial indices. *Journal of Applied Business Research (JABR),* 34(2), pp. 339-354.

Zhang, Y. J., Yao, T., He, L. Y., & Ripple, R. (2019). Volatility forecasting of crude oil market: Can the regime switching GARCH model beat the single-regime GARCH models? *International Review of Economics & Finance*, *59*, pp. 302-317.

https://economics.rabobank.com/publications/2013/april/country-report-bahrain/

https://faculty.washington.edu/ezivot/econ589/ch18-garch.pdf

https://bookdown.org/compfinezbook/introcompfinr/bollerslevs-garch-model.html

https://www.sciencedirect.com/topics/computer-science/dummy-variable

Indian Accounting Review
Vol. 26, No. 2, December 2022

Indian Aviation Industry: An Insight Through Financial Analysis of Some Select Airlines

Amita S. Kantawala
Department of Accounting and Financial Management
Faculty of Commerce, The Maharaja Sayajirao University of Baroda
E-mail: askantawala@yahoo.com

ABSTRACT

Air transport is considered to be one of the vital elements of the country's transport infrastructure. It also contributes to the growth of international trade. Considering the rapid increase in use of air transport for commutation and international trade, the increased number of airlines in play, and also the recent developments, with reference to two big airlines, viz. Air India and Jet airways, it was considered a matter of importance and interest to examine the financial health of three leading airlines. The present paper attempts to examine key ratios for selected period, examine trend in selected ratios over a period of time, attempts to examine the difference in ratios, if any, between selected airlines and derive Altman's Z". score. Very interesting observations are coming to the light.

Key words: Indian Aviation Industry, Financial Ratios, Altman's Z" score, Regression, ANOVA

I. INTRODUCTION AND EARLY HISTORTY OF AILINES

In an increasingly globalised economy, air transport is a vital element of the country's transport infrastructure. Air transport has contributed to the rapid growth in India's international trade by offering a reliable and faster mode of transport services to move products and personnel across long distances. Therefore, sustaining a viable aviation industry is vital if the economy is to reap the full benefits of the future growth in foreign trade and investment (Report of Working Group on Civil Aviation Sector, 2012).

The Indian aviation industry has passed through the fast growth phase with opening up of the economy and the entry of the private players with the state run facility. One such important player Air India was initially founded by JRD Tata as Tata airlines in 1932 and it became a public limited company in 1946. It went on expanding its international operations and was performing well. In 1953 it was nationalised (Phadnis, 2020) and Indian Airlines was established mainly to take care of domestic flights. Thereafter, slowly and slowly the performance started deteriorating. In 2007, Air India and Indian airlines were merged. Merger did not result into any improvement in performance of Air India. It continued to incur losses. It lost its first place and slipped to 4th place with entrance of the

new players. By 2018 Government of India (GoI) wanted to divest 76 percent of its stake (History of Air India n.d) but this could not materialize. In 2020 GOI decided to divest 100% in Air India. Finally, Tata group gained control on Air India on 27 January 2022. (Pranav Mukul, 2022).

The second important player Jet Airways (India) Limited (JAIL) was incorporated on 1st April 1992 as a private company with limited liability and became a deemed public company on 1st July 1996. [Jet Airways (India) Ltd.(Jet Airways)- Company history n.d.] Jet was just next to Air India at the second place. But with coming up of Indigo and Spice Jets, Jet Airways slipped back. By November 2018 Jet Airways faced losses. On 17th April 2019 Jet Airways suspended all operations. (Cummins, 2019).

The third important player Inter Globe Aviation was originally incorporated as Inter Globe Aviation Private Limited (IndiGo) on 13 January 2004. The Company was converted into a public company and the name of the Company was changed to Inter Globe Aviation Limited. (Interglobe Aviation Ltd. (Indigo) - Company History n.d.).

The fourth player Spice Jet Ltd was incorporated in the year 1984 as a leasing company. In the year 1993 the company ventured into domestic aviation operations under technical partnership with Deutsche Lufthansa AG. In 2005 the company's name was changed to Spice Jet Ltd. [Spice jet Ltd. (Spice Jet) Company History n.d. and Company history Spice jet Ltd. n.d.] The company's annual report for the year 2020-21, in its independent Auditor's report, bears the subtitle 'Material uncertainty related to going concern'. This para states the accumulated losses' have resulted in complete erosion of net worth of the company'.

Thus, there are many developments of the important players in the industry, one being offered in the private hands and one facing the insolvency. On examining the market share of the above 4 companies it is observed that they governed about 79 to 80 percent of the market share. As Jet Airways has undergone insolvency, other three companies are selected for the purpose of the study considering that they represent the industry. That makes it interesting to examine their financial performance and trend over a period of time. The company-wise market share of passengers carried in airlines across India in financial year 2018, 2019 and 2021, (Market share of airlines across India by passenger carried for respective years n.d.) are presented in Table 1.

TABLE 1

Market share of passengers carried in airlines across India (Company wise)

Airlines	Domestic market share 2018	Domestic market share 2019	Domestic market share 2021
IndiGo	39.7%	43%	55%
Jet Airways	15%	12%	NA
Spicejet	13.1%	13%	13.3%
Air India	12%	11%	9%
Total of above 4	79.8%	79%	77.3%

Airlines	Domestic market share 2018	Domestic market share 2019	Domestic market share 2021
Go Air	8.8%	9%	7.5%
Air Asia	4%	5%	6.8%
Vistara	3.6%	4%	6.3%
Jetlite	2.2%	2%	NA
Alliance Air	1%	1.1%	1.3%
Truejet	0.4%	0.5%	0.5%
Air India Express	0.1%	0.1%	NA
Others	0.02%	0.02%	0.1%

Source: Compiled from https://www.statista.com/statistics/575207/air-carrier-india-domestic-market-share/

II. LITERATURE REVIEW

Some studies have been carried out with reference to aviation industry in the recent time looking at their interesting developments in the Indian aviation industry. Some of the studies are also carried out with reference to aviation industry in foreign countries. Various developments are taking place in aviation industry in India and abroad. Accordingly, researchers have studied varied aspects of airlines in the aviation industry. Some of them are given below.

Stepanyan (2014) examineed the health of 7 US leading airlines companies through Altman Z score (prescribed for the manufacturing industries) taking a period of 6 years and he observed that all 7 companies remained potentially bankrupt.

Pardeshi, Bisoyi and Patil (2012) carried studies on three airlines viz., Kingfisher Airline Ltd., Jet Airways Ltd. and Jet SpiceJet Ltd. for a period of three year viz., 2008-09 to 2010-11. The authors observed that King Fisher was in grey zone, Jet airways was in distress zone and Spice Jet was in safe zone. Shome and Verma (2020) examined the existence of the financial distress of 4 leading airlines, viz. Air India, Jet airways, IndiGo and Spice jet applying Altman Z Score Model, P-Score Model, Fuzzy Logic Model and Kroeze Model to study possibilities of the bankruptcy using financial data. Period of study is 4 years from 2015 to 2018. The author establishes the existence of financial distress with help of all 4 models. In a study carried out by Gowri, Sugirtham and Asmitha (2022) they have applied Altman's score for manufacturing sector for deriving Z score for IndiGo, Spice Jet and Global Vectra helicopter Ltd. for 2017 to 2022. It is observed by the authors that IndiGo is in Grey zone for first 2 years and then in 'distress for next 3 years. The other two companies are in distress zone for all 5 years.

On the analysis of the above selected studies, it emerges that most of the studies applied Z Score to examine the financial health,. The period of study was 3 to 6 years, for deriving score for prediction of bankruptcy and then to examine whether they were strong, weak or in question mark. For deriving the Z score or similar score, the shorter period is justified, however if one wants to examine the movement and trend in the health of an entity, longer period helps in better

analysis. It is also important to understand the trend and whenever there is a change in trend, analyse the factors contributing to the same.

III. OBJECTIVES OF THE STUDY

Thus, the basic objectives of the present study are:

1. To examine the average profitability, leverage, efficiency and liquidity of selected airline companies and variations (trends) therein over a period of time
2. To examine the financial health of the selected airlines based on Altman's Z" score

IV. METHODOLOGY

Data Collection

For the purpose of financial analysis, data from annual reports were collected from the website of the respective companies. These data were collected from their start-ups and hence there is some variation in the period of study (vide table 2)

TABLE 2

Period of study

Company	Period	No. of years
Air India	2008-09 to 2020-21	13 years
IndiGo	2010-11 to 2020-21	11 years
Spice jet	2007-08 to 2020-21	14 years

Source: Based on available of annual reports.

Data Analysis

As mentioned above, the main focus is on the financial aspects. Therefore, the thrust is on the financial statement analysis based on relevant accounting ratios.

From profitability ratios, we have selected (i) EBIT/Total Revenue (TR), (ii) PBT/ TR, (iii) PAT/ TR, (iv) PAT/Share holders' Fund (SHF), (v) Operating Cash Flows (OCF) / TR, (vi) EBDIT/ TR, (vii) EBIT/ Total Assets (TA) and (viii) EBIT/ Net Assets (NA). Of these EBIT/TA is the ratio included by Altman (2000) in determination of Z score. Amongst leverage ratios (ix) Total Debt/Equity (TD/E), (x) Long term Debt /Equity (LTD/E), (xi) EBDIT/Interest, (xii) Accumulated Retained Earnings/ Total Assets (ARE/TA) and (xiii) Book Value of Equity/Total Liabilities (BE/TL) are selected. Amongst activity ratios (xiv) Total Revenue / Total Assets (TR/TA), (xv) TR /Net Fixed Assets (NFA), (xvi) TR /Current Assets (CA) and (xvii) Average Collection Period (ACP) are selected. All these 4 ratios indicate the efficiency with which the underlying asset is being used for the revenue generation. And amongst liquidity ratios (xviii) CA/CL (CR) (xix) CA-Inventory/CL, (QR) (xx) Net Working Capital/ Total Assets (NWC/TA) and (xxi) NWC/Net Assets (NWC/NA) are selected. Poor liquidity leads to insolvency and

considering that the important liquidity ratios are selected. Out of these 4 ratios NWC/TA is included in determination of Z score by Altman (2000).

All the above ratios are computed for the period under study and thereafter their standard deviation (SD) and Coefficient of variation (CV) are computed. A significant movement in the average indicates the change in trend and the volatility indicates the risk. Considering these, the average, SD and CV are computed. To know the trend in the selected ratios over a period of time linear regressions analysis is carried out.

To examine whether there is a significant difference for a selected ratio between the selected companies or not, one way analysis of variance (ANOVA) is applied and to overcome the precondition of normal distribution for ANOVA, Kruskal-wallies test is also applied.

Internationally detailed work has been carried out to examine the financial distress of the companies. Beaver (1966) has made important contribution in the area of analysis of financial health applying the ratio analysis - using comparison of ratios, dichotomous classification test and analysis of likelihood ratios. The ratios do give signals but when interpreted as single variable, one ratio may be giving negative signal indicating poor financial performance and the other ratio may give positive signal indicating financial soundness. This creates confusion in final prediction about the health of an entity. Altman (2000) carried out noteworthy research in the area of financial distress keeping ratios at the core but taking the combined effect of the same by applying multiple discriminant analysis and thereby assigning weights to certain selected ratios having strong predictive power indicated by Z score initially. This was latter revised to Z′ score and Z″score. Accordingly, Z" = 6.56 (X_1)+ 3.26 (X_2) + 6.72 (X_3) + 1.05 (X_4). (Altman 2000) Here X_1= Net working capital/ Total Assets (TA), X_2= Accumulated Retained Earnings/ TA, X_3= EBIT/TA and X_4= Book value of Equity/ Total Liabilities. As explained by Altman (2000) 'This particular model is also useful within an industry where the type of financing of assets differs greatly among firms and important adjustments, like lease capitalization, are not made. In the present study as Air India is offered for disinvestment and for Spice jet, auditors have stated material uncertainty for going concern, it was considered important to derive Altman's Z" score for period under study. The latter model is applied for examining the financial distress of the select airlines considering its application in some of the studies and considering the argument offered by Altman (2000).

The findings of the analysis are presented in the following lines.

V. FINDINGS

Ratio Analysis

This section presents separately the analysis through selected ratios in respects of the airlines for relevant periods.

(a) Air India*:* For Air India data were available from 2008-09 to 2020-21. First of all, the average, SD and CV are computed taking period from 2008-09 to 2019-20. Year 2020-21 is not included because year 2020-21 was a non-normal year on account of pandemic and the aviation industry was affected by the same. Again, the year 2008-09 is excluded and average, SD and CV are computed for the period 2009-10 to 2019-20. The reason for including 2008-09

first and then excluding is that it was the year of transition. In 2007-08 Indian airlines was merged with Air India and company called NACIL was created. After merger it became Air India. In the next stage, year 2020-21 is included and all three measures are computed for the period 2009-10 to 2020-21. To have focus on analysis SD is omitted from presentation in the table. The CV nullifies the size effect and gives the variations in terms of percentage. Thus average and CV for selected ratios are presented in table 3 for the periods the 2008-09 to 2019-20, 2009-10 to 2019-20 and 2009-10 to 2020-21.

TABLE 3

Air India: Selected Ratios

	Ratios	Average	CV	Average	CV	Average	CV
		2008-09 to 2019-20		2009-10 to 2019-20		2009-10 to 2020-21	
	Profitability Ratios						
1	EBIT/ TR	-0.1660	-80.77	-0.1446	-81.00	-0.1542	-75.56
2	PBT/ TR	-0.3495	-32.79	-0.3328	-31.17	-0.3532	-34.37
3	PAT/ TR	-0.3394	-29.91	-0.3329	-31.17	-0.3534	-34.50
4	PAT/SHF	-1.8388	-424.87	0.4149	73.78	0.3934	76.55
5	OCF/ TR	-0.0956	-248.68	-0.0786	-307.25	-0.0680	-342.81
6	EBDIT/ TR	-0.0689	-184.84	-0.0469	-228.18	-0.0340	-327.93
7	EBIT/TA	-0.0616	-76.66	-0.0536	-75.01	-0.0533	-72.00
8	EBIT/NA	-0.1049	-135.60	-0.0987	-149.48	-0.2463	-215.36
	Leverage Ratios						
9	TD/E	5.2546	522.55	-2.6637	-48.59	-2.5095	-53.58
10	LTD/E	5.9967	454.09	-1.8542	-76.70	-1.7100	-84.50
11	EBDIT/Interest	-0.3916	-207.54	-0.1984	-243.84	-0.1535	-317.32
12	ARE/TA	-0.6665	-57.86	-0.7272	-46.61	-0.7692	-46.07
13	BE/TL	-0.2533	-53.92	-0.2769	-41.50	-0.2969	-43.68
	Activity Ratios						
14	TR / TA	0.4010	14.83	0.4038	15.25	0.3861	22.00
15	TR /NFA	0.6139	30.64	0.6251	30.88	0.5983	34.48
16	TR /CA	3.4151	31.16	3.5125	30.14	3.4532	29.83
17	ACP	40.7364	40.60	38.4352	39.54	38.0498	38.25
	Liquidity Ratios						
18	Current Ratio	0.3156	101.48	0.2443	87.61	0.2298	91.47
19	Quick ratio	0.2573	105.35	0.1975	92.87	0.1860	96.44
20	NWC/TA	-0.5125	-65.69	-0.5603	-46.61	-0.5891	-52.52
21	NWC/NA	-1.1451	-189.62	-1.2507	-179.48	-3.9891	-243.78

Source: Author's Computations.

Profitability ratios: From the Table 3 it can be seen that the average for all

the profitability ratios are negative. (2008-09 to 2019-20). PAT/TR has the lowest whereas PAT / SHF has got the highest CV (2008-09 to 2019-20). Again, EBIT was negative for all years under consideration except 2015-16 and 2016 -17. This positive figure was also very low and therefore the average is negative. PBT and PAT are negative for all years under consideration. OCF is negative for all years except 2014-15, 2015-16, 2016-17 and 2019-20. Therefore, average is negative. EBDIT is negative for all years from year 2009-10 except 2014-15, 2015-16, 2016-17, 2017-18 and 2019-20. This is with low volume. Therefore, average is negative. From all above, it can be inferred that even operating profit of Air India was negative.

Leverage ratios: The average TD/E and LTD/E are found to be positive. Because of low value of equity and high value of debt, both the ratios are very high for the year 2008-09 and that results into positive average ratio (2008-09 to 2019-20) in spite of negative ratios for all remaining years. This has resulted in very high CV for both these ratios. From the year 2009-10 equity is negative, this has resulted in negative average (2009-10 to 2019-20). ARE is positive for the year 2008-09, however the ratio is very small. This is negative from the year 2009-10. This explains the reason for negative ARE/TA and BE/TL ratio.

Activity ratios: TR/TA is observed to be very low. TR/NFA is little higher, however, TR/CA is quite high. This is on account of the high share of the fixed assets in the total assets. ACP seems to be quite high considering the aviation industry. It is about 40 days. However, it is important to note that the company is trying to control the same and it has improved its efficiency over a period of time. It was at 66 days and 71 days for the years 2008-09 and 2009-10 respectively. This has moved down to 17 days in 2019-20.

Liquidity ratios: Average CR and QR are quite low as compared to the acceptable standards. During the year 2008-09 they were 1.099 and 0.9148 respectively. However, during the year 2019-20 it has moved down to 0.0896 and 0.0737. This necessarily indicates the liquidity crunch faced by Air India. The average NWC/TA is found to be negative as the NWC is negative for all years except 2008-09. Similarly, NWC/NA is also found to be positive for the year 2008-09 and then negative throughout the period of study on account of negative NWC except the year 2018-19. For the year 2018-19 the ratio is found positive as the net assets also turn out negative on account of high level of CL. Thus ratio analysis does not give correct signal here.

When year 2008-09 is dropped, on the whole not much difference is observed in the ratios. However, for 3 ratios significant change is observed. For PAT/SHF as shown in the table the average becomes positive from negative. But this is to be interpreted with caution. This does not indicate the improvement but it is a deterioration. The ratio is positive because the numerator and denominator both are negative. This brings forth the limitation of ratio analysis where correct indication of concern is not revealed through the ratio.

Similarly, TD/E and LTD/E becomes negative from positive. This is because positive equity with very small value leading to high ratio is removed (2008-09) and therefore the negative equity effect comes to surface. Here the ratio analysis and averaging of the same improves the analysis. The CV for these three ratios reduce drastically with dropping of one year.

On insertion of year 2020-21 for the profitability ratios no much difference is observed except EBIT/NA. For leverage and activity ratios also no much difference is observed. Amongst the liquidity ratios for NWC/NA substantial difference was observed on inclusion of 2020-21. This is on account of reduction in net asset to a substantial extent.

(b) IndiGo: The company data were available for 2010-11 to 2020-21. Considering the effect on aviation industry on account of the global scenario during 2020-21, average and CV are presented for two blocks separately in Table 4.

Profitability ratios: On taking the analysis period 2010-11 to 2019-20 it is observed that the profitability ratios are quite good for IndiGo. All are positive. The CV is also not very high. This indicates that profitability ratios are stable. On including year 2020-21, it is observed that all the ratios are moving down and the PAT/SHF becomes negative. This is because PAT is negative for this year and SHF becomes too low leading to very high negative ratio resulting into negative average ratio. For aviation industry this year was very disturbing because of the pandemic situation from March 2020. As the ratios have moved substantially down for this year, this has also resulted into very high CV especially for EBIT/TR, PBT/TR, PAT/TR and PAT/SHF.

TABLE 4

IndiGo: Selected Ratios

	Ratios	Average	CV	Average	CV
		2010-11 to 2019-20		2010-11 to 2020-21	
	Profitability Ratios				
1	EBIT/ TR	0.1027	64.76	0.0720	166.49
2	PBT/ TR	0.0865	81.85	0.0448	342.82
3	PAT/ TR	0.0686	79.72	0.0286	499.04
4	PAT/SHF	0.9708	110.88	-6.5915	-380.83
5	OCF/ TR	0.1705	18.81	0.1456	60.44
6	EBDIT/ TR	0.1309	49.67	0.1248	51.94
7	EBIT/TA	0.1325	66.47	0.1127	94.41
8	EBIT/NA	0.2010	70.86	0.1688	102.03
	Leverage Ratios				
9	TD/E	2.7533	110.61	5.7154	179.17
10	LTD/E	2.7088	112.23	2.9519	101.45
11	EBDIT/Interest	10.5176	64.91	9.6044	74.44
12	ARE/TA	0.0778	75.06	0.0619	123.76
13	BE/TL	0.2043	78.17	0.1858	87.88
	Activity Ratios				
14	TR /TA	1.2752	14.87	1.1925	27.53
15	TR /NF	4.3576	31.61	4.0370	41.74
16	TR /CA	2.5999	38.83	2.4327	45.50
17	ACP	2.8636	26.27	3.0608	31.63
	Liquidity Ratios				
18	Current ratio	1.6305	28.49	1.5814	29.71

19	Quick ratio	1.6022	29.01	1.5541	30.17
20	NWC/TA	0.2050	67.66	0.1900	74.05
21	NWC/NA	0.3084	64.64	0.2868	70.50

Source: Author's Computations.

Leverage ratios: It is observed that the leverage ratios are high, simultaneously the coverage ratio is also high. This necessarily indicates the strength of the organization. The proportion of ARE seems to be low in relation to TA and BE/TL also seems to be low. On inclusion of 2020-21 in the study period it is observed that TD/E and LTD/E are moving up with reduction in value of equity on account of losses. The TD/ E ratio has ranged from 0.3159 (2019-20) to 8.5297 (2014-15) during period 2010-11 to 2019-20. This has moved to 35.3357 in 2020-21 on account of very high short term borrowing and huge reduction in equity on account of losses. EBDIT/ Interest, ARE/TA and BE/TL have also moved down. ARE/ TA turned negative for the year 2020-21. This has resulted in high CV.

Activity ratios: Amongst these ratios it is observed that the FATOR is higher than the CATOR. This indicates that the volume of the fixed assets is low as compared to CA. The average collection period was found quite low indicating the collection efficiency of the company. On an average it is found just 2.86 days. It has ranged from 1.51 days in 2010-11 to 4.37 in 2018-19. On inclusion of year 2020-21 for the analysis, three ratios are moving down indicating reduction in efficient utilization of assets. The ACP is moving up to a little extent, still the ACP for IndiGo is quite low.

Liquidity ratios: It is seen that both the current ratio and quick ratio are satisfactory. The current ratio is below the acceptable standard, but the quick ratio is quite above that. Therefore, one can infer that the liquidity position is quite good. On examining year-wise ratios, it is observed that CR and QR have ranged between 1.0188 and 0.9953 for the year 2013-14 to 2.3896 and 2.3597, for the year 2017-18, respectively. NWC/TA and NWC/ NA are found to be quite satisfactory. Thus, the liquidity position of the company is quite satisfactory. However, it is important to note that on inclusion of year 2020-21 all 4 liquidity ratios are moving down. But still they are quite okay.

(c) *Spice Jet:* For this, data are available for the period 2007-08 to 2020-21. For analysis, the total period is divided in two blocks, viz., 2007-08 to 2019-20 and 2007-08 to 2020-21, as 2020-21 was not the normal year for this industry. Table 5 presents the average and CV for select ratios for these two time blocks.

Profitability Ratios: On examining these ratios of the Spice JET it is seen that all the ratios are negative when the period of study is 2007-08 to 2019-20 except OCF/ TR. For some of the years company performed well and few profitability ratios like EBIT/TR, PBT/TR, PAT/TR, EBIT/TA and EBIT/NA are positive for the years 2009-10, 2010-11, 2015-16, 2016-17 and 2017-18. For the year 2020-21 PAT/SHF is positive as both numerator and denominator are negative. This leads to improper inference from ratio analysis.

TABLE 5

Spice Jet: Selected Ratios

	Ratios	Average	CV	Average	CV
		2007-08 to 2019-20		2007-08 to 2020-21	
	Profitability Ratios				
1	EBIT/ TR	-0.0274	-338.90	-0.0301	-298.57
2	PBT/ TR	-0.0420	-228.41	-0.0506	-192.86
3	PAT/ TR	-0.0439	-218.72	-0.0525	-186.22
4	PAT/SHF	-0.7724	-542.47	-0.6895	-585.58
5	OCF/ TR	0.0101	1025.42	0.0120	829.51
6	EBDIT/ TR	-0.0025	-4129.87	0.0106	1037.24
7	EBIT/TA	-0.0528	-377.44	-0.0515	-371.79
8	EBIT/NA	-0.5427	-393.38	-0.5117	-401.42
	Leverage Ratios				
9	TD/E	-2.2058	-404.76	-2.0678	-415.56
10	LTD/E	-1.5216	-420.15	-1.4214	-432.96
11	EBDIT/Interest	0.3684	2571.57	0.4735	1923.97
12	ARE/TA	-0.6927	-44.34	-0.6695	-45.95
13	BE/TL	-0.1155	-170.98	-0.1205	-158.31
	Activity Ratios				
14	TR /TA	1.9590	23.81	1.8575	31.62
15	TR /NFA	6.4179	131.78	6.0219	137.16
16	TR /CA	7.5425	42.59	7.1733	47.14
17	ACP	4.4003	62.27	5.5414	90.51
	Liquidity Ratios				
18	Current ratio	0.4112	50.52	0.4056	49.49
19	Quick ratio	0.3863	54.95	0.3810	53.79
20	NWC/TA	-0.4548	-41.43	-0.4548	-39.80
21	NWC/NA	-3.1517	-83.48	-3.0292	-84.81

Source: Author's computations

Leverage ratios: All leverage ratios except EBDIT/Interest are found to be negative for which high fluctuations are observed. This is because the equity is negative for most of the years except 2007-08 and 2010-11, resulting into negative ratios. ARE /TA is also found to be negative as ARE is negative. BE/TL is negative for most of the years except year 2010-11 when the FCCB are converted to equity and therefore equity has increased. Coverage ratio on an average is quite low. As the ratio ranges from -19.59 in 2008-09 to 14.1277 in year 2010-11 very high CV is observed.

Activity ratios: These ratios are found to be quite okay. However, it is worth noting that the volatility of TR/NFA is quite high. This may be because of

reduction in FA especially during the year 2010-11. CA are found to be quite active as indicated by the ratio. Volatility is also found to be quite low for the same. Average collection period is found to be quite low at about 4 days. For all years under observation it has ranged between 0.4099 (2007-08) to 8.7097 (2013-14). For ACP substantial increase is observed on inclusion of 2020-21 as it increased to 30 days (2020-21) from about 8 days (2019-20). As a result the volatility has also increased.

Liquidity ratios: While examining the CR and QR it is observed that there is no much difference between them. However, both the ratios are quite low indicating the liquidity crunch. As the CA are lower than CL, NWC is negative. Hence NWC/TA and NWC/NA ratios are found to be negative. This is again a cause of concern. With inclusion of year 2020-21, much differences are not observed.

Thus, on the whole ratio analysis has given certain important clues about the health and performance of the selected companies.

Trends over a Period of Time

To examine the trend in various selected ratios over a period under study linear trend is examined using regression analysis.

(a) Air India*:* As mentioned in the analysis of the ratios the analysis for Air India is carried out in 3 parts. Accordingly, for regression also the analysis is carried out in three parts (a) 2008-09 to 2019-20 (b) 2009-10 to 2019-20 and (c) 2009-10 to 2020-21. Findings and interpretation are presented in the following lines.

Table 6 presents the regression results of Air India for the period 2008-09 to 2019-20. For all profitability ratios intercept is negative and slope is positive indicating that the performance is improving. For 4 out of 8 selected ratios the slope is significant at 1 percent viz. EBIT/TR, PBT/TR, PAT/TR and EBDIT/TR. For EBIT/ TA it is significant at 5 percent level of significance and it is also significant at 10 percent for OCF/TR.

Amongst the leverage ratios for EBDIT/Interest intercept is negative, slope is positive significant at 1% indicating a steady improvement in an interest coverage ratio. However, it is important to note that for ARE/TA and BE/TL the slope is negative indicating a worsening situation and it is significant at 1 percent. Trend for all 4 activity ratios is found to be significant. For 3 ratios it is significant at 1 percent and for one at 5 percent. For activity ratios of total assets, net fixed assets and current assets the slope is positive indicating the improvement in ratios over a period of time. The ACP has a negative slope which indicates the improvement in the collection efficiency of the company.All liquidity ratios have the negative slope indicating a concern for liquidity. Three ratios viz. current ratio, quick ratio and NWC/TA have significant negative trend.

TABLE 6

Air India: Regression Results 2008-09 to 2019-20

		R Square	Intercept	Slope	t-value	ρ-value
	Profitability Ratios					
1	EBIT/TR	0.5755	-0.9435	0.0282	* 3.6817	0.0042
2	PBT/ TR	0.6486	-0.5159	0.0256	* 4.2958	0.0016
3	PAT/ TR	0.5522	-0.4714	0.0209	* 3.5115	0.0056
4	PAT/SHF	0.2072	-8.2493	0.9862	1.6165	0.1371
5	OCF/ TR	0.3126	-0.3351	0.0369	*** 2.1326	0.0588
6	EBDIT/ TR	0.5846	-0.2445	0.0270	* 3.7513	0.0038
7	EBIT/TA	0.4612	-0.1194	0.0089	** 2.9258	0.0151
8	EBIT/NA	0.0893	-0.1816	0.0118	0.9904	0.3453
	Leverage Ratios					
9	TD/E	0.1975	27.2523	-3.3843	-1.5687	0.1478
10	LTD/E	0.1986	27.8723	-3.3655	-1.5741	0.1465
11	EBDIT/Interest	0.5365	-1.4647	0.1651	* 3.4025	0.0067
12	ARE/TA	0.9330	0.0051	-0.1033	* -11.804	3.41E-07
13	BE/TL	0.7525	-0.0397	-0.0329	* -5.5142	0.0003
	Activity Ratios					
14	TR /TA	0.6010	0.3179	0.0128	* 3.8808	0.0031
15	TR /NFA	0.6583	0.3387	0.0423	* 4.3893	0.0014
16	TR/CA	0.4914	2.0701	0.2069	** 3.1086	0.0111
17	ACP	0.9207	69.3458	-4.4014	* -10.772	8.01E-07
	Liquidity Ratios					
18	Current ratio	0.4586	0.7065	-0.0601	** -2.9102	0.01556
19	Quick ratio	0.4340	0.5792	-0.0495	** -2.7693	0.0198
20	NWC/NA	0.0784	-0.0492	-0.1686	-0.9223	0.3781
21	NWC/TA	0.5561	-0.0599	-0.0696	* -3.5397	0.0054

Source: Author's computations.

While examining the ratios it was observed that dropping 2008-09 had significant effect on the average and CV of some of the ratios. Dropping 2008-09 trend is also examined. Results of these regressions for the period 2009-10 to 2019-20 are presented in table 7. When the period of study is taken as 2009-10 to 2019-20, for all profitability ratios intercept is negative (except PAT/SHF) and slope is positive (except PAT/SHF) indicating that the performance is improving. For 6 out of 8 selected ratios the slope is significant at different levels of significance. Thus it is important to note that for PAT/SHF, the results change in a noticeable way when year 2008-09 is dropped.

TABLE 7

Air India: Regression Results 2009-10 To 2019-20

		R Square	Intercept	Slope	t-value	p-value
	Profitability Ratios					
1	EBIT/ TR	0.4549	-0.28752	0.0238	**2.7407	0.0228
2	PBT/ TR	0.5526	-0.4723	0.0232	*3.3341	0.0087
3	PAT/ TR	0.5527	-0.4724	0.0233	*3.3352	0.0087
4	PAT/SHF	0.5773	0.8356	-0.0701	*-3.5059	0.0067
5	OCF/ TR	0.2685	-0.3050	0.0377	1.8175	0.1025
6	EBDIT/ TR	0.4610	-0.1784	0.0219	**2.7746	0.0216
7	EBIT/TA	0.3137	-0.0944	0.0068	***2.0282	0.0731
8	EBIT/NA	0.0677	-0.1681	0.0116	0.8083	0.4397
	Leverage Ratios					
9	TD/E	0.8112	-4.7725	0.3515	*6.2203	0.0001
10	LTD/EQUITY	0.6119	-3.8667	0.3354	*3.7669	0.0044
11	EBDIT/ INTEREST	0.4581	-0.7909	0.0987	**2.7585	0.0222
12	ARE/TA	0.9170	-0.1400	-0.0979	*-9.9704	3.67E-06
13	BE/TL	0.6811	-0.1053	-0.0286	*-4.3847	0.0017
	Activity Ratios					
14	TR /TA	0.4074	-0.1764	0.0273	**2.4874	0.0346
15	TR /NFA	0.6882	0.3354	0.0483	*4.4574	0.0016
16	TR /CA	0.4352	2.2490	0.2106	**2.6334	0.0272
17	ACP	0.8974	64.4819	-4.3411	*-8.8723	59E-06
	Liquidity Ratios					
18	Current ratio	0.3016	0.4570	-0.0354	***-1.9716	0.0801
19	Quick ratio	0.2659	0.3686	-0.0285	-1.8054	0.1045
20	NWC/NA	0.0530	-0.3158	-0.1558	-0.7097	0.4958
21	NWC/TA	0.4449	-0.1896	-0.0618	**-2.6856	0.0250

Source: Author's computations.

With 2008-09 included, TD/E and LTD/E had negative insignificant trend. With dropping of 2008-09, it shows positive significant trend. Intercept value changes from high positive to low negative value. [This is because 2008-09 has very low positive equity value leading to very high TD/E and LTD/E ratio.] From 2009-10 equity turns negative and the ratios are also negative.

Trend for all 4 activity ratios is significant at different levels of significance. For activity ratios of total assets, net fixed assets and current assets the slope is positive indicating the improvement in ratios over a period of time. The ACP has a negative slope which again indicates the improvement in the collection efficiency of the company.

TABLE 8

Air India: Regression Results 2009-10 To 2020-21

		R Square	Intercept	Slope	t-value	p-value
	Profitability Ratios					
1	EBIT/ TR	0.1850	-0.2445	0.0139	1.5064	0.1629
2	PBT/ TR	0.0639	-0.4085	0.0085	0.8262	0.4280
3	PAT/ TR	0.0616	-0.4080	0.0084	0.8105	0.4365
4	PAT/SHF	0.5841	0.8085	-0.0638	*-3.7479	0.0031
5	OCF/ TR	0.2750	-0.2884	0.0339	***1.9474	0.0801
6	EBDIT/ TR	0.5451	-0.1823	0.0228	* 3.4618	0.0061
7	EBIT/TA	0.2555	0.0883	0.0054	*** 1.8524	0.0937
8	EBIT/NA	0.1622	0.1388	-0.0593	-1.3913	0.1943
	Leverage Ratios					
9	TD/E	0.8387	-4.7295	0.3415	* 7.2110	2.89E-05
10	LTD/EQUITY	0.6558	-3.8197	0.3246	* 4.3653	0.0014
11	EBDIT/INTEREST	0.5129	-0.7822	0.0967	* 3.2447	0.0088
12	ARE/TA	0.9274	-0.1539	0.0947	* -11.305	5.11E-07
13	BE/TL	0.7544	-0.0938	-0.0312	* -5.5421	0.0003
	Activity Ratios					
14	TR /TA	0.4969	-0.1831	0.0288	** 3.1430	0.0105
15	TR /NFA	0.1869	0.4375	0.0247	1.5163	0.1604
16	TR /CA	0.2221	2.5718	0.1346	1.6899	0.1219
17	ACP	0.7594	60.9114	-3.5172	* -5.6173	0.0002
	Liquidity Ratios					
18	Current ratio	0.3395	0.4506	-0.0340	** -2.2670	0.0468
19	Quick ratio	0.3000	0.3631	-0.0273	***-2.0703	0.0653
20	NWC/NA	0.006	0.7854	-0.0475	-0.2458	0.8108
21	NWC/TA	0.5019	-0.1939	0.0608	* -3.1744	0.0099

Source: Author's computations.

All liquidity ratios have the negative slope indicating a concern for liquidity. NWC/TA have significant negative trend at 5% level of significance and CR has significant negative trend at 10% level of significance. Thus, when 2008-09 is dropped, trend of QR becomes insignificant.

Inclusion of the year 2020-21 for regression shows different results. Amongst the profitability ratios now only 4 ratios show significant trend. EBIT/TR, PBT/ TR, PAT/TR do not show significant trend now. For PAT/SHF, trend continues to be negative and significant, trend in OCF/TR which was insignificant for time block 2009-10 to 2019-20 turns out significant at 10 % level of significance. EBDIT/TR turns significant at 1% level and EBIT/TA continues to have same

trend. For leverage ratios, inclusion of the year 2020-21 does not result into any change in trend. Amongst the activity ratios, TR/NFA and TR/CA turn out to have insignificant trend. Amongst the liquidity ratios, quick ratio again shows significant negative trend (see table 8).

TABLE 9

IndiGo: Regression Results 2010-11 To 2019-20

		R Square	Intercept	Slope	t-value	p-value
	Profitability Ratios					
1	EBIT/ TR	0.0681	0.1342	-0.0057	-0.7648	0.4664
2	PBT/ TR	0.1359	0.1339	-0.0086	-1.1218	0.2945
3	PAT/ TR	0.2233	0.1156	-0.0085	-1.5167	0.1678
4	PAT/SHF	0.3504	2.1285	-0.2105	***-2.0775	0.0714
5	OCF/ TR	0.1121	0.1900	-0.0035	-1.0049	0.3444
6	EBDIT/ TR	0.0001	0.1298	0.0002	0.0264	0.9796
7	EBIT/TA	0.1211	0.1882	-0.0101	-1.0498	0.3245
8	EBIT/NA	0.1858	0.3125	-0.0203	-1.3513	0.2136
	Leverage Ratios					
9	TD/E	0.2770	5.6653	-0.5295	-1.7509	0.1181
10	LTD/E	0.2578	5.5131	-0.5099	-1.6671	0.1340
11	EBDIT/INTEREST	0.2561	16.7936	-1.1411	-1.6595	0.1356
12	ARE/TA	0.2129	0.0288	0.0089	1.4711	0.1795
13	BE/TL	0.4250	0.0152	0.0344	** 2.4317	0.0411
	Activity Ratios					
14	TR /TA	0.5815	1.5380	-0.0478	** -3.3341	0.0103
15	TR /NFA	0.1109	5.1908	-0.1515	-0.9987	0.3472
16	TR /CA	0.1815	3.3813	-0.1421	-1.3321	0.2195
17	ACP	0.4506	1.9461	0.1668	** 2.5616	0.0336
	Liquidity Ratios					
18	Current ratio	0.1910	1.2616	0.0671	1.3744	0.2066
19	Quick ratio	0.1947	1.2296	0.0677	1.3907	0.2018
20	NWC/TA	0.1481	0.1080	0.0176	1.1795	0.2721
21	NWC/NA	0.1112	0.1876	0.0220	1.0003	0.3464

Source: Author's computations.

***(b) IndiGo**:* For trend analysis of the IndiGo, first the period of 2010-11 to 2019-20 is taken and then 2010-11 to 2020-21 is taken. The results of regression are presented in the table 9 and table 10 respectively. For IndiGo when the period for regression analysis is taken from 2010-11 to 2019-20 it is observed that even though all profitability ratios (except EBDIT/TR) had negative trend it was insignificant except PAT/SHF which shows negative significant trend at 10 percent level of significance. When the period is taken from 2010-11 to 2020-21,

it is observed that for all the profitability ratios the trend which was negative turns significant (except PAT/SHF) This may be on account of the situation prevalent in the world since March 2020 and the restrictions put up on the flights affecting the revenue and the profits of the company. Out of 5 leverage ratios, BE/TL is found to have significant positive trend at 5%. This necessarily indicates that the strength of the company is improving. With insertion of year 2019-20, ARE/TA trend continues to be positive, but it becomes insignificant and with further insertion of year 2020-21, trend becomes negative, even though insignificant.

TABLE 10

IndiGo: Regression Results 2010-11 To 2020-21

		R Square	Intercept	Slope	t-value	p-value
	Profitability Ratios					
1	EBIT/ TR	0.2960	0.1899	-0.0197	***-1.9455	0.0836
2	PBT/ TR	0.3472	0.2086	-0.0273	***-2.1880	0.0564
3	PAT/ TR	0.3778	0.1871	-0.0264	**-2.3377	0.0442
4	PAT/SHF	0.2709	17.0427	-3.9390	-1.8285	0.1007
5	OCF/ TR	0.3242	0.2362	-0.0151	***-2.0780	0.0675
6	EBDIT/ TR	0.0215	0.1420	-0.0029	-0.4449	0.6669
7	EBIT/TA	0.2983	0.2178	-0.0175	***-1.9558	0.0822
8	EBIT/NA	0.3635	0.3566	-0.0313	**-2.2673	0.0496
	Leverage Ratios					
9	TD/E	0.1232	-0.7882	1.0839	1.1248	0.2898
10	LTD/E	0.0835	4.5172	-0.2609	-0.9055	0.3888
11	EBDIT/ INTEREST	0.3706	17.479	-1.3124	**-2.3022	0.0468
12	ARE/TA	0.0031	0.0696	-0.0012	-0.1682	0.8701
13	BE/TL	0.1133	0.0864	0.0166	1.0723	0.3115
	Activity Ratios					
14	TR /TA	0.6087	1.6557	-0.0772	*-3.7420	0.0046
15	TR /NFA	0.2908	5.6807	-0.2740	***-1.9210	0.0869
16	TR /CA	0.3247	3.5737	-0.1902	***-2.0805	0.0672
17	ACP	0.5874	1.7185	0.2237	*3.5794	0.0059
	Liquidity Ratios					
18	Current ratio	0.0331	1.4268	0.0257	0.5548	0.5925
19	Quick ratio	0.0359	1.3934	0.0268	0.5791	0.5767
20	NWC/TA	0.0182	0.1557	0.0057	0.4081	0.6927
21	NWC/NA	0.0087	0.2527	0.0057	0.2809	0.7851

Source: Author's computations.

For BE/TL, similar position is observed, with little difference. With insertion of the year 2019-20 the level of significance goes down and with insertion of year

2020-21, trend becomes insignificant. On account of the reduced revenue and profit during the year 2020-21, EBDIT/Interest shows negative significant trend.

In the activity ratios group, for the period 2010-11 to 2019-20, TR/TA had negative significant trend and ACP had positive significant trend. Both these are the cause of concern. However, it is important to note that ACP for IndiGo is quite low, less than about 3 days on an average.

On account of the prevalent situation from Mach 2020, revenue reduced and the level of assets remained almost constant. Hence, TR/NFA and TR/CA show negative significant trend with inclusion of year 2020-21.

All the liquidity ratios for the period 2010-11 to 2019-20 are showing positive insignificant trend. With inclusion of year 2020-21, no change in trend is observed.

(c) *Spice Jet*: For Spice JET as mentioned in the preceding para, data are available from 2007-08 to 2020-21. This is divided into two time blocks viz. 2007-08 to 2019-20 and 2007-08 to 2020-21. The results of the regression are presented in Table11 and Table 12 respectively.

On taking the study period 2007-08 to 2019-20, for profitability ratios, two ratios are found to have positive significant trend viz. OCF/TR and EBDIT/TR at 1 percent and 5 percent level of significance respectively. This necessarily indicates that both of them are improving over a period of time. Amongst the leverage ratios TD/E is showing negative significant trend at 10 percent level of significance indicating thereby reduction in the level of debt over a period of time. None of the activity ratios are found to have significant trend over a period of time except ACP showing the positive significant trend indicating an increase in the ACP over a period of time. However it is worth noting that the average ACP is quite low ranging between 4 to 5 days. Amongst the liquidity ratios CR and QR are negative significant trend at 1 percent level of significance over a period of time, and significant negative trend for NWC/TA at 10 percent level of significance. This indicates that the level of liquidity is reducing over a period of time. Thus, it may be noted that out of 4 ratios specified in Altman's Z" score model, only NWC/TA has negative significant trend.

With insertion of year 2020-21, OCF/TR and EBDIT/TR continue to show positive significant trend. TD/E now turns out to have negative insignificant trend. Amongst activity ratios, negative trend of TR/TA becomes significant indicating deterioration in revenue generation per unit of asset employed. For liquidity ratios, no change in trend is observed with insertion of year 2020-21.

TABLE 11

Spice Jet: Regression Results 2007-08 to 2019-20

		R Square	Intercept	Slope	t-value	p-value
	Profitability Ratios					
1	EBIT/ TR	0.1649	-0.0952	0.0097	1.4740	0.1685
2	PBT/ TR	0.1508	-0.1055	0.0095	1.3976	0.1898
3	PAT/ TR	0.1257	-0.1052	0.0088	1.2576	0.2346
4	PAT/SHF	0.0264	0.4524	-0.1750	-0.5466	0.5955

5	OCF/ TR	0.5807	-0.1312	0.0202	* 3.9029	0.0025
6	EBDIT/ TR	0.3535	-0.1116	0.0157	** 2.4526	0.0321
7	EBIT/TA	0.1380	-0.1860	0.0190	1.3270	0.2114
8	EBIT/NA	0.1357	-1.9563	0.2019	1.3144	0.2155
	Leverage Ratios					
9	TD/E	0.2388	5.6358	-1.1202	*** -1.8575	0.0902
10	LTD/E	0.2201	3.8692	-0.7701	-1.762	0.106
11	EBDIT/INTEREST	0.1780	-6.7654	1.0264	1.5431	0.1511
12	ARE/TA	0.1146	-0.8796	0.0267	1.1930	0.2580
13	BE/TL	0.0051	-0.0902	-0.0036	-0.2370	0.8170
	Activity Ratios					
14	TR /TA	0.0728	2.1852	-0.0323	-0.9293	0.3727
15	TR /NFA	0.0775	10.6504	-0.6046	-0.9615	0.3570
16	TR /CA	0.1323	5.4422	0.3000	1.2951	0.2218
17	ACP	0.3099	1.6585	0.3917	** 2.2228	0.0481
	Liquidity Ratios					
18	Current ratio	0.5102	0.6780	-0.0381	* -3.3852	0.0061
19	Quick ratio	0.5327	0.6648	-0.0398	* -3.5412	0.0046
20	NWC/TA	0.2899	-0.2724	-0.0260	*** -2.1190	0.0577
21	NWC/NA	0.0163	-2.5479	-0.0863	-0.4270	0.6776

Source: Author's computations.

Based on the detailed study carried out to examine trend in selected ratios over a period of time with help of regression, with inclusion of one more year it is observed that, even though on the whole it may not make much difference, but for some of the ratios one year data has made a marked difference in indication of trend as discussed at the respective place.

Analysis of Variance

To examine variations between selected companies, the statistical tool of ANOVA is applied. This technique basically is useful to compare the means of more than 2 populations 'The basic principle underlying the technique is that the total variations in the dependent variable is broken in two parts – one which can be attributed to the specific causes is called variation between samples and the other which is attributed to chance is termed as the variation within samples. (Chawla and Sondhi, 2011) .

Therefore, to examine whether there is a significant variation in a given ratio between 3 selected companies for the period under study, ANOVA is applied. To have common period under study the years for which observations are available for all 3 companies are taken. Hence 2010-11 to 2020-21 is the period taken for applying ANOVA. Use of MS excel is made for applying ANOVA. The critical value of F at 5% (at 1%) level of significance is 3.32 (5.39). Hence, if the F statistic is greater than this value then null hypothesis is rejected indicating that there is a

significant difference in the means of companies. The important values based on calculations are presented in table 13. From table 13 it can be observed that out of 21 selected ratios the variations in the means of ratios between the companies are found to be significant for 17 ratios. Only for 4 ratios the variations are not significant *viz,* PAT/SHF,

TABLE 12

Spice Jet: Regression results, 2007-08 to 2020-21

		R Square	Intercept	Slope	t-value	p-value
	Profitability Ratios					
1	EBIT/ TR	0.0969	-0.0802	0.0067	1.1346	0.2787
2	PBT/ TR	0.0304	0.0782	0.0041	0.6138	0.5508
3	PAT/ TR	0.0237	-0.0794	0.0036	0.5399	0.5991
4	PAT/SHF	0.0122	0.1116	-0.1068	-0.3857	0.7064
5	OCF/ TR	0.5071	-0.1148	0.0169	* 3.5136	0.0043
6	EBDIT/ TR	0.4556	-0.1220	0.0178	* 3.1690	0.0081
7	EBIT/TA	0.1179	-0.1695	0.0157	1.2665	0.2294
8	EBIT/NA	0.1255	-1.8162	0.1739	1.3120	0.2141
	Leverage Ratios					
9	TD/E	0.1676	4.2399	-0.8410	-1.5545	0.1460
10	LTD/E	o.1533	2.8955	-0.5760	-1.4740	0.1662
11	EBDIT/ Interest	0.1565	-5.9421	0.8617	-1.4922	0.1615
12	ARE/TA	0.1736	-0.8993	0.0306	1.5876	0.1384
13	BE/TL	0.0114	-0.084	-0.0049	-0.3714	0.7168
	Activity Ratios					
14	TR /TA	0.2240	2.3559	-0.0665	*** -1.8609	0.0874
15	TR /NFA	0.0935	10.6235	-0.5993	-1.1127	0.2876
16	TR /CA	0.0131	6.4806	0.0924	0.3984	0.6973
17	ACP	0.4122	-0.2319	0.7698	** 2.9007	0.0133
	Liquidity Ratios					
18	Current ratio	0.4658	0.6512	-0.0328	* -3.2346	0.0072
19	Quick ratio	0.4803	0.6356	-0.0340	* -3.33305	0.0060
20	NWC/TA	0.2326	-0.2983	-0.0209	*** -1.9072	0.0807
21	NWC/NA	0.0011	-2.8793	-0.020	-0.1128	0.9120

Source: Author's computations.

EBIT/NA, TR/NFA and NWC/NA. Variations in means of most of the ratios (16) are found to be significant at 1% level of significance. Through ANOVA attempt is also made to examine the difference in ratios between the years. The results are not presented here on account of findings being insignificant.ANOVA assumes that sample is drawn from the normal population. It is possible that

this sample is not coming from the normal population. Therefore, to overcome this limitation Kruskal-Wallies Test is also applied. The results of the same are presented in Table 13 in last two columns.

TABLE 13

Results of One way analysis of variance between selected companies & Kruskal Wallis Test

	ANOVA RESULTS						Kruskal Wallis Test Results	
Sr. no.	Ratios	Sum of square	DOF	Mean square	F-Ratio		Chi-squre value	
	Profitability Ratios							
1	EBIT/ TR						14.7419	*
	(i) Between Groups	0.2641	2	0.1321	11.0541	*		
	(ii) Within Groups	0.3587	30	0.0119				
2	PBT/ TR						20.3150	*
	(i) Between Groups	0.9291	2	0.4646	28.5031	*		
	(ii) Within Groups	0.4889	30	0.0163				
3	PAT/TR						18.0010	*
	(i) Between Groups	0.8741	2	0.4370	28.7417	*		
	(ii) Within Groups	0.4562	30	0.0152				
4	PAT/SHF						2.0010	
	(i) Between Groups	313.3967	2	156.6993	0.7239			
	(ii) Within Groups	6493.7902	30	216.4597				
5	OCF/TR						12.1419	*
	(i) Between Groups	0.2546	2	0.1273	5.2413	**		
	(ii) Within Groups	0.7285	30	0.0243				
6	EBDIT/TR						10.0865	*
	(i) Between Groups	0.1252	2	0.0626	6.7644	*		
	(ii) Within Groups	0.2776	30	0.0092				
7	EBIT/TA						11.5061	*
	(i) Between Groups	0.1717	2	0.0858	5.8838	*		
	(ii) Within Groups	0.4377	30	0.0146				
8	EBIT/NA						7.5975	**
	(i) Between Groups	1.0783	2	0.5392	0.7617			
	(ii) Within Groups	21.2351	30	0.7078				
	Leverage Ratios							
9	TD/E						21.1590	*
	(i) Between Groups	600.9032	2	300.4516	5.9080	*		
	(ii) Within Groups	1525.6453	30	50.8548				
10	LTD/E						21.4118	*

	(i) Between Groups	204.6959	2	102.3479	10.2963	*		
	(ii) Within Groups	298.2070	30	9.9402				
11	EBDIT/Interest						14.7963	*
	(i) Between Groups	559.8594	2	279.9297	8.2167	*		
	(ii) Within Groups	1022.0496	30	34.0683				
12	ARE/TA						22.3374	*
	(i) Between Groups	4.8117	2	2.4058	39.0578	*		
	(ii) Within Groups	1.8479	30	0.0616				
13	BE/TL						24.3986	*
	(i) Between Groups	1.4464	2	0.7232	30.5730	*		
	(ii) Within Groups	0.7097	30	0.0236				
	Activity Ratios							
14	TR/TA						22.8916	*
	(i) Between Groups	11.5904	2	5.7952	38.4527	*		
	(ii) Within Groups	4.5212	30	0.1507				
15	TR/NFA						20.3559	*
	(i) Between Groups	177.8636	2	88.9318	2.9591			
	(ii)Within Groups	901.5981	30	30.0533				
16	TR/CA						18.5046	*
	(i) Between Groups	212.6463	2	106.3232	30.3714	*		
	(ii)Within Groups	105.0229	30	3.5008				
17	ACP						23.1191	*
	(i) Between Groups	6778.6846	2	3389.3423	71.5708	*		
	(ii)Within Groups	1420.6952	30	47.3565				
	Liquidity Ratios							
18	Current ratio						25.2037	*
	(i) Between Groups	13.2191	2	6.6096	83.9959	*		
	(ii)Within Groups	2.3607	30	0.0787				
19	Quick ratio						26.3121	*
	(i) Between Groups	13.3171	2	6.6585	86.0620	*		
	(ii) Within Groups	2.3211	30	0.0774				
20	NWC/TA						21.8201	*
	(i) Between Groups	4.4216	2	2.2108	60.3546	*		
	(ii)Within Groups	1.0989	30	0.0366				
21	NWC/NA						18.4249	*
	(i) Between Groups	127.7229	2	63.8615	1.7406			
	(ii)Within Groups	1100.645	30	36.6882				

Source: Author's computations.

Significance at 1% and 5% level indicated by * and ** respectively.

The critical values of Chi squre at 5% (1%) level of significance is 5.991 (9.210). On carrying out the Kruskal Wallis test it was observed that all 3 companies have significant difference for means of 20 ratios out of 21 ratios. Only for PAT/ SHF or RONW there was no significant difference between companies. This ratio is common with the findings for ANOVA.

ii. Altman Z Score:

As mentioned in the preceding para to examine the financial distress with reference to an entity varied models are being applied. However, the prominent amongst them is Altman's Z" score model. As Air India has proceeded with privatization and for Spice Jet auditors have stated material uncertainty for a going concern, it was considered appropriate to derive Altman's Z" score. As the companies belong to aviation industry the equation of manufacturing and listed companies is not applied but the one with book value of equity instead of market value of equity and dropping of variable 'Sales/ TA' is applied. Accordingly, the model (Altman 2000) applied is:

$Z'' = 6.56 (X_1) + 3.26 (X_2) + 6.72 (X_3) + 1.05 (X4)$. Here, X_1= NWC/TA, X_2= ARE/ TA, X_3= EBIT/TA and X_4= BE/TL.

If the Z" score is less than 1.10, it indicates that the unit is sick and if Z' score is greater than 2.60, it indicates that the unit is strong. Z" score between 1.10 and 2.60 indicates difficulty in prediction of the health of an undertaking. Z" score is derived for all 3 companies under study for all the years under study. From the score the indication regarding sick [S], grey [G] and non-sick [NS] is mentioned against each value in table 14.

TABLE 14

Altman's Z"-Score Of Selected Companies

Year	Air India	I	IndiGo	I	Spice Jet	I
2007-08					-2.3676	S
2008-09	-0.8956	S			-8.8566	S
2009-10	-1.1311	S			-4.4151	S
2010-11	-6.3276	S	2.9009	NS	-3.6982	S
2011-12	-6.0670	S	2.1473	G	-7.2817	S
2012-13	-5.0378	S	2.7482	NS	-3.8661	S
2013-14	-5.6535	S	0.6093	S	-9.6590	S
2014-15	-6.2119	S	1.4704	G	-10.3941	S
2015-16	-5.1971	S	3.5481	NS	-6.5689	S
2016-17	-7.4163	S	3.9015	NS	-5.4387	S
2017-18	-8.6991	S	4.7146	NS	-3.7703	S
2018-19	-12.9411	S	3.5077	NS	-4.6589	S
2019-20	-8.9925	S	1.4895	G	-3.3554	S
2020-21	-10.8286	S	-0.63113	S	-4.6178	S

Source: Author's computations, I= Indication

It can be observed from table 14 that Air India and Spice Jet are sick for all years. In case of IndiGo, for two years it is sick of which one is 2020-21 that was not the normal year for aviation industry. Thus, overall it can be inferred that

IndiGo is not under financial distress.

Thus, Altman's Z" score gives very important clue about the health of the entity. The Government started privatization process for Air India in 2018, however Z" score indicates that it was sick even from 2008-09. Similarly for Spice jet the material uncertainty is stated for the year 2020-21, but the Altman's Z" score indicates the airlines in the sick status even from the year 2007-08.

VI. CONCLUDING REMARKS AND SUGGESTIONS

Based on the findings of the study, major conclusions are given below.

For Air India, profitability, leverage, efficiency and liquidity are causes of concern. This is clear from ratio analysis as well as trend analysis. This is also supported by Altman's Z" score. It is worth noting that the process of privatization and thereby restructuring has already begun and new management is expected to take care of the situation.

Out of three selected companies, IndiGo definitely has better performance in terms of profitability, leverage, coverage, efficiency and liquidity and the company seems quite healthy. But it gives an alert via PAT/SHF as it turned negative for 2019-20 and 2020-21 which can be attributed to disturbing global Pandemic scenario where passenger movement was restricted substantially for a long period affecting revenue generation.

For Spice Jet even though no problem has come to surface, average profitability ratios are negative and OCF/TR shows alarming CV. Equity has also turned negative. Liquidity ratios are also found to be unsatisfactory. It is important to note that the report of the independent auditor for the year 2020-21, 'material uncertainty related to a going concern' has raised concerns. Altman's Z score gives an alert for the company. The owners and stakeholders should look to the case carefully and try to see that it does not become sick.

On examining trend in ratios for all selected three companies for the period under study, different observations are made for each company. However, the important point to be noted is that with insertion of one or two years there can be a change in the trend as pointed out at respective places. Moreover, the regression analysis also indicates important trends with reference to Air India for all 4 ratios (which are specified) of Altman's Z score.

On examining the existence of significant difference between selected companies, it is observed that there is a significant difference for selected ratios except four ratios, viz. PAT/SHF, EBIT/NA, TR/NFA and NWC/NA as per ANOVA and for first ratio as per Kruskal - Wallies test. Thus even though size is nullified with ratios, all three companies belong to aviation industry, and all three are leaders in the industry.

Following **suggestions** may also be made.

EBDIT/TR is negative for Air India and Spice Jet, whereas the same is positive for IndiGo. This necessarily indicates that the operational efficiency of both Air India and Spice Jet is required to be improved. For IndiGo the average is around 12 to 13 %. This necessarily indicates that the cost reduction measures are necessary for the other two airlines. With Air India going in to the private hands the new management is making their best efforts. Tata sons chairman Chandrasekaran announced, "Tata group will make Air India Financially fit, upgrade aircraft, bring new fleet and make it technologically advanced airline

globally".

It may also be suggested that along with cost reduction measures comparative analysis regarding the terms on which the airfare is determined may be made and this may also be streamlined to the extent possible, so that with rising fuel charges airlines remain healthy.

References

Air-India Annual Report, 2020-21, pp.16-17.

Altman Edward, (2000), Predicting Financial Distress of Companies: Revisiting the Z-Score and Zeta® Models, pp. 1-54, July, https://pages.stern.nyu.edu/~ealtman/Zscores.pdf, Accessed on 27-8-2022.

Beaver William H. (1966). Financial Ratios As Predictors of Failure, *Journal of Accounting Research,* Vol. 4, Empirical Research in Accounting: Selected Studies 1966, pp. 71-111.

Chawla Deepak & Sondhi Neena, (2011), Research Methodology: Concepts and Cases, Vikas Publishing House Pvt. Ltd., p.362.

Cummins Nicholas, (2019). The Story of Jet Airways – From Boom To Near Bust April 12, & update on same, https://simpleflying.com/jet-airways-story/ accessed on 02-09-2022 .

Gowri M., Sugirthan and Asmitha, (2022): Altman Z score Analysis of Indian Aviation Sector, *Gedrag & Organisatie Review,* Vol. 35, Issue1, Jan.

History of Air India (n.d.) https://www.seatmaestro.com/airlines-seating-maps/air-india/history/ accessed on 02-09-2022.

Interglobe Aviation Ltd. (Indigo) - Company History (n.d) https://www.business-standard.com/company/interglobe-aviat-33159/information/company-history accessed on 02-09-2022 .

Jet Airways (India) Ltd. (JETAIRWAYS) – Company history, (n.d.) https://www.business-standard.com/company/jet-airways-5586/information/company-history accessed on 02-09-2022

Market share of airlines across India by passenger carried https://www.statista.com/statistics/575207/air-carrier-india-domestic-market-share/ accessed on 02-09-2022.

Pardeshi Bhushan, Bisoyi Padma Lochana and Patil Pavan C. (2012), A Study of Financial Solvency of Indian Airline Companies with reference to Z-Score, *International Journal of Research in Engineering, IT and Social Sciences*, Volume 2, Issue 11 (November).

Phadnis Ashwini. (2020). All you wanted to know about Air India Divestment, December 21, 2020, https://www.thehindubusinessline.com/opinion/columns/slate/all-you-wanted-to-know-about/article33386790.ece accessed on 02-09-2022.

Pranav Mukul. (2022). Explained what happens after the Tata group gets control of Air India today? January 28, 2022 https://indianexpress.com/article/explained/air-india-tata-group-handover-explained-7743920/ accessed on 02-09-2022.

Report of Working Group on Civil Aviation Sector, National Transport Development Policy Committee. **(**2012). June, Ministry of Civil Aviation, Government of India, p.11.

Shome Samik, Verma Sushma. (2020). Financial Distress in Indian Aviation Industry: Investigation Using Bankruptcy Prediction Models, *Eurasian Journal of Business and Economics,* 13(25), 91-109.

Spice jet Ltd. (Spice Jet) Company History n.d. and Company history Spice jet Ltd. n.d. https://www.business-standard.com/company/spicejet-3367/information/company-history accessed on 02-09-2022 and https://economictimes.indiatimes.com/spicejet-ltd/infocompanyhistory/companyid-7876.cms accessed on 02-09-2022.

Spice- Jet Annual Report Year 2020-21, p.50.

Stepanyan A, (2014) Altman's Z-Score in the Airline Business. Case Study of Major U.S. Carriers. Are they Potential Bankruptcy Candidates?, *International Journal of Advances in Management and Economics Available online at www.managementjournal.info Case Study,* |Jan.-Feb. | Vol.3 | Issue 1|16-24.

Tata group formally joins race for Air India (2020) https://www.ndtv.com/business/tata-group-to-file-expression-of-interest-for-air-india-today-report-2338253 (December 14 2020) accessed on 02-09-2022.

Indian Accounting Review
Vol. 26, No. 2, December 2022

Performance of Select Cement Companies of India during Pre-and-Post GST era : A Study based on Data Envelopment Analysis

Namrata Roy
Research Scholar, Department of Commerce, University of Calcutta
E-mail: namratar2093@gmail.com

ABSTRACT

The Indian cement industry is the second largest producer in the world after China. It accounts for 7% of the global installed capacity. Cement is considered to be the second most consumed material on the planet and is one of the important corporate for development of infrastructure and crucial input for construction industry. The implementation of GST has brought about revolutionary change in the cement industries which is significantly impacting infrastructure and housing industry because of their dependency on cement. In this study Data Envelopment Analysis is used on the sample cement companies in order to find out their performance efficiency during pre-and-post GST era. It was found that out of 40 cement companies, 20 companies (i.e., 50 percent) attain the status of locally technically efficient. However, in 2019-20, out of 40 cement companies, 21 (i.e., 52.5 percent) are locally technically efficient. The mean of Pure Technical Efficiency scores has increased from 0.921 in 2015-16 to 0.941 in 2016-17 followed by a reduction in the subsequent years. Therefore, this indicates that the extent of Pure Technical Inefficiency of Indian cement industry has increased from 7.9 percent in 2015-16 (pre-GST) to 8.5 percent in 2019-20 (post-GST).

Keywords: Data Envelopment Analysis, Pure Technical Efficiency, Pure Technical Inefficiency

I. INTRODUCTION

Cement plays an important role toward development of the infrastructure and is a crucial input for the construction industry. It is the second most consumed material on the planet (WBCSD, 2002). The Indian cement industry is the second largest producer in the world after China, larger than Japan and the United States of America. The Indian cement industry contributes about 1.3 % of GDP. Due to increasing focus on industrialisation, urbanisation and with the government focus on construction and housing developments, concrete consumption has increased. Demand for cement is predicted to expand at a CAGR of 8.6% from FY21 to FY24E, compared to a CAGR of 4.7 percent for clinker output, increasing industrial clinker consumption. Increased clinker consumption resulted in higher demand (4.1 percent CAGR between FY17 and FY21) leading to higher sector profitability (average EBITDA/ton increased by

10% during FY17 and FY21) (Gupta et al., 2020; IBEF, 2020).

Even after being profitable and popular, the cement industry goes through different types of challenges due to the concerns related to the environment and issues related to sustainability (Dasgupta & Das, 2021). It is an energy-intensive operation and cannot be seen as an environmentally friendly process (Vishwakarma, et al., 2019 some firms are more apprehensive regarding environmental protection in comparison to their counterparts. What determines the environmental proactiveness of these firms which go beyond extant laws to adopt proactive environmental strategies (PES. Moreover, it uses huge amount of raw materials that are non-renewable and creates a lot of carbon dioxide in the process. To reduce the influence of the issues related to the cement industry, it is very obvious that the construction and the cement industry should adopt more sustainable measures and should be ready to accept various innovative practices.

Moreover, with the introduction of GST in India with effect from July 01, 2017, cement is subject to GST at a rate of 28%. Despite this high rate, taxation under GST has been a welcome change for the workings of this industry. Prior to implementation of the GST regime, cement manufacturers had to pay multiple rates and excise duties on cement, depending on factors like type of cement, form of supply (packaged or in bulk form) and Industrial or trade purpose, and excise duties and VAT alone would round up to 24%-25%.

In this backdrop, the study seeks to evaluate how efficiently select Indian cement companies have performed during pre-and-post GST period using Data Envelopment Analysis (DEA) technique.

II. INDIAN CEMENT INDUSTRY: RECENT TREND

India is the world's second-largest cement producer, contributing more than 7% of global manufacturing capability. India, entire cement production capacity in FY22 was roughly 545 million tonnes (MT). The private sector holds 98 percent of overall production and the government controls the rest. The top 20 companies in India produces over 70% of the total. Having a large volume of high-quality limestone deposits all around the country, Indian cement industry has a lot of room to grow. Due to the rising demand in diverse fields, including residential, construction management, and industrial development, the cement industry consumption is predicted to reach 419.92 MTPA by FY 27. India shipped 294.4 million metric tonnes (MT) of cement in FY21, down from 329 million metric tonnes (MT) in FY20. In February 2021, India's cement revenue grew by 7.8% over February 2020. The production of cement in India in FY21 amounted to 262 million metric tonnes (MT) (Till February 2021). Owing to increasing expenses on housing and infrastructure initiatives, the Indian construction industry is likely to add 80 million metric tonnes (MT) capacity by FY24, the largest in ten years, as per CRISIL Research. Increased infrastructure investment in the union budget for FY23 – US$ 26.75 billion for roadways and US$ 18.84 billion for railways – is expected to enhance cement consumption. Numerous federal programs, including MGNREGA and the PM Garib Kalyan Rozgar Abhiyan, as well as public programs like Matir Srisht in West Bengal and public service programs in Jharkhand, have

helped to boost consumption. Mr. Narendra Modi, the Indian Prime Minister, announced the Gati Shakti - National Master Plan (NMP), for intermodal interconnectivity in October 2021. This will increase cement consumption over the years. According to CLSA (institutional broking and financial organisation), the production of cement in India is increasing. The organization's main members are ACC, Dalmia, and Ultratech Cement. Cement companies in India have shown a high increase in profitability in the second quarter of FY21, as rural consumers fully recovered and consumption for the sector surged as construction works resumed during post-paudemic period. In India the nation, there are 210 big cement factories with a total working capacity of 410 million tonnes (MT) and 350 small cement factories with a total working capability of 350 million tonnes (MT). 77 of India's 210 large cement plants are located in the states of Andhra Pradesh, Rajasthan, and Tamil Nadu. Cement sales in India totalled Rs 63,771 crore (US$ 9.05 billion) in the fiscal year 2020. In FY20, the RBI created the Credit Guarantee Enhancement Corporation, which will strengthen the stream of income for infrastructure enhancement. A group of 25 specialists in the cement sector was established by the government in July 2021 (containing UltraTech Cement MD Mr. K C Jhanwar and Dalmia Bharat Group CMD Mr. Puneet Dalmia) to minimize waste, increase performance, lower prices, and maintain process consistency. Cement and gypsum had been able to attract US$ 5.24 billion in FDI between April 2000 and September 2021, as per the information supplied by the Department for Promotion of Industry and Internal Trade (DPIIT). The Indian government is focusing heavily on building infrastructure to increase economic progress, to create 100 urban areas. The government reportedly plans to increase railway capability as well as packaging and processing equipment to make cement distribution easier and less expensive. Such steps will result in more project construction, which would raise cement consumption. In the Union Budget FY 22-23, the Urban Restoration Quest: AMRUT and Smart Cities Mission received Rs. 13,750 crore (US$ 1.88 billion) and Rs. 12,294 crore (US$ 1.68 billion) correspondingly, while the Swachh Bharat Mission received Rs. 48,000 crore (US$ 6.44 billion) (http://amrut.gov.in/content/, https://smartcities.gov.in/).

III. LITERATURE REVIEW AND OBJECTIVES

A few related literatures, national and international, have been studied. Sarangarajan et al. (2013) have observed that the cement industry performance was good in Tamil Nadu during 1997, 1998 and 2004, rest of the years the industry should improve their financial performance. It has been concluded that the cement companies in Tamil Nadu have to be combined in order to become strong, vibrant and also have to concentrate on export market besides maintaining a good supply chain management strategy. Geetha & Ramaswamy (2014) using DEA in their study have observed that income from sales is the most proficient expression than other variables followed by interest income. The CAGR of the operating cost is found to be14.01% per year whereas CAGR of expenses is 15.55% per year. Shekhar (2017) used DEA for measuring the relative performance of selected cement industries for the period from 2011-2015. The study identifies the efficient and inefficient companies based on scale efficiency, overall technical efficiency, and pure technical efficiency. The

study shows how the company will reduce losses and earn maximum profits. Furthermore, Kundi & Sharma (2015) has applied DEA to study the efficiency and flexibility of cement firms in India. The paper has highlighted the importance of flexibility in the production processes of inefficient firms in order to bring their efficiency at par with efficient firms. The study also shows that the foreign firms are more technically efficient than the domestic firms and economies of scale have helped the large firms to be more scale efficient compared to small and medium firms. In another related study, Raikar (2018) has used DEA based Malmquist Productivity Index in his study to show Total Factor Productivity (TFP) change in 22 cement industries over a period of 2012-13 to 2016-17. He has concluded that on the basis of market capitalisation productivity regress in large companies are slightly higher than the small companies. Further a declining trend is recorded in all other components of TFP except managerial and local efficiency. Accroding to Maity et al. (2019)an efficient allocation, management and manipulation of various factors are required to enhance profitability. This study attempts to identify some factors to understand how and to what extent these factors influence the profitability of the Indian cement industry. A Fixed Effect Regression (FER) investigates the performance of Indian cement companies across 146 firms over a period of 22 years (1996-2017) employing fixed effect regression technique using certain firm specific and macroeconomic variables. Their analysis hints that firm specific factors (size, age of firm, fixed assets turnover) and macroeconomic variables (GDP, inflation, export intensity) show a significant impact on profitability of these companies.

In global context, Hossain & Moudud-Ul-Huq (2014) have investigated credit strength and financial performance of cement industries in Bangladesh for the period from 2007 to 2011. Altman Z score Model has been used to analyse the credit strength and they have found that the cement companies in Bangladesh are mostly on financial distress and the credit strength of cement industry in Bangladesh is far behind its landmark. Whereas, Oggioni et al. (2011) in their paper attempted to analyse environmental performance of cement industries of 21 countries worldwide using three DEA models with undesirable outputs and a directional distance function approach are compared in order to capture the different environmental performances of the cement industry operating in these countries covering a period of the years 2005-2008. The study results have shown that countries without environmental regulation, in particular emerging countries like China and India, have been increasing their cement production in recent years and show high efficiency levels. Moreover, Ahmed et al. (2021) seeks to evaluate environmental impacts and ways to improve the environmental performance of cement manufacturing in Asia. Since cement production consumes a significant amount of raw materials and resources, it is necessary to evaluate its environmental impact and determine how the industry can proceed in terms of sustainable practices. More specifically, the current literature review serves for (i highlights that adequate government funding, incentives and R&D efforts.

The review of the existing literature shown above reveals that no study has been made on the performance of Indian cement industry during post-GST era. Therefore, the study has been taken up to evaluate the performance efficiency of

select cement companies of India over a period of five years, covering two years prior to the introduction of GST (2015-16 and 2016-17), year of the introduction of GST (2017-18) and two years after the introduction of GST (2018-19 and 2019-20). The years 2020-21 and 2021-22 have not been considered in this study anticipating adverse impact on the performance of the companies due to COVID Pandemic.

IV. RESEARCH METHODOLOGY

The proposed study considers 40 cement companies of India and secondary data have been collected from different published reports annual reports of the concerned companies, NSE and BSE websites, databases like CMIE PROWESS, etc, for a period of five years (2016-17 to 2019-20)- two years prior to the introduction of GST (2015-16 and 2016-17), year of the introduction of GST (2017-18) and two years after the introduction of GST (2018-19 and 2019-20). For evaluating the performance efficiency, Data Envelopment Analysis (DEA) technique has been used.

Selection of the sample size

DEA scores largely depends on the sample size and the sample size selected for the study considers the various thumb rules that are normally used for DEA. Cooper et al. (2011) gives such two rules which can be combinedly expressed as $n \geq \{m \times n\}$ or $n \geq \{3(m+n)\}$, where n = number of Decision-Making Units (DMUs), m = number of inputs, s = number of outputs. For the current study, we have selected four *inputs - raw materials, salaries, other expenses* and *total capital employed,* and two *outputs -sales* and p*rofit after tax*, based on related literatures. The sample size is kept at 40 which satisfies both the above equations. The companies are selected on the basis of availability of data for the study period.

Technical efficiency (TE)

Technical Efficiency is the rate of success or failure of transforming inputs into outputs. Parametric or nonparametric frontier technique is used to measure the efficiency of firms compared to an estimated best-practice frontier which targets optimum utilisation of resources. Data Envelopment Analysis (DEA) is such a non parametric approach that deals with the construction of a particular frontier through linear combination of input-output set that envelops the data of all the firms in the sample. Non parametric approach is used in the present study to determine input-oriented efficiency of the cement companies in India. The efficiency of one Decision Making Unit (DMU) is compared with another with a simple assumption that all DMUs lies on or below the efficiency frontier. DMUs lying on the frontier is considered as more efficient than those lying below the efficiency frontier which are considered as inefficient. The target of DEA is to compare how one DMU has competitive advantage over the others and how others are working on their improvement in order to make them efficient. Radial distances on the frontier are minimised due to unique way of enveloping the data. Efficiency scores are calculated by solving linear programming equation. DEA works on two assumptions- Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS). From the assumption we get Overall Technical Efficiency

(OTE) decomposed into Pure Technical Efficiency (PTE) and Scale Efficiency (SE) stated in the following equation:

OTE = PTE × SE

OTE refers to maximum utilisation of resources where PTE refers to running at a point where the production frontier exhibits constant returns to scale.

TE of a firm implies production of maximum output(s) with given level of input(s) or using minimum input(s) for procuring given level of output(s). The concept of TE emphasises on the producer's ability of minimising the wastage of resources given the challenges faced by all companies within a group. The first discussion in relation to the measurement of TE is given by Farrell (1957) to define an easier measure of productive efficiency to account for multiple inputs.

Farrell's T is given as:

T = (x, y): x can produce y; x≥0, y≥0}

Therefore, a feasible input output combination $\{x^0, y^0\}$ is possible if $\{x^0, y^0\}$ € T

V. RESULTS AND DISCUSSION

Tables 1 and 2 given in the Appendix shows the efficiency scores of the sample Indian cement companies for the study perio. The year-wise mean distribution of overall (OTE) and pure (PTE) scores as well as the summary for all 40 Indian cement companies are presented chronologically in Table 4 and 5 respectively. Starting from the initial years it has been found that the average OTE score is the least in the year 2018-19 followed by 2017-18. However, there has been an increase in the mean OTE scores in 2019-20. The corresponding mean OTE scores are 0.806 and 0.823 respectively for 2017-18 and 2019-20. As the mean OTE score stands at 0.823 for the year 2019-20, it hints that the overall technical *inefficiency* (OTIE) is approximately 18 percent (17.7 percent). Since an input-oriented approach has been followed for computing the technical efficiency scores, the results indicate that Indian cement companies are capable to decrease their inputs further by 18 percent with a simultaneous increase in their outputs.

The OTE scores can be further decomposed into two non-additive elements -- pure technical efficiency (PTE) and scale efficiency (SE) -- that are mutually exclusive in nature. The analysis is restricted to the computation of technical efficiency only. The PTE scores have been computed by applying the BCC model on the same dataset, and efficiency scores arrived at applying the BCC model gives the estimates of PTE that is free from scale effects. The results of PTE scores are presented in Table 2. In case, where there exists any difference in the efficiency scores (between OTE and PTE scores) of an individual cement company, it specifies *scale inefficiency* (SIE). In accordance with the DEA literatures, DMUs with OTE scores equal to 1 are 'globally technically efficient' whereas DMUs with PTE scores equal to 1 but OTE scores less than 1, are designated as 'locally technically efficient'. Moreover, the efficiency obtained by application of BCC model that uses VRS assumption creates a frontier line that envelopes the data points more tightly (i.e., it forms a convex hull of the intersecting planes) than the CRS model (as it creates a conical hull shape) and therefore generates technical efficiency scores (PTE) that are either greater than or equal to the efficiency scores arrived at under the CRS model (OTE scores) (Coelli, 1996; Goyal et al., 2019).

Further, Tables 3.1 – 3.5 (Appendix) reveal the status of sample Indian cement companies that are either globally or locally technically efficient over the study period. It has been found that out of 40 cement companies, 20 companies (i.e., 50 percent) attain the status of locally technically efficient with PTE score equal to 1 in 2015-16. However, in the year 2019-20 out of 40 cement companies, 21 (i.e., 52.5 percent) are locally technically efficient. The mean of PTE scores has also increased from 0.921 in 2015-16 to 0.941 in 2016-17 followed by a reduction in the subsequent years. However, at the end of the year 2019-20, the mean of the efficiency score is the least (0.915), which indicates that the extent of pure technical *inefficiency* (PTIE) of Indian cement industry has increased from 7.9 percent in 2015-16 to approximately 8.5 percent in 2019-20. Thus, it can be perceived that 8.5 percent out of 17.70 percent of OTIE (2019-20) can be primarily attributed to managerial inefficiency. It has also been observed that despite marginal improvement in OTE in 2016-17, out of 40 cement companies the number of cement companies with OTE scores equal to 1 has declined and only 11 cement companies are globally as well as locally technically efficient (i.e., having OTE scores equal to 1) in the year 2019-20. Furthermore, the remaining 10 cement companies (i.e., 21 cement companies with PTE score of 1 minus 11 cement companies with OTE score of 1) although are locally technically efficient but are globally *inefficient.* Thus, the OTIE of these 10 cement companies for the year 2019-20 may be due to their inability to consistently operate at the most productive scale size (MPSS). Furthermore, the proportion of locally technically efficient cement companies has decreased to 21.

Significant variations have been observed in the Scale Efficiency (SE) scores for sample of Indian cement companies. Table 4 (Appendix I) shows the SE scores that is simply the ratio between the OTE and PTE scores. SE score of 1 implies that a particular cement company is operating at the MPSS, while a SE $\neq$ 1 indicates that the company is inefficient due to non-operation at the required scale size. The summary statistics results from Table 5 reveals that the mean of SE score for 2019-20 is 0.868 indicating that average level of scale inefficiency (SIE) is 13.13 percent. Also, during the same period the SE scores ranges between 0.3347 and 1. Lastly, the higher mean (0.9159) and lower standard deviation (0.122307) values of PTE scores vis-à-vis the SE (mean: 0.8687 and standard deviation: 0.19047) score value indicate that a considerable proportion of OTIE is due to scale inefficiency during the study period.

VI. CONCLUSION

The paper attempts to analyse Overall Technical Efficiency of select companies in the Indian Cement Industry over the period of five years starting from 2015-2016 and ending in 2019-20. It has been found that out of 40 cement companies, 20 companies (i.e., 50 percent) attain the status of locally technically efficient with PTE score equal to 1 in 2015-16. However, in the year 2019-20, out of 40 cement companies, 21 (i.e., 52.5 percent) are locally technically efficient. The mean of PTE scores also increased from 0.921 in 2015-16 to 0.941 in 2016-17 (i.e., efficiency has increased during pre-GST period of study), followed by a decrease in the subsequent years, indicating that the extent of pure technical *inefficiency*

(PTIE) of Indian cement industry has increased from 7.9 percent in 2015-16 to 8.5 percent in 2019-20 (i.e., cement companies have become inefficient during post-GST period of study). Thus, it can be perceived that 8.5 percent out of 17.70 percent of OTIE (2019-20) can be primarily attributed to managerial inefficiency. It has also been found that despite marginal improvement in OTE till 2017-18, in the year 2019-20 out of 40 cement companies the number of cement companies with OTE scores equal to 1 has decreased and only 11 cement companies are globally as well as locally technically efficient (i.e., having OTE scores equal to 1). And the remaining 10 cement companies (i.e., 21 cement companies with PTE score of 1 minus 11 cement companies with OTE score of 1) are locally technically efficient but are globally inefficient, may be due to their inability to consistently operate at the most productive scale size (MPSS). Therefore, it may be concluded that performance efficiency during post-GST period has deteriorated compared to pre-GST period. The primary reason for the variance may be the higher rates of GST of 28% on the industry. With an increase in tax rate from about 24% to 28% (GST) has increased the cost of supply which is ultimately burdening the cost on the consumer end. However, with passing time the facility of input tax credit can overcome the increased cost burden. In the long run, the cement sector is expected to have a price advantage, owing to increased clinker consumption, which in turn is expected to generate higher revenue.

References

Ahmed, M., Bashar, I., Alam, S. T., Wasi, A. I., Jerin, I., Khatun, S., and Rahman, M. (2021). An overview of Asian cement industry: Environmental impacts, research methodologies and mitigation measures. *Sustainable Production and Consumption*, 1018–1039. https://www.sciencedirect.com/science/article/abs/pii/S2352550921002232

Coelli, T. (1996). A Guide to DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program. *Centre for Efficiency and Productivity Analysis Working Paper* (96/08). https://www.une.edu.au/econometrics/cepa.htm

Dasgupta, D., and Das, S. (2021). Sustainability performance of the Indian cement industry. *Clean Technologies and Environmental Policy*, *23*(4), 1375–1383. https://doi.org/10.1007/s10098-020-01998-6

Cooper, W.W., Seiford, L.M. and Zhu, J. (2011), Data Envelopment Aualysis: History, Models and Inter pretations, Interaalional Series in operiation Research & Management Science, Boston, MA, http://doi.org/10.1007/978-11-4419-6151-8-1.

Farrell, M.J. (1957). Masurement of Productive Efficiency, *Journal of the Royal Statitical Society,* Vol. 120, No. 3.

Geetha, T., and Ramaswamy (2014). A study on the financial performance efficiency of selected cement industries in India. *International Journal of Emerging Research and Technology*, *2*(9), 106–111.

Goyal, J., Singh, M., Singh, R., and Aggarwal, A. (2019). Efficiency and technology gaps in Indian banking sector: Application of meta-frontier directional distance function DEA approach. *Journal of Finance and Data Science*, *5*(3), 156–172. https://doi.org/10.1016/j.jfds.2018.08.002

Gupta, S., Mohapatra, B. N., and Bansal, M. (2020). A review on development of Portland limestone cement: A step towards low carbon economy for Indian cement industry. *Current Research in Green and Sustainable Chemistry*, *3*(July). https://doi.org/10.1016/j.crgsc.2020.100019

Hossain, M. K., & Moudud-Ul-Huq, S. (2014). Analysis of Credit-Strength of Cement Industry

in Bangladesh. *Management Studies and Economic Systems*, *1*(2), 97–114. https://doi.org/10.12816/0006209

IBEF (2020) In *Report on Cement Industry* (Vol. 30, Issue 10). https://doi.org /10.1144 / geosci-30-10, November.

Kundi, M. and Sharma, S. (2015). Efficiency Analysis and Flexibility: A Case Study of Cement Firms in India. *Global Journal of Flexible Systems Management*, *16*(3), 221–234. https://doi.org/10.1007/s40171-015-0094-0

Maity, B., Suresh, V., & Baidya, M. K. (2019). Performance of Indian Cement Industry: Drivers, Models and Empirics. *Global Economy Journal*, *19* (2). https://doi.org/10.1142/S219456591950009X

Nayaka, B. (2021). A Study on Impact of Goods and Services Tax (GST) on Cement Industry in India. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3834940

Oggioni, G., Riccardi, R., & Toninelli, R. (2011). The cement industry: Eco-eciency country comparison using data envelopment analysis. *Journal of Statistics and Management Systems*, *14*(6). https://www.tandfonline.com/doi/abs/10.1080/09720510.2011.10701602

Raikar, A. (2018). Performance Analysis of Selected Cement Companies in India Using DEA Malmquist Productivity Approach. *ZENITH International Journal of Multidisciplinary Research*, *8*(7), 343–353.

Rajamani, K., R. S., L., & Ravi, A. (2018). A Study on the Dealer ' s Opinion about the Effect of GST with Reference to Cement Industry. *International Research Journal of Business and Management-IRJBM*, *11*(5), 60–65.

Sarangarajan, V., Ananth, A., & Lourthuraj, S. (2013). Financial Performance Efficiency of Select Cement Companies in Tamilnadu. *International Journal of Advanced Research in Management*, 34–44.

Shekhar, C., 2017. a Study on the Performance Efficiency of Cement Sector in India. *International Educational Scientific Research Journal*, *3*(3), 36.

Vishwakarma, A. K., Nema, A. K., & Sangle, S. (2019). What determines environmental proactiveness in the Indian cement sector? An empirical study. *Journal of Cleaner Production*, *234*, 961–971. https://doi.org/10.1016/j.jclepro.2019.06.291

APPENDIX

TABLE 1

Overall Efficiency Scores of Sample Indian Cement Companies

DMU	2015-16	2016-17	2017-18	2018-19	2019-20
A C C Ltd.	0.783939	0.809239	0.902479	0.893183	0.873617
Ambuja Cements Ltd.	0.935998	0.930763	0.843617	0.860203	0.953469
Bharathi Cement Corpn. Pvt. Ltd.	1	1	1	1	0.460913
Bhilai Jaypee Cement Ltd.	0.504197	0.306979	0.411031	0.575096	0.859172
Birla Corporation Ltd.	0.618433	0.666003	0.889863	0.969975	0.631526
Calcom Cement India Ltd.	0.976848	0.899074	0.775428	0.824912	0.735217
Chettinad Cement Corpn. Pvt. Ltd.	1	1	1	0.930375	0.626268
Dalmia Cement (Bharat) Ltd.	0.879148	1	0.846885	0.764331	1
Heidelberg Cement India Ltd.	0.633264	0.681696	0.629033	0.732013	0.896042
India Cements Ltd.	0.746077	0.790586	0.682364	0.713924	0.796392
J K Cement Ltd.	0.776232	0.769375	0.759135	0.722631	0.916496
J K Lakshmi Cement Ltd.	0.813233	0.791027	0.794723	0.778307	1
J S W Cement Ltd.	0.837359	0.951512	0.707565	0.555965	0.688647
K C P Ltd.	0.578556	0.632149	0.590576	0.778329	0.967883
Kalburgi Cement Pvt. Ltd.	0.9526	0.967645	1	1	0.877138
Kesoram Industries Ltd.	0.590497	0.580727	0.439775	0.564285	1
Khyber Industries Pvt. Ltd.	0.377855	0.349665	0.29293	0.285296	0.961834
Mangalam Cement Ltd.	0.634757	0.672793	0.620784	0.639828	0.986728
My Home Inds. Pvt. Ltd.	0.926539	0.929427	0.882953	0.935466	0.796359

DMU	2015-16	2016-17	2017-18	2018-19	2019-20
N C L Industries Ltd.	1	1	1	1	1
Nuvoco Vistas Corporation Ltd.	0.695571	0.734469	0.695632	0.692542	1
O C L India Ltd. [Merged]	1	1	1	1	1
Orient Cement Ltd.	0.886894	0.973528	1	1	0.884856
Penna Cement Inds. Ltd.	1	1	1	1	0.559458
Prism Johnson Ltd.	0.553501	0.570932	0.497675	0.495946	0.827617
Purbanchal Cement Ltd.	1	1	1	1	0.625323
R C C P L Pvt. Ltd.	0.760386	0.897381	1	0.887495	0.9319
Rain Cements Ltd.	1	0.959258	0.894585	0.848568	0.633857
Ramco Cements Ltd.	0.859467	0.888603	0.725821	0.806402	0.546271
Sagar Cements (R) Ltd.	1	1	0.86927	0.67247	0.334746
Sagar Cements Ltd.	0.882973	0.834187	0.783794	0.678128	0.955917
Sanghi Industries Ltd.	1	1	1	1	1
Saurashtra Cement Ltd.	0.704787	0.69689	0.73699	0.709173	0.629969
Shree Cement Ltd.	1	1	1	1	0.817199
Shree Digvijay Cement Co. Ltd.	0.637652	0.508669	0.583988	0.538408	1
Star Cement Ltd.	0.912042	1	1	1	1
Ultratech Cement Ltd.	0.934082	0.933617	0.823973	0.859793	0.981171
Ultratech Nathdwara Cement Ltd.	1	1	0.616222	0.112369	1
Wonder Cement Ltd.	1	1	1	1	1
Zuari Cement Ltd.	0.855732	0.857799	0.946844	0.83175	0.400856

**Source:* Author's calculations.

TABLE 2

Pure Technical Efficiency Scores of Sample Indian Cement Companies

DMU	2015-16	2016-17	2017-18	2018-19	2019-20
A C C Ltd.	0.865886	0.86479	1	1	1
Ambuja Cements Ltd.	1	1	0.901774	1	1
Bharathi Cement Corpn. Pvt. Ltd.	1	1	1	1	0.615821
Bhilai Jaypee Cement Ltd.	0.70507	1	1	1	1
Birla Corporation Ltd.	0.756728	0.778362	1	1	0.838012
Calcom Cement India Ltd.	1	1	0.853801	1	1
Chettinad Cement Corpn. Pvt. Ltd.	1	1	1	0.954436	0.735376
Dalmia Cement (Bharat) Ltd.	0.901531	1	1	0.951564	1
Heidelberg Cement India Ltd.	0.682056	0.773623	0.681073	0.827655	0.922277
India Cements Ltd.	0.775296	0.846228	0.759177	0.792456	0.831542
J K Cement Ltd.	0.847565	0.803664	0.77871	0.752185	0.952884
J K Lakshmi Cement Ltd.	0.814901	0.812616	0.803923	0.784298	1
J S W Cement Ltd.	0.966185	1	0.782949	0.623772	0.706289
K C P Ltd.	1	1	1	1	0.975924
Kalburgi Cement Pvt. Ltd.	1	0.976742	1	1	0.894566
Kesoram Industries Ltd.	0.80331	0.645573	0.532467	0.635207	1
Khyber Industries Pvt. Ltd.	1	1	0.713468	0.639627	0.969141
Mangalam Cement Ltd.	0.70969	0.770596	0.750113	0.917692	0.988018
My Home Inds. Pvt. Ltd.	0.942791	0.959338	0.917107	0.968608	0.796838
N C L Industries Ltd.	1	1	1	1	1
Nuvoco Vistas Corporation Ltd.	1	1	1	1	1
O C L India Ltd. [Merged]	1	1	1	1	1
Orient Cement Ltd.	0.937494	0.993132	1	1	0.885995
Penna Cement Inds. Ltd.	1	1	1	1	1
Prism Johnson Ltd.	0.758064	0.692483	0.665024	0.637859	0.86246
Purbanchal Cement Ltd.	1	1	1	1	0.63479
R C C P L Pvt. Ltd.	0.776874	0.945526	1	1	1
Rain Cements Ltd.	1	1	1	1	0.680316
Ramco Cements Ltd.	0.864044	0.927484	0.767696	0.81453	0.665328
Sagar Cements (R) Ltd.	1	1	1	0.764155	1
Sagar Cements Ltd.	1	1	1	0.796411	1

Sanghi Industries Ltd.	1	1	1	1	1
Saurashtra Cement Ltd.	0.938054	1	1	1	0.753792
Shree Cement Ltd.	1	1	1	1	0.925885
Shree Digvijay Cement Co. Ltd.	0.940495	0.85709	0.927147	0.951134	1
Star Cement Ltd.	0.927963	1	1	1	1
Ultratech Cement Ltd.	1	1	1	1	1
Ultratech Nathdwara Cement Ltd.	1	1	0.794542	1	1
Wonder Cement Ltd.	1	1	1	1	1
Zuari Cement Ltd.	0.925759	1	1	0.973687	1

**Source:* Author's calculation.

TABLES 3.1 – 3.5

Frequency Distribution of Efficiency Scores of Sample Indian Cement Companies

TABLE 3.1

2015-16					
PTE			OTE		
Eff. range	DMUs	Percentage	Eff. Range	DMUs	Percentage
0.6<= E <0.7	1	2.5	0.3<= E <0.4	1	2.5
0.7<= E <0.8	6	15	0.4<= E <0.5	0	0
0.8<= E <0.9	5	12.5	0.5<= E <0.6	4	10
0.9<= E <1	8	20	0.6<= E <0.7	5	12.5
E =1	20	50	0.7<= E <0.8	5	12.5
			0.8<= E <0.9	7	17.5
			0.9<= E <1	6	15
			E =1	12	30
Mean		0.921	Mean		0.831

**Source:* Author's calculations.

TABLE 3.2

2016-17					
PTE			OTE		
Eff. Range	DMUs	Percentage	Eff. Range	DMUs	Percentage
0.6<= E <0.7	2	5	0.3<= E <0.4	2	5
0.7<= E <0.8	3	7.5	0.4<= E <0.5	0	0
0.8<= E <0.9	5	12.5	0.5<= E <0.6	3	7.5
0.9<= E <1	5	12.5	0.6<= E <0.7	5	12.5
E =1	25	62.5	0.7<= E <0.8	4	10
			0.8<= E <0.9	6	15
			0.9<= E <1	7	17.5
			E =1	13	32.5
Mean		0.941	Mean		0.840

Continued on the following page

TABLE 3.3

2017-18					
PTE			OTE		
Eff. Range	DMUs	Percentage	Eff. Range	DMUs	Percentage
0.5<= E <0.6	1	2.5	0.2<= E <0.3	1	2.5
0.6<= E <0.7	2	5	0.3<= E <0.4	0	0
0.7<= E <0.8	7	17.5	0.4<= E <0.5	3	7.5
0.8<= E <0.9	2	5	0.5<= E <0.6	2	5
0.9<= E <1	3	7.5	0.6<= E <0.7	5	12.5
E =1	25	62.5	0.7<= E <0.8	7	17.5
			0.8<= E <0.9	7	17.5
			0.9<= E <1	2	5
			E =1	13	32.5
Mean		0.916	Mean		0.806

**Source:* Author's calculations.

TABLE 3.5

2019-20					
PTE			OTE		
Eff range	DMU's	Percentage	Eff range	DMU's	Percentage
0.6<= E <0.7	4	10	0.3<= E <0.4	1	2.5
0.7<= E <0.8	4	10	0.4<= E <0.5	2	5
0.8<= E <0.9	5	25	0.5<= E <0.6	2	5
0.9<= E <1	6	15	0.6<= E <0.7	6	15
E ==1	21	52.5	0.7<= E <0.8	3	7.5
			0.8<= E <0.9	7	17.5
			0.9<= E <1	8	20
			E ==1	11	27.5
Mean		0.915	Mean		0.823

**Source:* Author's calculations.

TABLE 4

Summary Statistics of Efficiency Scores of Sample Indian Cement Companies

YEARS	OTE				
	Min	Mean	Max	Median	Std. Dev
2015-16	0.3779	0.8312	1	0.8811	0.171616
2016-17	0.307	0.8396	1	0.9143	0.187486
2017-18	0.2929	0.8061	1	0.8453	0.192453
2018-19	0.1124	0.7914	1	0.8283	0.208167
2019-20	0.3347	0.82892	1	0.8904	0.190479

YEARS	PTE					SE				
	Min	Mean	Max	Median	Std. Dev	Min	Mean	Max	Median	Std. Dev
2015-16	0.6821	0.921	1	0.9831	0.102459	0.3779	0.9004	1	0.9575	0.140566
2016-17	0.6456	0.9412	1	1	0.098875	0.307	0.8915	1	0.9544	0.166059
2017-18	0.5325	0.9157	1	1	0.126578	0.4106	0.8763	1	0.9159	0.153516
2018-19	0.6238	0.9196	1	1	0.124522	0.1124	0.8584	1	0.8898	0.182305
2019-20	0.6158	0.9159	1	1	0.122307	0.3347	0.8687	1	0.8902	0.190478

*Source: Author's calculations.

INTERNATIONAL ACCOUNTING CONFERENCE-2023

Theme

CHANGING DIMENSIONS OF ACCOUNTING & FINANCE

January 28th & 29th, 2023

Venue: **Hotel Sheraton**
44, Kemal Ataturk Avenue, Banani
Dhaka-1213, Bangladesh

Bangladesh Accounting Association

The Bangladesh Accounting Association is a voluntary association of persons having direct and indirect interest in the education, research and professional practice of Accounting and its allied domain. This Association is a non-profit and non-political forum, formed for the improvement of Accounting in all its dimensions that benefit its members and the society at large with the Motto **"Accounting for Good Governance".** It was incorporated on 1st April 2021 as a "Company Limited by Guarantee" under section XXVIII of the Companies Act, 1994 with License No.09/2021 and Registration No. CA-170408/2021. Its Registered Office is located at Department of Accounting and Information Systems, MBA Bhaban, University of Dhaka, Dhaka, Bangladesh **(www.baa-bd.org).** The Executive Council is represented by academics, corporate leaders, government officials, professionals and practitioners in Accounting and Financial Management from across the country and the ex-officio representatives from the Institute of Chartered Accountants of Bangladesh (ICAB), the Institute of Cost and Management Accountants of Bangladesh (ICMAB) and the Institute of Chartered Secretaries of Bangladesh (ICSB).

Indian Accounting Association (IAA) Research Foundation

IAA Research Foundation is a not-for-profit making body constituted under the Societies Registration Act (Registration No. S/63876 of 1989-90). It is a forum of accounting academics, professionals and corporate executives with its objectives, among others, of promoting higher accounting education and research in India and abroad. The Foundation has already earned a great deal of reputation in India and abroad through its activities **(www.iaarf.in)** of conducting national and international conferences, publishing research volumes, sponsoring research projects, conducting management development programmes and publishing an international journal, *Indian Accounting Review,* in accounting and finance since 1997 (www.journal.iaarf.in). So far, IAARF has organised 15 international conferences in five-star hotels, Calcutta University and Science City, Kolkata. Its 10th International Conference was jointly held with International Association for Accounting Education and Research (IAAER) at Taj Bengal Hotel in Kolkata (January, 2011). Among its seven research publications, the last publication, *First Thirty Years of IAA Research Foundation: 1991-2020,* is a landmark one.

CONFERENCE CALL

Background and Context

As financial markets integrate overcoming a pandemic era, business operations diversify, accountability and good governance deepen, the need for consolidated adoption of common global accounting practices intensifies. Heightening this need further are inadequacies in accounting and reporting systems that sometimes undermine the credibility of published financial data. Incidences of inadequate reporting in turn have consistently been making calls for broader research on how best to align the content and presentation of government's and corporate financial statements better with the interests of the statement's users.

The BAA-IAARF, two fora for academics, researchers, professionals, practitioners, and policymakers in the area of accounting and public financial management, is going to organize an **International Conference on Emerging Issues in Accounting and Financial Management: The Role of Academics & Professionals** on January 28 & 29, 2023 (Saturday & Sunday). Through its broadly defined scope, we welcome research papers in areas such as 'accounting journey' in retrospect as a social good, inter-disciplinary perspectives on accounting, financial reporting, convergence of technology in accounting and public sector financial management and so on. This conference provides a forum for high-quality, refereed empirical research on critical aspects of accounting and financial management for the moment. Purely theoretical research with the potential for empirical applications and in-depth literature reviews are also welcome. It aims to bring together leading academics, research scholars, policy makers and industry experts with diversity to exchange and share their experiences and research results on all aspects of Accounting and Public Financial Management. It aspires to build-up as a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Accounting and Public Financial Management.

Call for Contributions

Prospective authors are requested to contribute and help shape the conference through submissions of their original and unpublished, high-quality conceptual, constructive, empirical, experimental, or theoretical research papers in all areas of Accounting and Public Financial Management for presentation at the conference. **A list of themes and topics are given alongside this write up inviting research papers from accounting academics, professionals/ practitioners, and research scholars.**

The Conference solicits contribution in the form of abstracts, papers and e-posters that address themes and topics of the Conference, including figures, tables and references of novel research materials.

Conference Theme and Venue

The International Conference of Bangladesh Accounting Association (BAA) and Indian Accounting Association Research Foundation (IAARF) will be held at **Hotel Sheraton, 44, Kemal Ataturk Avenue, Banani, Dhaka-1213, Bangladesh on 28th and 29th January 2023** (Saturday and Sunday). The theme of the Conference is **Emerging Issues in Accounting and Financial Management:**

The Role of Academics & Professionals.

Research-based papers on the **following major themes and topics** are invited for presentation at the Conference:

- Accounting Education and Research in Emerging Economies
- Public Financial Management
- Management of Public Sector Enterprises
- Corporate Environmental Management
- Enhancing Competitiveness of the Firm: The Role of Cost Management
- Financial Inclusion

Submission Guidelines

Authors are invited to submit their **research papers including abstract** on the conference theme and topics for oral presentation. Only a limited number may be considered for e-poster presentations. While submitting research papers, it is requested to please follow the *guidelines* below:

- an introductory part outlining the background and significance of the study;
- brief literature review;
- objectives of the study;
- methodologies adopted ;
- analysis and interpretation;
- findings of the study;
- concluding observations;
- references.

What is needed to know before the start of submission?

- If an author would like to submit more than one research paper, he/she should send all papers from the same account.
- Each paper should preferably be within 5000 words including tables and references. In addition, an abstract of not more than 500 words.
- Papers can be submitted for either oral or e-poster presentations. All the papers will be subject to blind review by experts referred by Scientific/Technical Committee, and thereafter selected for oral or e-poster presentations.

The Decision of the Scientific/ Technical Committee will be final in this regard, and authors will be communicated through their registered e-mail ID in due course. Papers selected for e-poster presentations may be advised for electronic presentation using ppt.

Manuscript Preparation

All manuscripts must be in Microsoft® Word [*PDF(.doc or .docx)*] *and formatted in 12-point Times New Roman and one & half spaced (1.5 line).*

- ***Title:*** *Bold, Centred and 14 point. Each word should start with a capital letter.* ***Author's Name:*** *Centred and 12 point, with affiliation & e-mail ID, below the name in 10 point.*
- ***Section Heading:*** *All Capital letters in Bold, Centred and 14 point, e.g.,* ABSTRACT, INTRO
- ***Sub-headings:*** *Bold, upper-lower, 10 point, from left margin.*

- ***Text:*** *In 12 point and there should be 1-inch margins on all four sides.*
- ***Tables and Figures:*** *'TABLE' and 'FIGURE' in capital letter and centred in 10 point, and the table description in bold, upper lower 10 point.*

References: *APA style (7th edition)*

- A declaration must be submitted, along with the paper, by the author(s) mentioning that the manuscript is not copyrighted, and has not been submitted/ published elsewhere.
- Papers must be submitted within **December 15, 2022*.**
- Notification about the acceptance or otherwise of a paper will be made by **January 15, 2023.**

Authors from outside Bangladesh are requested to submit their papers *on or before December 07, 2022* so that acceptance or otherwise may be communicated within December 31, 2022 in order to get time for making necessary arrangements for attending the conference such as getting VISA and Air ticket, etc.

Participants and Tentative Programme

Distinguished academicians and practitioners from different parts of the world are expected to attend the Conference. Besides members of the Bangladesh Accounting Association, scholars from the Indian Accounting Association (IAA) Research Foundation, practising me mbers of the Institute of Chartered Accountants of Bangladesh (ICAB), the Institute of Cost and Management Accountants of Bangladesh (ICMAB), the Institute of Chartered Secretaries of Bangladesh (ICSB), academic heads and deans of many reputed business schools and universities in Bangladesh and India, distinguished expatriate Bangladeshi academics and practitioners, and senior officials of the Government of Bangladesh will enrich the event by their kind presence and active participation in different sessions. About 350 delegates are expected to attend the Conference. The Conference is expected to be inaugurated by a high level digmitary of the Country and the Government of Bangladesh on 28th January, 2023. At the inaugural session, **Professor Shyam Sunder**, Yale School of Management, and past President of American Accounting Association (AAA), and **Professor Bhabatosh Banerjee,** past President of the Indian Accounting Association (IAA) and incumbent President of the IAA Research Foundation, have consented to grace the occasion among others. In the First Plenary, Professor Shyam Sunder will present the keynote address on a contemporary issue. This Session will be chaired by Mr. Mohammad Muslim Chowdhury, Comptroller and Auditor General (C&AG) of Bangladesh and Chair of the Conference Convening Committee. There will be concurrent Sessions on different technical papers on contemporary Accounting and Public Financial Management issues in the post-lunch session. On 29th January, the Conference will be resumed with concurrent sessions followed by post-lunch Plenary. **Professor (Dr.) Zabihollah Rezaee,** Thompson-Hill Chair of Excellence, Professor of Accounting, School of Accountancy, The University of Memphis, Memphis, Tennessee-38152, USA has positively responded (final confirmation awaiting) to deliver key note address in the Plenary Session. Valedictory Address is expected to be delivered by distinguished Accounting scholar Professor Bhabatosh Banerjee. There will be many more distinguished academics and professionals (from India and Bangladesh) who will either chair a con-current session or speak in a Plenary/Valedictory Session. Interested participants may visit the Bangladesh Accounting Association's website **(www.baa-bd.org/conference)** and IAA Research Foundation's website

(www.iaarf.in) from time to time for updated information in this respect.

Registration Fees

(For delegates from Bangladesh, India, and other SAARC Countries)

	For payment on or before	For payment After
	January 10, 2023	January 10, 2023
Member of BAA (BDT)	3,000	3,500
Members of IAARF / IAA (INR)	2,500	3,000
Non-member (BDT)	4,000	4,500
Corporate (BDT)	5,000	6,000
Delegates from Non-SAARC	$100	$100

- Deadline for Registration: January 20, 2023 (no spot registration).
- Accommodation Charges for delegates from outside Bangladesh only (for 3 nights, i.e., January 27, 28 & 29, 2023): US$25 (INR 2,000.00 for IAARF/IAA Members) per delegate on a double occupancy basis.

(*Only a few rooms at a Social Club/Guest House will be available **for overseas delegates** on a first-come, first-served basis. Registration fees will cover 3 breakfasts, 2 luncheons, 2 dinners, a copy of the Conference Proceedings and transport facilities within the city (for attending the Conference only).

For online payment by foreign delegates:
MSD Account No. 00712100742154
Bank name with address: EXIM Bank Ltd., Gulshan Branch, Delta Tower, Gulshan-2,
Dhaka, Bangladesh.
Swift Code : EXBKBDDH007
*Details will be made available in www.baa-bd.org/conference in due course

Dhaka Weather

In January, the weather in Dhaka is pleasant, with temperature varying between 12°C and 22°C. There are many beautiful places and monuments of tourist attractions in the City, e.g., Dhaka, the Capital of Bangladesh. The Country is famous for the warm hospitality, and it is well connected by air, rail, and other transport facilities.

Contact Persons for Sending Queries, Papers, Registration of Interest

Prof. Dr. Md. Sayaduzzaman
Professor, Dept. of Accounting and Information Systems, University of Rajshahi Rajshahi-6205, Bangladesh and
General Secretary
Bangladesh Accounting Association
e-mail:milons66@yahoo.com
www.baa-bd.org/conference

Prof. D R Dandapat
Professor, Department of Commerce University of Calcutta, India and
Secretary
IAA Research Foundation
e-mail:dhrubacal@yahoo.com
e-mail: baaiaarfconf2023@gmail.com
www.iaarf.in

INDIAN ACCOUNTING REVIEW

Statement of Policy, Requirements & Guidelines

Policy

Indian Accounting Review (IAR) is a bi-annual research journal published by the Indian Accounting Association Research Foundation. It is published in June and December each year. It is a refereed international journal with the review process being double blind. The scope of the journal encompasses all areas of accounting including auditing, taxation, management accounting and information systems. IAR seeks to publish high quality, research-oriented and original articles. It encourages both fundamental and applied research works.

Submission requirements

Two copies of manuscripts along with a C.D. should be submitted for consideration for publication in IAR. Manuscripts from abroad should be accompanied by a US $100 non-refundable submission fee payable by cheque in favour of 'IAA Research Foundation[1]. For authors from SAARC countries, non-refundable submission fee is ₹ 800 but for each published article, ₹ 1,500 will be awarded.

All manuscripts should be typed *one and half-spaced*. A separate list of references should be used, not made a part of the footnotes. Footnotes, also **one and half spaced**, should be listed at the end of the paper. **Manuscripts should not normally exceed 20 pages** including figures, tables, footnotes and references, printed on 8.5" x 11" paper.

Each manuscript should contain a non-mathematical abstract of not more than 100 words. There should be a title page containing the name of the article, authors' names (without designations), affiliations and corresponding author's address. The names of the authors should not appear on the first page of the manuscript to facilitate blind review. **Manuscripts must be prepared strictly following the guidelines.**

The submission of a manuscript to IAR means that the author certifies that the manuscript is not copyrighted, nor has it been accepted for publication (or published) by any refereed journal; nor is it being submitted elsewhere, at the same time.

Manuscript-preparation guidelines

The following guidelines should be followed.

Heading : Bold, centred and 14 point. Each word should start with a capital letter.
Author Name : Centred 12 point, with affiliation below the name in 10 point but no designation,
Abstract : Indented from both sides in 10 point.
Headings : Bold, upper case only centred in 12 point.
Sub-headings : Bold, upper-lowers, 10 point, from left margin.
Text: In 12 point and there should be one-inch margins on all four sides.
Tables and Figures : Table in capital and centred in 10 point, and the table description in bold, upper lower 12 point.
For further details see Foundation's Website **(www.journal.iaarf.in)**

References: Samples:

(i) **Book :** Choi, F.D.S., Frost, C.A. & Meek, O.K. (1999). *International Accounting*, Upper Saddle River, N.J.: Prentice Hall, 24-31.

(ii) **Journal :** Rivera, J.M. (1991). Prediction performance of earnings forecasts : the case of U.S. multinationals. *Journal of International Business*, 22, 265-288.

Submission address :

Manuscripts from the U.S.A., Canada, Mexico, South-American and European countries should be submitted to : **Professor Shyam Sunder**, Yale School of Management, Connecticut, USA.
Email: shyam.sunder@yale.edu
Manuscripts from other countries should be submitted to : **Professor Dhrubaranjan Dandapat**, Editor IAR, Department of Commerce, University of Calcutta, Kolkata - 700 073.
Email : dhrubacal@yahoo. co.in / drdcaluniv@gmail.com

INDIAN ACCOUNTING REVIEW

[Vol. 26, No. 2, December 2022]

IAR is indexed in :

1. Indexed Copernicus
2. Research Bible
3. Directory of Research Journal Indexing (DRJI)
4. Cosmos Impact Factor
5. Cite Factor
6. ISRA Journal Impact Factor
7. Scientific Indexing Service (SIS)
8. Google Scholar
9. International Scientific Indexing (ISI)
10. Academic Keys
11. General Impact Factor
12. Open Researcher and Contributor ID (ORCID)
13. International Institute of Organised Research (I2OR)

and

14. Research Junction

IAR is distributed free to its members.

Printed by Dr. Dhrubaranjan Dandapat, on behalf of IAA Research Foundation, at Rohini Nandan, 19/2, Radhanath Mallick Lane, Kolkata - 700 012 (Mobile.: 9231508276)