

Scopus®

- ◆ **A Meta-Analysis of the Application of Artificial Neural Networks in Accounting and Finance**  
Dr. Narinder Pal Singh, Dr. Bhupender Kumar Som, Dr. C. Komalavalli and Himanshu Goel


 ज्ञान-विज्ञान विमुक्तये  
UGC Care Group II List

- ◆ **An Empirical Analysis of BRICS Bond Market Integration**  
Dr. Vaishali S. Dhingra and Dr. Pooja Patel

- ◆ **A Study on Employee Perception about the Use of E-HRM in IT Organisations**  
Dr. Rupa Rathee and Ms. Renu Bhuntel

EBSCO

- ◆ **Working Capital Management as a Determinant of Financial Performance: Accounting vs Market-based Approach**  
Rajesh Desai

 INDEX COPERNICUS  
INTERNATIONAL

- ◆ **Employee Demography and Employee Engagement- An Empirical Study on IT Employees**  
Meru Das, Dr. Vivek Singh and Dr. Shashank Mehra

- ◆ **Goal Setting: Its Impact on Employee Outcome**  
Krishnasree Gogoi and Dr. Papori Baruah

J-Gate

- ◆ **Earnings Management in Banking Industry: A Systematic Review of Literature**  
Dr. Deepa Mangala and Neha Singla

ProQuest.

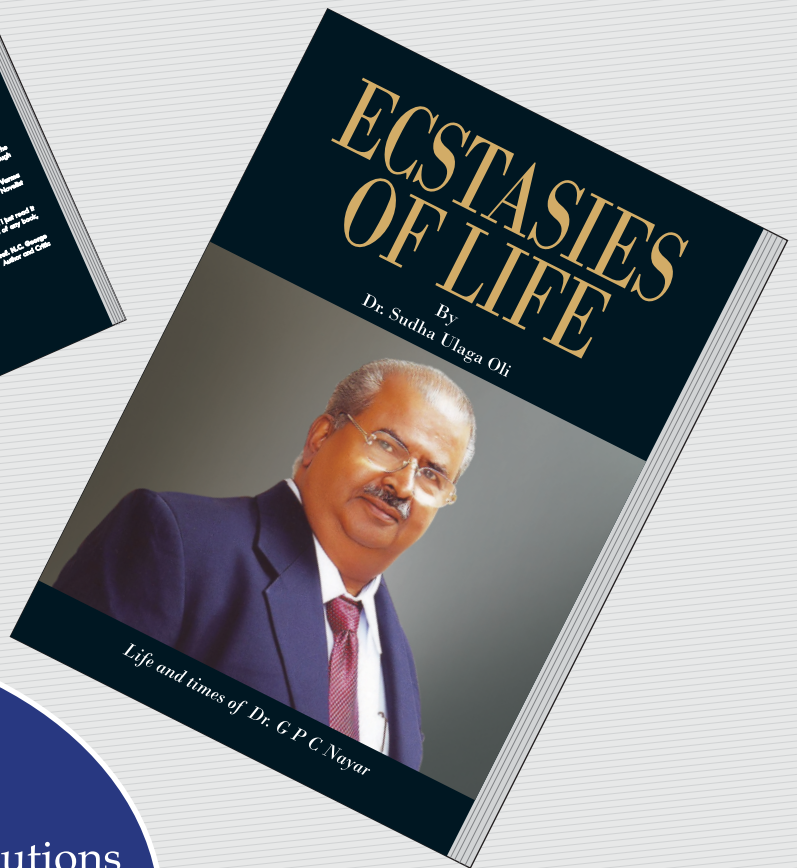
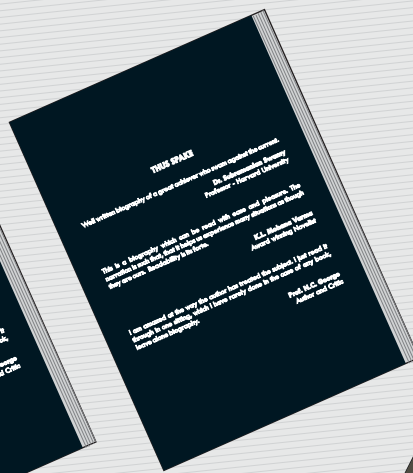
- ◆ **The Impact of Extrinsic and Intrinsic Rewards on Employee Commitment in the Public Sector Manufacturing Companies in India**  
Amal Jishnu H.M. and Dr. Hareendrakumar V.R.


 ULRICHSWEB™  
GLOBAL SERIALS DIRECTORY

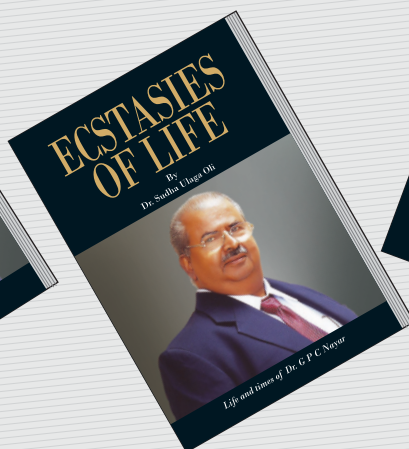
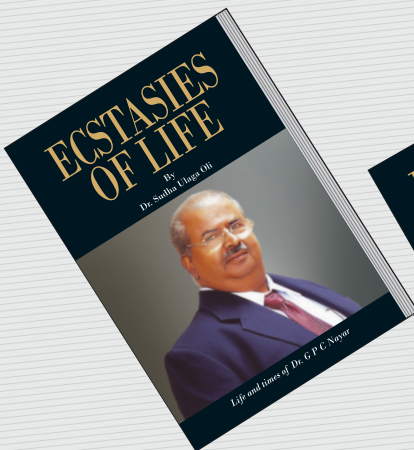
- ◆ **Dialectics of Constructed Identities as Tools of Oppression – Concept of Reverse Metamorphosis as a factor Reinforcing Ageism**  
Dr. Chitra S. Nair


 Indian Citation Index

- ◆ **Co-Integration and Causality Among Stock Market Indices: A Study of 35 Indices Across 5 Continents**  
Dr. Nisarg A Joshi and Mruga Joshi



Here's an entrepreneur  
who has created  
some excellent academic institutions  
in an unfriendly environment.  
It is a saga of trials and tribulations  
in an extremely readable manner  
by a consummate  
writer in English.



# Contents

January - March 2021, Vol. XVIII, Issue No. 1

## Articles

- 5      **A Meta-Analysis of the Application of Artificial Neural Networks in Accounting and Finance**  
*Dr. Narinder Pal Singh, Dr. Bhupender Kumar Som, Dr. C. Komalavalli and Himanshu Goel*
- 22      **An Empirical Analysis of BRICS Bond Market Integration**  
*Dr. Vaishali S. Dhingra and Dr. Pooja Patel*
- 37      **A Study on Employee Perception about the Use of E-HRM in IT Organisations**  
*Dr. Rupa Rathee and Ms. Renu Bhuntel*
48.      **Working Capital Management as a Determinant of Financial Performance: Accounting vs Market-based Approach**  
*Rajesh Desai*
59.      **Employee Demography and Employee Engagement- An Empirical Study on IT Employees**  
*Meru Das, Dr. Vivek Singh and Dr. Shashank Mehra*
75.      **Goal Setting: Its Impact on Employee Outcome**  
*Krishnasree Gogoi and Dr. Papori Baruah*
87.      **Earnings Management in Banking Industry: A Systematic Review of Literature**  
*Dr. Deepa Mangala and Neha Singla*
107.      **The Impact of Extrinsic and Intrinsic Rewards on Employee Commitment in the Public Sector Manufacturing Companies in India**  
*Amal Jishnu H.M. and Dr. Hareendrakumar V.R.*
122.      **Dialectics of Constructed Identities as Tools of Oppression – Concept of Reverse Metamorphosis as a factor Reinforcing Ageism**  
*Dr. Chitra S. Nair*
131.      **Co-Integration and Causality Among Stock Market Indices: A Study of 35 Indices Across 5 Continents**  
*Dr. Nisarg A Joshi and Mruga Joshi*



## Chairman's Overview

The divide between human and machine is narrowing with every major advance in technology. On one side is Elon Musk's Neuralink developing neural laces to provide a common interface between human brains and digital technology, while on the other side, technologies such as artificial neural networks try to mimic human brain functioning in machine learning. Our lead article, this time about the applications of Artificial Neural Networks in accounting and finance, offers a fascinating glimpse into the literature published in this area and points out possible directions for future research.

As the world economy grapples with the long term effects of the pandemic induced slowdown, the second article in the issue offers empirically backed insights into risk mitigation strategies for investors. The authors investigate long- term and short- term BRICS Bond Market Integration through a variety of analytical tools and come up with some interesting findings and recommendations.

E-HRM and the factors that affect its implementation in IT companies is another study that is especially relevant to these times of increasing work from home culture. This issue also features a good mix of articles on subjects ranging from working capital management in the healthcare industry to earnings management in the banking industry. We have interesting perspectives on how employee demographics influence employee engagement, how goal setting is perceived by employees and the outcomes of such goal- setting, as well as how reward systems in public sector companies influence employee commitment. A qualitative study that explores identity construction and its effect on the subjective wellbeing and quality of life of aged women, as well as a comprehensive study on stock market integration across 35 indices in 5 continents, rounds out the collection of scholarly literature offered for your perusal.

I am confident that this issue will be truly informative and educative to our readers.

**Dr. G. P. C. NAYAR**

Chairman, SCMS Group of Educational Institutions.



# SCMS Journal of Indian Management

A Quarterly Publication of  
SCMS-COCHIN

## Editors

Editor-in-Chief  
**Dr. G. P. C. Nayar**  
Chairman

SCMS Group of Educational Institutions

Editor  
**Dr. Radha Thevannoor**  
Registrar and Group Director  
SCMS Group of Educational Institutions

## Editorial Board

Dr. Subramanian Swamy  
PhD (Economics, Harvard University)  
Formerly Union Cabinet Minister of Commerce,  
Law & Justice, Formerly Professor of Economics  
IIT, Delhi & Department of Economics,  
Harvard University, USA

Dr. Jose Maria Cubillo-Pinilla  
Director of Marketing Management  
ESIC Business and Marketing School  
Madrid, Spain

Dr. Naoyuki Yoshino  
Professor of Economics  
Keio University  
Tokyo, Japan

Dr. I.M. Pandey  
Professor of Research  
Delhi School of Business  
New Delhi

Dr. George Sreeba  
Joint Mg. Director, V Guard  
Industries Ltd., Kochi

Mr. Jiji Thomson IAS  
Formerly Chief Secretary  
Kerala

Dr. Azhar Kazmi  
Professor, King Fahd University  
of Petroleum and Minerals  
Dhahran, Saudi Arabia

Dr. Thomas Steger  
(Chair of Leadership and Organization)  
Faculty of Business, Economics and  
Management Indoraction System  
University of Regensburg  
Germany

Dr. Mathew J. Manimala  
Formerly Professor  
Indian Institute of  
Management, Bangalore

Dr. Kishore G. Kulkarni  
Distinguished Professor of Economics and Editor  
Indian Journal of Economics and Business  
Denver, US

Dr. Abhilash S. Nair  
Co-ordinator  
Management Development Programs  
IIM (K), Kochi Campus, Kerala



## Editorial

### Transformation through Disruption



Three months into 2021, as the new financial year is being ushered in, with the positive notes of large scale development and distribution of effective vaccines, it is finally possible to hope that normality will return with time, though the definition of what is normal will be changed forever. It is up to each individual and business to take on the challenge of embracing the new normal and making it one that is better and more humane.

Grappling with the crisis brought in by the pandemic has given business schools across the world a never-before opportunity- that of using real-time, real-world experiences that each individual is experiencing, as case studies, for teaching students' crisis management principles. The world has, in effect, become a gigantic case study- one that is replete with takeaway lessons for anyone with a mind that is willing to think, question and learn from the life unfolding around them. Businesses are coming out of the worst of the pandemic with new lessons learnt and fresh insights on the possibilities of managing disruptions and emerging stronger.

In many ways, this change is for good. There has been an opportunity for introspection and for re-evaluating the accepted norms and procedures followed. Hybrid delivery of classes- with a combination of offline and online sessions, seems to be increasingly preferred. Students are encouraged to be increasingly self-reliant in their learning, and physical classes are used as a platform for discussing and putting into practice what they have learned. The shakedown should result in the academic world re-evaluating its course contents and assessing whether students are actually learning the skills that it takes to navigate a world of uncertainty. We are witnessing the birth of a new culture- one that is characterized by a questioning of how things have always been done, to one that is willing to embrace the 'ifs' and 'buts', and grow and become stronger with the challenges.

**Dr. Radha Thevannoor**

**Associate Editor**

Anju Varghese Philip

**Asst. Editors :**

Dr. Mohan B.  
Sudheer Sudhakaran

**Editorial Committee:**

Prof. K. J. Paulose  
Dr. Praveena K.  
Praveen Madhavan

# A Meta-Analysis of the Application of Artificial Neural Networks in Accounting and Finance

**Dr. Narinder Pal Singh**

Associate Professor,  
Jagan Institute of Management Studies  
Email: npsinghagam@gmail.com

**Dr. Bhupender Kumar Som**

Professor & Director,  
Lloyd Business School  
Email: bksoam@live.com

**Dr. C. Komalavalli**

Professor  
Jagan Institute of Management Studies  
Email: komal@jimsindia.org

**Himanshu Goel**

Assistant Professor  
Lloyd Business School, Greater Noida  
Email: himanshugoel571@gmail.com

## A b s t r a c t

Artificial Neural Networks (ANNs) have emerged as a robust technique of forecasting and prediction in almost every part of the business. This study explores the development of ANNs over a period of time and provides an extensive and exhaustive literature review on the applications of ANN in various fields of accounting and finance, such as stock market prediction, bankruptcy, and many others. The findings of the study support the superiority of the ANN model over conventional statistical techniques in prediction, such as Linear Discriminant Analysis (LDA), Logit Model, etc. However, determining the optimal architecture of an ANN model is a time consuming and difficult process. The novelty of this study lies in the fact that there is a dearth of literature on applications of ANNs in some sub-areas of accounting and finance, namely time series forecasting, specifically in foreign exchange and commodity markets. Thus, ANN application can be explored in these sub-areas of accounting and finance.

**Keywords:** Neural Networks (NNs), Artificial Neural Networks, Meta-Analysis, Bankruptcy, Stock Market Prediction.

## 1. Introduction

“Artificial Neural Network is a system of hardware and software patterned after the operation of neurons in the human brain. It builds a relationship in the form of data through a process that mimics the way a human brain operates.” Artificial Neural Networks are dynamic in nature as they can adapt to changes in output so that they provide the best possible result without changing the input nodes. ANNs have shown huge potential in the field of finance where they are used for various purposes to enhance the productivity of the business in the global arena. ANN follows a series of algorithms that helps in finding the underlying relationship between the output and input variables. ANN consists of several neurons or nodes that are operated in parallel and arranged in layers or tiers. The layers are highly connected as each node from the tier N is connected to subsequent tiers N+1. The first layer receives raw input and transfers it to the preceding layer to generate the desired output, and the middle layer is called the hidden layer, which is responsible for connecting the first layer, i.e., the input layer and the last layer called the output layer. However, the number of nodes and layers depends on the desired accuracy to be achieved and also the complexity of the problem. Also, there can be a series of nodes in the output layer which forms an image in the readable format. In ANN, each node carries a weight that entirely depends on values that contribute to getting the correct answers. In other words, nodes that contribute to getting the desired results are awarded higher weights in comparison to nodes that don't. Initially, nodes are flooded with huge chunks of data and output is told to the network in advance. With advantages also come drawbacks and ANN is the one that is unaffected by this curse as the assumptions people make that causes bias during training has evolved as the biggest threat for the practitioners. If the data feeding is not neutral – the machine propagates bias.

Many scientists, practitioners and academicians have developed models based on ANNs in the past. The first computational model of Artificial Neural Networks, popularly called threshold logic which was based on mathematics and algorithms, was developed by Warren McCulloch and Walter Pitts in 1943. It splits the ANNs research into two approaches. The first approach was related to the biological process in the human brain, and the second approach was related to the application of ANNs. Later, Minsky and Papert (1969) discovered two critical issues with the Artificial Neural Network technique. The first one

was the ability of the machine to solve complex problems, and the second was the incapability of the computers to run large ANN models efficiently. This brought a slowdown in research on ANNs till the machines got fast processing circuit boards.

Due to its ability to learn and model non-linear relationships, its usage has gained popularity in different fields of business. They also allow users to build a strong and reliable model that can help in predicting future events. Nowadays, it is being used to check the reliability of a business plan, recognition of human faces, speech, characters and so on. Also, it is widely used in various areas of finance such as prediction of stocks, evaluation of loan application, analyzing the credit-worthiness of customers and many more. However, there is a dearth of review articles that combines the various applications of the ANN model in accounting and finance. Moreover, the authors believe that there is a great demand for comprehensive review articles that combine the various methods and current studies. Therefore, this study analyzes the various applications of the ANN model in different fields of accounting and finance.

This paper presents a review of articles comparing numerous models of ANN and conventional statistical techniques. Section 1 represents the introduction of the study, and section 2 consists of relevant literature in different areas of accounting and finance. The results of the study have been presented and summarized in section 3; section 4 deals with the future scope for research, and the last section deals with the conclusion part of the study discussing certain issues pertaining to ANN models.

## 2. A Review of Literature

Over the past few years, the usage of ANN has gained popularity due to its distinct ability to detect the underlying relationship between different sets of data. However, there are various factors that determine the accuracy of ANNs, which include the choice of input variables, architecture selected for a specified problem, training pattern of ANNs, etc. Thus, it becomes significantly important to study these factors before building an Artificial Neural Network. Also, various studies conclude that ANNs have provided a better statistical technique in forecasting when compared with other conventional prediction models. However, some studies also reveal that traditional statistical tools have outperformed ANNs in forecasting. Thus, it becomes important to identify the key areas where ANNs have shown good potential. This section provides a brief overview of applications of ANN in various areas of accounting and

finance, namely bankruptcy prediction, stock market prediction and other applications.

### **2.1. Bankruptcy Prediction**

Much of the research has been done on bankruptcy prediction as detection of accounting frauds, and bankruptcy is an important measure to evaluate a firm's performance. In the study of Odom et al. (1990), an analysis was performed on ratios using both discriminant and artificial neural network techniques. The authors have used the predictive abilities of both the models and the results show that neural networks might apply to this problem. Salchenberger et al. (1992) made a comparative analysis between a logit and ANN model, and to reduce the dimensionality of the model; the authors employed stepwise regression on twenty-nine variables resulting in five significant variables. The findings of the study reveal the ANN model has outperformed the logit model in terms of forecasting bankruptcy. Furthermore, the authors reported a reduction in type I and an increase in Type II error.

Tam and Kiang (1992) introduced a neural network approach to perform Linear Discriminant Analysis (LDA). They compared the performance of the ANN technique with linear classifier, logistic regression, k-Nearest Neighbour and ID3. The results show that ANN is a promising technique having the ability to outperform other traditional statistical models, especially in evaluating bank conditions. However, there are certain limitations too that includes limited interpretation ability of weights and computation time etc. The authors have also quoted that it is necessary to test the on-line capabilities before the full potential of ANNs is asserted.

One year later, Fletcher and Goss (1993) stated that ANN provides a better and accurate view of the given data. The author has used two methods to ascertain the firm's performance and stated that ANNs are more statistically accurate and viable than logit function as it has less variance and lowers forecasting risk as determined by the coefficient of variation. However, both methods failed to predict the performance of the firms implying the presence of missing explanatory variables in the model. After one year, Wilson and Sharda (1994) explained that the ANNs are better at forecasting the bankruptcy of firms in comparison to the traditional discriminant model. The author used five

variables and achieved 97% accuracy. The study argued that the number of variables has a direct relation with the accuracy of NNs, i.e. larger the number of variables higher will be the accuracy. However, NNs failed to predict correctly in the case of non-bankrupt firms due to limitations in the data set, methodology, and training. Still, when NNs were provided with balanced data sets, they outperformed discriminant analysis in forecasting non-bankrupt firms.

Later, in the same year, Fanning and Cogger (1994) determined two basic interpretations, ANNs should be viewed as a potential competitor, especially in the area of predicting financial distress of the firms and- ANNs can outperform other existing models that can be used in prediction. ANNs can be capitalized in the arena of forecasting as they are capable of exploring the underlying relationship between different data sets. The authors quoted that NNs have good potential that can be used in several other areas of business. Yang et al. (1999) examined four different methods to predict bankruptcy using financial ratios of the U.S. oil industry. Fisher Discriminant Analysis, back-propagation NN and probabilistic NN with and without patterns were used to determine the bankruptcy of firms, particularly in the oil industry, using deflated and non-deflated data. The authors quoted that the back-propagation NN model managed to achieve the highest accuracy using non-deflated data and the possible reason inferred was it predicted non-bankruptcy only. Another important finding of the study was that the discriminant analysis technique obtained the best results when using deflated data sets in both bankrupt and non-bankrupt firms.

Further, Zhang et al. (1999) explained that ANN techniques are superior to traditional statistical methods of prediction. In his study, the authors used the ANN technique to predict the bankruptcy of firms and also quoted that a better understanding of causes can substantially impact the financial and managerial decision-making process. The findings of the study reveal that ANN is the only known model that makes use of posterior probability to determine the underlying relationship of the unknown population. The study used a cross-validation technique to verify the robustness of neural classifiers, and the results reveal that ANNs are quite robust. The study also compared logistic regression with the ANN technique for classification purpose, and the results were very encouraging as ANNs were significantly superior to logistic regression in



determining the classification rate of the unknown population.

Charalambous et al. (2000) proved that ANNs show superior results in comparison to traditional methods of prediction in the current scenario. However, the author also argued that the reliability of the model majorly depends on the complexity of the problem and variables used, but researchers can apply the ANNs to their problems to find whether they indeed provide better results than commonly used statistical methods or not. Atiya (2001) explained that ANNs are better techniques, especially in predicting stock prices. However, the author also said that improvements must be made by way of better training methods, inputs, and architecture. The study showed this by improving the inputs resulting in improved performance of ANNs. Two years later, Lin et al. (2003) stated that Fuzzy Neural Networks (FNNs) outperformed other statistical models, and the performance of FNNs was compared with the logit model using fraudulent and non-fraudulent firm's data set. Both models have proved their potential in classifying non-fraud cases that will, in turn, enhance the validity and efficiency of the audit. However, the authors also quote that the Logit model was slightly better in forecasting non-fraud cases, and at the same time, FNN was substantially better than the Logit model in predicting fraud cases. Overall, when compared with other conventional statistical methods of forecasting, FNN was better in assessing the risk associated with the fraudulent firms. The study also recommends the auditors to implement these techniques as they offer the great potential that can enhance the effectiveness and efficiency of the audit.

West et al. (2005) explained ensemble ANNs are better predictors than "Single best" multilayer perceptron models, and this fact was supported by examples of three real-world financial data sets where generalization error was reduced by 3-4%, which is a significant reduction statistically. The author evaluated bagging and boosting strategies on the same data set and found bagging was more effective than boosting with the fewest number of variables and least noise. Later, Alfaro et al. (2008) compared two classification methods and showed improvement in accuracy that AdaBoost achieved against ANNs. The authors used these technologies to ascertain the corporate bankruptcy using financial ratios, and the results of the study indicate that the AdaBoost algorithm outperformed

the ANN technique both in the cross-validation and test set estimation in the classification error because AdaBoost makes use of a modified version of the training set to build consecutive classifiers. Also, the authors used accounting-based variables, the size of the firm, the industry and the organizational structure as inputs to evaluate the financial performance of the firm.

Celik and Karatape (2007) examined the performance of ANN in forecasting banking crises. The authors indicated by using a 25 input neurons ANN model that ANN is capable of forecasting banking crises, and ANN can be used for developing effective policies for the banking sector. Kim and Kang (2010) proposed an ensemble neural network for enhancing the performance of conventional ANN models for predicting bankruptcy. The results of the study indicate that the bagged and boosted ANN is a better predictor than traditional ANN models. Particularly, bagged ANN produced better accuracy than other classifiers. Also, the authors recommended more algorithms for future research. Rafiei et al. (2011) made the comparison of ANN, GA, and MDA for bankruptcy prediction. The results of the study indicate that the ANN is better than the other two models. However, the Genetic Algorithm has also evolved as a powerful technique of prediction. Olson et al. (2012) compared the forecasting ability of decision tree algorithms, artificial neural networks and support vector machines. The results of the study indicate that decision trees are more powerful predictors than ANN and SVM. Also, the authors indicate there were more rule modes than desired.

Lee and Choi (2013) analyzed the performance of ANN and MDA for a "multi-industry bankruptcy prediction model". The results indicate an ANN model outperformed the traditional MDA technique. Also, the authors quote the results will partially overcome the limitations of ANNs. Bredart (2014) developed a model to predict the bankruptcy of small and medium enterprises by using three financial ratios that are easily available and achieved 80 percent accuracy. Iturriaga and Sanz (2015) proposed a model based on ANNs to predict the bankruptcy of U.S. banks. The authors took into consideration some specific features of the financial crisis of 2014. Also, they combined multilayer perceptrons and self-organizing maps that can access the insolvency up to three years before bankruptcy occurs. The results reveal the proposed model to be more accurate due to the following reasons. First, the developed model has

outperformed other statistical tools. Second, it provides a better visualization of the complex structures. Third, it is simpler than other models proposed in the previous studies. However, the authors have also explained certain limitations that limit its usage.

Duan (2019) quoted that NNs can outperform traditional statistical tools. The author used Multi-Layer Perceptron (MLP) consisting of three hidden layers trained by the back-propagation algorithm to predict loan default. The study classifies the loan application into three categories: safe loan, risky loan and bad loan. The results of the study reveal that the accuracy level of MLP was much better than the conventional logistic model and the commonly used MLP with one hidden layer.

## 2.2. Stock Market Prediction

During the past few decades, a precise prediction of the stock price has become a significant issue. Thus, ANN models are used extensively to predict stock price movement more precisely and accurately. Yoon et al. (1991) quoted that the precise forecasting of a stock price is a difficult and complex proposition. The findings revealed that artificial neural networks are capable of learning a function that maps input to output and encoding it in the magnitudes of the weights in the network's connection. The number of hidden layers employed in the model contributed to achieving a certain amount of viability. Also, the increase in the number of hidden units resulted in higher performance. However, additional hidden units beyond the point impaired the model's predictive performance. Furthermore, the results of the comparison reveal a superior performance of the ANN model than the MDA approach.

Chen et al. (2001) proposed that Probability Neural Networks (PNNs) have shown great potential in forecasting stock price movement as compared to the GMM-Kalman filter and the random walk model. The results of the study reveal that PNN guided trading strategies have obtained higher returns in comparison to strategies suggested by other models. The authors also recommend that Probability Neural Networks (PNNs) capability can be increased by including the threshold levels. Three years later, Cao et al. (2004) explained the superiority that ANNs have established over a period of time in predicting stock prices. ANNs indeed do provide an opportunity for the investors to

enhance their predictive ability that can, in turn, increase profitability. The findings of the study also suggest that the univariate model has shown more potential than multivariate models in predicting stock prices and also recommends using macroeconomic variables like volume; economic indicators can significantly enhance the accuracy estimates of NNs.

Kim and Lee (2004) proposed a genetically transformed ANN for stock market prediction. The results reveal that the proposed methodology is significantly better than the models considered for comparison in this study. Zhang and Wu (2009) proposed an integrated model consisting of IBCO and BPNN for the prediction of various stock indices. The authors used the IBCO algorithm to adjust the weights of the BPNN network and achieved better results than the traditional BPNN model. Further, Hadavandi et al. (2010) proposed a novel methodology based on the Genetic Fuzzy System and SOM Clustering for predicting stock price. In their study, the authors used the three-stage method to model the proposed structure. In the first stage, they used stepwise regression to choose significant variables, then in the second stage, they categorized the data into k clusters by SOM method, and in the last stage, they fed the clusters into a genetic fuzzy network to build the proposed model and validated the results using real-life datasets. In the end, the authors concluded that the proposed method outperforms all other models held for comparison. One year later, Guresen et al. (2011) compared simple MLP, DAN2 and Hybrid models that used GARCH to define input variables and reported that simple MLP outperforms the other two models in predicting NASDAQ stock exchange prices and recommended focusing on improving the architecture of DAN2 and hybrid models to improve accuracy measures.

Kara et al. (2011) analyzed the performances of ANN and Support Vector Machines (SVM) to predict the stock price movement. The results of the study clearly reveal the potential of the ANN model in determining the stock price movement in comparison to SVM with an average accuracy of 75.74%. Ticknor (2013) introduced a novel technique that combined the Bayesian regularization and ANN for predicting stock prices. The results of the study reveal the proposed methodology solves the problem of overfitting and local minima than commonly used ANNs. Later, Qiu et al. (2016) examined the NN approach to predict the return on

NIKKEI 225. The authors selected seventy-one variables with respect to the Stock Index of Japan, and then they made new combinations of eighteen input variables by fuzzy surfaces. The results showed that eighteen selected variables were capable of successfully predicting stock prices on NIKKEI 225. For selecting the best model, the authors conducted an experiment of nine hundred parameter combinations using the Back Propagation (BP) Algorithm. Also, the authors used a hybrid approach based on the Genetic Algorithm (GA) and Simulated Annealing (SA) that significantly enhanced the prediction ability of ANNs and outperformed the traditional BP algorithm.

Moghaddam et al. (2016) evaluated different architectures to predict the NASDAQ stock index. The results reveal that the network with 20-40-20 neurons has produced the highest level of accuracy. Inthachot et al. (2016) proposed a hybrid methodology for predicting the stock prices of Thailand's stock index. The results of the study indicate the proposed model is better than the previous model in terms of predicting stock prices. Ghasemieh et al. (2017) analyzed the performance of the ANN model using metaheuristic algorithms, and the results suggest that particle swarm optimization outperforms all other algorithms considered for a study that is cuckoo search, improved cuckoo search, improved cuckoo search genetic algorithm, and genetic algorithm.

Later, Alonso et al. (2018) explained the benefits of deep learning and the advantages that users can take while using it. The authors evaluated different ANN models to achieve the highest level of accuracy in time series and Long Short Term Model (LSTM) to be best suited because of the fact that autocorrelations, cycles, and non-linearity are present in time series. Furthermore, time-series data exhibits other challenging features such as estimations and non-stationarity. However, Eltman ANNs are also good candidates, but LSTMs have performed better in non-financial problems. Also, the authors have quoted it is not the performance of the LSTM, which is significant; the LSTMs have shown consistency in their predictions. In the end, the authors have concluded that LSTMs are powerful techniques in forecasting time series. Menon et al. (2018) stated that CNN outperformed all other models considered for the study. Furthermore, the author concluded that there exist underlying dynamics between the National Stock Exchange (NSE) and the New York Stock Exchange (NYSE).

### ***2.3 Other Applications in Accounting and Finance***

Other applications include time series forecasting, foreign exchange prediction, etc., which is a relatively new area of application for ANN as much of the research has focused on bankruptcy and stock market prediction. Jensen (1992) examined "the making and training of ANN to analyze the creditworthiness of the loan applicants is the practical and easy approach" The Author used 100 sample loan applications to train them and still achieved around 75-80% accuracy. The research has also highlighted the effectiveness of ANNs in forecasting. It is economically viable against other statistical methods of prediction. Later, Leung et al. (2000) examined the forecasting ability of a specific ANN architecture called the general regression neural network (GRNN) and compared its performance with numerous forecasting techniques, including a multi-layered feedforward network (MLFN), multivariate transfer function, and random walk models. The findings of the study reveal that GRNN achieved a higher degree of prediction accuracy but also performed significantly better than other models considered for the study. Later, West (2000) analyzed the prediction accuracy of ANN models for credit scoring applications by considering two real financial data sets. The results of the study suggest that ANN credit scoring models can enhance their accuracy level ranging from 0.5 to 3% by using advanced training methods and improved modelling skills. The author also suggests that radial basis ANNs and the mixture of experts are more accurate than other prevailing models in predicting the credit score of the applicant.

Further, Yao and Tan (2000) used the ANN technique to forecast the movement of exchange rates of the American dollar with respect to five major currencies "Japanese Yen, Deutsch Mark, British Pound, Swiss Franc, and Australian Dollar". The results are very encouraging for most currencies except Yen, and the reason could be the market of Japanese Yen is vaster and developed in comparison with other currencies selected for reference. The authors also recommend that ANNs can be best used when dealing with the real trading dataset. The findings of the study suggest using a more robust approach than Mean of Squared Errors (NMSE) for evaluating the performance of Neural Networks. However, sometimes it is important to have a small NMSE for testing and validation purpose. Later, Walczak (2001) analyzed that Neural Network incurs cost. It

can be in the form of money, time and effort. During his study, the author focused on training ANNs and argued that typically a Neural Network takes around 1 to 2 years to produce the best results through the back-propagation algorithm.

One year later, Nag and Mitra (2002) explained that ANNs had proved superiority over traditional statistical models in forecasting exchange rates in the past few decades. However, researchers argue that there is no theory available on the model building process as it depends on the decision of the model builder to choose an optimal number of hidden layers and a number of neurons in hidden and input layers to find the best solution. Therefore, the authors used a genetic algorithm optimization technique to overcome the shortcomings of traditional ANN models. The findings of the study revealed the potential of the proposed approach over conventional ANNs in forecasting foreign exchange rates. The researchers also quote that the proposed model is best suited to find the optimal topology of NNs, and further Malhotra and Malhotra (2003) compared the performance of Multiple Discriminant Analysis (MDA) and Artificial Neural Network in identifying potential loans. The findings of the study show that the ANN techniques consistently perform better than the MDA models in identifying potential loans and alleviating the problem of bias in the training set, and to examine the robustness of the model in identifying bad loans, the authors cross-validate the results through seven different samples of the data. In the same year, Zhang (2003) used a hybrid methodology consisting of ARIMA for linear modelling and ANN for non-linear modelling. The author concludes that the proposed hybrid methodology is significantly better than the traditional ANN model. Also, the authors validated the results by considering real-life data sets.

Later, Kumar and Bhattacharya (2006) stated ANNs outperformed Linear Discriminant Analysis (LDA) in both training and tests partition as they are capable of handling complex data sets and can be even employed to unseen data as it has the potential to determine the underlying relationship between the target and input variables. However, the author employed both techniques to check the credit score of companies by using financial statements and found NNs achieved a 79% accuracy level and the LDA technique achieved a 60% accuracy level which is very low

statistically. Also, the findings of the study suggest carefully choosing the variables after addressing the problem of multicollinearity in order to enhance the validity and reliability of the model. Weizhong (2012) proposed an automatic ANN modelling scheme that made use of a special type of network called GRNN. The author introduced several design parameters to automate the process of modelling ANN for time series forecasting. In the end, the results of the study conclude that GRNNs are robust and potentially good candidates for the automatic ANN modelling process.

Later, Wang et al. (2015) proposed the ADE-BPNN model to enhance the prediction accuracy of traditional BPNN. In their study, the authors concluded that ADE-BPNN outperforms conventional BPNN and statistical tools such as ARIMA in time series forecasting. Also, the authors validated the results by using two real-life cases. Khandelwal et al. (2015) proposed a novel methodology for time series forecasting that combines the unique features of Discrete Wavelet Transform (DWT), ARIMA and ANN. The results of the study were compared with Zhang's hybrid model and found to be significantly better. Parot et al. (2019) analyzed the performance of the hybrid model to forecast EUR/USD returns. The results of the model indicate that the proposed methodology is better than the traditional and classical forecasting models. Also, the authors recommend that post-processing is significant for increasing forecasting accuracy. Cao et al. (2019) introduced a novel methodology by combining the CEEDMAN and LSTM neural networks, and the results of the study indicate that the proposed method is better than other models used for comparison. Also, the authors say the proposed model can also be used for predicting other time series such as traffic and weather.

### 3. Findings

This paper presents a review of the application of ANN models in accounting and finance. The authors have reviewed 50 papers that have used ANN and other models to forecast in various areas of accounting and finance, namely bankruptcy prediction, stock market prediction and other applications such as time series forecasting, etc. An attempt is made to look at the literature more critically with respect to various criteria such as the number of variables, sample size chosen for the study, error measure, the model used in the study and the findings.

The articles discussed in the survey are summarized in tables 1-3. Each table provides a summary of each area in accounting and finance in order bankruptcy prediction, stock market prediction and other applications in accounting and finance. Each table consists of seven columns. Column 1 represents the year in which the study

was conducted, column 2 represents the names of the authors, column 3 illustrates the models used for the study, column 4 shows the number of variables, column 5 represents the sample size selected for the study, column 6 gives the error measure, and column 7 represents the findings of the respective studies.

**Table1: Applications of ANN in Bankruptcy Prediction**

Year	Author	RM	No. of Variables	Sample Size	Error Measure	Findings
1990	Odom and Sharda	NN and MDA	5	129	Confusion Matrix	NNs are better than MDA
1992	Salchenberger et al.	BPNN and LM	29	3479	Confusion Matrix	NNs outperformed Logit Model
1992	Tam and Kiang	NN, Linear Classifier, kNN, ID3 and LR	19, LR-14	236	Confusion Matrix	NN outperforms all three other statistical techniques
1993	Fletcher and Goss	BPNN and LM	3	36	Confusion Matrix, MSE	NN are better predictors than LM
1994	Wilson and Sharda	NN and MDA	5	129	Confusion Matrix	NN outperformed MDA
1994	Fanning and Cogger	GANNA, BPNN and LR	3	230	Confusion Matrix	GANNA outperformed the other two models
1999	Yang et al.	BPNN, PNN, FDA and MDA	5	122	Confusion Matrix	PNN is better than the other three models
1999	Zhang et al.	NN and LR	6	220	Confusion Matrix	NN outperforms LR
2000	Charamlambous et al.	LVQ, RBF and FFNN	7	139	Confusion Matrix	LVQ is better than the other two models
2001	Atiya	NN	5 and 6	911	Confusion Matrix	Proposed novel Indicators to improve performance of NNs
2003	Lin et al.	FNN and Logit	8	200	Confusion Matrix	Mixed Results
2005	West et al.	MLP, Cross-validation, Boosting, Bagging	24, 5	1000, 329	Confusion Matrix	Ensembles are better than single best MLP
2007	Celik and Karatape	ANN	25	350	RMS	ANN performs reasonably well.



2008	Alfaro et al.	AdaBoost and NNs	16	590	Confusion Matrix	AdaBoost outperforms NNs
2010	Kim and Kang	NN, Bagged NN, Boosted NN	32	1458	Type I and Type II	Bagged and Boosted NN is better than traditional NN.
2011	Rafiei et al.	ANN, GA and MDA	17	180	Confusion Matrix	ANN outperforms other models
2012	Olson et al.	Decision Tree, MLP, RBF, BPNN and SVM	18	1321	NA	Decision trees outperformed neural networks and SVM
2013	Lee and Choi	BPNN and MDA	46,40 and 58	6767	t-test	BPNN outperforms MDA
2014	Bredart	NN	3	3728	Confusion Matrix	NN achieves 80% accuracy
2015	Iturriaga and Sanz	MLP and SOM	32	386	ROC	The proposed model is better than other statistical techniques
2019	Duan	MLP and LM	28	887383	MSE, Confusion Matrix	MLP outperforms LM

Table 1 illustrates the application of ANN models in bankruptcy prediction. In most of the cases, the ANN model outperformed the other statistical models except for two. Olson et al. (2012) showed that decision tree algorithms are better predictors than ANN models and Alfaro et al. (2008)

showed the Adaboost algorithm is better than an artificial neural network. However, there are studies that compare the different kinds of ANN models. Also, it is clear from the table that the majority of the studies have used the confusion matrix as the most common error measure.

**Table 2: Applications of ANN in Stock Market Prediction**

Year	Author	RM	No. of Variables	Sample Size	Validation Method	Findings
1991	Yoon and Swales	NN and MDA	9	58	Confusion Matrix	NNs are better than MDA
2003	Chen et al.	PNN, RWM and GMM-kalman filter	4 and 6	128	Confusion Matrix	PNN outperformed the other two models
2004	Cao et al.	ANN and Fama and French's Model Fuzzy Transformation Model, Genetic	1 and 3	367	MAD, MAPE, SD, MSE	ANN is better than other statistical models
2004	Kim and Lee	Transformation Model, Linear Transformation Model	12	2348	Confusion Matrix	GTM outperform all other models
2009	Zhang and Wu	IBCO-BPNN and BPNN	1	2350	MSE	IBCO-BPNN outperformed BPNN

2010	Hadavandi et al.	Hybrid Model, ANN, ARIMA and CGFS	4	2047	MAPE	CGFS outperformed all other models
2011	Guresen et al.	MLP, DAN2, Hybrid models with GARCH	2	182	MSE and MAD	MLP outperform all other models
2011	Kara et al.	ANN and SVM	10	2733	RMS	ANN outperformed SVM
2013	Ticknor	Bayesian Regularized Artificial Neural Network (BRANN), ARIMA	6	734	MAPE	BRANN outperformed ARIMA
2016	Qiu et al.	BPNN and BPNN with GA and SA	18	180	MSE	The hybrid model outperformed traditional BPNN
2016	Moghaddam et al.	BPNN	5,10,20,40, 50,100,200	99	R-Square and MSE	Evaluated different architectures
2016	Inthachot et al.	ANN and GA	44	1464	MSE and MAPE	The hybrid Model outperformed the previous model.
2017	Ghasemieh et al.	ANN	28	1609	MSE	Particle Swarm Optimization Algorithm performs better than other algorithms
2018	Alonso et al.	NN and LSTM	50 and 53	560	MSE	LSTM is better than traditional NN
2018	Menon et al.	MLP, RNN, CNN, LSTM, ARIMA	NA	4861	MAPE	CNN outperform all other models

Table 2 illustrates the application of ANN in forecasting stock price. Over a period of time, different ANN models have been used for stock market prediction, and a comparative analysis is done with the other statistical

models and traditional ANN models. It is clear from the table that in recent times a hybrid model that combines two or more techniques has outperformed the traditional statistical techniques and conventional ANN models.

**Table 3: Other Applications of ANN**

Year	Author	RM	No. of Variables	Sample Size	Validation Method	Findings
1992	Jensen	NN	8	125	Confusion Matrix	NNs are quite practical and easy.
2000	Leung et al.	GRNN, MLFN, RWM	6	259	MAE and RMSE	GRNN outperformed all three models
2000	West	MOE, RBF, LVQ, FAR, MLP, kNN, LR, LDA, KD and CART	2 and 5	1000 and 690	Confusion Matrix	Mixed results

2000	Yao and Tan	NN and ARIMA	5 and 6	510	NMSE	NN outperformed ARIMA
2001	Wakczak	BPNN	2 and 3	125	Confusion Matrix	BPNN incurs cost
2002	Nag and Mitra	GANN, FGNN, ARCH, GARCH, EGARCH, AGARCH	NA	250	AAE, MAPE, Max AE, RSQ, MSE	GANN is better than other models
2003	Malhotra and Malhotra	MDA and NNs	6	1078	Confusion Matrix	NN outperformed MDA
2003	Zhang	NN and Hybrid Model	4	1133	MAD and MSE	Hybrid model outperformed NNs
2006	Kumar and Bhattacharya	LDA and ANN	25 and 8	129	Confusion Matrix	ANN is better than LDA
2012	Weizhong	GRNN	12	111	sMAPE	GRNNs performed well
2015	Wang et al.	BPNN and ADE-BPNN	12	168	RMSE, MAPE, MSE	ADE-BPNN outperforms BPNN
2015	Khandelwal et al.	DWT, ARIMA, ANN and Zhang's Hybrid Model	4	1133	MSE and MAPE	Proposed model outperformed all other techniques
2019	Parot et al.	ANN, VAR, VECM	20	4242	RMSE, MAE, MAPE	Proposed model is better than classical models
2019	Li et al.	CEEDMAN, LSTM, SVM and MLP	9951	128	MAE, RMSE and MAPE	The Proposed model is better than other models

Table 3 illustrates the application of ANN models in other areas of accounting and finance which includes time series forecasting and exchange rate prediction. Various models have been studied by the researchers and a comparison is made with other ANN models. The table shows a recent trend of using hybrid models instead of traditional ANN models.

**Table 4: Frequency of error measures used**

Error Measure	No. of Papers
Confusion Matrix	24
MSE/RMSE/NMSE	16
MAPE/MAE/MAPE/AAE	12
MAD	3
RMS	2
R square	2
ROC	1
Type I and Type II	1
t-test	1
SD	1
Max AE	1

Table 4 illustrates the error measures used in the studies to compare the performance of different techniques. Confusion matrix has been used most frequently, followed by MSE/RMSE/NMSE.

#### 4. Future Scope and Limitations

The present study has further scope for more comprehensive results. It can be explored in other areas of accounting and finance as there is a dearth of literature on applications of ANNs in other areas of accounting and finance such as time series forecasting, foreign exchange rate prediction and commodity market prediction. Furthermore, a comparative analysis can be done by comparing the forecasting accuracy of traditional ANN models and the hybrid models that combines two or more techniques. Also, the current study can be performed using different techniques such as the PRIMA method, bibliometric analysis, systematic analysis, etc.

Though ANN models find applications in a wide spectrum of areas like geo-engineering, marketing, operations etc., but the scope of this study is limited to applications of ANNs in the finance and accounting domain. Another limitation of this study is that it reviews research articles published over

the last three decades. Despite this limitation, the present study covers the entire gamut of applications of ANNs in accounting and finance.

#### 5. Conclusion

In this study, we have carried out a comprehensive literature review on the evolution of artificial neural networks over a period of time and the application of ANN models in various domains of accounting and finance. Since artificial neural networks have gained popularity over the last three decades due to which they have been applied to different domains. The review clearly points out the superiority of artificial neural networks over the conventional statistical models for classification and prediction problems. However, there have been studies where traditional statistical models outperformed the artificial neural network technique. One of the biggest advantages of this technique is it can model any non-linear function. This aspect is particularly useful where the relationship between the variables is unknown, as in the case of prediction of stock prices. However, the determination of various parameters like the number of hidden layers, number of nodes within the layers, the number of input variables is not straight forward and finding the optimal architecture is a time-consuming process.

Another disadvantage highlighted in most of the studies is the lack of interpretability of the weights obtained during the model building process. In this respect, the traditional statistical model stands out as they offer an interpretation of variables, and inferences can be drawn based on these variables. Further, most of the studies have compared the neural network with other statistical models such as logistic regression, linear discriminant analysis and artificial found neural networks to be more effective as they were capable of handling non-linear datasets and establish a relationship between them more precisely. This is particularly so because the performance of these conventional statistical models depends on the validity of the assumptions, which is not considered in the majority of the studies. Also, in most of the articles, the architecture of artificial neural networks is selected by trying out various models on the training data set, which is not done in the case of traditional statistical techniques. Furthermore, various studies have combined the artificial neural network technique with other statistical models and algorithms to enhance the predictive and classification ability of artificial neural networks, and results are very encouraging as they help in lowering down the error

rate by 3 to 5%, which is significant statistically. Therefore, the authors conclude that ANN has shown potential in the field of prediction, specifically in accounting and finance and outperforms the traditional statistical techniques. However, the predictability or accuracy level depends on the understanding of the problem statement. Thus, utmost care should be taken while designing the ANN model for a given problem.

## References

- Alfaro, E., García, N., Gámez, M., & Elizondo, D. (2008). Bankruptcy forecasting: An empirical comparison of AdaBoost and neural networks. *Decision Support Systems*, 45(1), 110-122. doi:10.1016/j.dss.2007.12.002
- Alonso, M. N., Batres-Estrada, G., & Moulin, A. (2018). Deep Learning in Finance: Prediction of Stock Returns with Long Short-Term Memory Networks. *Big Data and Machine Learning in Quantitative Investment*, 251-277. doi:10.1002/9781119522225.ch13
- Atiya, A. (2001). Bankruptcy prediction for credit risk using neural networks: A survey and new results. *IEEE Transactions on Neural Networks*, 12(4), 929-935. doi:10.1109/72.935101
- Bredart, X. (2014). A "User Friendly" Bankruptcy Prediction Model Using Neural Networks. *Accounting and Finance Research*, 3(2). doi:10.5430/afr.v3n2p124
- Cao, J., Li, Z., & Li, J. (2019). Financial time series forecasting model based on CEEMDAN and LSTM. *Physica A: Statistical Mechanics and its Applications*, 519, 127-139. doi:10.1016/j.physa.2018.11.061
- Cao, Q., Leggio, K. B., & Schniederjans, M. J. (2005). A comparison between Fama and French's model and artificial neural networks in predicting the Chinese stock market. *Computers & Operations Research*, 32(10), 2499-2512. doi:10.1016/j.cor.2004.03.015
- Celik, A. E., & Karatepe, Y. (2007). Evaluating and forecasting banking crises through neural network models: An application for Turkish banking sector. *Expert Systems with Applications*, 33(4), 809-815. doi:10.1016/j.eswa.2006.07.005
- Charalambous, C., Charitou, A., & Kaourou, F. (2001). Comparative Analysis of Artificial Neural Network Models: Application in Bankruptcy Prediction. *SSRN Electronic Journal*. doi:10.2139/ssrn.251082
- Chen, A., Daouk, H., & Leung, M. T. (2001). Application of Neural Networks to an Emerging Financial Market: Forecasting and Trading the Taiwan Stock Index. *SSRN Electronic Journal*. doi:10.2139/ssrn.237038
- Duan, J. (2019). Financial system modeling using deep neural networks (DNNs) for effective risk assessment and prediction. *Journal of the Franklin Institute*, 356(8), 4716-4731. doi:10.1016/j.jfranklin.2019.01.046
- Fanning, K. M., & Cogger, K. O. (1994). A Comparative Analysis of Artificial Neural Networks Using Financial Distress Prediction. *Intelligent Systems in Accounting, Finance and Management*, 3(4), 241-252. doi:10.1002/j.1099-1174.1994.tb00068.x
- Fletcher, D., & Goss, E. (1993). Forecasting with neural networks An application using bankruptcy data. *Information & Management*, 24, 159-167.
- Ghasemiyeh, R., Moghdani, R., & Sana, S. S. (2017). A Hybrid Artificial Neural Network with Metaheuristic Algorithms for Predicting Stock Price. *Cybernetics and Systems*, 48(4), 365-392. doi:10.1080/01969722.2017.1285162
- Guresen, E., Kayakutlu, G., & Daim, T. U. (2011). Using artificial neural network models in stock market index prediction. *Expert Systems with Applications*, 38(8), 10389-10397. doi:10.1016/j.eswa.2011.02.068
- Hadavandi, E., Shavandi, H., & Ghanbari, A. (2010). Integration of genetic fuzzy systems and artificial neural networks for stock price forecasting. *Knowledge-Based Systems*, 23(8), 800-808. doi:10.1016/j.knsys.2010.05.004
- Inthachot, M., Boonjing, V., & Intakosum, S. (2016). Artificial Neural Network and Genetic Algorithm Hybrid Intelligence for Predicting Thai Stock Price Index Trend. *Computational Intelligence and Neuroscience*, 2016, 1-8. doi:10.1155/2016/3045254
- Jensen, H. L. (1992). Using Neural Networks for Credit Scoring. *Managerial Finance*, 18(6), 15-26. doi:10.1108/eb013696
- Kara, Y., Acar Boyacioglu, M., & Baykan, Ö. K. (2011). Predicting direction of stock price index movement using artificial neural networks and support vector machines: The sample of the Istanbul Stock Exchange. *Expert Systems with Applications*, 38(5), 5311-5319. doi:10.1016/j.eswa.2010.10.027



- Khandelwal, I., Adhikari, R., & Verma, G. (2015). Time Series Forecasting Using Hybrid ARIMA and ANN Models Based on DWT Decomposition. *Procedia Computer Science*, 48, 173-179. doi:10.1016/j.procs.2015.04.167
- Kim, K., & Lee, W. B. (2004). Stock market prediction using artificial neural networks with optimal feature transformation. *Neural Computing and Applications*, 13(3), 255-260. doi:10.1007/s00521-004-0428-x
- Kim, M., & Kang, D. (2010). Ensemble with neural networks for bankruptcy prediction. *Expert Systems with Applications*, 37(4), 3373-3379. doi:10.1016/j.eswa.2009.10.012
- Kumar, K., & Bhattacharya, S. (2006). Artificial neural network vs linear discriminant analysis in credit ratings forecast. *Review of Accounting and Finance*, 5(3), 216-227. doi:10.1108/14757700610686426
- Lee, S., & Choi, W. S. (2013). A multi-industry bankruptcy prediction model using back-propagation neural network and multivariate discriminant analysis. *Expert Systems with Applications*, 40(8), 2941-2946. doi:10.1016/j.eswa.2012.12.009
- Leung, M. T., Chen, A., & Daouk, H. (1999). Forecasting Exchange Rates Using General Regression Neural Networks. *SSRN Electronic Journal*. doi:10.2139/ssrn.200448
- Lin, J. W., Hwang, M. I., & Becker, J. D. (2003). A fuzzy neural network for assessing the risk of fraudulent financial reporting. *Managerial Auditing Journal*, 18(8), 657-665. doi:10.1108/02686900310495151
- López Iturriaga, F. J., & Sanz, I. P. (2015). Bankruptcy visualization and prediction using neural networks: A study of U.S. commercial banks. *Expert Systems with Applications*, 42(6), 2857-2869. doi:10.1016/j.eswa.2014.11.025
- M, H., E.A., G., Menon, V. K., & K.P., S. (2018). NSE Stock Market Prediction Using Deep-Learning Models. *Procedia Computer Science*, 132, 1351-1362. doi:10.1016/j.procs.2018.05.050
- Malhotra, D. K., & Malhotra, R. (2002). Evaluating Consumer Loans using Neural Networks. *SSRN Electronic Journal*. doi:10.2139/ssrn.314396
- Moghaddam, A. H., Moghaddam, M. H., & Esfandiyari, M. (2016). Stock market index prediction using artificial neural network. *Journal of Economics, Finance and Administrative Science*.
- Mokhatab Rafiei, F., Manzari, S., & Bostanian, S. (2011). Financial health prediction models using artificial neural networks, genetic algorithm and multivariate discriminant analysis: Iranian evidence. *Expert Systems with Applications*, 38(8), 10210-10217. doi:10.1016/j.eswa.2011.02.082
- Nag, A. K., & Mitra, A. (2002). Forecasting daily foreign exchange rates using genetically optimized neural networks. *Journal of Forecasting*, 21(7), 501-511. doi:10.1002/for.838
- Odom, M., & Sharda, R. (1990). A neural network model for bankruptcy prediction. *1990 IJCNN International Joint Conference on Neural Networks*. doi:10.1109/ijcnn.1990.137710
- Olson, D. L., Delen, D., & Meng, Y. (2012). Comparative analysis of data mining methods for bankruptcy prediction. *Decision Support Systems*, 52(2), 464-473. doi:10.1016/j.dss.2011.10.007
- Paliwal, M., & Kumar, U. A. (2009). Neural networks and statistical techniques: A review of applications. *Expert Systems with Applications*, 36(1), 2-17. https://doi.org/10.1016/j.eswa.2007.10.005
- Parot, A., Michell, K., & Kristjanpoller, W. D. (2019). Using Artificial Neural Networks to forecast Exchange Rate, including VAR-VECM residual analysis and prediction linear combination. *Intelligent Systems in Accounting, Finance and Management*, 26(1), 3-15. doi:10.1002/isaf.1440
- Qiu, M., Song, Y., & Akagi, F. (2016). Application of artificial neural network for the prediction of stock market returns: The case of the Japanese stock market. *Chaos, Solitons & Fractals*, 85, 1-7. doi:10.1016/j.chaos.2016.01.004
- Salchenberger, L. M., Cinar, E. M., & Lash, N. A. (1992). Neural Networks: A New Tool for Predicting Thrift Failures. *Decision Sciences*, 23(4), 899-916. doi:10.1111/j.1540-5915.1992.tb00425.x
- Smith, K. A., & Gupta, J. N. (2000). Neural networks in business: techniques and applications for the operations researcher. *Computers & Operations Research*, 27(11-12), 1023-1044.
- Tam, K. Y., & Kiang, M. Y. (1992). Managerial Applications of Neural Networks: The Case of Bank Failure Predictions. *Management Science*, 38(7), 926-947. doi:10.1287/mnsc.38.7.926

- Ticknor, J. L. (2013). A Bayesian regularized artificial neural network for stock market forecasting. *Expert Systems with Applications*, 40(14), 5501-5506. doi:10.1016/j.eswa.2013.04.013
- Walczak, S. (2001). An Empirical Analysis of Data Requirements for Financial Forecasting with Neural Networks. *Journal of Management Information Systems*, 17(4), 203-222. doi:10.1080/07421222.2001.11045659
- Wang, L., Zeng, Y., & Chen, T. (2015). Back propagation neural network with adaptive differential evolution algorithm for time series forecasting. *Expert Systems with Applications*, 42(2), 855-863. doi:10.1016/j.eswa.2014.08.018
- Weizhong Yan. (2012). Toward Automatic Time-Series Forecasting Using Neural Networks. *IEEE Transactions on Neural Networks and Learning Systems*, 23(7), 1028-1039. doi:10.1109/tnnls.2012.2198074
- West, D. (2000). Neural network credit scoring models. *Computers & Operations Research*, 27(11-12), 1131-1152. doi:10.1016/s0305-0548(99)00149-5
- West, D., Dellana, S., & Qian, J. (2005). Neural network ensemble strategies for financial decision applications. *Computers & Operations Research*, 32(10), 2543-2559. doi:10.1016/j.cor.2004.03.017
- Wilson, R. L., & Sharda, R. (1994). Bankruptcy prediction using neural networks. *Decision Support Systems*, 11(5), 545-557. doi:10.1016/0167-9236(94)90024-8
- Yang, Z., Platt, M. B., & Platt, H. D. (1999). Probabilistic Neural Networks in Bankruptcy Prediction. *Journal of Business Research*, 44(2), 67-74. doi:10.1016/s0148-2963(97)00242-7
- Yao, J., & Tan, C. L. (2000). A case study on using neural networks to perform technical forecasting of forex. *Neurocomputing*, 34(1-4), 79-98. doi:10.1016/s0925-2312(00)00300-3
- Youngohc Yoon, & Swales, G. (n.d.). Predicting stock price performance: a neural network approach. *Proceedings of the Twenty-Fourth Annual Hawaii International Conference on System Sciences*. doi:10.1109/hicss.1991.184055
- Zhang, G. (2003). Time series forecasting using a hybrid ARIMA and neural network model. *Neurocomputing*, 50, 159-175. doi:10.1016/s0925-2312(01)00702-0
- Zhang, G., Y. Hu, M., Eddy Patuwo, B., & C. Indro, D. (1999). Artificial neural networks in bankruptcy prediction: General framework and cross-validation analysis. *European Journal of Operational Research*, 116(1), 16-32. doi:10.1016/s0377-2217(98)00051-4
- Zhang, Y., & Wu, L. (2009). Stock market prediction of S&P 500 via combination of improved BCO approach and BP neural network. *Expert Systems with Applications*, 36(5), 8849-8854. doi:10.1016/j.eswa.2008.11.028

\*\*\*\*\*

## Appendix

The abbreviations used in tables 1 - 4 are described below:

Notation	Meaning
LR	Logistic Regression
MDA	Multivariate Discriminant Analysis
k-NN	k-Nearest Neighbour
NN	Neural Network
ANN	Artificial Neural Network
LM	Logit Model
BPNN	Back Propagation Neural Network
GANNA	Generalized Adaptive Neural Network Architectures
PNN	Probability Neural Networks
FDA	Fisher Discriminant Analysis
LVQ	Learning Vector Quantization
FFNN	Feed Forward Neural Network
FNN	Fuzzy Neural Network
RBF	Radial Basis Function
GA	Genetic Algorithm
MLP	Multilayer Perceptron
SVM	Support Vector Machine
SOM	Self-Organizing Maps
BRANN	Bayesian Regularized Artificial Neural Network
LSTM	Long Short Term Memory
CNN	Convolutional Neural Network
ARIMA	Auto Regressive Integrated Moving Average
GARCH	Generalized AutoRegressive Conditional Heteroskedasticity
RNN	Recurrent Neural Network
GFS	Genetic Fuzzy Systems
RWM	Random Walk Model
GMM	Generalized Methods of Moments
IBCO	Improved Bacterial Chemotaxis Optimization
DAN2	Dynamic Artificial Neural Network
GRNN	General Regression Neural Network
MLFN	Multi Layered Feed forward Network
MOE	Mixture of Experts
FAR	Fuzzy Adaptive Resonance

---

KD	Kernel Density estimation
GANN	Genetic Algorithm Neural Networks
FGNN	Fixed Geometry Neural Networks
EGARCH	Exponential Generalized AutoRegressive Conditional Heteroskedasticity
AGARCH	Asymmetric Generalized AutoRegressive Conditional Heteroskedasticity
VECM	Vector Error Correction Model
CEEDMAN	Complete Ensemble Empirical Mode Decomposition with Adaptive Noise
ADE	Adaptive Differential Evolution
VAR	Vector AutoRegression
DWT	Discrete Wavelet Transformation
LDA	Linear Discriminant Analysis
MSE	Mean Squared Error
RMSE	Root Mean Squared Error
NMSE	Normalized Mean Squared Error
MAPE	Mean Absolute Percentage Error
MAE	Mean Absolute Error
ROC	Receiver Operating Characteristic Curve
SD	Standard Deviation
Max AE	Maximum Absolute Error
MAD	Mean Absolute Deviation
AAE	Average Absolute Error
sMAPE	Symmetric Mean Absolute Percentage Error

\*\*\*\*\*

---

# An Empirical Analysis of BRICS Bond Market Integration

**Dr. Vaishali S. Dhingra**

Assistant Professor

Applied Mathematics and Humanities Department,  
Sardar Vallabhbhai National Institute of Technology,

Surat, Gujarat, India

Email: vaishalidhingra1@gmail.com

**Dr. Pooja Patel**

Assistant Professor

S. R. Luthra Institute of Management

Surat, Gujarat, India

Email: poojappatel313@gmail.com

## A b s t r a c t

This paper aims to understand the financial linkages and interdependence of BRICS (Brazil, Russia, India, China and South Africa) nations through the Government security market considering the 10-year bond yield. Long-run and short-run linkages among the 10-year bond yield of these countries are investigated using Johansen and Juselius' co-integration method. Interdependence and Causal relationship are further explored using correlation, cross-correlation, Granger causality test and Wald test. The coefficients of correlation recorded very small values, yet positive, for the bond markets of BRICS economies except for Russia with Brazil and India. The results of cross-correlation, Granger causality tests and Wald tests suggested several statistically significant unidirectional linkages. The results of Johansen co-integration identified a single balanced relationship in the long run among BRICS countries. The paper suggests and supports the adoption of diversification through investments in these emerging market economies, especially in the long-term government security market, as few countries have revealed negative correlation which would induce in lessening the risk during financial distress.

**Keywords:** *BRICS, government security market, financial linkages, Johansen and Juselius' co-integration, Granger causality test*



## 1. Introduction

Brazil, Russia, India, China and South Africa, collectively known as BRICS economies, are a small group of countries that have acquired lots of consideration from researchers and investors during the past decade. The reasons are diverse, but the essential perception being these emerging economies of relatively large size could potentially deliver the anticipated push to augment the economic growth of the world. As a consequence of the Global Financial Crisis of 2007-2008, the yearly growth rate of per capita GNP at an international level has plunged to an average of 1.7% (measured in 2005 \$PPPs during 2008 to 2017). On the other hand, BRICS economies have been the major contributors to the growth of per capita GNP globally, at an average of 5.4% and are considered to outlast the key drivers of growth of the world by 2030. These economies are currently accounting for 30.4% of total world GNP.<sup>1</sup> Since 2015, these five countries have been sharing a GDP of \$ 16.6 trillion, which is equivalent to roughly about 22 percent of the gross world GDP. The estimated expansion in the growth rate of BRICS is 5.3% in 2019.<sup>2</sup>

This turn of the century has observed one of the most complex and major financial crisis so far. The crisis has escalated rapidly from the U.S. housing market to its own financial market and to the whole world financial market. The proliferating growth of the BRICS market has made them significantly financially dependent on other markets of the world. BRICS economies today are more matured, and thus their markets are exhibiting a higher level of financial integration and linkages with other developed markets of the world. BRICS stock market exhibit linkages with global stock market (S&P index), commodity markets (oil and gold) and U.S. stock market uncertainty (Mensi, Hammoudeh, Reboredo, & Nguyen, 2014). Furthermore, bilateral relations among BRICS nations are mainly based on equality, non-interference and mutual benefit (Lopes Jr, 2015). These five BRICS countries differ in their structural characteristics, economic policies and

geopolitical importance. Brazil and Russia are primarily natural resource-based economies, well-known for the export of commodities and are more open in terms of foreign trade. Their capital markets witness liberal regulation with limited control by the state as compared to the markets of India, China and South Africa. These three countries are relatively closed and highly populated amongst the five BRICS economies, where the majority of the population is living in the rural areas having a state-controlled capital market.

The remarkable fall in the equity market wealth resulting from the deteriorating consumption patterns worldwide could pose grave implications on the health of the economy as well as on its financial institutions (Dynam & Maki, 2001). The correlations between major asset classes (particularly stock markets and bond markets) are of major concern for financial regulators and monetary authorities alike. An enriching number of researches in this domain have analysed the characteristics of these linkages and their essence through which information flows between markets. The past literature has been focusing on studying the interaction among the BRICS economies and how / what they contribute to the global markets. The domestic asset prices shocks pose a substantial impact on assets prices; however, the international spillover, both within and across various asset classes, is more considerable (Ehrmann, Fratzscher & Rigobon, 2011). International bond markets hence play a very crucial role in determining asset prices for the developed markets of the world. Financial authorities can influence the term structure minimally. Fundamentally, the expected future inflation and the short term real interest rates determine the long term bond rates. The increased co-variation amongst the bond rates of different economies restricts the influence of higher monetary authorities towards the term structure.

The correlation between bond markets of different countries may crop up through various channels. It can be done by framing an internationally diversified portfolio or determination of real rates by global factors. Risks in the worldwide prices or 'flight to quality' in terms of financial stress may also cause this correlation. The indefinite measure of correlations amongst the key international bond markets indicated an increased association between these markets since the 1960s; however, the results of

<sup>1</sup> Mckinley, T. (2018, Apr 20). Brics to play a leading role in driving future global economic growth (Blog post). Retrieved from <https://www.ineteconomics.org/perspectives/blog/brics-to-play-a-leading-role-in-driving-future-global-economic-growth>

<sup>2</sup> Global Economic Prospects: Divergences and Risks, A World Bank Group Flagship Report, 2016

correlations were neutral in displaying any trend (Solnik, Boucrelle & Le Fur, 1996; Christiansen & Pigott, 1997). In spite of the fact that the absolute prices and measures of the international bond market correlations are not in a situation of increasing trends, the measures taken by the monetary authorities in balancing the yield curve by changing the short-term rates still prevails.

A generous number of studies have examined the linkages, co-movements and correlations amongst the stock markets of BRICS nations (Sharma, Singh, & Litt, 2011; Xu & Hamori, 2012; Chkili & Nguyen, 2014; Bekiros, 2014; Mensi et al., 2014). Many of them have also tried to find the integration of one of the BRICS nations with U. S. bond markets, but the present study is differentiated from the other research by studying the integration within the BRICS nations through the government security market. In the same direction, the impact of the bond price movement on the rest of the BRICS countries has also never been examined. Thus, the study is novel in its type and explores the same concepts with the new dimensions.

The present study attempts to investigate the relationship between the 10-year bond yields of BRICS economies. The empirical analysis uses monthly data from January 2008 to December 2017. At the first stage, the presence of unit root and order of integration of all five series was examined. Secondly, the test of correlation, cross-correlation and Granger causality were adopted to identify short-run linkages and Johansen and Juselius (1994) co-integration framework was used to examine the long term relationships among BRICS countries. Finally, the short-run relationship was verified and confirmed using the Wald test. The paper is further structured as follows: Section 2 provides the synopsis of previous studies. The methodology and description of data are presented in section 3. Estimated results and their rationales are enumerated in section 4, followed by a conclusion and final summary in section 5.

## 2. Literature Review

The crash of stock markets in October 1987 was one of the key stimulants to study the financial market associations. Koutmos and Booth (1995) find that the major stock markets of New York, London and Tokyo witnessed higher interdependencies after the crash of 1987. The 1997 financial crisis played an influential role in bringing the

integration of ASEAN stock markets with other economies (Janor, Ali, & Shaharudin, 2007). The globalisation of economies had driven this obvious increase in the linkages between the domestic equity markets, which in turn have increased the presence of international investors worldwide. The early studies of international financial integration and linkages were triggered by the motive of having an internationally diversified portfolio (Grubel, 1968; Hilliard, 1979; Becker, Finnerty, & Gupta, 1990; Hamao, Masulis, & Ng, 1990). The increased number of foreign investors and strong international market interrelations are motivated by the relaxed restrictions of the capital markets (Phylaktis & Ravazzolo, 2005). The contagion financial crisis of the developed countries along with their portfolio diversification has attracted researchers to investigate the topics of financial integration. The correlation between the BRICS and the USA is increasing since early 2009 after the global financial crisis (Dimitriou, Kenourgios & Simos, 2013). Tornell and Westermann (2002) show that many countries that liberalised their financial markets experienced the development of lending that sometimes resulted in twin crises. King and Wadhvani (1990) anticipated volatility transmission as a result of contagion effect because intermediaries do not measure the economic inference of news from the foreign market; rather, they are merely responding by reacting first and thinking (Shiller, Kon-Ya & Tsutsui, 1991; Taylor & Sarno, 1997; Calvo, 1998). Dhingra, Gandhi, & Bulsara (2016) also argued that the foreign portfolio investors are purely the feedback traders and hence, they increase the financial market volatility. Pereira (2018) investigated the contagion effect in the BRICS economies with special reference to the collapse of Lehman Brothers and the European Sovereign Debt Crisis. The relationship and co-movements between the BRICS markets are analysed using the co-integration, causality and VECM methodology. The results verified and confirmed the long run and short-run relationship between the BRICS nations; however, the same has significantly changed during the crisis period.

Some of the empirical papers have also studied the relationship between stock and bond markets. A VAR approach of Campbell and Shiller (1987) has been used by the studies of Shiller and Beltratti (1990) and Campbell and Ammer (1993) to decompose asset returns. The results

of this study recorded an unexplained change in excess returns, and hence these returns can be explained by future events which are predominantly driven by the future expected inflation rates. Norden and Weber (2009) studied inter temporal co-movement among stock return, Credit Default Swap (CDS) and bond market, where they clearly showed stock returns lead CDS and bond spread changes. A negative relationship is found between the uncertainty measures and the future correlation of stock and bond returns (Connolly, Stivers & Sun, 2005). The returns on the bond market are likely to be higher compared to returns on the stock market, particularly on those days when the volatility in the stock market increases significantly, and the turnover is unusually low or high.

Barr and Priestley (2004) study the integration of the selected world markets by applying the factors of returns on government bonds and expected risks. Their study applies a conditional asset pricing model, which allows changes in the price and risk exposure. The results of the conditional asset pricing model reveal a partial integration of national markets with the world markets. Nasir and Fan Fah (2012) investigate the dynamic relationship of bond yields using the government bond returns and yield curves of India, Japan, Malaysia, Singapore and Thailand. With the results of VECM (Vector Error Correction Model), they indicate a presence of co-integration among all considered nations except Japan. Lapodis (2010), using GARCH (Generalised Autoregressive Conditional Heteroskedasticity) and VAR (Vector Autoregression), identify the existence of short-run relationships for the sovereign bond market of four major economies; Germany, Japan, the U.S. and the U.K. He confirms that the U.S bond market volatility also affects the other countries bond yield. Chaieb, Errunza and Brandon (2020) studied the dynamics of bond market integration for 21 developed and 18 emerging markets of the world. Results revealed a higher degree of integration for factors like political stability, credit quality, lower level of inflation and lower illiquidity. The level of integration and its impact on borrowing cost is measured using an asset pricing model in this study.

To our knowledge, few studies like Yu, Fung and Tam (2007), Barr and Priestley (2004) and Clare, Maras, and Thomas (1995) investigated the relationships between international bond markets. Ahmad, Mishra and Daly (2018)

analysed the financial connectedness with the help of returns and volatility spillovers of BRICS with three global indices. DY model, correlation analysis and VAR were applied to investigate the volatility spillover. Russia and South Africa are found to be the net transmitters of shocks and may have an adverse impact on other BRICS nations. Conversely, China and India revealed weak connectedness. Mohammad and Palaniappan (2017) investigated the integration of stock markets of BRICS nations. Johansen Co-integration Test (1994) and Pairwise Granger Causality test were applied to measure the interdependency and dynamic linkages among these markets. The results supported the absence of a long-run relationship between these markets. The literature studying the relationship amongst the bond yield of BRICS nations are scant in number. The present paper aims to coincide with the existing literature on financial market linkages by analysing the links between government security markets.

### 3. Data and Methodology

#### 3.1 Data

To render a comprehensive account of interrelationships, integration, interdependencies and dynamic linkages of the BRICS economies through the government security market, monthly data of 10-year bond prices have been extracted and further considered for detailed analysis. The data set comprises 120 observations ranging from January, 2008 to December, 2017 (i.e. last ten years) for five series or variables (representing BRICS economies) viz. Brazil, Russia, India, China and South Africa.

#### 3.2 Preliminary Analysis

The co-integration test in the time series analysis requires fulfilling the assumption of time series being integrated of the same order to make the regression equation balanced. Augmented Dickey-Fuller and Phillips-Perron unit root tests have been performed for checking the stationarity of individual series. Results of stationarity tests reveal that all the series are stationary at the first difference, that is, individually, they are  $I(1)$ . To verify autocorrelation among the residuals Ljung-Box  $Q$ -statistic is used, which suggests the absence of significant autocorrelations among the residuals. Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (BIC) are used to determine the optimal lag length.

### 3.3 Correlation Analysis

Correlation analysis is performed for getting the initial sign of dynamic linkages and integration among these EMEs through the government security market. The correlation test measures the direction and strength of the association between the considered series. However, Leong and Felmingham (2003) criticised the reliability of the correlation test since the coefficients of correlation tend to be more upward biased in nature if the series is suspect to heteroskedasticity.

### 3.4 Contemporaneous Cross-correlation Analysis

To measure the strength of linear dependence between any two series under consideration, the cross-correlation coefficients are calculated (Haugh, 1976). The cross correlation between  $Y_{i,t}$  and  $X_{j,t-i}$  is defined as

$$\rho_{YX}(L) = \frac{\text{Cov}(Y_{i,t}X_{j,t-i})}{\sigma(Y_{i,t})\sigma(X_{j,t-i})} \quad \text{Equation 1}$$

Where  $\sigma(Y_{i,t})$  and  $\sigma(X_{j,t-i})$  are the standard deviation of  $Y_{i,t}$  and  $X_{j,t-i}$ , respectively and are assumed to be time-independent.

Non-zero value of  $\rho_{YX}(L)$  (where  $i > 0$ ) indicates that the series  $X_{j,t}$  leads the series  $Y_{i,t}$  at lag  $L$ , whereas the non-zero value of  $\rho_{XY}(L)$  (where  $i > 0$ ) implies that the series  $X_{j,t}$  lags the series  $Y_{i,t}$  at lag  $L$ .

### 3.5 Granger Causality Test

To eliminate the possible simultaneity bias, the Granger causality test (Granger, 1988) is performed, which uses standard  $F$ -test:

$$A_{21}(1) = A_{21}(2) = A_{21}(3) = \dots = A_{21}(L) = 0 \quad \text{Equation 2}$$

$A_{ij}(L)$  represents the coefficients between values of variable  $j$  at time  $t-1$  and variable  $i$  at time  $t$ . The null hypothesis being variable  $j$  does not Granger cause variable  $i$  if all other coefficients of the polynomial  $A_{ij}(L)$  are set to zero.

The Granger Causality test involves estimating the following pair of equations:

$$X_t = \sum_{i=1}^m \alpha_i X_{t-i} + \sum_{j=1}^m \beta_j Y_{t-j} + \mu_{1t} \quad \text{Equation 3}$$

$$Y_t = \sum_{i=1}^m \gamma_i Y_{t-i} + \sum_{j=1}^m \delta_j X_{t-j} + \mu_{2t} \quad \text{Equation 4}$$

Where  $\mu_{1t}$  and  $\mu_{2t}$  are white noise processes;  $m$  is a suitably chosen lag length;  $t$  is the trend variable;  $\alpha_i$ ,  $\beta_j$ ,  $\gamma_i$  and  $\delta_j$  are the slope parameters. One pair of equations is estimated for each series of bond prices with the other four series of bond prices. While estimating this pair of equations, all the series are  $I(1)$ .  $\beta_j$  denotes the linear dependence of  $X_t$  on  $Y_{t-j}$  in the presence of  $X_{t-i}$ . Similarly,  $\delta_j$  denotes the linear dependence of  $Y_t$  on  $X_{t-j}$  in the presence of  $Y_{t-i}$ .

### 3.6 Cointegration Test

To examine the presence of a long-run relationship among BRICS' bond markets, the VAR based co-integration approach has been adopted, which is given by Johansen and Juselius (1994). The pre-requisite for the application of this approach confirms the considered variables to be non-stationary at level and having the same order of integration. This method finds the co-integrating relationship between non-stationary variables using maximum likelihood estimation. To carry out the test, the first VAR of variables  $p$  and order  $k$  is formulated using equation 5.

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \varepsilon_t \quad \text{Equation 5}$$

Where,  $Y_t$  is the  $(p \times 1)$  vector containing the  $p$  variables  $(Y_{1t}, Y_{2t}, \dots, Y_{nt})$ .  $A_1, A_2, \dots, A_p$  are the  $(n \times n)$  matrix of parameters and  $\varepsilon_t$  is an independently and identically distributed  $n$ -dimensional vector with zero mean and constant variance.

The reparameterisation of equation 5 would yield equation 6.

$$\Delta Y_t = \pi Y_{t-1} + \sum_{i=1}^{p-1} \pi_i \Delta Y_{t-i} + \varepsilon_t \quad \text{Equation 6}$$

Where,  $\pi = -(I - \sum_{i=1}^p A_i)$  and  $\pi_i = -\sum_{j=i+1}^p A_j$

$\pi$ , in equation 6 is the rank of the matrix. It represents the number of co-integrating vectors. If rank  $\pi = 0$ , the ma-

trix is null. In such a condition, equation 6 becomes the ordinary VAR with the first difference signifying that variables in  $Y_t$  are not co-integrated. Value of the rank  $\pi = 1$  indicates the presence of only co-integrating vector and  $\varepsilon_t$  denotes the error term.  $1 < \text{rank}(\pi) < n$  suggests the existence of multiple co-integrating vectors.

One can obtain the existence of a number of co-integrating vectors by assessing the significance of characteristic roots of  $\pi$ .  $\lambda_{\text{trace}}$  and  $\lambda_{\text{max}}$  statistics can be used to check the number of characteristic roots that are significantly different from one.

The statistic given by equation 7 involves assessing the null hypothesis that the number of distinct co-integrating vectors is less than or equal to  $r$  against the alternative.

$$\lambda_{\text{trace}}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \quad \text{Equation 7}$$

The second test  $\lambda_{\text{max}}$  represented by equation 8 assesses the null that the number of co-integrating vectors is  $r$  against the alternative  $r+1$  co-integrating vectors.

$$\lambda_{\text{max}}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad \text{Equation 8}$$

In equation 7 and 8,  $\hat{\lambda}_i$  and  $\hat{\lambda}_{r+1}$  are the estimated values of the characteristic roots, which are obtained from the estimated  $\pi$  matrix, also known as eigen values, and  $T$  is the number of usable observations.

### 3.7 Wald Test

Toda and Yamamoto (1995) proposed the Granger Causality technique to determine the causal relationship between two variables. The technique became very popular among researchers due to its simple application, which does not involve pre-testing of the same level of integration and co-integrating properties of the considered variables. Toda and Yamamoto (1995) gave an augmented VAR( $p+d$ ) model estimated through equation 9, which is used to test the causality between integrated variables.

$$Y_t = \hat{\nu} + \hat{A}_1 Y_{t-1} + \dots + \hat{A}_p Y_{t-p} + \dots + \hat{A}_{p+d} Y_{t-p-d} + \hat{\varepsilon}_t \quad \text{Equation 9}$$

Where variables with circumflex represent the OLS estimates,  $p$  and  $d$  represent the order of the process and

the order of integration respectively of the considered variables.  $k^{\text{th}}$  element of  $Y_t$  non-granger cause the  $j^{\text{th}}$  element of  $Y_t$  becomes the null hypothesis. The test for causality between two variables in  $Y_t$  can be written as equation 10, which is popularly known as Modified Wald (MWALD) test. The full set of coefficients in the model may be arrayed in a single coefficient vector,  $\gamma$ . Assume  $\hat{\gamma}$  to be the sample estimator of  $\gamma$  and  $V$  the estimated asymptotic covariance matrix. The Wald statistic for the null hypothesis  $R\gamma - q = 0$  is.

$$W = (R\hat{\gamma} - q)'[RVR']^{-1}(R\hat{\gamma} - q) \quad \text{Equation 10}$$

The null hypothesis for the Granger causality test will be a certain sub-vector of  $\gamma$ , say  $\gamma_0$ , equals zero, where the test statistic will be equation 11.

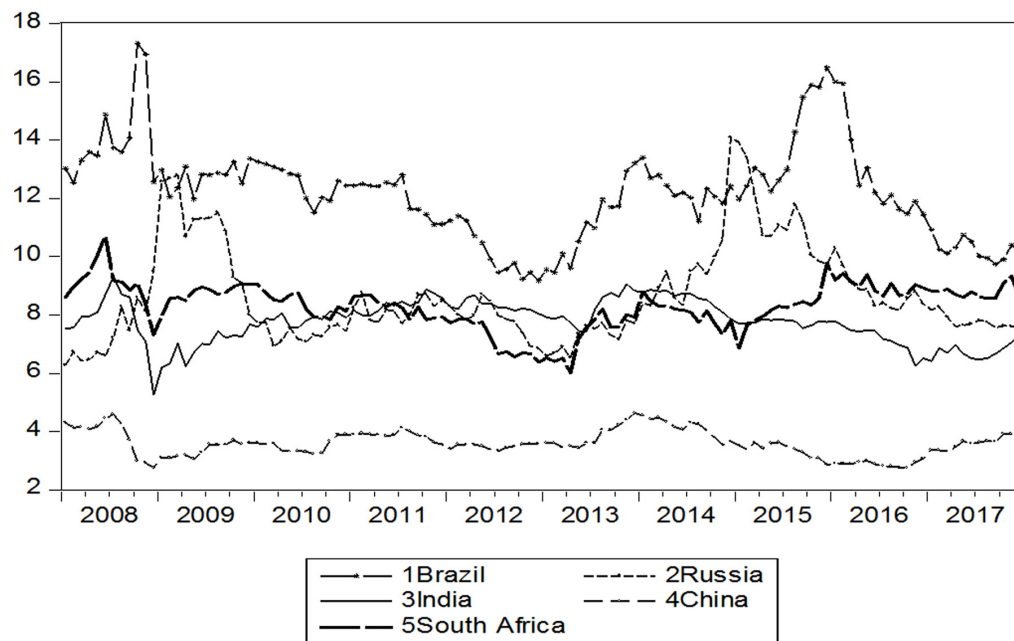
$$W_0 = c'_0 V_{00}^{-1} c_0 \quad \text{Equation 11}$$

Where  $V_{00}$  is the corresponding sub-matrix of  $V$ . The adequacy of the models is tested by serial correlation test and the test of heteroskedasticity. The null hypothesis for serial correlation is that residuals are not serially autocorrelated. For the heteroskedasticity test, the null hypothesis is that the residuals are homoskedastic. The proficiency of both the tests is measured by its  $p$  values. The value of the coefficient of determination that is  $R$ -square from the regression is an indication of the extent to which the conditional variance is explained. It helps to evaluate the adequacy of the models. The model having a high  $R$ -square suggests the good-fit.

## 4. Empirical Analysis and Discussion

### 4.1 Preliminary Analysis

The daily bond prices of BRICS (Brazil, Russia, India, China, and South Africa) economies are illustrated using a graph for the considered period of study in Figure 1. This plot hints at the likely nature of the time series. Figure 1 exhibits an upward and downward trend in the prices of bonds for BRICS economies, suggesting the changes in the mean values of different series and the series are confirmed to be of non-stationary nature.



Source: Author's analysis

**Figure 1: Daily bond prices of BRICS economies**

To achieve the objective of the study that is identifying long-run and short-run linkages among BRICS economies, Johansen co-integration test has been performed. This test pre-conditions that the variables under consideration should be in the same order of integration. Augmented Dickey-Fuller(ADF) Test and a Phillips-Perron (PP) Test are used

to examine the non-stationarity of the series. The results of both the tests of unit root in Table 1 confirm the presence of non-stationarity at level and stationarity at the first difference for all the series. All the series, therefore, are integrated at order one, that is  $I(1)$ .

**Table 1: Unit Root Test**

Variable	ADF Statistics at level	ADF Statistics at first difference	PP Statistics at level	PP Statistics at first difference
<b>BRAZIL</b>	-2.579	-11.512*	-2.543	-11.537*
<b>RUSSIA</b>	-2.376	-10.123*	-2.549	-10.120*
<b>INDIA</b>	-2.532	-7.224*	-2.719	-12.267*
<b>CHINA</b>	-2.136	-8.634*	-2.136	-8.582*
<b>SOUTH AFRICA</b>	-2.722	-12.727*	-2.601	-13.081*

Note: Estimation procedure follows Ordinary Least Square (OLS) method. The null hypotheses are series contain unit root. '\*\*' denotes values significant at 1% level.



#### 4.2 Correlation Analysis

The correlation analysis enumerated in Table 2 reveals that all bond price series are positively related to each other except the relationship of Russia with Brazil and India. All these coefficients do not support the strong association as these values are ranging between 0-0.3 except for the

correlation coefficient between Brazil and South Africa. The reason being that all the bond investments are related directly to policy rates, and they tend to be related for the long term. Investors cannot further exploit arbitrage opportunity in these markets due to the presence of interest rate parity.

**Table 2: Correlation Analysis**

	BRAZIL	RUSSIA	INDIA	CHINA	SOUTH AFRICA
BRAZIL	1				
RUSSIA	-0.011	1			
INDIA	0.210	-0.035	1		
CHINA	0.052	0.021	0.366	1	
SOUTH AFRICA	0.533	0.185	0.200	0.123	1

Source: Author's analysis

#### 4.3 Contemporaneous Cross-correlation Analysis

Table 3 shows the estimated cross-correlation coefficients of the first variable  $X(\pm i)$  up to 5 leads and lags. The “leads” and “lags” of the first variable are given in the first column as positive and negative integers. Lead coefficient suggests the influence of the first series  $X_t$  that is the bond price of one country at time  $(t+1)$  on the other country bond price at time  $t$ . Similarly, the lag coefficient suggests the influence of the second series at time  $(t-1)$  on the bond price of the first series. Brazil bond price influences the bond prices of China and South Africa as the lead

coefficients of Brazil are statistically significant, whereas lag coefficients with Russia, India and South Africa are statistically significant. These suggest the bidirectional cause and effect relationship between Brazil and South Africa. Russia and India have a causal relationship flowing from each other. In the rest of the relationships between Russia - China, Russia - South Africa, India - China, India - South Africa and China - South Africa, the former causes change in the latter variable. A significant coefficient at lag 0 implies a contemporaneous two-way relationship for the selected variables.

**Table 3: Contemporaneous Cross-correlation Analysis**

Lead/Lag ( $k$ in $X_{i,t \pm k}$ )	BRAZIL( $\pm i$ ), RUSSIA	BRAZIL( $\pm i$ ), INDIA	BRAZIL( $\pm i$ ), CHINA	BRAZIL( $\pm i$ ), SOUTH AFRICA	RUSSIA( $\pm i$ ), INDIA
5	0.015	0.032	0.046	0.314*	0.002
4	-0.161	0.063	0.118	-0.068	0.133
3	0.172	0.112	0.267*	0.025	-0.165
2	-0.053	0.162	0.116	-0.082	-0.124
1	0.061	0.042	-0.169	0.040	-0.228*

<b>0</b>	-0.011	0.210*	0.052	0.533*	-0.035
<b>-1</b>	-0.263*	-0.176	-0.145	-0.301*	0.036
<b>-2</b>	0.144	-0.146	-0.069	0.033	-0.088
<b>-3</b>	0.139	0.010	0.171	0.114	0.076
<b>-4</b>	0.154	0.189*	-0.183	-0.002	-0.198*
<b>-5</b>	0.001	0.073	0.065	0.123	0.207*
<b>Lead/Lag (<math>k</math> in <math>X_{t \pm i}</math>)</b>	<b>RUSSIA(<math>\pm i</math>), CHINA</b>	<b>RUSSIA(<math>\pm i</math>), SOUTH AFRICA</b>	<b>INDIA(<math>\pm i</math>), CHINA</b>	<b>INDIA(<math>\pm i</math>), SOUTH AFRICA</b>	<b>CHINA(<math>\pm i</math>), SOUTH AFRICA</b>
<b>5</b>	-0.004	-0.020	<b>-0.182*</b>	0.150	0.102
<b>4</b>	-0.106	-0.024	-0.042	0.077	-0.203*
<b>3</b>	-0.236*	0.047	-0.006	0.069	0.216*
<b>2</b>	-0.121	-0.059	0.374*	0.020	-0.026
<b>1</b>	-0.099	-0.270*	0.217*	0.216*	0.165
<b>0</b>	0.021	0.185*	0.366*	0.200	0.123
<b>-1</b>	0.045	-0.063	0.041	-0.052	0.056
<b>-2</b>	-0.202	-0.003	-0.023	-0.011	0.095
<b>-3</b>	0.031	0.042	-0.148	-0.070	0.068
<b>-4</b>	-0.123	0.040	-0.060	-0.014	-0.118
<b>-5</b>	0.208	0.076	-0.036	-0.098	-0.075

Note: Asymptotic standard error for the cross-correlation coefficients is  $\pm 0.1789$ . First column of the table denoted as " $k$ " represents the leads/lags of first variable  $X(\pm i)$ . Here correlation is between  $X_{t \pm i}$  and other series and is denoted as  $\rho_{i,j}(l)$ . "\*" represents significant cross correlation coefficient which fall outside the asymptotic bounds.

#### 4.4 Granger Causality Test

Short-run causality among considered Emerging Markets has been analysed using an alternative approach. This approach involves estimating Granger causality statistics by applying the Toda–Yamamoto (1995) approach, which has its roots in the VAR model. Table 4 provides bivariate VAR framework-based results of the Granger causality test. The presence of unidirectional causality from Brazil to the other four countries has been confirmed from the results. Russia granger causes China at lag 2. However, the causality

in the case of India is flowing only towards Russia. The null hypotheses, "China does not Granger cause Brazil/India", are rejected. The result further suggests that the China bond market contains useful information for Brazil and India. Similarly, South Africa contains useful information for Russia and India. These results are consistent with the results of the cross-correlation of Brazil and India.

**Table 4: Granger Causality Test**

		BRAZIL	RUSSIA	INDIA	CHINA	SOUTH AFRICA
BRAZIL	1		-	-	✓	-
	2		-	-	✓	-
RUSSIA	1	✓		✓	-	✓
	2	✓		✓	-	✓
INDIA	1	-	-		✓	✓
	2	✓	-		✓	✓
CHINA	1	✓	-	-		-
	2	-	✓	-		-
SOUTH AFRICA	1	✓	-	-	-	
	2	✓	-	-	-	

Note: Arrow “✓” shows unidirectional causality running from column variable to row variable. “-” indicates the absence of causal relationship at particular lag. Arrows represent significant *F*-statistics at 5% level. Number of lags have been determined using BIC criterion.

#### 4.5 Lag selection Criteria

The first and foremost step to analyse either long-run or short-run relationship among considered series is to select a proper lag length for further analysis. To decide the lags to be included for estimating the Johansen – Juselius co-integration test (for long-run relationship) and the Wald

test (for short-run relationship), unrestricted Vector Auto Regression (VAR) has been estimated. The test statistics for lag selection criteria are shown in Table 5. FPE, AIC, SC and HQ unanimously select lag 2. Thus, the inclusion of variable up to two lags would make the model parsimonious and restrict us from over-parameterisation.

**Table 5: Lag selection criteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	478.72	NA	0.00	-8.17	-8.05	-8.12
1	954.48	902.30	0.00	-15.94	-15.22717*	-15.65
2	997.73	78.30	<b>6.02e-14*</b>	<b>-16.25394*</b>	<b>-14.95</b>	<b>-15.72395*</b>
3	1016.87	33.00	0.00	-16.15	-14.25	-15.38
4	1043.05	<b>42.87788*</b>	0.00	-16.17	-13.68	-15.16

Note: \* indicates selected lag order by the criterion at 5% significant level. LogL, LR, FPE, AIC, SC and HQ stands for Log Likelihood ratio, sequential modified LR test statistics, Final prediction error, Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion, respectively.

#### 4.6 Cointegration Test

To ascertain whether the non-stationary bond price series share a long-run stochastic trend, Johansen – Juselius co-integration test is employed, and the results are shown in Table 6. The calculated values of  $\lambda_{trace}$  and  $\lambda$  are reported in the second and fourth column. The considered series for all five variables are  $I(1)$ . From both the test statistics,

it is likely to accept the alternative hypothesis of the presence of one or more co-integrating vectors by rejecting the null hypothesis of no co-integrating vector, as the test statistics exceed the 5 per cent critical value. The values of the  $\lambda_{trace}$  and  $\lambda$  statistics are such that the null hypothesis of no co-integration (i.e.,  $r=0$ ) is soundly rejected. As such, it is evident that there is only one co-integrating vector among the five BRICS variables.

**Table 6: Johansen Cointegration Test**

Hypothesized No. of CE(s)	Unrestricted cointegration rank test (Trace- $\lambda_{Trace}$ )		Unrestricted cointegration rank test (Maximum Eigenvalue- $\lambda_{max}$ )	
	Trace Statistic	Prob**	Max-Eigen Statistic	Prob**
None *	78.625	0.008	35.091	0.035
At most 1	43.534	0.120	21.575	0.243
At most 2	21.959	0.300	11.594	0.588
At most 3	10.364	0.253	8.963	0.289
At most 4	1.400	0.236	1.401	0.237

Note: “\*” denotes rejection of the hypothesis at the 0.05 level and “\*\*” MacKinnon-Haug-Michelis (1999) p-values

#### 4.7 Wald Test

To test the joint hypotheses of two or more coefficients, instead of using the classical  $F$ -test, the Wald test is used, which is a large sample test. The Wald statistics follow the  $Chi-square$  statistic with degrees of freedom equal to the number of regressors estimated. The null hypothesis, as in the usual  $F$ -test, is that all the regressor coefficients are zero simultaneously; that is, collectively, none of the regressors have any bearing on the endogenous variable. In our case, the  $Chi-square$  statistics are significant for Brazil, India, China and South Africa. Collectively, out of all the regressors India and China have an important impact

on the monthly bond prices of Brazil. For India, short-run causality is running from all other countries except Russia. China and South Africa are in a short-run equilibrium relationship with South Africa and Brazil, respectively. Although the co-integration test confirms the long-run relationship among the bond markets of all five countries, they also possess a short-term causal relationship with some of the countries under consideration. The findings of the Wald test are perfectly matching with the findings of the Granger causality test for Brazil, India and South Africa. It is interesting to note that the findings of the Wald test for Russia is quite different from the findings of the Granger causality test (Please refer Table 7).

**Table 7: Wald Test**

Endogenous Variable	Test Statistics	Exogenous Variable				
		BRAZIL	RUSSIA	INDIA	CHINA	SOUTH AFRICA
BRAZIL	F-stat	-	0.347	3.430*	3.628*	0.242
	$\chi^2$ -stat	-	0.693	6.859*	7.257*	0.484
RUSSIA	F-stat	2.080	-	0.033	0.524	0.414
	$\chi^2$ -stat	4.160	-	0.067	1.049	0.827
INDIA	F-stat	12.322*	1.428	-	6.360*	11.754*
	$\chi^2$ -stat	24.644*	2.857	-	12.720*	23.507*
CHINA	F-stat	4.315	2.181	0.126	-	3.264*
	$\chi^2$ -stat	19.390	4.363	0.253	-	6.528*
SOUTH AFRICA	F-stat	6.465*	0.799	1.618	0.050	-
	$\chi^2$ -stat	12.930*	1.597	3.235	0.101	-

#### 4.8 Breusch-Godfrey Serial Correlation Test and Breusch-Pagan-Godfrey Heteroskedasticity Test

The last step to validate the findings is checking the model fit by analysing the residuals for serial correlation and the presence of heteroskedasticity. Table 8 shows the results for the Breusch-Godfrey Serial Correlation Test and Breusch-Pagan-Godfrey Heteroskedasticity Test. The observed F-statistics for serial correlation fails to reject the null hypothesis that there is no serial correlation in the generated residuals series of the regression model. This

validates the results of Johansen – Juselius co-integration test and Wald test for the long run along with short-run linkages as the residuals are not victimised by autocorrelation throughout the series. The p-values for corresponding F-statistics in Breusch-Pagan-Godfrey Heteroskedasticity Test fails to reject the null hypothesis of the presence of Heteroskedasticity for all considered models except for South Africa. Thus one can conclude that the residuals are homoskedastic in nature.

**Table 8: Breusch-Godfrey Serial Correlation Test and Breusch-Pagan-Godfrey Heteroskedasticity Test**

Dependent Variable	Breusch-Godfrey Serial Correlation LM Test		Breusch-Pagan-Godfrey Heteroskedasticity Test	
	F-stat	Prob	F-stat	Prob
BRAZIL	1.6022	0.2064	4.8701	0.0801
RUSSIA	0.0732	0.9295	1.2875	0.2240
INDIA	2.8380	0.0631	3.2529	0.0902
CHINA	0.1021	0.9030	0.8828	0.5850
SOUTH AFRICA	0.3297	0.7199	4.3154	0.0001

## 5. Summary and Conclusion

The study of linkages and interdependencies between financial markets has been a highly researched topic in the field of finance. Several studies tried to find the linkages between the stock markets, money markets and bond markets of different countries. The BRICS nations in the past decade have already gone through noteworthy changes in their processes, international trade opportunities and financial integration (Pereira, 2018). The absence of linkages between markets results in an advantage for investors and leads to the creation of portfolio diversification in the global market. On the contrary, some studies revealed a negative performance in the portfolio returns due to the occurrence of extreme events such as financial crises and stock market catastrophes. In such cases, foreign investors should be allowed greater flexibility to switch between equity and debt assets which will make their investments more elastic. Such type of balance strategies may help to stabilise the movements of foreign investors in and out of any country. This kind of prudent measure would be an indirect effort to prevent asset price bubbles in the financial markets. This may result in imposing the ban on certain financial activities for a short time span by governments, as is deemed fit (Bulsara, Dhingra, & Gandhi, 2015; Dhingra et al., 2016).

The existing research is an empirical assessment of short-term and long-term integration among the bond values of BRICS (Brazil, Russia, India, China and South Africa) economies. In order to determine the co-integrating relationships for the bond markets of the five economies of BRICS, the co-integration approach given by Johansen was performed on these variable series. The data is ranging from January, 2008 to December, 2017. The results of the test strongly support the presence of a co-integrating relationship among the bond markets of these emerging economies. These results are consistent with the findings of Bianconi, Yoshino and De Sousa, 2013. This will benefit international investors by diversifying their portfolio internationally in the long run.

In order to assess the presence of co-variation and short-term co-movements contemporary correlation coefficients were calculated. The coefficients of

correlation recorded very small values, yet positive, among these countries' bond markets except Russia with Brazil and India. This result provides international investors with a chance to exploit the opportunity of possible diversification in the international bond market. The results of Granger causality tests and Wald tests confirm quite a few numbers of statistically significant unidirectional links. In the short run, Brazil is dependent on India and China, India is dependent on China and South Africa and South Africa is dependent on Brazil. These short-run relationships are not so strong for Russia and China if both the tests (Granger causality tests and Wald tests) are considered.

The Johansen co-integration test revealed the existence of a single balance long-run relationship among the BRICS countries. This co-movement may emerge due to the existence of some of the common factors, which restricts the independent movement of the bond prices of these countries and leaves scope for prediction. The certification of such relationships, in turn, facilitates the investment opportunities in international portfolio diversification. The results advocate the possibility for international investors in the long run to espouse the investment strategies which combine assets from the countries that do not show association in the long run, particularly in the government security market where inflow and outflow are not much frequent. The existence of these long-run and short-run relationships questions the legitimacy of the efficient market hypothesis. The prediction of the price movement of one series can be improved if the movements of the rest of the variable series in the model are known.

## References

- Barr, David G., and Richard Priestley. "Expected returns, risk and the integration of international bond markets." *Journal of International Money and Finance* 23.1 (2004): 71-97.
- Becker, Kent G., Joseph E. Finnerty, and Manoj Gupta. "The intertemporal relation between the US and Japanese stock markets." *The Journal of Finance* 45.4 (1990): 1297-1306.
- Bekiros, Stelios D. "Contagion, decoupling and the spillover effects of the US financial crisis: Evidence from the BRIC markets." *International Review of Financial Analysis* 33 (2014): 58-69.



- Bianconi, Marcelo, Joe A. Yoshino, and Mariana O. Machado De Sousa. "BRIC and the US financial crisis: An empirical investigation of stock and bond markets." *Emerging Markets Review* 14 (2013): 76-109.
- Bulsara, Hemantkumar P. Bulsara, Vaishali Dhingra, and Shailesh B. Gandhi. "Dynamic Interactions between Foreign Institutional Investment Flows and Stock Market Returns—The Case of India." *Contemporary Economics* 9.3 (2015): 271-298.
- Calvo, Guillermo A. "Capital flows and capital-market crises: the simple economics of sudden stops." *Journal of Applied Economics* 1.1 (1998): 35-54.
- Campbell, John Y., and John Ammer. "What moves the stock and bond markets? A variance decomposition for long term asset returns." *The journal of finance* 48.1 (1993): 3-37.
- Campbell, John Y., and Robert J. Shiller. "Cointegration and tests of present value models." *Journal of political economy* 95.5 (1987): 1062-1088.
- Chaieb, Ines, Errunza, Vihang, and Gibson Brandon, Rajna. "Measuring sovereign bond market integration." *The Review of Financial Studies* 33.8(2020), 3446-3491.
- Chkili, Walid, and Duc Khuong Nguyen. "Exchange rate movements and stock market returns in a regime-switching environment: Evidence for BRICS countries." *Research in International Business and Finance* 31 (2014): 46-56.
- Christiansen, Hans, and Charles Pigott. "Long-term interest rates in globalised markets." *OECD Economics Department Working Papers*, 175. (1997).
- Clare, Andrew D., Michael Maras, and Stephen H. Thomas. "The integration and efficiency of international bond markets." *Journal of Business Finance & Accounting* 22.2 (1995): 313-322.
- Connolly, Robert, Chris Stivers, and Licheng Sun. "Stock market uncertainty and the stock-bond return relation." *Journal of Financial and Quantitative Analysis* 40.1 (2005): 161-194.
- Dhingra, Vaishali S., Shailesh Gandhi, and Hemantkumar P. Bulsara. "Foreign institutional investments in India: An empirical analysis of dynamic interactions with stock market return and volatility." *IIMB Management Review* 28.4 (2016): 212-224.
- Dimitriou, Dimitrios, Dimitris Kenourgios, and Theodore Simos. "Global financial crisis and emerging stock market contagion: A multivariate FIAPARCH–DCC approach." *International Review of Financial Analysis* 30 (2013): 46-56.
- Dynan, Karen E., and Dean M. Maki. "Does stock market wealth matter for consumption?." (2001). *FEDS Discussion Paper No.* 2001-23.
- Fah, Cheng Fan, and Annuar Nasir. "Dynamic relationship between bonds yields of Malaysia, Singapore, Thailand, India and Japan." *International Journal of Academic Research in Business and Social Sciences* 2.1 (2012): 220.
- Ehrmann, Michael, Marcel Fratzscher, and Roberto Rigobon. "Stocks, bonds, money markets and exchange rates: measuring international financial transmission." *Journal of Applied Econometrics* 26.6 (2011): 948-974.
- Granger, Clive WJ. "Some recent development in a concept of causality." *Journal of econometrics* 39.1-2 (1988): 199-211.
- Grubel, Herbert G. "Internationally diversified portfolios: welfare gains and capital flows." *The American Economic Review* 58.5 (1968): 1299-1314.
- Hamao, Yasushi, Ronald W. Masulis, and Victor Ng. "Correlations in price changes and volatility across international stock markets." *The review of financial studies* 3.2 (1990): 281-307.
- Haugh, Larry D. "Checking the independence of two covariance-stationary time series: a univariate residual cross-correlation approach." *Journal of the American Statistical Association* 71.354 (1976): 378-385.
- Hilliard, Jimmy E. "The relationship between equity indices on world exchanges." *The Journal of Finance* 34.1 (1979): 103-114.
- Irshad VK, Mohammad, and Shanmugam, Velmurugan, Palaniappan. "Stock Market Integration Among BRICS Nations-An Empirical Analysis." (*June 18, 2017*).
- Janor, Hawati, Ruhani Ali, and Roselee Shah Shaharudin. "Financial integration through equity markets and the role of exchange rate: Evidence from ASEAN-5 countries." *Asian Academy of Management Journal of Accounting and Finance* 3.1 (2007): 77-92.

- Johansen, Søren, and Katarina Juselius. "Identification of the long-run and the short-run structure an application to the ISLM model." *Journal of Econometrics* 63.1 (1994): 7-36.
- King, Mervyn A., and Sushil Wadhvani. "Transmission of volatility between stock markets." *The Review of Financial Studies* 3.1 (1990): 5-33.
- Koutmos, Gregory, and G. Geoffrey Booth. "Asymmetric volatility transmission in international stock markets." *Journal of International Money and Finance* 14.6 (1995): 747-762.
- Lopes Jr, Gutemberg P. "The Sino-Brazilian principles in a Latin American and BRICS context: the case for comparative public budgeting legal research." *Wis. Int'l LJ* 33 (2015): 1.
- Mensi, Walid, et al. "Do global factors impact BRICS stock markets? A quantile regression approach." *Emerging Markets Review* 19 (2014): 1-17.
- Norden, Lars, and Martin Weber. "The co movement of credit default swap, bond and stock markets: An empirical analysis." *European financial management* 15.3 (2009): 529-562.
- Pereira, Dirceu. "Financial Contagion in the BRICS Stock Markets: An empirical analysis of the Lehman Brothers Collapse and European Sovereign Debt Crisis." *Journal of Economics and Financial Analysis*, Triple Publishing House 2.1(2018): 1-44.
- Phylaktis, Kate, and Fabiola Ravazzolo. "Stock market linkages in emerging markets: implications for international portfolio diversification." *Journal of International Financial Markets, Institutions and Money* 15.2 (2005): 91-106.
- Sharma, Gagan Deep, Sanjeet Singh, and Gurjit Singh Litt. "Inter-linkages between Stock exchanges: A study of BRIC Nations." *Available at SSRN 1837223* (2011).
- Shiller, Robert J., and Andrea E. Beltratti. *Stock prices and bond yields: Can their co-movements be explained in terms of present value models?*. No. w3464. National Bureau of Economic Research, 1990.
- Shiller, Robert J., Fumiko Kon-Ya, and Yoshiro Tsutsui. "Investor behaviour in the October 1987 stock market crash: The case of Japan." *Journal of the Japanese and International Economies* 5.1 (1991): 1-13.
- Solnik, Bruno, Cyril Boucrelle, and Yann Le Fur. "International market correlation and volatility." *Financial analysts journal* 52.5 (1996): 17-34.
- Taylor, Mark P., and Lucio Sarno. "Capital flows to developing countries: long- and short-term determinants." *The World Bank Economic Review* 11.3 (1997): 451-470.
- Toda, Hiro Y., and Taku Yamamoto. "Statistical inference in vector autoregressions with possibly integrated processes." *Journal of econometrics* 66.1-2 (1995): 225-250.
- Tornell, Aaron, and Frank Westermann. "Boom-bust cycles in middle income countries: Facts and explanation." *IMF Staff Papers* 49.1 (2002): 111-155.
- Wasim, Ahmad, Mishra, Anil, V., and Daly, Kevin, J. "Financial connectedness of BRICS and global sovereign bond markets." *Emerging Markets Review* 37 (2018): 1-16.
- Woodford, Michael. "Optimal monetary policy inertia." *The Manchester School* 67 (1999): 1-35.
- Xu, Haifeng, and Shigeyuki Hamori. "Dynamic linkages of stock prices between the BRICs and the United States: Effects of the 2008-09 financial crisis." *Journal of Asian Economics* 23.4 (2012): 344-352.
- Yu, Ip-wing, Laurence Fung, and Chi-sang Tam. "Assessing bond market integration in Asia." *Available at SSRN 1330709* (2007).

\*\*\*\*\*

---

# A Study on Employee Perception about the Use of E-HRM in IT

**Dr. Rupa Rathee**

Assistant Professor

DMS, DCRUST, Murthal, Haryana, India

ruparathee@gmail.com

**Ms. Renu Bhuntel**

Research Scholar

DMS, DCRUST, Murthal, Haryana, India

bhuntelrenu101@gmail.com

## A b s t r a c t

In a digital economy, the use of online systems is pertinent for all organisations. The online systems have provided better connectivity and save a lot of time due to reduced paperwork. One such system is e-HRM which helps in smoothening the operations of the HR department. Since e-HRM helps in faster decision-making and better communication, therefore, it was found to be an important area for research. Thus, the present study was undertaken to find out the various factors that influence the implementation of e-HRM system. This forms the primary objective of this research. For this, data was collected from employees of IT organisations located in the National Capital Region, India. The sample size for the study was 320 employees using convenience sampling. The data was analysed using SPSS version 23. It was found that there are eight factors that influence the e-HRM system in IT organisations. These factors include ease of use of technology, experience of information technology, secure systems, technology usefulness, communication tools, risk perception, usage intention and organisational support. All these factors play an important role in the effective implementation of e-HRM. The study has several implications, important among which is that organisational support should be taken care of as the adoption of e-HRM requires that the employees should have the required support.

**Keywords:** *e-HRM, IT organisations, factors of E-HRM implementation, organisational support, usage intention*

## 1. Introduction

Over recent years, the majority of organisations have integrated their HR departments with IT using e-HRM systems to improve their performance. This shift has not been sudden, but the changes were gradual as the requirement for automated systems became a necessity. According to Strohmeier (2007), “e-HRM is the planning, implementation and application of information technology for both networking and supporting at least two individual or collective actors in their shared performing of HR activities.” However, moving from pen and paper to online systems has not been an easy task.

In developed countries, e-HRM is already being used on a large scale. However, its implementation in Indian organisations has taken place mostly in the past few years. In the present scenario, there is a need for revision in the HR department because now internet technology has been associated profoundly with HRM. The term e-HRM came into existence in the early 1990s. Now the trend is new innovative technological developments, which realised the concept of paperless work at the touch of a finger. In fact, e-HRM has transformed traditional HR into a more realistic, informative and interactive format. Everything, including our way of thinking, living, communicating, culture, economies, demographics and even society, has been affected by these technological changes.

The organisations were influenced by several factors in the implementation of these systems. The internal environment and several external variables included technology available, sense of security, ease of use, use of technology and many more. The e-HRM implementation has been the fastest in the IT industry in comparison to others as the employees of this industry are tech-savvy when compared to those in other industries. Therefore, the present study dealt with the various factors affecting the implementation of e-HRM in the IT industry.

## 2. Review of Literature

### 2.1 Implementation of e-HRM

Panayotopoulou et al. (2010) conducted a study in 13 European countries. They explored the impact of the background of the nation on e-HRM implementation. They

stressed the existence of front end and back end systems. The study outcomes revealed that there were three clusters, namely Northern, Central and South-Eastern, on the basis of diffusion of e-HRM. In another study, Stone and Dulebohn (2013) presented advanced theory and research on HRMS (Human Resource Management System) and e-HRM. They also enhanced the effectiveness of these systems in organisations. This article reviewed the evolution of HRMS and e-HRM and provided an overview of the existing literature. The authors examined how HR scholars may perceive HRMS and e-HRM. A conceptual study was conducted for the research. HRMS and e-HRM provided internal support for HR professionals, e-HRM applications provided access to all internal and external stakeholders. The study also found that strategic considerations influenced decision-making on e-HRM applications. Ruel and Kaap (2012) aimed to clarify the relationship between e-HRM usage and HR value creation by considering contextual factors. A sample of 450 was collected from three different large international organisations of the Netherlands through e-mail and an online questionnaire. This study clearly indicated that contextual factors moderates the relationship between e-HRM usage and HR value creation- as HRM facilitation increases, the relationship between usage and HRM value creation becomes weaker.

Pant et al. (2012), in their conceptual study, provided a framework for e-HRM implementation. The exceptional success of e-commerce systems motivated organisations to make use of e-HRM systems. These systems have created dramatic changes in the HR department along with improvement in performance. Through this study, the authors have tried to assess the benefits of implementing e-HRM systems. They have also tried to find the factors that influence the relationship of e-HRM implementation with its benefits. More recently, Subhashree and Vasantha (2020), in their study, reviewed previous literature related to the adoption of e-HRM. The study discussed the importance of automation of tasks which reduces the burden on HR and saves time. The study also found that the most important factors influencing e-HRM adoption were the implementation of IT infrastructure and the expertise of employees in the field of IT. Earlier, Al-kasasbeh et al. (2016) focused on a review of the literature regarding

electronic human resource management and proposed a model to integrate variables of e-HRM, workforce agility and organisational performance. This was a conceptual study. The result of the review was employed to develop the study's theoretical framework. The framework of the study comprised of integrating literature and models of electronic human resource management, e-HRM implementation at the firm level, organisational performance and workforce agility. Guenter et al. (2014) aimed to provide a conceptual framework for understanding how delays in information exchange negatively impacted employee outcomes. This was a conceptual study. It was found that managers and co-workers should focus on restoring control in employees in order to prevent delays and deterioration of workplace relationship. Delay in information exchange and its impact on co-worker relationship was important for researchers who studied temporal events at work as well as managers structuring workplace interactions. Similarly, Findikli and Bayarcelik (2015) focused on the perspectives for choosing the applications and perspectives about e-HRM for the system. A descriptive study was conducted for the research. A qualitative method with an open-ended questionnaire and semi-structured interviews was used. A limited number of respondents in the company were chosen from only the HR department without involving any level of management hierarchy or other departments. The study found that the primary motivators for e-HRM applications were time management, ease of acquiring, access to personal data and reduced administration cost. Nagendra and Deshpande (2014) found that to increase the effectiveness of HR planning, HRIS (Human Resource Information System) needs to offer more intelligent capabilities. The authors tried to investigate the contribution of HRIS subsystem, to the training recruiting subsystem, to the workforce planning of an organisation, and to the development of the workforce of an organisation through HRIS. Primary data was collected from a sample that included 50 senior and junior HR managers/ executives in three organisations in Pune. The findings of the paper clearly showed that senior HR executives were well aware that they can increase the efficiency of HR planning through HRIS.

## 2.2 Factors influencing e-HRM implementation

Sindu (2018) tried to find how various factors influence organisational culture in the adoption of e-HRM systems. The study made use of previous literature and models in order to find the impact of these factors. These included the Yale model of communication and persuasion, Theory of Planned Behaviour and Technology Acceptance Model. On the basis of previous literature, it was found that actorial, external and organisational factors influence e-HRM implementation. Heikkila (2013) studied the application of e-HRM and strategic IS (Information System). They also focused on how normative, cognitive and regulative institutional dimensions in MNC (Multi-National Companies) subsidiaries in China affect western-based e-HRM practices. Interview data from Beijing and Shanghai related to key informants in 10 MNC subsidiaries was collected. The study found that institutional pressures created both negative dysfunctional and positive transformational consequences for subsidiaries. They also found that the ability of the information system to achieve its strategic potential was based on subsidiary responses to these substantial pressures. Al-Dmour et al. (2013) used content analysis to collect data regarding the adoption and implementation of HRIS (Human Resource Information System). The authors found that many researchers had tried to find the factors affecting HRIS implementation. The authors categorised them as internal and external factors of the environment. However, it was found that many of the studies had conflicting results. Later, Azhar Naima (2019) conducted a study in Iraq to find the factors that influence the acceptance of e-HRM. The data was collected using a two-part questionnaire from a sample of 332 respondents. Random sampling was used for data collection. On applying regression analysis, the results of the study revealed that industry support, management support, IT expertise, compatibility, complexity and employee attributes influence the adoption of e-HRM. Earlier, Masum (2015) identified the factors influencing the adoption of e-HRM in Bangladeshi Banks. A sample of 265 bank employees was taken using stratified random sampling. A pre-tested questionnaire was used to collect

the data. The results of the study showed that industry pressure, IT infrastructure, management support and compatibility, and individual attributes had an influence on the adoption of e-HRM in banks of Bangladesh. Ibrahim and Yusoff (2015) investigated the antecedent factors of technostress towards e-HRM in government agencies of Malaysia. Semi-structured interviews were conducted with seven HRMIS (Human Resource Management Information System) experts in three state governments agencies of Malaysia. The findings of the paper focused on the implementation of HRMIS in Malaysian government agencies and solving the problem of training and development program. The HRMIS experts were of the opinion that three characteristics (attitude, technology readiness and readiness for change) were all related to components of technostress. Later, Rahman et al. (2018) researched on the Bangladeshi government organisations regarding e-HRM implementation. They tried to find the influence of various factors like social, legal, economic, political, organisational, environmental and technological. The study used a case study method as a part of qualitative research. Two government organisations were used as part of the study. The study busted certain myths surrounding the slow implementation of e-HRM in government agencies. It also provided empirical data for further research.

### **2.3. Research Gap**

The above literature review on e-HRM shows that there is a gap in the understanding of the e-HRM practices in the IT organisation. There is a need to explore the e-HRM practices used in IT organisation and the factors which affect the e-HRM. e-HRM practices focus on how the organisation can facilitate the employer-employee relationship by using information technology. E-HRM and its implementation have been studied in various sectors like manufacturing/mining, banking, hotels etc. There is a need to study the e-HRM and the factors affecting it in IT organisations as well.

### **2.4. Objective of the Study**

To find the factors influencing the effective implementation of e-HRM in IT organisations.

## **3. Research Methodology**

### **3.1 Sample size and population**

The study used a descriptive research design. The data was collected from IT companies located in the National Capital Region, India. A sample of 320 IT employees was taken using a non-probability sampling technique. A sample of above 300 was taken as it is considered to be a good sample size (Comrey & Lee, 1992). The mail-ids of employees were obtained for mailing the questionnaire.

### **3.2 Data collection**

Primary data was collected using a structured questionnaire using online Google forms. Secondary data was collected from research papers, books, magazines using keywords such as “e-HRM”, “factors affecting e-HRM”, “implementation of e-HRM”. The data was collected from May 2020 to August 2020.

### **3.3. Measures**

The questionnaire consisted of two sections the first section included statements related to factors influencing the effective implementation of e-HRM in IT organisations. In the second section demographic information of the respondents was recorded. The statements were developed by researchers using previous literature and expert opinion. Initially, a total of 40 statements were developed, but only 31 statements were used in the final questionnaire. The items were measured on a 5-point Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree”.



## 4. Results

**Table 1: Demographic Profile of IT employees**

Demographic Factors	Category	Frequency	%
Gender	Male	226	70.6
	Female	94	29.4
Age groups (in years)	<25	83	25.9
	25 – 35	124	38.8
	35 – 45	45	14.1
	45 – 55	51	15.9
	Above 55	17	5.3
Region	Rural	105	32.8
	Urban	215	67.2
Education	Engineering	145	45.3
	Non-Engineering	62	19.4
	Post-graduation	113	35.3
Designation	Software Engineer	92	28.7
	Senior Software Engineer	37	11.6
	Technical Lead	56	17.5
	Team Lead	59	18.4
	Project Manager	41	12.8
	Others	35	10.9
Experience (in years)	0 – 5	145	45.3
	5 – 10	77	24.1
	10 – 15	58	18.1
	15 – 20	31	9.7
	>25	9	2.8

Source: Survey by author

### 4.1. Factor Analysis

**Table 2: KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.766
Bartlett's Test of Sphericity	Approx. Chi-Square	4428.731
	df	465
	Sig.	.000

Source: Survey by authors

Before applying factor analysis, the values of KMO and Bartlett's test of sphericity were checked. As seen from the table, the value of KMO was .766 and the significance

value ( $p < .001$ ) of Bartlett's test of sphericity was less than .05. As both the values were within range (Nunnally, 1978) factor analysis could be applied.

**Table 3: Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.128	16.541	16.541	5.128	16.541	16.541	3.351	10.811	10.811
2	3.868	12.476	29.017	3.868	12.476	29.017	2.735	8.824	19.635
3	2.758	8.898	37.915	2.758	8.898	37.915	2.700	8.710	28.345
4	2.422	7.814	45.729	2.422	7.814	45.729	2.591	8.357	36.701
5	2.159	6.964	52.692	2.159	6.964	52.692	2.586	8.340	45.042
6	1.553	5.010	57.702	1.553	5.010	57.702	2.508	8.090	53.132
7	1.400	4.515	62.217	1.400	4.515	62.217	2.248	7.251	60.383
8	1.317	4.250	66.467	1.317	4.250	66.467	1.886	6.083	66.467

Extraction Method: Principal Component Analysis.

Source: Survey by authors

On applying factor analysis, eight factors were generated. The total variance explained for the eight factors was 66.46 per cent. Further on applying varimax rotation the factor

loadings were above .5 for all the items. Since the factor loadings of all items were above the recommended values, all eight factors were retained

**Table 4: Rotated Component Matrix<sup>a</sup>**

	Component							
	1	2	3	4	5	6	7	8
EUT4	.820							
EUT5	.819							
EUT2	.801							
EUT3	.735							
EUT1	.733							
EIT3		.833						
EIT2		.801						
EIT1		.756						
EIT4		.643						
SS2			.836					
SS3			.802					
SS4			.796					
SS1			.617					
TU4				.935				
TU3				.889				
TU2				.886				
TU1				.876				
CT1					.840			
CT3					.824			
CT2					.823			
CT4					.630			
RP2						.855		
RP3						.849		
RP4						.742		
RP1						.526		
UI3							.812	
UI1							.809	
UI2							.714	
OS3								.746
OS2								.733
OS1								.692

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations. Source: Survey by authors

**Table 5: Factor Analysis**

Factors	Statements	Loading	Cronbach's alpha	% of variance
EUT (EASE OF USE OF TECHNOLOGY) AVE=.61, CR=.88				
FACTOR 1	e-HRM is easy to use, so I can follow all the useful information.	.820	.861	10.81
	Ease of use of e-HRM increase usefulness that expected to it.	.819		
	If e-HRM is easy to use this will increase staff administration to use it.	.801		
	The perceived usefulness of e-HRM increases the interest to use it.	.735		
	Staff acceptance of e-HRM is proof that system is easy to use.	.733		
EIT (EXPERIENCE OF INFORMATION TECHNOLOGY) CR=.58, AVE=.84				
FACTOR 2	ICT device which are available in the organisation enough to use e-HRM.	.833	.836	8.82
	The employee has the ability and skills to use e-HRM system.	.801		
	Employee must be trained continuously to reduce perceived risk of the e-HRM system.	.756		
	The availability of computers and modern communications tools can reduce the risk of e-HRM.	.643		
SS (SECURE SYSTEMS) CR=.58, AVE=.84				
FACTOR 3	A high level of system security reduces the risk of e-HRM.	.836	.806	8.71
	I need more training on the e-HRM system to reduce mistakes and increase my knowledge of the tools available in it.	.802		
	e-HRM system should not take time to perform tasks through it to increase system efficiency.	.796		
	Less time needed to use e-HRM increases system usefulness.	.617		
TU (TECHNOLOGY USEFULNESS) CR=.81, AVE=.93				
FACTOR 4	The concept of e-HRM is clear	.935	.814	8.35
	Perceived usefulness of e-HRM increase staff attitude to use it	.889		
	Perceived usefulness of e-HRM increase staff behaviour intention to use it	.886		
	Using e-HRM reduces employee mistakes in the work.	.876		

CT (COMMUNICATION TOOLS) CR=.61, AVE=.86				
FACTOR 5	The lack of using communication tools reduces employee's intention towards e-HRM.	.840	.798	8.09
	The lack of using communication tools increase e-HRM perceived risks.	.824		
	Dependence on e-HRM increase communication between employees within the organisation.	.823		
	e-HRM simplifies the connecting in the organisation to deliver employees needs to managers.	.630		
RP (RISK PERCEPTION) CR=.56, AVE=.83				
FACTOR 6	e-HRM must be difficult and complex to reduce perceived risk	.855	.795	7.25
	My attitude decline if e-HRM system is not secured.	.849		
	Perceived usefulness of e-HRM increases when perceived risk is decreased.	.742		
	e-HRM system within the organisation is clear and highly secure.	.526		
UI (USAGE INTENTION) CR=.60, AVE=.82				
FACTOR 7	The perceived usefulness of e-HRM increase my desire to use it	.812	.747	7.25
	I intend to use or continue to use the e-HRM system	.809		
	Employee adoption of e-HRM increases colleagues' intention to use.	.714		
OS (ORGANIZATIONAL SUPPORT) CR=.52, AVE=.76				
FACTOR 8	The organisation support to use e-HRM system increase employees' intention to use it	.746	.735	6.08
	The organisation decisions adoption of e-HRM reinforce employees' attitude to use it	.733		
	The organisation depends on e-career system to attract employees.	.692		

Source: Survey by authors

The eight factors generated were as follows:

#### **FACTOR 1: EUT (EASE OF USE OF TECHNOLOGY)**

Ease of use of technology was the first factor. The value of Cronbach's alpha for this factor was .861 (as recommended by Hair et al., 2014). This was the most important factor because the eigen value and the total

variance explained was the highest for this factor. The eigen value was 5.12 and the total variance explained was 10.81. The value of AVE and CR was .61 and .88 respectively. Thus, the factor was both valid and reliable. In this factor the total number of five statements were included. The statements include: "e-HRM is easy to use, so I can follow all the useful information, ease of use of e-HRM increase usefulness that expected to it, if e-HRM is easy to use this

will increase staff administration to use it, perceived usefulness of e-HRM increase the interest to use it, staff acceptance of e-HRM is proof that system is easy to use” (Voermans & Veldhoven, 2007).

## **FACTOR 2: EIT (EXPERIENCE OF INFORMATION TECHNOLOGY)**

Experience of information technology was the second factor. The alpha value of the four statements of this factor was 0.836. The total percentage of variance explained by this was 8.82 and the eigen value was 3.8. Here also, the value of AVE and CR was above the recommended value of .5 and .8 respectively. This factor also included the four statements as: “ICT device which are available in the organisation enough to use e-HRM, the employee has the ability and skills to use e-HRM system, Employee must be trained continuously to reduce perceived risk of e-HRM system, the availability of computers and modern communications tools can reduce the risk of e-HRM” (Pant et al., 2012).

## **FACTOR 3: SS (SECURE SYSTEMS)**

Secure system was analysed as the third factor through the factor analysis. The Cronbach’s alpha of system security was .806. The total variance explained and the eigen value was the second-highest for this factor. The eigen value was 2.7 and the total variance explained was 8.71. The value of AVE and CR was .58 and .84 respectively. This factor included four statements. The statements were: “High level of system security reduces the risk of e-HRM, I need more training on the e-HRM system to reduce mistakes and increase my knowledge of the tools available in it, e-HRM system should not take time to perform tasks through it to increase system efficiency, less time needed to use e-HRM increase system usefulness” (Rahman et al., 2018).

## **FACTOR 4: TU (TECHNOLOGY USEFULNESS)**

Technology usefulness was the fourth important factor in the analysis. The value of Cronbach’s alpha for this factor was .814. The eigen value and total variance explained was 2.4 and 8.35 respectively. The value of AVE and CR was .81 and .93 respectively. The technology usefulness factor included four statements. The statements were: “The concept of e-HRM is clear, perceived usefulness of e-

HRM increase staff attitude to use it, perceived usefulness of e-HRM increase staff behaviour intention to use it, using e-HRM reduce employee mistakes in the work” (Voermans & Veldhoven, 2007).

## **FACTOR 5: CT (COMMUNICATION TOOLS)**

Communication tools was the fifth factor. The Cronbach’s alpha value of this factor was .798, which was above the cutoff of .7. The total variance explained and the eigen value was 8.34 and 2.15. Here also, the value of AVE and CR was above the recommended value of .5 and .8 respectively. This factor included the four statements and these statements were as: “The lack in using communication tools reduces employee’s intention towards e-HRM, the lack in using communication tools increase e-HRM perceived risks, Employee must be trained continuously to reduce perceived risk of e-HRM system, the availability of computers and modern communications tools can reduce the risk of e-HRM” (Pant et al., 2012; Azhar Naima, 2019).

## **FACTOR 6: RP (RISK PERCEPTION)**

Risk perception was the sixth factor generated through factor analysis. The value of Cronbach’s alpha for perceived risk was .798. The value of AVE and CR was .56 and .83 respectively. In this factor four statements were included. These statements were: “e-HRM must be difficult and complex to reduce perceived risk, my attitude decline if e-HRM system is not secured, perceived usefulness of e-HRM increase when perceived risk is decreased, e-HRM system within an organisation is clear and highly secure”. The eigen value of this factor was 1.55 and the total variance explained was 8.09 (Voermans & Veldhoven, 2007).

## **FACTOR 7: UI (USAGE INTENTION)**

Usage intention was the seventh important factor of the analysis. The Cronbach’s alpha value of this factor was .747. The total variance explained by this factor was 7.25 and the eigen value was 1.4. Here also, the value of AVE and CR was above the recommended value of .5 and .8 respectively. The usage intention factor included the following three statements: “Perceived usefulness of e-HRM increase my desire to use it, I intend to use or continue to use e-HRM system, Employee adoption of e-HRM increase colleagues’ intention to use” (Rahman et al., 2018).

## FACTOR 8: OS (ORGANIZATIONAL SUPPORT)

Organisational support was the eighth and the last factor of the analysis. The alpha value of this factor was .735. The total variance explained was 6.08 and the eigen value was 1.3. Here also, the value of AVE and CR was above the recommended value of .5 and .8 respectively. This factor included the three statements and these statements were: “The organisation support to use e-HRM system increase employees’ intention to use it, the organisation decisions adoption of e-HRM reinforce employees’ attitude to use it, the organisation depends on the e-career system to attract the employees” (Azhar Naima, 2019).

## 5. Discussion

In the context of the current study, it was found that e-HRM includes eight factors that were found to have a significant impact on its effective implementation. These factors included ease of use of technology, experience of information technology, secure systems, technology usefulness, communication tools, risk perception, usage intention and organisational support. These factors were critical to the implementation of e-HRM. Numerous researchers revealed that there were similar factors that affected e-HRM implementation (Voermans & Veldhoven, 2007; Pant et al., 2012; Rahman et al., 2018; Azhar Naima, 2019). The researchers had worked on different factors included ease of use of technology, technology usefulness, risk perception (Voermans & Veldhoven, 2007), experience of information technology, communication tools (Pant et al., 2012), secure systems, usage intention (Rahman et al., 2018), communication tools and organisational support (Azhar Naima, 2019). Among these, the most important factor was the ease of use of technology which was found to be having the highest value of explained variance that was more than 10 per cent. Employees of organisations, especially IT organisations in this case, find it suitable to use e-HRM as it is an easy-to-use technology. It makes their work simpler and convenient. No previous study had found all these factors contributing together to the effective implementation of e-HRM. Thus, the study made a significant contribution to the field of e-HRM by exploring the major factors affecting e-HRM.

## 6. Conclusion

The implementation of e-HRM has been influenced by a number of factors. Previous authors have given factors like

security, the expertise of employees, infrastructure etc., as the main factors. In this study, the authors also tried to study factors affecting e-HRM implementation from the perspective of IT employees. The study revealed that there were primarily eight factors that were influential in e-HRM implementation. These factors included ease of use of technology, experience of information technology, secure systems, technology usefulness, communication tools, risk perception, usage intention and organisational support. The organisations should take care of these aspects when implementing e-HRM so that the process can be smoothened.

## 7. Implications

The present study provided some useful implications for organisations and HR managers. The successful e-HRM implementation requires that the employees should have secure systems and communication tools. Next, organisational support was another important aspect that should be taken care of as the adoption of e-HRM requires that the employees should have the required support. Further, organisations should try to involve people with experience in information technology to initiate successful e-HRM implementation. The HR managers should also take an assessment of the risks involved when implementing e-HRM. These risks may be related to lack of technological support, lack of coordination between departments, shortage of skilled staff and training facilities. Organisations should try to overcome these risks for the smooth implementation of e-HRM.

## 8. Limitations

The study was conducted only in the IT organisations of India and cannot be generalised to other industries. The study was conducted through questionnaires and thus was subject to respondent bias.

## 9. Future Research

The present study focused only on the IT sector. But e-HRM is used in many other sectors also like banking, hospital, education, manufacturing, hotels, forecasting and many others which can also be studied in future. The majority of the respondents in the present study belonged to the younger age-group. There is a scope in future to study the adoption of technology among the senior employees working in an organisation.



## References

- Al-Dmour, R. H., Love, S., & Al-Zu'bi, Z. "Factors influencing the adoption of HRIS applications: A literature review". *IJMBS*, 34, (2013): pp. 9-26.
- Al-kasasbeh, A. M., Halim, M. A. S. A., & Omar, K. "E-HRM, workforce agility and organisational performance: A review paper toward theoretical framework". *International Journal of Applied Business and Economic Research*, 14(15), (2016): pp.10671-10685.
- Azhar Naima, M. "Factors Affecting the Acceptance of E-HRM in Iraq". *International Journal of Academic Research in Business and Social Sciences*, 9(2), (2019).
- Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis (2<sup>nd</sup> Edition)*, Hillsdale, NJ: Lawrence Erlbaum.
- Fýndýklý, M. A., & Beyza Bayarçelik, E. "Exploring the outcomes of Electronic Human Resource Management (E-HRM)?". *Procedia-Social and Behavioral Sciences*, 207, (2015): pp. 424-431.
- Guenter, H., van Emmerik, I. H., & Schreurs, B. "The negative effects of delays in information exchange: Looking at workplace relationships from an affective events perspective". *Human Resource Management Review*, 24(4), (2014): pp. 283-298.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. "Multivariate Data Analysis. Exploratory Data Analysis in Business and Economics". *Pearson New International Edition*, (2014), [https://doi.org/10.1007/978-3-319-01517-0\\_3](https://doi.org/10.1007/978-3-319-01517-0_3)
- Heikkilä, J. P. "An institutional theory perspective on e-HRM's strategic potential in MNC subsidiaries". *The Journal of Strategic Information Systems*, 22(3), (2013): pp. 238-251.
- Ibrahim, H., & Yusoff, Y. M. "User characteristics as antecedents of techno stress towards EHRM: From experts' views". *Procedia-Social and Behavioral Sciences*, 172, (2015): pp. 134-141.
- Masum, A. K. M. "Adoption Factors of Electronic Human Resource Management (e-HRM) in Banking Industry of Bangladesh". *Journal of Social Sciences/Sosyal Bilimler Dergisi*, 11(1), (2015).
- Nagendra, A., & Deshpande, M. "Human Resource Information Systems (HRIS) in HR planning and development in mid to large sized organisations". *Procedia-Social and Behavioral Sciences*, 133, (2014): pp. 61-67.
- Nunnally, J. C. *Psychometric Theory*. New York: Mc Graw Hill, (1978).
- Panayotopoulou, L., Galanaki, E., & Papalexandris, N. "Adoption of electronic systems in HRM: Is national background of the firm relevant?". *New Technology, Work and Employment*, 25(3), (2010): pp. 253-269.
- Panayotopoulou, L., Galanaki, E., & Papalexandris, N. "Adoption of electronic systems in HRM: Is national background of the firm relevant?". *New Technology, Work and Employment*, 25(3), (2010): pp. 253-269.
- Pant, S., Chatterjee, A. & Jaroliya, D. "e-HR systems implementation: a conceptual framework". *AMCIS 2008 Proceedings*, 338, (2012).
- Rahman, M., Mordi, C., & Nwagbara, U. "Factors influencing E-HRM implementation in government organisations". *Journal of Enterprise Information Management*, (2018).
- Ruël, H., & Van der Kaap, H. "E-HRM usage and value creation. Does a facilitating context matter?". *German Journal of Human Resource Management*, 26(3), (2012): pp. 260-281.
- Sindu, M. "Adoption and implementation factors for the establishment of e-HRM systems". *International Journal of Scientific Development and Research*, 3(11), (2018): pp. 172-176.
- Stone, D. L., & Dulebohn, J. H. "Emerging issues in theory and research on electronic human resource management (eHRM)", (2013).
- Strohmeier, S. "Research in e-HRM: Review and implications". *Human Resource Management Review*, 17(1), (2007): pp. 19-37.
- Subhashree, V. and Vasantha. "Influence of IT Infrastructure and IT Expertise on E-HRM Adoption". *International Journal of Scientific & Technology Research*, 9(01), (2020): pp. 585-589.
- Voermans M. and Veldhoven M. V. "Attitude towards E-HRM: an empirical study at Philips", *Emerald Personnel Review*, 36(6), (2007): pp. 887-902.

\*\*\*\*\*

---

# Working Capital Management as a Determinant of Financial Performance: Accounting vs Market-based Approach

**Rajesh Desai**

Assistant Professor

Chimanbhai Patel Institute of Management & Research

Ahmedabad – 380015, Gujarat

Email: rajesh.desai8@gmail.com

## A b s t r a c t

The present study analyses the influence of working capital management on the financial performance of Indian healthcare companies. Considering a sample of 211 listed companies over a reference period of 10 years (2010 – 2019), the study examines the effect of inventory holding period and net receivable period on accounting (measured by return on assets – ROA) as well as stock market (measured by Tobin's Q ratio) based measures. Findings, based on panel data regression along with fixed and random effects estimation, have presented dynamic effects of working capital management and firm performance. The inventory holding period has reported a significant negative impact on ROA, whereas it has a strong positive effect on Tobin's Q ratio. On the contrary, the net receivable period has a negative effect on both measures but lacks statistical significance. The outcome of the current research will assist managers to understand the relevance of liquidity management, and it also bridges the gap in the existing literature by contributing to the pool of knowledge.

**Keywords:** *Working Capital, Return on Assets, Tobin's Q, Healthcare, Panel data regression*

## 1. Introduction

Functions of corporate finance are categorised into four major groups, i.e. investment, financing, working capital and dividend decision. Investment and financing are associated with a long-term horizon and are non-recurring functional areas. On the other hand, working capital management (WCM) is more concerned with the operating activities of business and is more episodic than other aspects. The quest for working capital starts with the procurement of raw material, transforming them into finished goods to cash collection from debtors (Soukhakian & Khodakarami, 2019). The importance of WCM has been recognised in financial literature and is evidenced by ample contribution by past researchers (Deloof, 2003; Lazaridis & Tryfonidis, 2006; Garcia-Teruel & Martinez-Solano, 2007; Muhammad, Jan, & Ullah, 2008; Aggarwal & Chaudhary, 2015; Afrifa & Tingbani, 2018). In practice, WCM is a process of striving for a balance between liquidity and profitability. Lowering investments in current assets such as stock and receivables can reduce cost and improve profitability (Afrifa & Tingbani, 2018), whereas disproportionate investment in current assets yields suboptimal returns (Raheman & Nasr, 2007). Efficient management of WCM can assist in maximisation of firms' value (Deloof, 2003) and have a critical impact on profitability and risk of the firm (Garcia-Teruel & Martinez-Solano, 2007).

Conventionally, the influence of WCM on profitability has been analysed using operating profit and return on assets (ROA) as a measure (Raheman & Nasr, 2007; Rahman, 2011; Vijayakumaran & Atchyuthan, 2017) which further extended to market-based measures like Tobin's Q ratio (Abuzayed, 2012; Afrifa & Tingbani, 2018). The present research work is aimed at assessing the effect of WCM on the financial performance of the Indian healthcare industry. The current study differs from existing work in two ways. Firstly, it adopts 'net receivables period' as a novel measure of WCM, as firms always attempt to balance between accounts receivable and payable period to reduce the need for excessive working capital financing; hence, the net period should be used due to offsetting effects. Secondly, the study examines the effect of WCM on accounting as well as market-based financial performance in the context of the Indian healthcare industry. Besides, past studies have revealed contradictory results, such as the research findings

of Ganesan (2007), Ramachandran and Janakiraman (2009), Aggarwal and Chaudhary (2015) and Vartak and Hotchandani (2019) have concluded that WCM has a negative effect on profitability whereas Muhammad et al., (2008), Sharma and Kumar (2011) and Makori and Jagongo (2013) have reported a positive impact. Such differing results create a need for further probing in this area.

The present article has been organised as follows. The first section highlights the theoretical foundation of WCM and its importance in research as well as corporate practice. The second section briefly describes the Indian healthcare industry, along with its position in the Indian economy. A review of past literature has been summarised in the third section, followed by the research methodology adopted for conducting research. Further, data analysis, scope of future research and concluding comments are included at the end.

### 1.1 Indian Healthcare Industry

Healthcare has become one of the largest sectors in India in terms of revenue as well as employment. The industry stood as the fourth largest employer in India in 2017 by employing more than 0.3 million people. The Indian healthcare sector is expected to grow at a CAGR of 22% by the fiscal year 2022 and will reach a size of USD 372 billion. Besides, the medical equipment and hospital industry will record a CAGR of 16% and will cross USD 143.82 billion by FY2022. Favourable demographic conditions such as increasing income, improving health attentiveness, lifestyle diseases and access to health insurance facilities are major growth drivers of this industry in India. The healthcare industry contributes nearly 14% to the nations' GDP, which is expected to increase to 19.7% by 2027.

Government and regulatory support is also acting as a major determinant of growth in the healthcare industry. Public expenditure on the health industry has grown at 1.4% of GDP in FY 2018, which will reach 2.5% by 2025. Policies such as allowing FDI, tax advantages on life-saving equipment, healthcare education and training, National Nutrition Mission and such other initiatives have witnessed encouraging steps of regulators. High potential and favourable government schemes attract competitors, and that leads to increasing mergers and acquisitions (M&A)

deals. In FY2019, the total value of M&A in the healthcare sector has recorded a 155% increment and crossed USD 1 billion. Cost-effective medical services have attracted medical tourism and the establishment of international R&D centres. Growing demand, coupled with a favourable regulatory environment, are major success drivers of the health care industry.

## 2. Review of Literature

WCM practices and their impact on financial performance has been studied extensively by researchers using different approaches. The majority of research work has focused on assessing the effect of WCM on accounting-based performance indicators such as gross operating profit, net operating profit, ROA and return on equity (ROE). Further, several researchers have concentrated on WCM and market-based performance measures like Tobin's Q ratio. Besides, few research articles have moderated the influence of WCM on firm performance by macro-economic variables such as GDP growth and inflation. The present section summarises the findings of past research work by classifying them into three broad categories as discussed.

### 2.1 WCM and Accounting based Financial Performance

Financial performance of business, as indicated by measures like gross profit margin, net operating profit, ROA, ROE, and earnings per share, is based on information recorded in the books of accounts. Deloof (2003) has considered gross operating income as a measure of firms' performance. He has concluded that profitability can be improved significantly by reducing receivable days and inventory conversion period. Hindered collections result in a cash deficit which further leads to delay in payments to creditors. Lazaridis and Tryfonidis (2006) have supported the findings of Deloof (2003) and proved the adverse effect of a longer cash conversion cycle (CCC) on profitability. The extension of credit to the customer may lead to collection delinquencies and bad debts. To incorporate this adverse effect, gross profitability should be replaced by net profitability, i.e. net operating profit. Raheman and Nasr (2007) and Ramachandran and Janakiraman (2009) have considered net operating profit as a measure of financial performance. They have shown the strong negative effect of various components of

working capital management on operating profit, indicating that longer conversion cycles adversely affect financial performance. Firms with lower profitability are persuaded to reduce the credit period allowed to customers to bridge the gap between cash requirement and its availability (Ramachandran & Janakiraman, 2009).

Profitability, when expressed as a percentage of assets or investments, enables peer comparison and assists in decision making. ROA has been one of the most widely used measures of accounting-based financial performance (Chowdhury & Amin, 2007; Rahman, 2011; Makori & Jagongo, 2013; Gaur & Kaur, 2017). However, Deloof (2003) advocated for the use of operating income ratio to measure financial performance. But, ROA incorporates the operating profits of the company as well as utilisation of available assets in generating such profits (Makori & Jagongo, 2013) and hence can be viewed as a comprehensive measure of profitability (Padachi, 2006). Following the past studies from Senanayake, Dayaratna, and Semasinghe (2017) and Vartak and Hotchandani (2019), the study adopts ROA as the accounting-based measure of financial performance. Liberal credit policy can increase sales which further boosts profitability, but it also extends the CCC, which is used as a wide-ranging measure of WCM of the firm. Hence, companies have to trade-off between profitability and liquidity. Higher cash holding enables companies to avoid high-cost financing and also provides autonomy in decision making (Vijayakumaran & Atchyuthan, 2017). Sharma and Kumar (2011) have concluded a similar positive relationship for Indian corporates by considering a large data set of 263 listed companies. The direct relationship between profitability and CCC is quite uncommon in empirical research and has been contradicted by the findings of Rahman (2011), Goel and Jain (2017) and Vartak and Hotchandani (2019). A longer conversion cycle may be the result of inefficiency in the production process and delay in receiving payments. CCC as a composite measure cannot assist in decision making directly because of its inclusiveness, and therefore, it has to be broken down into sub-parts, namely stock conversion period (SCP), receivable payment period (RPP) and creditor disbursement period (CDP). Research studies from Ganesan (2007), Muhammad et al. (2008) and Aggarwal and Chaudhary (2015) have augmented the single

measure of WCM, i.e. CCC, by incorporating activity-wise conversion time to assist managerial decision making. Holding inventory for a longer span of time is an indicator of poor financial performance as firms with deteriorating profits find their stock level intensifying (Deloof, 2003; Garcia-Teruel & Martinez-Solano, 2007; Sharma & Kumar, 2011). The delay in payments adversely affects the profitability and credit worthiness of an organisation, and hence profitable firms prefer to discharge their obligations on time (Vartak & Hotchandani, 2019). On the contrary, loss-making firms struggle to pay their dues and hence longer CDP adversely affects profitability (Ganesan, 2007; Muhammad et al., 2008; Seyoum, Tesfay, & Kassahun, 2016). In addition to the phases of operating cycle and time period involved, the working capital policy can be analysed using an activity ratio expressed as a frequency rather than number of days. Rehman and Anjum (2013) and Gaur and Kaur (2017) have considered current ratio, acid-test ratio, current assets to total assets and current assets to sales ratio as exploratory variables and assessed their impact on financial performance. Both research studies have confirmed a positive relationship between working capital management and the profitability of firms. Collectively, this section highlights the significant impact of WCM on firms' performance; however, it also reveals that the research findings are not consistent.

## 2.2 WCM and Tobin's Q Ratio

Maximisation of shareholders' wealth is the central area of all financial decision making. The wealth of shareholders is expressed by the market value of the firm derived from the price of its equity shares listed on the capital market. Accounting measures cannot express the response of investors on firms' business practices, and hence it is inevitable to study the effects of financial practices such as capital budgeting, capital structure, dividend and working capital management on the market value of the firm. Further, the profitability of the firm is an outcome of historical revenue, whereas firm value is an estimation based on expected future revenue. Hence, the linkage between firm value and WCM may differ from that of profitability and WCM (Abuzayed, 2012). Firm value can be measured by market-based performance indicators as P/E ratio, market-to-book value ratio, and Tobin's Q ratio. Out of these, Tobin's Q ratio has been the most commonly

used measure in past studies (Nazir & Afza, 2009; Abuzayed, 2012; Altaf & Ahmed, 2019). Q ratio captures the reputational value effects of firms WCM capabilities on the performance (Afrifa & Tingbani, 2018), and it has more desirable distribution properties than other measures (McGahan, 1999). Therefore, following the extant literature, the study considers the Q ratio as a measure of market-based financial performance. Investors assess the efficiency of senior management in handling working capital issues, and the same has been reflected in the market price of shares. The findings of Abuzayed (2012) and Afrifa and Tingbani (2018) reveal that stockholders attach negative value to longer CCC as an investment in working capital needs external funds, which leads to borrowing cost. Nazir and Afza (2009) have examined the effect of working capital investment (measured by current assets) and working capital financing (measured by current liabilities) on shareholders' value creation and proved the significant positive effect of aggressive financing policy on the Q ratio. On the other hand, Altaf and Ahmed (2019) have found an inverted U-shaped relationship between Tobin's Q ratio and working capital financing. They have concluded that a low (high) level of working capital finance through short-term borrowings improves (deteriorates) financial performance. The above discussion implies that shareholders consider WCM as value-relevant while evaluating a company's performance. But, this area has been less explored, especially in emerging economies like India.

## 2.3 WCM and Financial Performance moderated by Macro-Economic variables

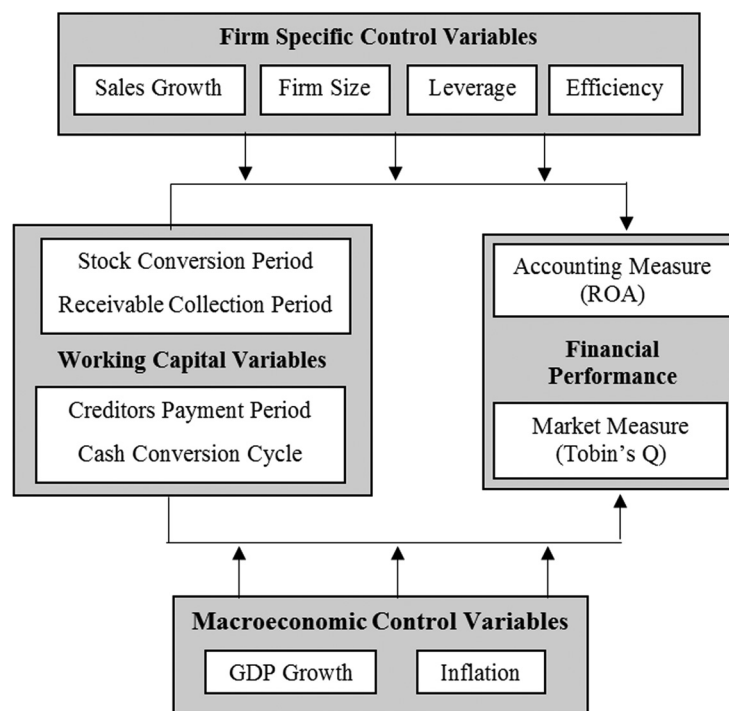
Macroeconomic conditions affect the financial performance of companies operating in a particular country. Favourable conditions such as increasing GDP, moderate inflation, virtuous balance of payments and exchange rates affect the profitability and investment activities in a progressive manner. One of the most commonly used proxies for macroeconomic conditions is the annual growth rate in GDP (Garcia-Teruel & Martinez-Solano, 2007; Nazir & Afza, 2009; Abuzayed, 2012; Soukhakian & Khodakarami, 2019). Garcia-Teruel and Martinez-Solano (2007) have concluded the positive and significant impact of GDP growth on ROA. The confidence of investors gets reinforced with the positive growth in GDP, which is reflected in the market value of

the firm (Nazir & Afza, 2009; Abuzayed, 2012). Soukhakian and Khodakarami (2019) have considered GDP growth and inflation rate as economic indicators and have concluded the direct and significant effect of these variables on financial performance. However, they lack evidence to support the moderating effect of economic factors on firm performance and WCM and have explained that the firm's WCM policy depends on company-specific factors. Lastly, the section concludes that the moderating effect of economic variables needs to be tested through further research.

## 2.4 Research Gap and Conceptual Model

Though substantial literature focusing on working capital and firm performance is available, very limited research

work has concentrated on the linkage between WCM and shareholders' wealth as well as the market value of the firm. Besides, empirical studies focusing on this point are not carried out in the Indian context, especially in the healthcare sector. Moreover, past research work shows inconsistent results so far as WCM and financial performance are concerned. Hence, the current research will bridge the gap in the existing research by assessing the effect of WCM market based financial measures along with accounting measures. Figure – 1 presents the conceptual model highlighting the working capital, financial performance along with firm-specific and macroeconomic control variables identified from the review of literature.



(Source: Developed by Author)

**Figure 1. Conceptual Model**

## 3. Research Methodology

### 3.1 Purpose, Variables of Study and Hypothesis

The present research aims to analyse the effect of working capital management on accounting and market based

financial performance of selected healthcare sector companies in India. The current study extends the research work of Nazir and Afza (2009) and Abuzayed (2012) in the Indian context. Based on the existing literature, the variables of the study are divided into three categories, i.e. (i)

financial performance, (ii) working capital, and (iii) control variables.

*Financial performance* has been considered as the dependent variable. Accounting and market performance

has been measured by return on asset (ROA), and Tobin's Q (TQ) ratio, respectively and are computed as mentioned below.

$$\text{Return on Asset (ROA)} = \frac{\text{EBIT}}{\text{Total Asset}}$$

$$\text{Tobin's Q Ratio (TQ)} = \frac{\text{Market Value of Equity} + \text{Book value of Debt}}{\text{Book Value of Equity} + \text{Book value of Debt}}$$

WCM, treated as the independent variable, has been measured using the stock conversion period (SCP) and net receivable period (NRP). As against past research work, CCC has been dropped as conclusions derived from it need

to be re-examined activity-wise for decision making. NRP is a novel measure calculated as the difference between the receivables collection period and creditors disbursement period.

$$\text{Stock Conversion Period (SCP)} = \frac{\text{Inventories}}{\text{Cost of Sales}} \times 365$$

$$\text{Net Receivable Period (NRP)} = \left( \frac{\text{Debtors}}{\text{Sales}} \times 365 \right) - \left( \frac{\text{Creditors}}{\text{Purchases}} \times 365 \right)$$

*Controls*, as the financial performance is affected by several firm-specific factors other than WCM; hence, revenue growth (RG), size (SZ), leverage (LV) and efficiency measured by asset turnover ratio (AR) are considered as control variables. The annual percentage change in sales has been proxied for growth (Gaur & Kaur, 2017), whereas the size is measured by the natural log value of total assets (Vijayakumaran & Atchyuthan, 2017). Leverage is computed as the ratio of debt to assets (Makori & Jagongo, 2013), and the asset turnover ratio is measured as sales to total assets ratio. The present study adopts a descriptive methodology of research and analyses the effect of WCM on financial performance. Following hypothesis are formed and eventually tested using empirical results.

- H<sub>01</sub>: SCP does not have a significant impact on ROA
- H<sub>02</sub>: NRP does not have a significant impact on ROA
- H<sub>03</sub>: SCP does not have a significant impact on Tobin's Q Ratio
- H<sub>04</sub>: NRP does not have a significant impact on Tobin's Q Ratio

### 3.2 Sampling Plan and Data Collection

The present study focuses on the Indian healthcare industry; hence all listed companies are considered for inclusion in

the sample. The empirical results are based on the secondary data collected from the Centre for Monitoring Indian Economy (CMIE), Prowess and Ace Equity database. According to the CMIE database, 230 healthcare companies are listed on the Indian stock exchanges. To create a balanced panel dataset for the study period of 10 years (2010 – 2019), companies are selected using a multistage sampling technique. Continuous listing and availability of data for selected variables throughout the study period are the primary filters of sample selection. Finally, 211 companies are selected based on the requirement, which creates an ultimate dataset of 2110 firm-year observations.

### 3.3 Techniques of Data Analysis

Financial data collected from secondary sources have been analysed using descriptive analysis, correlation and multiple regression analysis. The data has been validated for assumptions like autocorrelation and multicollinearity using the Durbin-Watson (DW) test and Variance Inflation Factor (VIF), respectively. Panel data methodology has been adopted as it incorporates the potential endogeneity of variables arising from unobserved firm heterogeneity, which is ignored in the ordinary least square method (Vijayakumaran & Atchyuthan, 2017). Fixed effects model

assess the firm-wise variation in intercept assuming same slope, constant variations, and time-invariant individual effects whereas random-effects model treats individual intercept as a random variable with mean value  $\alpha$  and express intercept of each company as  $\alpha_i = \alpha + \varepsilon_i$  where  $\varepsilon_i$  is a random

error with zero mean (Gujarati, 2003). The suitability of fixed and random effects has been examined by a Hausman test with the null hypothesis that a random-effects model is a better estimate than fixed effects. Following regression models are formulated considering financial performance as the dependent variable and WCM as the independent variable.

#### *Fixed Effects Model*

$$ROA_{it} = \alpha_i + \beta_1 SCP_{it} + \beta_2 NRP_{it} + \beta_3 RG_{it} + \beta_4 SZ_{it} + \beta_5 LV_{it} + \beta_6 AR_{it} + u_{it}$$

$$TQ_{it} = \alpha_i + \beta_1 SCP_{it} + \beta_2 NRP_{it} + \beta_3 RG_{it} + \beta_4 SZ_{it} + \beta_5 LV_{it} + \beta_6 AR_{it} + u_{it}$$

#### *Random Effects Model*

$$ROA_{it} = \alpha + \beta_1 SCP_{it} + \beta_2 NRP_{it} + \beta_3 RG_{it} + \beta_4 SZ_{it} + \beta_5 LV_{it} + \beta_6 AR_{it} + \varepsilon_i + u_{it}$$

$$TQ_{it} = \alpha + \beta_1 SCP_{it} + \beta_2 NRP_{it} + \beta_3 RG_{it} + \beta_4 SZ_{it} + \beta_5 LV_{it} + \beta_6 AR_{it} + \varepsilon_i + u_{it}$$

Where,

$\alpha$  = Intercept

$\beta_1$  to  $\beta_6$  = Regression coefficients

$u_{it}$  = stochastic error of firm  $i$  and year  $t$

$i$  = Number of Firms

$t$  = Time period from 2010 – 2019

## 4. Data Analysis And Interpretation

### 4.1 Descriptive Results

Descriptive statistics that assist in analysing the data and its variability have been summarised in Table 1. Indian healthcare companies generate an average ROA of 12.88% with a standard deviation of 7.88%, which indicates moderate volatility in returns. The mean and standard deviation values of the Q ratio are 1.1014 and 0.6930, respectively, indicating quite satisfactory results. The

average stock holding period of selected companies is approximately 67 days indicating a huge piling of inventory in the industry. The average net receivable period is close to 10 days, and its standard deviation is 38 days portraying firm-wise differences in collection and payment policies. The Healthcare industry has reported an average revenue growth of 15.71%, whereas its average debt ratio is only 0.2805, from which it can be inferred that healthcare companies rely more on owners' funds compared to borrowings.

**Table 1. Descriptive Statistics**

Variable	Obs.	Mean	Std. Dev.	Lowest	Highest
ROA	2110	0.1288	0.0788	-0.2344	0.4093
TQ	2110	1.1014	0.6930	0.3477	4.9413
SCP	2110	67.2599	25.1005	13.1464	170.8774
NRP	2110	9.9333	38.8616	-97.4932	136.2331
RG	2110	0.1571	0.2247	-0.5406	1.8381
SZ	2110	3.5387	0.5202	1.9511	4.5765
LV	2110	0.2805	0.3576	0.0000	0.7825
AR	2110	0.7848	0.3032	0.2150	1.7444

Source: Compiled from SPSS Output



#### 4.2 Correlation Matrix

Results of Pearson correlation have been abridged in Table 2, indicating linear relationships among the selected variables. A significant negative correlation has been observed between ROA and both WCM indicators. The results indicate that a higher length of operating cycle will adversely affect the financial performance of selected companies. Reducing the storage period of inventory and minimising the gap between collection and payment days can significantly improve the profitability of firms. Past research from Deloof (2003), Lazaridis and Tryfonidis (2006) and Sharma and Kumar (2011) has also supported the inverse relationship. Analysing the result for Tobin's Q ratio, NRP has an indirect relation, but it is not significant, and only inventory holding has a significant positive relation which is contradicting previous studies. An explanation for such results can be given as the current market value of a firm is an indicator of future returns, and investors analyse inventory holding jointly with revenue growth. Increasing inventories are associated with higher sales which can further improve operating profitability (Abuzayed, 2012) and gives a positive signal towards future profitability. Further, among control variables, sales growth, asset turnover, and leverage have significant relation with ROA, whereas Q ratio is significantly related with only leverage and turnover ratio.

**Table 2. Correlation Matrix**

Variables	ROA	Tobin's Q
SCP	-0.2951**	0.1596**
NRP	-0.0712*	-0.0554
RG	0.1493*	0.1260
SZ	-0.3666	-0.0732
LV	-0.3617**	-0.1143*
AR	0.4321**	0.1772*
** - Significant at 1%      * - Significant at 5%		

Source: Compiled from SPSS Output

#### 4.3 Result of Econometric Models

To strengthen the conclusion on the effect of WCM on financial performance, multiple regression analysis has

been applied. Table 3 and Table 4 summarises the regression output of Model 1 and Model 2, respectively. The robustness of results has been analysed by estimating both equations using fixed-effects as well as random effects methods, and the Hausman test has been applied to check their suitability. The results support (Significance value < 0.05) rejection of the null hypothesis and confirms the applicability of fixed-effects for both econometric models. Further, DW statistic and VIF values are also within the acceptable range (DW = 1.5 to 2.5; VIF < 10), indicating that any problem of autocorrelation and multicollinearity has been controlled (Gujarati, 2003). The fit of regression models has been tested using F-statistics, and its probability value (<0.01) shows that both models are significant.

The output of regression Model 1 (see Table 3) portrays the negative impact of WCM variables on the profitability of selected companies. SCP has a significant adverse effect on ROA, whereas the impact of NRP has not been supported by statistical significance. Holding inventory for a longer span of time will increase the carrying cost that adversely affects the profitability of the firm. Likewise, increasing the gap between collection and payments creates a liquidity crunch and forces companies to resort to external financing that leads to interest and procurement cost. Critical values of regression coefficients of SCP and NRP concludes **rejection of  $H_{01}$**  hypothesis whereas **failed to reject  $H_{02}$**  hypothesis. The findings of the present research coincide with the conclusions drawn from the research work of Raheman and Nasr (2007), Ramachandran and Janakiraman (2009), Aggarwal and Chaudhary (2015) and Goel and Jain (2017). Makori and Jagongo (2013) have reported contradictory results and concluded the positive effect of stock holding on profitability as higher inventory reduces the possibility of production interruption and loss of sales. Among the control variables, only leverage and asset turnover ratio are found to be significant, and leverage reported negative impact, whereas turnover ratio improves profitability. Further, the fixed effects model can explain 56.30% variations in ROA, which is more than random effects validating the results of the Hausman test.

**Table 3. Regression Output of Model – 1 (ROA)**

	Fixed Effects Model		Random Effects Model	
	Co – Eff.	Prob. Value	Co – Eff.	Prob. Value
Constant	0.2297	0.0056	0.1746	0.0046
SCP	−0.0021	0.0000	−0.0011	0.0004
NRP	−0.0003	0.0682	0.0000	0.7651
RG	0.0289	0.1394	0.0056	0.7609
SZ	−0.0022	0.9061	−0.0056	0.7035
LV	−0.0773	0.0002	−0.0796	0.0000
AR	0.0784	0.0093	0.0884	0.0002
F – Stat (Sign. Value)	11.2571 (0.0000)		14.6892 (0.0000)	
R <sup>2</sup> / Adj. R <sup>2</sup>	0.6179 / 0.5630		0.3135 / 0.2922	
Hausman Test (Sign. Value): 21.7722 (0.0013)      DW Stat: 1.5738      VIF: 2.2132				

Source: Compiled from E-views Output

The effect of WCM on the market value of firm measured by Tobin's Q ratio has been highlighted in Table 4. As against ROA, SCP has a significant positive impact on the Q ratio, demonstrating that investors attach favourable signal to increasing inventory. Higher inventory reduces the procurement and operating risk and ensures undisturbed production. Further, as explained by Abuzayed (2012), the growing inventory level is linked with increasing sales which improves the profitability of the firm. This will further strengthen the expectations of future returns resulting in a positive effect on market value. Though this is in contrast with conventional understanding, the extant literature has not explored the relationship between the inventory holding period and Tobin's Q ratio adequately.

Thus, these findings need further validation through future inquiries in this direction. On the contrary, increasing NRP reduces the cash reserve of companies which could have been utilised for profitable investment opportunities and thereby maximising shareholders' returns. Hence, NRP has a negative impact on market performance, but the results are significant at a 10% level (Prob. value = 0.065). Hypothesis testing for Model 2 reveals a similar result as Model 1 and supports the **rejection of the H<sub>03</sub>** hypothesis, and **fails to reject the H<sub>04</sub>** hypothesis. The Asset Turnover Ratio has a positive and significant effect on Tobin's Q ratio as it indicates efficient utilisation of fixed assets. Other control variables are found to be insignificant.

**Table 4. Regression Output of Model – 2 (Tobin's Q)**

	Fixed Effect		Random Effect	
	Co – Eff.	Prob. Value	Co – Eff.	Prob. Value
Constant	0.5699	0.4908	0.7042	0.2841
SCP	0.0098	0.0229	0.0090	0.0053
NRP	−0.0036	0.0646	−0.0032	0.0572
RG	0.1218	0.5361	0.2158	0.2502
SZ	−0.1079	0.5701	−0.0083	0.9575
LV	−0.2140	0.1389	−0.2186	0.2086
AR	0.5020	0.0268	0.1435	0.0581
F – Stat (Sign. Value)	6.9074 (0.0000)		3.3114 (0.0000)	
R <sup>2</sup> / Adj. R <sup>2</sup>	0.4981 / 0.4260		0.2933 / 0.2652	
Hausman Test (Sign. Value): 11.2392 (0.0183)      DW Stat: 1.5393      VIF: 2.2132				

Source: Compiled from E-views Output

## 5. Conclusion And Research Extentions

Working capital management is an indispensable part of the decision making under corporate finance. The efficient management of current assets and current liabilities play a vital role in determining the profitability and value of a firm. The present research article examines the impact of working capital management on the financial performance of 211 healthcare companies in India by taking balanced panel data for ten years (2010 – 2019). Using panel data regression methodology, the study concludes the negative and significant effect of working capital measured by the inventory holding period on the accounting performance measures, whereas market measures have been favourably affected by the same. The net receivable periods has a negative influence on profitability and market value, but the relationship is significant at the 10% level. Hence, the findings conclude that firms can maximise their profitability and value by managing their working capital optimally. The outcome of research work will help practitioners to devise a suitable strategy for managing working capital, and it also bridges the gap in the existing literature by contributing to the pool of knowledge.

Though the present research attempts to provide a comprehensive view of WCM and financial performance, few areas still require further examination. The current research does not include macroeconomic variables, which can be explored for future research. The conceptual model developed from the literature review can be empirically tested with different industry datasets. Further, similar studies can be conducted by concentrating on small and medium enterprises (SMEs) as they are equally exposed to the problems of profitability and liquidity.

## References

- Abuzayed, Bana. "Working capital management and firms' performance in emerging markets: the case of Jordan." *International Journal of Managerial Finance* 8.2 (2012): 155-179.
- Afrifa, G. A. and I. Tingbani. "Working capital management, cash flow and SMEs' performance." *Int. J. Banking, Accounting and Finance* 9.1 (2018): 19-43.
- Aggarwal, Agrim and Rahul Chaudhary. "Effect of Working Capital Management on the Profitability of Indian Firms." *IOSR Journal of Business and Management* 17.8 (2015): 34-43.
- Nufazil Altaf, Farooq Ahmad. "Working capital financing, firm performance and financial constraints: Empirical evidence from India." *International Journal of Managerial Finance* (2019) <https://doi.org/10.1108/IJMF-02-2018-0036>
- Chowdhury, Anup and Md. Muntasir Amin. "Working Capital Management practised in Pharmaceutical Companies listed in Dhaka Stock Exchange." *BRAC University Journal* IV.2 (2007): 75-86.
- Deloof, Marc. "Does Working Capital Management Affect Profitability of Belgian Firms?" *Journal of Business Finance & Accounting* 30.3 & 4 (2003): 573-587.
- Ganesan, Vedavinayagam. "An Analysis of Working Capital Management Efficiency in Telecommunication Equipment Industry." *Rivier Academic Journal* 3.2 (2007): 1-10.
- Garcia-Teruel, Pedro Juan and Pedro Martinez-Solano. "Effects of working capital management on SME profitability." *International Journal of Managerial Finance* 3.2 (2007): 164-177. <<https://doi.org/10.1108/17439130710738718>>.
- Gaur, Reeti and Dr. Rajinder Kaur. "Impact of Working Capital Management on Firm Profitability: A Study of select FMCG Companies in India." *Indian Journal of Accounting* XLIX.1 (2017): 117-126.
- Goel, Prof. Kushagra and Surya Jain. "Impact of Working Capital Management on Profitability: Empirical Evidence from Indian Textile Industry." *International Journal of Management Studies* IV.4 (2017): 78-92.
- Gujarati, Damodar N. *Basic Econometrics*. 4th. New York: McGraw Hill, 2003.
- India Brand Equity Foundation. Healthcare. New Delhi: IBEF, 2020, <https://www.ibef.org/archives/industry/healthcare-reports/indian-healthcare-industry-analysis-january-2020> (Accessed on 24/02/2020)
- India Brand Equity Foundation. Healthcare. New Delhi: IBEF, 2019, <https://www.ibef.org/download/Healthcare-December-2019.pdf> (Accessed on 20/01/2020)

- Kumar, Sunil, Dr. Praveen Srivastava and Dr. S.K. Sinha. "An Empirical Study on efficiency of Working Capital Management of Indian Pharmaceutical Industry." *International Journal of Logistics & Supply Chain Management Perspectives* 3.3 (2014): 1253-1258.
- Lazaridis, Dr. Ioannis and Dimitrios Tryfonidis. "The relationship between working capital management and profitability of listed companies in the Athens Stock Exchange." *Journal of Financial Management and Analysis* 19.1 (2006): 26-35. <<http://ssrn.com/abstract=931591>>.
- Makori, Daniel Mogaka and , Ambrose Jagongo. "Working Capital Management and Firm Profitability: Empirical Evidence from Manufacturing and Construction Firms Listed on Nairobi Securities Exchange, Kenya." *International Journal of Accounting and Taxation* 1.1 (2013): 1-14.
- McGahan, A.M. "The performance of US corporations: 1981–1994." *Journal of Industrial Economics*, 47.4 (1999): 373–398.
- Muhammad, Malik, Waseem Jan and Kifayat Ullah. "Working Capital Management and Profitability An Analysis of Firms of Textile Industry of Pakistan." *Journal of Managerial Sciences* VI.2 (2008): 155-165.
- Nazir, Mian Sajid and Talat Afza. "A Panel Data Analysis of Working Capital Management Policies." *Business Review* 4.1 (2009): 143-157.
- Raheman, Abdul and Mohamed Nasr. "Working Capital Management and Profitability – Case of Pakistani Firms." *International Review of Business Research Papers* 3.1 (2007): 279-300.
- Rahman, Mohammad Morshedur. "Working Capital Management and Profitability: A Study on Textiles Industry." *ASA University Review* 5.1 (2011): 115-132.
- Ramachandran, Azhagaiah and Muralidharan Janakiraman. "The Relationship between Working Capital Management Efficiency and EBIT." *Managing Global Transitions* 7.1 (2009): 61-74.
- Rehman, Mobeen Ur and Naveed Anjum. "Determination of the Impact of Working Capital Management on Profitability: An Empirical Study From the Cement Sector in Pakistan." *Asian Economic and Financial Review* 3.3 (2013): 319-332.
- Senanayake, Mahasena, Banda O.G Dayaratna and D.M. Semasinghe. "The effects of working capital management on profitability, liquidity, solvency and organic growth with special reference to SMEs: A review." *International Journal of Accounting & Business Finance* 3.2 (2017): 19-50.
- "Trends in working capital management and its impact on firms' performance: An analysis of Sri Lankan small and medium enterprises." *International Journal of Accounting & Business Finance* 3.1 (2017): 46-60.
- Seyoum, Dr. Arega, Tadele Tesfay and Tadesse Kassahun. "Working Capital Management and Its Impact on Profitability Evidence from Food Complex Manufacturing Firms in Addis Ababa." *International Journal of Scientific and Research Publications* 6.6 (2016): 815-833.
- Sharma, A.K and Satish Kumar. "Effect of Working Capital Management on Firm Profitability: Empirical Evidence from India." *Global Business Review* 12.1 (2011): 159-173.
- Soukhakian, Iman and Mehdi Khodakarami. "Working capital management, firm performance and macroeconomic factors: Evidence from Iran." *Cogent Business & Management* 6 (2019): 1-24. <<https://doi.org/10.1080/23311975.2019.1684227>>.
- Vartak, Pallavi and Vishal Hotchandani. "Working Capital Management and Firm Performance: Evidence from Indian Listed Firm." *International Journal of Management, Technology And Engineering* IX.IV (2019): 914-925.
- Vijayakumaran, Ratnam and Nagajeyakumarn Atchyuthan. "Cash holdings and corporate performance: Evidence from Sri Lanka." *International Journal of Accounting & Business Finance* 3.1 (2017): 1-11.

\*\*\*\*\*

# Employee Demography and Employee Engagement- An Empirical Study on IT Employees

**Meru Das**  
Research Scholar  
MIT College of Management,  
MITADT University  
Pune, Maharashtra India  
Email: meruphd@gmail.com

**Dr. Vivek Singh,**  
Professor and HOD  
MIT College of Management,  
MITADT University  
Pune, Maharashtra, India  
Email: vivek.singh@mituniversity.edu.in

**Dr. Shashank Mehra**  
Professor  
School of Commerce & Management,  
Lingaya's, Vidyapeeth, Faridabad  
Email: dr.shashank@lingayasvidyapeeth.edu.in

## A b s t r a c t

In order to survive and gain a competitive advantage in today's fast-changing organisational environment, competitive pressures, and stakeholder demands, organisations attribute more importance to their workforce. The recent buzz among the industry, consulting firms and academia, still with vast scope for research, is the concept of employee engagement. There is an increasing awareness that employee engagement is pivotal to the success of the organisation. That is the reason that the world today is paying increased attention to Employee Engagement. The objective of the study is to ascertain how Employee Engagement and its facets like Growth, Teamwork, Management Support and Basic Needs, differ with workers demographic factors, including gender, age, and experience. Data was collected through self-administered questionnaires from 223 working adults in the IT companies of Pune, Maharashtra. Findings were made with the help of standard statistical software such as SPSS, and complete model testing was done with the help of AMOS. One-way ANOVA, Post Hoc test and T-tests are also used.

The current study discovered that overall male employees have elevated engagement level than females. Female employees outscore men employees in the dimension of Basic Need of Employee Engagement, thus concluding that females are greatly engaged at the entry-level. Findings reveal that employees between 31-40 years, and employees with more experience are highly engaged. The study has practical implications as now the employers are aware that employee engagement in males on two dimensions, namely Growth and Management support, is more than as compared to females in the IT organisations.

This study gives a clear understanding of how demographic factors influences employee work engagement that supports human capital management strategy within organisations. It is suggested that HR professionals can deploy targeted employee engagement programs and strategies to engage employees with their work and with the organisation.

**Keywords:** *Employee Engagement, Gender, IT, Experience, Age*

## 1. Introduction

In today's high-velocity environment, competition is the order of the day. In this cut-throat scenario, it's important that both businesses and individuals strive hard to keep their competitive edge intact. In this dynamic and increasing hyper-competition, managers will have to focus on employees physical and mental wellbeing. According to The Harvard Business Review (2013), 71 per cent of respondents concur with the thought that (employee engagement is a substantial predictor for the economic success of the organisation). Gallup (2006) defines Employee Engagement as "engaged employees are more likely to view the organisation and job as a healthy environment and therefore more likely to support the organisation." Hence, employee engagement is a strong tool that can be beneficial in these tough times. Employee engagement will be considered as a strategic technique for the service organisations to survive and to sustain in the prevailing extreme competitive environment (Amabile et al., 2011). Because engaged employees have a huge amount of energy which is obtained from the emotions which they experience in their workplace, and these engaged employees are fervent about their employment (John & Raj, 2020).

The engaged employees are the ones who go beyond that extra mile – who invest that discretionary effort for the success of the organisation (Leary Joyce, 2004). Employee engagement is a factor related to many organisational issues and individual outcomes such as work performance (Laschinger et al. 2006; Paul & Anantharaman, 2004) or turnover intentions (Agarwal et al., 2012; Bailey et al., 2015; Soane et al., 2012), and more productivity (Gallup, 2013)

Employee Engagement trait is used to denote the emotional and cognitive factors of organisational loyalty, which is desired to be in tandem with the missions and goals of the organisation (Ehambaranathan, et al., 2014). Engagement and immersing one's self into the job completely brings out a happy and good performer who will be more creative, motivated, authentic, non-retaliatory and overall, a more passionate employee about the work. Gallup, in their most recent "State of the Global Workplace Report" (2017), says that 85 per cent of the workforce is not engaged at

the workplace. Hence explaining it further, Gallup declares that 18 per cent are actively disengaged, while 67 per cent show all the characteristics of not being engaged at the workplace at all. The above-mentioned employees may not be the most awful performers, but these employees have a couldn't care less attitude with respect to their employment. This explains that employees do give their organisations the time, but they are not involved in their work in totality. Hence, their findings revealed that due to disengaged employees, the businesses suffered a major financial loss of \$7 trillion (Gallup, 2017.) Therefore, the organisation should develop strategies that serve to enhance engagement.

The exponential advancement of the IT sector has created incredible work prospects for a large section of educated women. Singhal (1995) is of the opinion that "Participation of women in the workforce is essential for economic development and population planning." According to the Ministry of Electronics & Information Technology, there are 34 per cent female employees, out of a total of 39.68 lakhs employees in Information Technology and web-enabled services combined. This is a fairly sudden increase from 21 per cent of women workers in 2001 (NASSCOM, 2001) and 30 per cent in 2012 (NASSCOM, 2013), cited in Gupta (2015).

In our patriarchal society, where a female is generally a homemaker or a caregiver, striking the right amount of balance amidst job and family can be quite a daunting task. Balancing work and family was one of the frequently quoted challenges in a study on women in Information Technology (Adya, 2008). The Information Technology sector is making all the endeavours to improve the work engagement of their employees as engagement makes the employee perform better, which in turn increases the productivity of the organisation.

Different employees will have different expectations, requirements, wants, desires, anticipations, etc., from the employers because they all are from varied social-demographic backgrounds. Hence, the management should, therefore, try to understand the employees at an individual level. Balain and Sparrow (2009) opined that when the attitudes of the employees have to be assessed, the employee demography should be taken into consideration.

Owing to its significance, employee engagement is now a matter of contention and is on the rise quite steadfastly up the agenda of Human Resource professionals. The literature revealed that employee engagement (EE) is diminishing and that an increasing disengagement currently exists in the workforce (Kular et al., 2008). Therefore, the engagement of the employee factor is keeping the HR folks and the employers on their toes since leveraging this key business driver is significantly critical for achieving competitive advantage. (Soldati, 2007; HR Focus, 2006) and now, the concept of work engagement is being researched comprehensively. This paper, therefore, is an effort to fill the gap in the literature and provide a different perception to the outcomes of earlier studies about the role of various demographics like age, experience and gender in employee engagement in the organisations under study.

## 2. Literature Review

### 2.1 Employee Engagement

Employee engagement, of late, has surfaced as an important part of business success in today's competitive arena (Saks, 2006; Bakker & Schaufeli, 2008). Sadique (2014) considered engagement as an emotional connect to the workplace because he opined that employees who are enthusiastic and passionate about their work are dedicated and are empowered. Albrecht (2011) added that engagement takes a particularly important role in all organisations. It makes an employee give his best performance in terms of work activities, and thereby allow them to understand the corporate culture. The investment in employees will help the organisation improve leadership and the creation of technological innovation that will result in elevated financial gain. Organisations that execute employee engagement strategies, implies that their employees have full faith in the company that they will be unbiased in all respects. Work engagement is also defined as the involvement and contributions that employees put into their work (Kuok & Taormina, 2017).

When business leaders implement the policies or strategies on employee engagement, it elevates customer satisfaction, increases production and profit (Bowen, 2016), and reduces turnover intentions (Memon et al., 2016). Consequently, employees with heightened employee engagement work more efficiently and effectively because

they work with a lot of involvement in their work, along with emotional connect.

Kahn (1990) recommended that engaged employees are ones who put a lot of effort into their work beyond the minimum requirement for the work to be completed by giving extra time, passion, and intellect. Chartered Institute of Personnel and Development (2013), in their report, describes employee engagement as "being positively present during the performance of work by willingly contributing intellectual effort, experiencing positive emotions and meaningful connections to others."

Recent research has identified engagement as more of an emotional feeling towards their work (Baumruk, 2004; Richman, 2006). In short, there is a psychic income or non-pecuniary income at work which is respect, appreciation, admiration, self-actualisation needs getting fulfilled, etc., and that makes employees committed and socially acceptable (Camerer & Malmendier, 2007).

In the opinion of many researchers, employee engagement is substantially related to the feeling that the employees are "glued" to their work (Harter et al., 2002; Schaufeli & Bakker, 2004). Engaged employees have an emotional attachment with the organisation, which results in higher productivity, return on investment, retention, loyalty and lower absenteeism (Shukla et al., 2015).

Consequently, these engaged employees are better suited to cope up with the uncertain demands of their work. These engaged employees will seldom have an intent to exit from the organisation, which is evident from the study of Schaufeli et al. (2001), who investigated that workforce who are engaged with full involvement in their job are more content with it and enjoy their work.

### 2.2 Demographic Variables

#### 2.2.1 Gender

Men are from Mars and Women are from Venus and which means that women can be just as unique professionally and personally. Though they are walking tall with men in the workplace, they have not become replicas of men. Both male and females exhibit different behaviours in the workplace.

Kelkar and Nathan (2002) stated in their study that the development of information technology (IT) in Asia has had a significant impact on women. Clark and Sekher (2007) assert in their study that IT employment to women has enhanced their socio-economic status. This has been reinforced by the findings of Shanker (2008), who also observed that Information Technology employment has contributed to the upliftment of the women employees pertaining to economic capital, social capital and symbolic capital.

Eagly's (1987) gender socialisation and social role theory stated that women are more focused on emotional relation investment by which they complete a task by emotionally connecting with the team, whereas men are supposed to be "agentic" and move directly to the project goal. Females believe in building relationships with people while on the task or job (Donelson, 2010; Eagly, 1987; Gilligan, 1982; Farrell & Finkelstein, 2007; and Knowles and Moore, 1970). This nature of females can be because they are highly compassionate and emotional and have great team-building skills. Ramamurthy and Flood (2004) reported in their study that women in general reported higher emotional attachment than men. The outcomes of many studies also indicate that the disparity in employee engagement between the genders is prevalent (Kong, 2009; Mauno et al., 2005; Rothbard, 2001).

Maitland (2001) suggested that in this dynamic environment, the women workforce will fill the gap of competent and well-trained talent in the workplace internationally. However, IT employers are facing a challenge when it comes to hiring and retaining skilled female employees. In spite of women-friendly retention policies, this is proving to be a substantial challenge in the Information Technology sector (Pfleeger & Mertz, 1995).

Shuttleworth (1992) found out that females in the IT companies are majorly participating in routine kinds of jobs, whereas men are involved in decision making and executive jobs. Many have advocated that enhancing the representation of females to decision-making levels and policy implementations will definitely make the workplace more conducive for women to work. On the contrary, many past studies have reinforced the fact that womenfolk in the IT field are at the lower and middle levels, and very few of them reach the top of the pyramid in the organisational

hierarchy (Myers, 1990; Benditt, 1992). Based on the research of Reid et al. (2010) and Trauth et al. (2012), the "equality argument" criticises existing world power structures, where men occupy most of the top positions in the IT field and elsewhere. Raghuram et al. (2017), in their research, found that 51 per cent of entry-level hires represent women; a little over 25 per cent of women reach the managerial level, but <1 per cent are at the senior executive level. Marcus and Gopinath (2017) signify in their study of professionals that gender as a demographic variable has no influence on employee engagement, i.e., no significant difference between male and female respondents with respect to the drivers of employee engagement in IT companies. Hence we propose:

H01: There is no significant difference in engagement levels of male and female employees.

### 2.2.2 *Experience of employees*

Robinson, Perryman and Hayday (2004) carried out a survey of around ten thousand employees in fourteen organisations and discovered that employee engagement decreased when the age and tenure in the organisation increased. Mahboubi et al. (2015) identified a significant association between work engagement and length of employee work experience. Employees who have spent more time with the employer are more likely to reach a level where there is no advancement in career (Allen, Poteet, & Russell, 1998) and thus feel low engagement level as compared to those who spend less time in the organisation. Jaupi and Llaci (2015) observed changes in the engagement levels of employees due to the longevity of experience with the organisation. Some studies conducted suggested that the engagement of the employee is not affected by the demographic factors such as gender, age, position, and income of the respondents (Madan & Srivastava, 2015; Sarath & Manikandan, 2014). Hence it is imperative to propose:

H02: There is no significant difference in engagement levels of employees with different years of experience.

### 2.2.3 *Age of Employees*

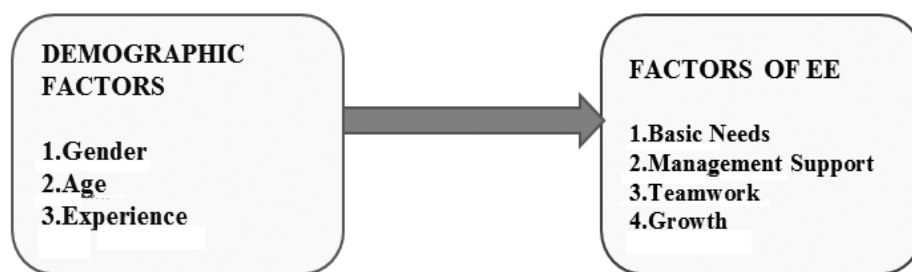
Not many researches have been conducted for examining the linkage between the age of an employee and employee engagement. Whatever researches have been conducted on



this critical area has given us quite contradictory outcomes. Age has been identified as a predictor of work engagement (Kim & Kang, 2017). Bezuidenhout and Cilliers (2011) and Douglas and Roberts (2020) stated that there exists a positive association between age and work engagement of employee, which suggests that employee engagement increases with age. Vijay et al. (2016) posited that employee engagement does not vary with the demographic factors, namely gender, age, position and income of the respondents. Pitt-Catsoupes and Matz-Costa (2008) did the analysis from data which was obtained from 20 organisations and highlighted the importance of job flexibility and reported that flexibility in the job was more important to older employees in comparison to young employees, and this could be the driver for employee engagement. Similarly, their work was substantiated by Brough, O'Driscoll and Kalliath 2005 and De Cieri et al.

2005, who examined the effects of flexibility at work on employee engagement, and their outcomes of the study revealed that more the flexibility more the employee engagement. George & Ben (2017) posited that age and gender have a statistically significant effect on the engagement level of employees. It was found those workers whose age was more than 45 years was more engaged. In research conducted by Wolfe (2004), it is indicated that the highest level of employee engagement is felt when the employees are in the first year of the job, and then it subsequently comes to stagnation and then again falling in the 5–10-year bracket. The age of an employee and the amount of work experience an employee has should increase the likelihood of engagement. Therefore, we propose

H03: There is no significant difference in the engagement levels of employees with different age groups.



**Figure 1: Conceptual framework**

### **2.3 The Information Technology (IT) Industry of India**

India has evolved as one of the primary IT service breadwinners in the World since it has a skilled and intellectual knowledge base. IT Services is the segment that is growing by leaps and bounds. According to the latest report by NASSCOM, 2018, the Information Technology sector is projected to make exports revenues of the order of US\$ 69.3 billion in the year 2017-18 as compared to US\$ 66.0 billion in the year 2016-17.

Quick advancement in technologies along with multi-dimensional projects or flexi-timings and multi-linguistic, multicultural employees stationed all across boundaries, in different time zones (Sharma, 2014). With the amalgamation of these factors, the IT industry is dynamic and unique at the same time. The advent of globalisation and huge development and advancement in Information Technology saw greater career opportunities.

Subsequently, Information Technology's dynamism and its technological advancement have increased the attentiveness of the academic attention of scholars in the recent past. Yet, very few studies have been carried out with respect to employee engagement in the Indian IT industry. Computer-aided disciplines are known to be project-based and normally operate with multi-dimensional tasks catering to customers who have varied demands, hence the demand for such personnel who can contribute emotionally to their job has risen. The IT industry has ever been trying to mitigate the challenge of lack of skilled manpower and the burning problem of retention of employees. (Pereira V & Budhwar P, 2015). The subtle nature of abilities of employees due to steadfast progressing hi-tech expertise, mergers, support and use of talent has become of significant value, and this empirical research attempts to study the effect of demographic variables on employee engagement of the employees across the IT companies of the city of Pune, Maharashtra.

## 2.4 The Current Study

This study explores the relationships of demographic attributes with employee engagement. We broaden the information in this realm by organising research and learning how employee engagement differs with the change in demographic factors, including age, gender, and experience.

## 3. Research Method

### 3.1 Research Setting

The research design is a quantitative research design that was deemed appropriate for this study. This study was conducted at the IT companies in Pune. The selection of samples was made by the judgement of the researcher. A total of 250 questionnaire surveys were administered to the prospective respondents from ten IT companies, out of which 223 usable responses were received, so the response rate was 89 percent. Participant ages ranged from < 30 years to > 50 years of age. There were 91 males and 132 females with less than 5 years of experience to more than 15 years of experience.

### 3.2 Description of the instrument

In this study, the information was collected through self-administered questionnaires distributed personally to the subjects by the researcher. The 12 items encompassing the Gallup Q12 (also known as the “Gallup Workplace Audit”) were used to review employee opinions of engagement. This scale is a four-factor scale consisting of 12 items intending to assess the four representing factors of employee engagement, i.e., Basic Needs, Management Support, Teamwork, and Growth. All items are scored on a seven-point Likert scale ranging from 1 (Strongly Agree) to 7 (Strongly Disagree).

It is important to note that each of the Q12 items relates to four psychological conditions promoting engagement: Basic Needs, Management Support, Teamwork, and Growth. For example, Items 1 and 2 relate to workers’ resources, i.e., possessing resources may be construed as being valued in the workplace, which is supposed to be a factor of Basic Needs. Items 3, 4, 5, and 6 describes the style, procedure, and method that the management uses to complete a certain task which is a part of psychological

Management Support. Item 7,8,9, and 10 refers to relations amongst the team members and managers, which is a component of Teamwork. Items 11 and 12 refer to progress in work or success in the competition of the task, which is a part of growth.

### 3.3 Data Analysis Technique

This is an applied research-based study. For analysis of multiple-choice questions, a computer program called Statistical Package for Social Sciences -SPSS 23 and AMOS was used. At first descriptive statistics (results have been shown in table 1 and 2) was used to study the characteristic of the statistical sample. One-Way Analysis of variance (ANOVA) and T-test is used to analyse how the mean of a variable is affected by different combinations of factors. In the study, the relationship of demographic variable, namely - age designations and gender and each of the factors of engagement, are analysed. The subsequent sections throw light on the relevance of the factors of employee engagement based on the age of the respondents using ANOVA, t-test, Fisher’s Least Significant Difference (LSD) is used to identify the pairs of means that are different.

### 3.4 Reliability

Cronbach’s alpha ( $\alpha$ ) values were applied to test the reliability of all the four factors of Employee Engagement so as to achieve a reliable result of “internal consistency” of the instrument which is measuring the variable. The outcomes of the reliability test show that for all four factors, alpha ( $\alpha$ ) values are more than .7 (Nunnally, 1994), which is a threshold value. This suggests a good “internal consistency” of all the items.

### 3.5 Validity

The validity refers to how well an instrument measures what it is supposed to measure. Content validity is called as logical or curricular validity. The scale used to measure Employee Engagement was adopted from the existing literature. To test the validity of the scale, specialists of the IT industry, academicians and IT employees were given the questionnaire, and every item in the questionnaire was assessed by the panel, and hence the validation of the scale was completed for further study. Confirmatory Factor Analysis was used to examine the construct and

discriminant validity of the measures. This method was used to examine our model. The measurement model encompassing all the 12 items from the questionnaires were put to the test. This statistical procedure tests the validity of the model by analysing the goodness of fit indices against the established GOF-goodness of fit analysis (Hu & Bentler, 1999). A good fit warrants the Root Mean Square Error of Approximation (RMSEA) to score 0.05 or below, and less than 0.08 is also treated as an acceptable value.

The Tucker-Lewis Index (TLI) and the Comparative Fit Index (CFI) should exceed 0.95 for a good model fit. The four-factor model fits well with the 12 items which are loaded on their latent factors with factor loadings greater than 0.40. The model was found to be a good fit. CMIN/Df = 1.096; RMSEA = 0.021 CFI = 0.998 ; TLI = 0.997). Therefore, the outcomes reinforce the validity of the factor structure measure by the Q12 scale.

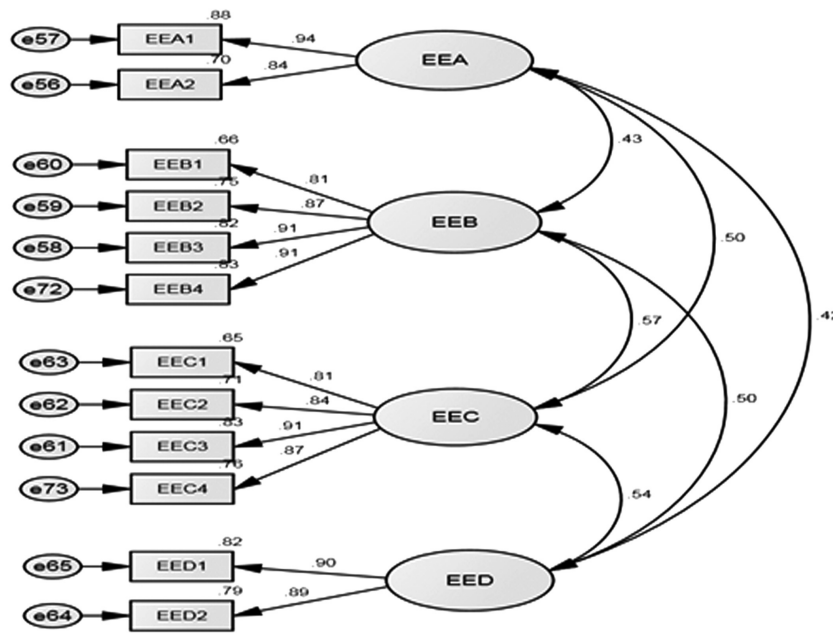


Figure 2: CFA of Employee Engagement

Table 1: Goodness-of-fit statistics

S. No	Fit Statistic	Value
1	CMIN/df	1.096
2	RMR	0.034
3	GFI	0.962
4	RMSEA	0.021
5	TLI	0.997

## 4. Results And Discussions

The data collected from 223 respondents working in various IT companies in Pune was analysed, and the findings are as under:

### 4.1. Demographic Characteristics of The Respondents

The range of respondents age was < 30 years to > 50 years. There were 91 males and 132 females with less than 5 years of experience to more than 15 years of experience. The age of the respondents has been divided into four groups, namely, < 30 years, 31-40 years, 41-50 years, > 50 years.

### 4.2 Testing of Hypothesis

#### 4.2.1 Gender

In table two, a T-test was performed to evaluate the four dimensions of work engagement among Females and Males. In the dimension of teamwork, males scored ( $M=4.11$ ,  $SD=1.29$ ) and females scored ( $M=3.96$ ,  $SD=.910$ ), with no significant difference ( $t= 0.001$ ,  $p= .343$ ) between the two. The males scored more in the Growth dimension and

Management Support dimension. Female employees gain more scores than males on the dimension of Basic Needs. The studies show that women are less engaged in the growth dimension. According to the NASSCOM-Mencher report (2009), the senior management women represent only five percent, the rationales ascribed to the above statement are: (1) 'stereotyped female professionals', (2) 'personal sense of mid-career guilt', and (3) 'glass ceiling effect'.

Female employees are thus clustered at the lower level of the career climbing ladder; hence it leads to a certain feminisation of jobs. The percentage of female workers reaching the top level is exceptionally low (Kelkar et al. 2002; Upadhyay, 2006). Shanker (2008) reiterated the similar outcomes in Bangalore that female employees' show less level of engagement at the senior level but are highly engaged at the entry-level, as most of the times, they fail to upgrade their technical proficiencies; they refrain from job-hopping and remain loyal to one company for a pretty long time (Shanker, 2008). Their family responsibilities forbid them to put up late hours in their work to establish networking (Upadhyay, 2006). Their

choice of career is governed by distance from home, family obligations, the security of the work and other social reasons that make the women less engaged when they climb up the ladder.

Our findings reveal that overall, the males have higher employee engagement as compared to females. This finding was in line with the study of Kong (2009). At the same time, female employees showed higher scores on the dimensions of the basic needs of employee engagement than their male counterparts. However, Madan and Srivastava (2015) reported that demographic variables such as age, gender and marital status do not have a significant impact on employee engagement. However, we conclude that there is a significant difference between male and female respondents with respect to the drivers of employee engagement in IT companies in Pune. Therefore, we reject the null hypothesis(H03). The only factor which was insignificant between the gender of the respondents was Teamwork.

**Table 2: Comparisons of dimensions of Employee Engagement between Females and Males (T-Test)**

EE Dimensions		N	Mean	SD	t value	p value	Remarks
Growth-EED	Male	91	4.0565	1.09141	0.683	0.03*	Significant
	Female	132	3.7498	.98713			
Teamwork-EEC	Male	91	4.1179	1.29569	0.001	0.343*	NS
	Female	132	3.9684	.91012			
Management Support-EEB	Male	91	3.7114	1.16716	0.183	0.049*	Significant
	Female	132	3.4243	.98551			
Basic needs-EEA	Male	91	3.6811	1.14455	0.000	0.078**	Significant
	Female	132	3.9281	.80739			
* significant at 5 percent ** significant at 10 percent							

#### 4.2.2 Experience

In table three, Fisher's LSD post hoc test was applied to compare the four factors of work engagement among three groups, namely D1, D2 and D3, it comprised of employees who have less than 5 years experience, 5-15 years experience and employees who have more than 15 years of experience respectively. There was a significant difference which was found in employee engagement, Growth, Teamwork, Management Support and Basic Needs between D1/D2, D1/D3, and D2/D3. Employees of the D2 group showed higher employee engagement and Teamwork (M= 4.59, SD= .888) than employees of group D1 (M=

3.6, SD= .85881, F= 66.699). Workers comprising of group D3 exhibited elevated employee engagement and Teamwork (M= 6.2940, SD= .601) as compared to those who were in group D1 (M= 3.61, SD= .85881, F= 66.699). Employees who were a part of the D3 group showed higher employee engagement and Teamwork (M= 6.290, SD= .601) than employees in the D2 group (M= 3.61, SD= .85881; F= 66.699).

Hence, workers with different tenure in the organisation differ substantially in the study as regards their engagement levels. Employees having more experience will be more

engaged than employees having fewer years of employee experience in the organisation. Similarly, Sibiya et al. (2014) too opined that years of service were positively related to employee engagement, implying that longer-tenured employees were more engaged. Having said that, more experienced workers go the extra mile, exercise more discretionary effort, and are likely to keep customers satisfied and generate more revenue for the Organisations. This may be because, with the increase in the length of service, the match between individuals' values and the organisational values gradually increases as individuals get edified (Yang, 2010). Besides, while their work experience gradually accumulates, and they have better work proficiency, they gradually enjoy higher positions and salaries. Thus, the sense of achievement and recognition coming from work gradually increases, which is reflected as increased job engagement and a sense of responsibility (Xudong et al., 2016).

In the survey done by Business World (2008), it was indicated that senior professionals with respect to

experience are highly engaged. Sharma et al. (2017) identified a statistically significant difference in the work engagement level of employees based on different years of experience. Employees who have more experience and have spent more time in the organisation are not mere employees in the organisation; they are the institution in themselves. They have remained with a company through all the challenges and been a witness to the strategies, policies, changes in personnel, mergers and acquisitions and redefining of competitive landscapes. The research conducted by Chaudhary and Rangnekar (2017) was in the same continuation with our findings where junior, middle, and senior employees with respect to work experience show different levels of engagement (Mathieu & Zajac, 1990).

Based on our above findings, we reject the null hypothesis ( $H_0$ ) that there is no significant difference in engagement levels of employees with different years of experience. Instead, there is a significant difference in the engagement levels of employees with different years of experience.

**Table 3: Comparisons of Dimensions of Work Engagement among Three Experience Groups**

(D1= less than 5 years; D2= 5-15 years; D3= more than 15 years)										
	D1 (N=146)		D2(N=67)		D3(N=10)		D1/ D2	D1/ D3	D2/ D3	f value
EE Dimensions	Mean	SD	Mean	SD	Mean	Sd				
Growth-EED	3.5446	.95975	4.3186	.76151	5.7265	.72086	*	*	*	39.515
Teamwork-EEC	3.6126	.85881	4.5998	.88895	6.2940	.60196	*	*	*	66.699
Management Support-EEB	3.2114	.91336	3.8996	.86270	5.9600	.36503	*	*	*	53.298
Basic needs - EEA	3.5280	.92634	4.2209	.64648	5.5590	.35468	*	*	*	38.387
* significant at 5percent										

#### 4.2.3 Age

In table four, Fisher's LSD post hoc test was performed to compare the four factors of employee engagement among four age groups. A1, A2 and A3, A4 comprised of age less

than 30, 31-40 years and 41-50 years and above 50 years, respectively. Significant difference was found in employee engagement and Growth, Teamwork, Management Support and Basic Needs between A1/A2, A1/A3 and A2/A4.

Employees who were in group A2 showed higher employee engagement and Teamwork ( $M= 4.36$ ,  $SD= 1.00$ ,  $F=8.065$ ) as compared to those who were present in group A1 ( $M= 3.41$ ,  $SD= 1.10$ ;  $F= 8.065$ ). Employees who were in group A3 showed higher employee engagement and Teamwork ( $M= 3.922$ ,  $SD= 1.025$ ) than employees in group A1 ( $M= 3.41$ ,  $SD= 1.10$ ;  $F= 8.065$ ). Employees who were in group A2 showed higher employee engagement and Teamwork ( $M= 4.36$ ,  $SD= 1.00$ ) than employees who were a part of group A4 ( $M= 3.995$ ,  $SD= 1.0588$ ,  $F= 8.065$ ).

Thus, we can say that the respondents who were in the 31-40 years bracket showed the highest level of employee engagement. This group of respondents are the ones who are looking at this particular work or job with their whole career in front of them. They show more engagement towards their work because they have their future professional life at stake more than the employees who are older in age as compared to them. These employees are possibly a little more stable, experienced and matured in comparison to employees who are less in age and who are inexperienced. This group between 31-40 years may be less demanding or have limited wants and desires and are less materialistic about the trivial needs that can detract them or irritate them about the working culture of the organisation. Hence these employees exhibit high levels of engagement at this juncture as they are more focused on their careers and their professional life.

Employees who are old or aged show low levels of accommodation with the circumstances and situations, are less ebullient, slow in their work, take extra sick days, etc., and hence appears to be having low levels of engagement. The real issue of older workers is absenteeism. It is known to be an ageing workforce tendency. There can be many reasons for their absence from work; either it is their health, or they are disengaged, that is, they are not motivated enough to work. The reason can be any, that does not matter; what matters is that the company has to incur that cost. Older employees seem to be less engaged.

As per the findings, employees under the age of 30 were least engaged when compared to other employees.

According to “The Qualtrics 2020 Employee Experience Trends” report, the employees under the age of 30 were found to be most at risk of attrition, with many of them looking to switch jobs within twelve months and the rest of them look for jobs within two years.

The teamwork dimension scored the highest amongst all the other factors of Employee Engagement, indicating that Worker engagement increases markedly when employees are able to work together in teams and show a team spirit. Employee engagement is enhanced tremendously when workers work in effective collaborations and together. The mantra for Google’s success and its efficient and effective team performance is attributed to the combined independence to take risky decisions, which paves the way for creativity and innovation. Hence when workers think they can voice their ideas, they have this feeling of sharing; those employees are engaged emotionally and connected to the work.

A global study of engagement was carried out by ADP Research Institute (2020), and the outcomes stated that when employees feel that they belong to a team, it elevates their engagement towards the work. A similar trend was found in a study by McKinsey (2020), where it was found out that employees working in teams exhibit a great amount of engagement because the team leaders develop trust in the employees. Trusting one’s team members and regarding him to be as helpful is viewed as a significant job- resource that helps in the achievement of personal as well as organisational goals associating substantially with employee engagement (Schaufeli & Bakker, 2004). May et al. (2004) were of the opinion that amicable and cordial relations with one’s team members could establish emotional safety in the organisation, leading to better job performance, thus being more engaged. On the contrary, employees who do not have good relations with other employees gives rise to mistrust resulting in disconnection in the workplace, contributing to disengaged employees. Ducharme and Martin’s (2000) results advocate those employees who have sound interpersonal relations exhibit heightened job satisfaction that will yield more employee engagement (Harrison et al., 2006).

**Table 4: Comparisons of dimensions of Work Engagement among four age group**

A1= <30 years, A2 = 31-40 years, A3 = 41-50 years A4 = above 50 years															
	A1 (N=42), <30 years		A2 (N=87),31-40 years		A3 (N=65),41-50 years		A4 (N=29),> 50years		A1/A2	A1/A3	A1/A4	A3/A2	A2/A4	A3/A4	f VALUE
EE Dimensions	Mean	SD	Mean	SD	Mean	Sd	Mean	SD							
Growth-EED	3.3710	1.21253	4.0931	.86593	3.8957	1.04447	3.9040	1.04328	*	*	*	*	*		4.820
Teamwork-EEC	3.4131	1.10437	4.3662	1.00057	3.9922	1.02596	3.9951	1.05881	*	*	*	*	*		8.065
Management Support-EEB	2.9314	1.08972	3.9010	.96245	3.4686	.98592	3.5097	1.14121	*	*	*	*	*		8.762
Basic needs -EEA	3.3261	1.16327	4.1043	.78839	3.8517	.92187	3.6670	.94956	*	*			*		6.972
* The mean difference is significant at the 5 percent level.															

## 5. Discussion and Conclusion

The study was conducted on Indian IT employees. We found that there is a difference in the employee engagement among IT workers of different genders, which is consistent with the results of some earlier studies (Li, 2011; Zhu et al., 2015). Our findings reveal that the employee engagement of women in this study is generally lower than that of men (Schaufeli, Martínez, Marques Pinto, Salanova, & Bakker, 2002; Zhou, 2013; Pang, 2014).

Domestic responsibilities may make women less likely to pursue an avenue for upward mobility (Britton, 2003; Rothbard, 2001). This implies that men in general (relative to women) have better status and influences in their positions, and thereafter are more likely to experience psychological meaningfulness and employee engagement. Of course, we have examples of career successes and upward mobility of several women moving into higher ranks of organisations. This may suggest that at least some organisations may have paid attention to improving the work engagement of female employees. It also suggests that successful women may also have invested an extra amount of hard work and resources in overcoming gender-discriminatory structures and cultures.

Employees in the age group of 31-40 years and employees who have more years of experience have a significant part to play in keeping the employees engaged by building trust in them, putting forth the goals and values of the company

and communicating what is expected of the employees by the management. They are an especially important and critical resource for the organisation, and that is why they can be termed as the ‘central nervous system’ of the organisation as they are highly engaged employees. Highly engaged employees bring spirit and energy to the workplace. Their motivation and drive to succeed don’t take long to spread to others. Such employees motivate others to achieve their tasks. Such employees are a lot more active to take up tasks and participate in activities. They facilitate in executing and implementing the plans and changes formed by the management in day-to-day activities because they naturally become company advocates. They feel a sense of pride to be a part of the organisation. These employees play a key role in setting a clear vision for what can be achieved through the implementation of senior management decisions (Parker & Williams, 2001).

All highly engaged employees put in the extra effort in terms of time, energy and passion in their work. The clients are satisfied with them, and they contribute more towards the organisational level outcomes of growth and productivity (Bulińska-Stangrecka & Iddagoda, 2020).

### 5.1 Implications

Engagement is a psychological state. Researchers call engagement “an amalgamation of commitment, loyalty, productivity and ownership” (Wellins & Concelman, 2005). It is much more than making employees feel happiness and paying them a hefty paycheck.

The current research will add to researchers endeavours in comprehending the relationship between employee engagement and demographic factors in the Information Technology sector. This research provides new findings to the management of the organisations by leading a discussion as it shows how employee engagement varies with diverse demographic attributes.

Male employees in the organisations were found to be more engaged in their jobs as compared to their female counterparts in the dimensions of Growth and Management Support. It was found that females are more engaged at the entry-level than their male counterparts. When they first enter the organisation, they are of the belief about the equal opportunities to achieve their potential as men, and subsequently, this enthusiasm and passion diminishes over time because what females observe and experience has an adverse effect on their belief system about the gender disparity. This was the most significant finding of this research.

It was also found that employees' having high experience were more engaged than employees' having less experience. Another outcome of this research was that the results pointed towards employees between the range of 31-40 years as the most engaged amongst all the employees. However, the Teamwork dimension of Employee Engagement was found to be of insignificant value in male and female employees of the IT workforce.

The findings of this study will help management and HR professionals to design strategies so that employee engagement can be enhanced to a great extent. Consequently, the employers need to understand that having an engaged workforce in the organisations will lead to enhanced productivity, happy, satisfied employees and fewer turnover intentions.

The organisations also need to develop strategies to engage the female workforce during the whole life cycle of their career. Due to family, travelling concerns, and in an effort to strike a balance in work and family life, the women employees are forced to remain in the organisation, at times which may not be conducive for them to stay, due to which

they become disengaged. This could lead to untoward consequences both for the employees and employer. So, engaging the women workforce by analysing the female-oriented issues should be a primary concern for the organisations. Organisations ought to give equal prospects to the female folk because a feeling of getting ignored or neglected conveys a malevolent shade on employee engagement levels. An engagement programme exclusively for women employees will build a better organisational culture where there is no scope for gender discrimination or biases against women.

Difference due to age can prove to be detrimental for employee interpersonal relationships, which can turn out to be a challenge for the engagement of employees in their employment. Hence the companies should involve staff members of diverse attitude, skills and age in team outings, outdoor activities and also execute programs like 'reverse mentoring.' Such activities will foster comradeship among the employees, and in general, the silo mentality can be broken.

The study also value adds to the sparse literature on employee engagement especially related to Information Technology that is undergoing huge turmoil and vagaries of business in the form of retentions, hiring skilled manpower, acquisitions, mergers, leaning the manpower and suffering from business closures.

### ***5.2 Limitations of the Study***

This paper has its own limitations. The study is based on a cross-sectional design, which is one limitation. Secondly, the sample size is less, due to which the outcomes are limited in generalisability.

### ***5.3 Directions for future Research***

The present results add to our knowledge in comprehending that employee engagement varies with demographic features, and it acquires a larger sample from many more Information Technology Companies. In future, more studies can be carried out while considering the seniority level/ hierarchy level of employees in the organisation to investigate their employee engagement level. It would also be interesting to know employee engagement differences across generations.



## References

- Adya, M. (2008). "Women at work: differences in IT career experiences and perceptions between south Asian and American women". *Human Resource Management*, 47(3), 601e635
- Agarwal, U.A., Datta, S., Blake Beard, S. and Bhargava, S. (2012). Linking LMX, innovative work behavior and turnover intentions: the mediating role of work engagement. *Career Development International*, 17, pp. 208– 230
- Amabile, Teresa M. and Kramer, Steven J., 2011. *The Progress Principle: Using Small Wins to Ignite Joy, Engagement and Creativity at Work*, Harvard Business School Publishing Corporation, Boston, USA
- Albrecht, S. L., & Andreetta, M. (2011). The influence of empowering leadership, empowerment and engagement on affective commitment and turnover intentions in community health service workers. *Leadership in Health Services*, 24(3), 228–237.
- Bakker, A. and Schaufeli, W., (2008). Positive organisational behavior: engaged employees in flourishing organizations, *Journal of Organizational Behavior*, Vol. 29, Issue 2, pp. 47 – 154.
- Bailey, Catherine & Madden, Adrian & Alfes, Kerstin & Fletcher, Luke. (2015). The Meaning, Antecedents and Outcomes of Employee Engagement: A Narrative Synthesis. *International Journal of Management Reviews*. 1-23.
- Balain, S., & Sparrow, P. (2009). Engaged to perform: A new perspective on employee engagement: Executive Summary. Lancaster University Management School.
- Bowen, D. E. (2016). The changing role of employees in service theory and practice: An interdisciplinary view. *Human Resource Management Review*, 26, 4–13.
- Barrick, M. R., Thurgood, G. R., Smith, T. A., & Courtright, S. H. (2014). Collective organisational engagement: Linking motivational antecedents, strategic implementation, and firm performance. *Academy of Management Journal*, 58, 111–135.
- Baumruk, R. (2004). 'The missing link: the role of employee engagement in business success. *Workspan*, Vol 47, pp 48-52.
- Bulińska-Stangrecka, H., Iddagoda Y. A. (2020). The relationship between inter-organisational trust and employee engagement and performance, *Academy of Management*, 4(1), 8-25
- Business World (2008, May).HR special survey: Engage the employee. *Business World*, 32–35.
- Brough P, MP O'Driscoll and TJ Kalliath (2005) The ability of 'family friendly' organisational resources to predict work-family conflict and job and family satisfaction. *Stress and Health* 21, 223–234.
- Carol Gilligan (1983) *In A Different Voice: Psychological Theory and Women's Development*.Cambridge MA, Harvard University Press,1982
- Chaudhary, R., & Rangnekar, S. (2017). Socio-demographic Factors, Contextual Factors, and Work Engagement: Evidence from India. *Emerging Economy Studies*, 3(1), 1–18.
- CIPD (2013) Employee Engagement, [Online]. Available from <http://www.cipd.co.uk/>>
- Clark, A.W. and T. V. Sekher, 2007 Can Career-Minded Young Women Reverse Gender Discrimination? A View from Bangalore" s High-Tech (5) Sector", *Gender, Technology and Development*, 11 (3), 2007, 285-319
- C. F. Camerer and U. Malmendier,(2007) Behavioral Economics of Organizations, Behavioral Economics and Its Applications, Chapter 7, Princeton University Press, New Jersey
- De Cieri H, B Holmes, J Abbott and T Pettit (2005) Achievements and challenges for work/life balance strategies in Australian organisations. *International Journal of Human Resource Management* 6(1), 90–103.
- Douglas, S., & Roberts, R. (2020). Employee age and the impact on work engagement. *Strategic HR Review*, ahead-of-print(ahead-of-print). doi:10.1108/shr-05-2020-0049

- Eagly, A. H. (1987). *John M. MacEachran memorial lecture series; 1985. Sex differences in social behavior: A social-role interpretation*. Lawrence Erlbaum Associates, Inc.
- Ehambaranathan, E., Samie, A. and Murugasu, S. (2014), "The recent challenges of globalisation and the role of employee engagement – the case of Vietnam", *International Journal of Human Resource Studies*, Vol. 5 No. 1, pp. 69-85
- Farrell, S. K., & Finkelstein, L. M. (2007). Organisational citizenship behavior and gender: Expectations and attributions for performance. *North American Journal of Psychology*, 9(1), 81–95.
- Forsyth, Donelson (2010). *Group Dynamics* (5th ed.). USA: Wadsworth. ISBN 978-0-495-59952-4
- Gallup (2006), Gallup study: engaged employees inspire company innovation: national survey finds that passionate workers are most likely to drive organisations forward, *The Gallup Management Journal*, [http://gmj.gallup.com/content/24880/Gallup Study Engaged Employees Inspire Company.aspxpfleeger](http://gmj.gallup.com/content/24880/Gallup+Study+Engaged+Employees+Inspire+Company.aspxpfleeger)
- Gallup (2013). State of the Global Workplace: Employee Engagement Insights and Advice for Global Business Leaders. Retrieved from: <https://www.gallup.com/services/178517/state-global-workplace.aspx>
- George, E., & Ben, N. (2017). Influence of age and gender on employee engagement. *Asian Journal of Research in Business Economics and Management*, 7(9), 97-105.
- Gupta, M. (2015). A study on employee's perception towards employee engagement. *Global Management Journal*, 9(1/2), 45–51.
- Harter, J.K., Schmidt, F.L., and Hayes, T.L. (2002), 'Business-Unit-Level Relationship Between Employee Satisfaction, Employee Engagement, and Business Outcomes: A Meta-Analysis,' *Journal of Applied Psychology*, 87, 268–279
- <https://economictimes.indiatimes.com/news/economy/indicators/india-to-overtake-japan-to-become-3rd-largest-economy-in-2025/articleshow/70193869.cms?from=mdr>
- HR Focus (2006), Critical issues in HR drive 2006 priorities: number 1 is talent management *HR Focus*, 83(8), 8–9
- Jaupi, F., & Llaci, S. (2015). The impact of communication satisfaction and demographic variables on employee engagement. *Journal of Service Science and Management*, 8(02), 191–200. doi:10.4236/jssm.2015.82021
- John, A., & Jagathy Raj, V. P. (2020). Employer brand and innovative work behaviour: Exploring the mediating role of employee engagement. *Colombo Business Journal*. 11(2), 93-113
- Kahn WA (1990), 'Psychological conditions of personal engagement and disengagement at work', *Academy of Management Journal*, 33(4), 692–724
- Kelkar, G., & Nathan, D. (2002). Gender Relations and Technological Change in Asia. *Current Sociology*, 50(3), 427–441
- Kim N., Kang S.-W. (2017). Older and more engaged: the mediating role of age-linked resources on work engagement. *Human Resource Management*. 56 731–746. 10.1002/hrm.21802]
- Kong, Y. (2009). A study on the job engagement of company employees. *International Journal of Psychological Studies*, 1(2), 65–68
- Kular, S., Gatenby M., Rees, C., Soane, E. and Truss, K (2008). *Employee Engagement: A Literature Review*. Kingston University.
- Kuok, A.C.H. & Taormina, R.J. (2017). Work engagement: evolution of the concept and a new inventory. *Publishing Psychology*, 10(2), 262-287.
- Leary Joyce J (2004), *Becoming an employer of choice: make your organisation a place where people want to do great work*, The Chartered Institute of Personnel and Development
- Laschinger, H.K.S., Leiter, M.P., 2006. The impact of nursing work environments on patient safety outcomes: the mediating role of burnout/engagement. *The Journal of Nursing Administration* 36 (5), 259–267.

- Madan, P. and Srivastava, S. (2016) 'Investigating the role of mentoring in managerial effectiveness-employee engagement relationship: an empirical study of Indian private sector bank managers', *European J. Cross-Cultural Competence and Management*, Vol. 4, No. 2, pp.146–167.
- Mahboubi, M., Ghahramani, F., Mohammadi, M., Amani, N., Mousavi, S. H., Moradi, F., Kazemi, M. (2015). *Evaluation of work engagement and its determinants in Kermanshah hospitals staff in 2013. Global Journal of Health Science*, 7(2), 170. PMID:25716395
- Maitland A (2001) A long-term solution to the IT skills shortage. *Financial Times* (22 February)
- Marcus, A., and Gopinath, N. M. (2017). Impact of the demographic variables on the employee engagement-an analysis. *Ictact Journal on Management Studies*, 3(2), 502-510. <https://doi.org/10.21917/ijms.2017.0068>
- Mathieu, J. E., & Zajac, D. M. (1990). A review and meta-analysis of the antecedents, correlates, and consequences of organisational commitment. *Psychological Bulletin*, 108(2), 171–194
- Mauno, S., Kinnunen, U., Makikangas, A., & Natti, J. (2005). Psychological consequences of fixed term employment and perceived job insecurity among health care staff. *European Journal of Work and Organizational Psychology*, 14(3), 209–237.
- Memon, M. A., Salleh, R., & Baharom, M. N. R. (2016). The link between training satisfaction, work engagement and turnover intention. *European Journal of Training and Development*, 40(6), 407–429. <https://doi.org/10.1108/EJTD-10-2015-0077>
- Myers K (1990) Cracking the glass ceiling: despite some high-profile gains, women executives in IS remain a rare phenomenon. *Information Week* 38, 284
- Pang, X. Y. (2014). Analysis of the engagement of medical personnel in five tertiary general hospitals in Tianjin City. *Chinese Journal of Hospital Administration*, (6), 455–456.
- Parker, S. & Williams, H. (2001). *Effective Teamworking: Reducing the Psychosocial Risks*, Norwich: HSE Books.
- Paul, A.K. and Anantharaman, R.N. (2004), "Influence of HRM practices on organisational commitment: a study among software professionals in India", *Human Resource Development Quarterly*, Vol. 15 No. 1, pp. 77-88
- Pereira V., and Budhwar P., HRM and firm performance: the case of Indian IT/BPO industry, Newyork: Routledge; 2015
- Pfleeger SL and Mertz N (1995) Executive mentoring: what makes it work? *Communications of the ACM* 38, 63–73
- Ramamoorthy, N. and P. C. Flood (2004). 'Gender and Employee Attitudes: The Role of Organizational Justice Perceptions', *British Journal of Management*, 15(3), pp. 247–258
- Raghuram, P., C. Herman, E. Ruiz Ben and G. Sondhi (2017), *Women and IT Scorecard - India, A Survey of 55 Firms*, Milton Keynes: The Open University, accessed 4 March 2017
- Reid, M. F., Allen, M. W., Armstrong, D. J., & Riemenschneider, C. K. (2010). Perspectives on challenges facing women in IS: The cognitive gender gap. *European Journal of Information Systems*, 19(5), 526–539
- Richman, A. (2006) 'Everyone wants an engaged workforce how can you create it?' *Workspan*, Vol 49, pp36-39.
- Rothbard, N. P. (2001). Enriching or depleting? The dynamics of engagement in work and family roles. *Administrative Science Quarterly*, 46(4), 655–684.
- Sadique, M. (2014) Employee Engagement in Hospitality Industry in India: An Overview. *Global Journal of Finance and Management*, 6(4), 375-378
- Sarath, P and Manikandan, K. (2014). Work engagement and work related wellbeing of school teachers. *SELP Journal of Social Science*, 5(22), 93-100
- Saks, M. (2006), "Antecedents and consequences of employee engagement", *Journal of Managerial Psychology*, Vol. 21 No. 7, pp. 600-619
- Schaufeli, W. B., Salanova, M., Gonzalez-Roma, V., & Bakker, A. B. (2002). The measurement of engagement and burnout and: A confirmative analytic approach. *Journal of Happiness Studies*, 3 (1), 71-92.

- Schaufeli, W.B., and Bakker, A.B. (2004), 'Job Demands, Job Resources, and Their Relationship with Burnout and Engagement: A Multi-Sample Study,' *Journal of Organizational Behavior*, 25, 293–315.
- State of the Global Workplace - Gallup Report (2017) GALLUP PRESS, New York
- Sibiya, M., Buitendach, J. H., Kanengoni, H., & Bobat, S. (2014). The prediction of turnover intention by means of employee engagement and demographic variables in a telecommunications organisation. *Journal of Psychology in Africa*, 24(2), 131–143. doi:10.1080/14330237.2014.903078
- Sleeth, R.G. and Humphreys, L.W., "Differences in Leadership Styles among Future Managers: A Comparison of Male and Female Managers" (unpublished).
- Soane, E., Truss, C., Alfes, K., Shantz, A., Rees, C. and Gatenby, M. (2012). Development and application of a new measure of employee engagement: the ISA Engagement Scale. *Human Resource Development International*, 15, pp. 529– 547
- Sushma Singhal (1995) *Development Of Education, Occupation, And Employment Of Women In India*. Mittal Publications, 1995
- Shuttleworth T (1992) Women and computer technology. Have the promises of equal opportunities been fulfilled? *Women in Management Review* 7, 24–30
- Sharma D.C(2014)., "Indian IT outsourcing industry: Future threats and challenges," *Futures*, vol. 56, pp. 73–80,
- Sharma, A., Goel, A., & Sengupta, S. (2017). How does Work Engagement vary with Employee Demography? *Procedia Computer Science*, 122, 146–153. doi:10.1016/j.procs.2017.11.353
- Shanker, Deepika, "Gender Relations in IT Companies: An Indian Experience," *Gender, Technology and Development*, 12 (2), 2008, 185- 207
- Shukla S, Adhikari B, Singh, V. Employee engagement-role of demographic variables and personality factors. *Amity Glob. HRM Rev.* 2015, 5, 65–73.
- Soldati P (2007), 'Employee engagement: what exactly is it?' [www.managementissues.com/2007/3/8/opinion/employee engagement what exactly is it.asp](http://www.managementissues.com/2007/3/8/opinion/employee%20engagement%20what%20exactly%20is%20it.asp)
- Trauth, E. M., Cain, C. C., Joshi, K. D., Kvasny, L., & Booth, K. M. (2012). Embracing Intersectionality in Gender and IT Career Choice Research. In Proceedings of the 50th annual conference on Computers and People Research - SIGMIS-CPR '12 (pp. 199–212)
- Vijay Anand, V., Vijaya Banu, C., Badrinath, V., Veena, R., Sowmiyaa, K., & Muthulakshmi, S. (2016). A Study on Employee Engagement among the Bank Employees of Rural Area. *Indian Journal of Science and Technology*, 9(27). doi:10.17485/ijst/2016/v9i27/97598
- Wellins, R., & Concelman, J. (2005), "Creating a culture for engagement", Workforce Performance Solutions ([www.WPSmag.com](http://www.WPSmag.com))
- Wolfe, H. (2004), 'Royal Bank of Scotland Case Study', Appendix four, In Robinson, D., Perryman, S. and Hayday, S. 'The drivers of employee engagement.' *Institute of Employment Studies*. Report 405.
- Zhou, *Employee engagement in private hospitals*, Master Thesis, Shandong Normal University (2013).

\*\*\*\*\*

---

# Goal Setting: Its Impact on Employee Outcome

**Krishnasree Gogoi**

Research Scholar

Department of Business Administration

Tezpur University, Assam

Email: krishnasree.02gogoi@gmail.com

**Dr. Papori Baruah**

Professor and Dean

Department of Business Administration

Tezpur University, Assam

Email: papori@tezu.ernet.in

## A b s t r a c t

The research investigated the individual perception of goal setting and its relationship with employee outcome. Using the 10-factor model of Goal Setting, 640 executives of Central Public Sector Enterprises (CPSEs) judged the quality of the goal-setting program in their respective organisations. The study also tried to establish the relationship between goal-setting factors and employee outcome. The results provided empirical evidence of a moderate implementation of the goal-setting program in the CPSEs. The correlation analysis further established the relationship between goal setting and employee outcome. The present study helped to figure out a more comprehensive picture of the influence of a goal-setting program on employee outcome, thereby providing important insights into the individual differences regarding the implementation of a goal-setting program.

**Key Words:** Goals, 10-factor model, Public Sector, Job performance, Job Satisfaction, Employee Engagement, Motivation

## 1. Introduction

Present-day organisations aim at maximising employee performance and achieving the highest level of quality output. In order to achieve these, the organisations need to translate their organisational objectives into individual and group level objectives. Performance Management System serves as a critical tool for achieving these objectives. The organisation that prioritises effective goal setting will succeed in its performance management, in developing its employees' skills and confidence, and in its business in general. One of the key components of performance planning is the setting of individual goals and objectives. It primarily refers to the process of setting the work-related activities in the form of job objectives that are integrated with the department or unit goals which are further tied to corporate goals and strategies. The goal-setting process needs to be properly planned and administered in order to achieve a desired level of performance. This study aims at investigating the perceptions of executives regarding the goal-setting process and analysing the possible relationship between goal setting with employee outcome.

## 2. Literature review

The modern understanding of goal setting and motivation was pioneered by Locke in 1968, where he highlighted that employees work more productively when guided by clear and achievable goals, given the appropriate feedback (Locke, E.A., 1968, 1982). His findings were validated by Latham and Baldes (1975) by stating that the performance increases immediately after assigning specific and hard goals. Kim and Hamner (1976) further found that goal setting without formal feedback can enhance performance, but when supervisory feedback and praise was added to a formal goal-setting program, performance was enhanced even more. Latham, Mithchell and Dossett (1978) found that employee participation in goal-setting led to higher goals being set than in a case when the supervisor assigns goals to the employee. In 1984, a 53-item questionnaire was developed by Locke and Latham that attempted to measure the core goal attributes of "specificity and difficulty" in addition to other attributes of the goal-setting process such as perceptions regarding participation in goal setting, supervisor support, conflict and stress. In 1990, however, a more comprehensive Goal Setting theory of motivation was presented by Edwin A. Locke and Gary P.

Latham on the basis of nearly 400 empirical studies conducted nearly over a 25-year period. These studies were conducted in Asia, Australia, Europe and North America, at individual, group and organisation levels, in both laboratory and field settings involving more than 40000 subjects, 88 different tasks, in different time spans and taking different performance criteria. The two core findings of these studies were; first, there is a linear relationship between goal difficulty and performance. Second, specific and difficult goals lead to higher performance than vague or abstract goals. (Locke & Latham, 1990, 2002, 2013). Over the years, the studies relating to goal setting was expanded across many domains. Lee et al. (1991) carried out a principal component analysis of the goal-setting questionnaire developed by Locke and Latham (1984) and extracted 10 meaningful factors consisting of both positive and negative factors. The positive factors were found to be positively associated with job performance and job satisfaction, whereas negative factors were found to be negatively associated for the same. Orpen (1995) found that the impact of goal setting was stronger among poor performers than among good performers and that this relationship was moderated by superior relations with the employees. Medlin and Green Jr (2009) investigated the relationships between goal setting, employee engagement, workplace optimism and individual performance and found that goal setting leads to engaged employees, which in turn leads to higher levels of workplace optimism that improves the individual performance of employees. Mahbod (2007) in their study, provided an integrated approach that prioritised organisational key performance indicators (KPIs) in terms of the criteria of SMART (Specific, Measurable, Attainable, Realistic, Time-sensitive) goals. Bipp and Kleingeld (2011) found that employee perception of a goal-setting system is related to both job satisfaction and goal commitment. Devrajan et al. (2018) studied the role of goal setting in the creation of work meaningfulness and found a positive association between goal rationale and work meaningfulness. Hoek et al. (2018) studied the extent and utility of goal setting at the team level within the public sector and its effect on their performance. From the individual and group level, the research on goal setting has been further extended to a more macro-level where the organisation as a whole is being studied. Goal-setting was proven in the literature to have increased the performance

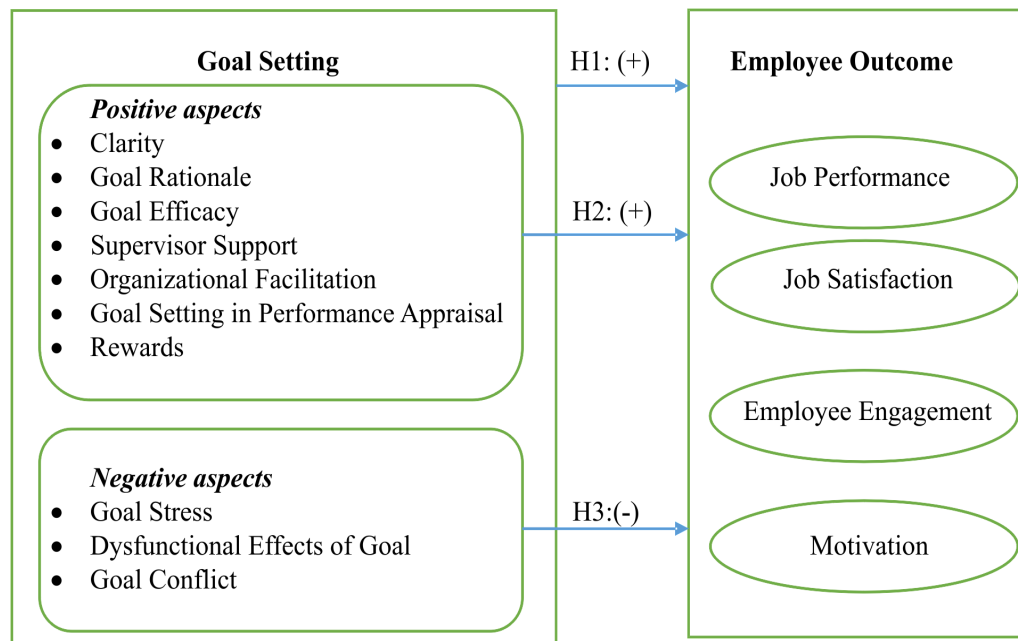
among individuals, teams, and the organisation in Germany (Asmus, Karl, Mohnen & Reinhart, 2015; Bipp & Kleingeld, 2011), Spain (Morelli & Braganza, 2012), Taiwan (Chiu, Chen, Lu, & Lee, 2006), Sweden (Thorgren & Wincent, 2013) and India (Bhattacharya & Neogi, 2006; Mishra & Srivastava, 2008).

### 3. Conceptual Framework

Goal Setting is an open theory, and there is no limit to the discoveries that can be made between the goal-setting theory and other theories (Locke & Lantham, 2006). Longitudinal studies are needed to gain insight into the perceptions of a goal-setting program and its effect on performance-related variables (Bipp & Kleingeld, 2011).

According to Lantham et al. (2008), goal setting has a role to play in public sector management, and it being combined with self-management techniques can prove equally important in the Public Sector. The past literature found limited studies considering all the relevant variables of the goal-setting scale developed by Locke and Latham in 1984 (Lee et al., 1991; Bipp & Kleingeld, 2011). However, most of these studies did not consider the overall employee outcome as one of its variables. Therefore, the present study mainly focuses on the relationship of the 10-factor model developed by Lee et al. (1991) with Employee Outcome. Therefore, a structural model is being theorised, incorporating Goal Setting as an antecedent to Employee Outcome, which is shown in Fig.1.1.

**Fig. 1.1: Hypothesised structural model.**



Source: From author's study

#### 3.1 Goal Setting variables

*Goal clarity* describes the clarity and specificity of goals and the prioritisation of those goals. *Goal rationale* is concerned with the clarity of performance-goal relationships and the reason behind those goals. *Goal efficacy* relates to the existence of proper action plans, job training and feedback and one's happiness on achieving

the goals. *Supervisor Support* relates to the supervisor's supportiveness and willingness to let subordinates participate in setting goals and strategies. *Use of goal setting in performance appraisal* describes the use of goal setting in the performance appraisal and review process. *Rewards* represent the probability that goal achievement will lead to security, pay raise and opportunity for promotions etc. *Organisational facilitation* for goal achievement relates to teamwork, company resources and

policies that facilitate goal achievement. *Goal stress* relates to the difficulty and stressfulness of goals and employee's failure to attain them. *Dysfunctional effects of goal* deals with punitive measures such as a non-supportive supervisor or top management, using goals as a mode of punishment rather than to facilitate performance. And *Goal Conflict* describes different types of goal induced conflicts such as inter-role conflicts, too many goals and personal value related conflicts (Lee et al., 1991).

### 3.2 Employee Outcome variables

Job performance refers to "employee behaviours that are consistent with the expectations and that contribute to organisational effectiveness (Judge & Meuller, 2012). Harter et al. (2002) defines the term employee engagement as "an individual's involvement and satisfaction with as well as enthusiasm for work". According to Locke (1976), job satisfaction is a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences. Motivation is defined by Pinder (1998) as "a set of energetic forces that originates both within as well as beyond an individual's being, to initiate work-related behaviour, and to determine its form, direction, intensity and duration" (cited in Tremblay et al., 2009).

## 4. Research Methodology

Based on the conceptual framework, a research design has been laid down to follow the study in a systematic way. Goal Setting is considered to be the primary independent variable and Employee Outcome is considered to be the key dependent variable for the present study.

The study is focused on the CPSEs present in Assam. The study has been conducted with respect to the presence of MoU based Goal Setting process in CPSEs. Only those Executives/Officers who are assigned with individual Key Result Areas (KRAs)/ Key Performance Areas (KPA) are taken into consideration for the study. Four behavioural attributes were taken into consideration while measuring the employee outcome.

### 4.1 Objectives

The study aims to fulfil the following objectives;

i) To measure employee perception regarding the quality of Goal Setting in Central Public Sector Enterprises in Assam.

ii) To examine the relationship between Goal Setting and Employee Outcome.

### 4.2 Sampling design

The data was collected from 640 participants from six profit-making CPSEs present in Assam, Oil and Natural Gas Corporation Ltd (ONGC), Indian Oil Corporation Ltd. (IOCL), Power Grid Corporation of India Ltd (PGCL), Oil India Ltd. (OIL), Airport Authority of India (AAI), North Eastern Electric Power Corporation Ltd. (NEEPCO). Judgement sampling was used to identify the top profit-making CPSEs from each category present in Assam (PE survey report, 2014-15). Non-probability purposive sampling method was used to select the sample for the present study. Purposive sampling, also known as judgment sampling basically involves selecting a sample that is believed to be representing the population (Gay & Diehl, 1992). Moreover, for the purpose of our research, the selection of cases was based on the following criteria;

- a. The respondent should be of Executive Level.
- b. The respondent should be assigned with goals and should be involved in the goal-setting process.

All the items in the questionnaire were measured in 5-point Likert Scale ranging from "Strongly Agree" to "Strongly Disagree".

### 4.3 Research tools

In order to measure the perception of goal setting, the 10-factor model developed by Lee et al. (1991) is being used. These 10 factors are a reduced version of the goal-setting questionnaire developed by Locke and Latham in 1984.

In order to measure Employee Outcome, four behavioural outcomes were selected, viz., Job Performance, Motivation, Employee Engagement and Job Satisfaction. It should be noted that the items that are related to individual job and job-related goals are included in the questionnaire. As such, the Job Performance scale by Koopmans et al. (2013), Work Motivation scale by Shouksmith (1989) and Tremblay et al. (2009), Employee Engagement scale by Harter, Schmidt & Hayes (2002), and the Job Satisfaction Scale by Macdonald and Macintyre (1997) and SHRM Report (2014), were taken into consideration for measuring these outcome variables.



#### 4.4 Hypotheses

The hypotheses for the present study were set in the following manner;

H1: Goal Setting is positively related to Employee Outcome.

H2: The positive aspects of Goal Setting are positively related to Employee Outcome variables.

H3: The negative aspects of Goal Setting are negatively related to Employee Outcome variables

#### 5. Analysis

The responses (n=640) are subjected to analysis using the SPSS 20 version. The reliability test revealed the Cronbach's Alpha for Goal Setting to be .89 and for Employee Outcome to be .92. These values fall under the acceptable range of 0.70 to 0.95 (Tavakol & Dennick,

2011). Descriptive analysis is carried out in order to find the mean scores for analysis of the first objective, and Correlational Analysis is done for the analysis of the second objective.

#### 5.1 Perception of Goal setting

The mean scores obtained from descriptive analysis were interpreted based on the criteria given by Kraetschmer et al. (2004) and Francois (2014), where mean scores less than 3 was termed as 'low level', 3 to 3.99 as 'moderate level' and 4 to 5 as 'high level' perception. The data on perception of executives of CPSEs regarding Goal Setting and its factors are displayed in the following manner, as shown in Table 1.1.

The mean scores (Table 1.1) indicated that the Goal Setting score (3.81) in CPSEs was 'Moderate'. This implied that the quality of Goal Setting process was perceived by the executives to be moderate in the CPSEs.

**Table 1.1 : Mean Scores of Goal Setting variables.**

GOAL SETTING		CPSEs (Total)
Positive Aspects of Goal setting	Goal Clarity	<b>4.43</b>
	Goal Rationale	3.95
	Goal Efficacy	<b>4.14</b>
	Supervisor Support	<b>4.03</b>
	Goal Setting in PA	3.85
	Rewards	3.34
	Organisational Facilitation	3.97
Negative aspects of Goal Setting	Goal Stress	3.44
	Dysfunctional Effects of Goal	3.50
	Goal Conflict	3.46
<b>Total Mean</b>		<b>3.81</b>

Source: Primary data

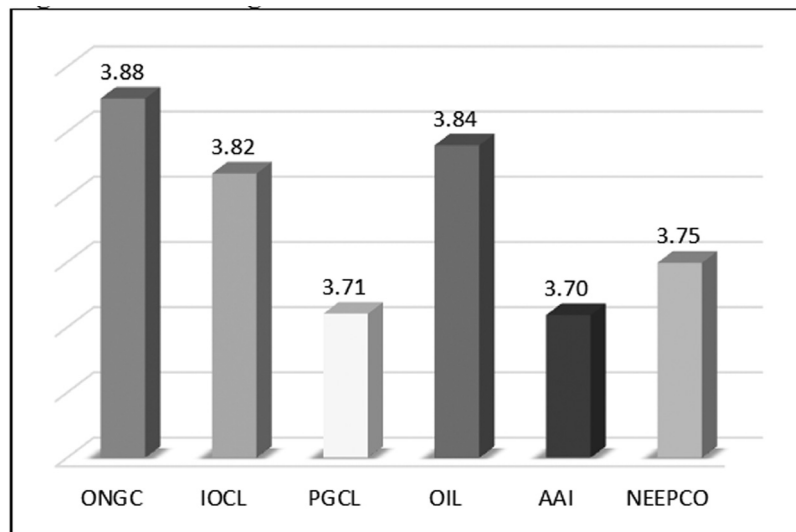
If the individual factors were analysed, the mean score of Goal Clarity (4.43), Goal Efficacy (4.14) and Supervisor Support (4.03) was found to be 'High' for the CPSEs. This implied that the executives of CPSEs have specific and clear goals set for the executives with proper prioritisation. They have all the skills and capabilities to achieve their goals. They are properly trained for the particular job assignments. There existed a participative relationship between the Supervisor and the Subordinate regarding Goal setting. The supervisors were found to be highly supportive

and helpful towards the executives in achieving their goals. It was also found that the other positive aspects, i.e., Goal Rationale (3.95), Use of Goals in Performance Appraisal (3.85), Rewards (3.34) and Organizational Facilitation (3.97), have scored 'Moderate'. This implied that the executives had moderate knowledge about their assigned goals and the use of those goals in their appraisal process. They perceived that they have a moderate level of goal-related rewards and that achievement of their goals is not directly linked to rewards like PRP, Promotion etc. It

should be noted that the executive's rewards are based on other factors as well, such as the Profit of CPSE, Executive's Grade, MoU rating, Performance review rating and the recommendations by the Remuneration Committee (DPE OM's dated 26.11.08 & 09.02.09). The negative aspects, viz., Goal Stress (3.44), Dysfunctional Effects (3.50) and Goal Conflict (3.46) of Goal setting were also found to be present at a 'Moderate' level in the CPSEs. This implied that executives experience a moderate level of difficulty and stressfulness in relation to their goals.

They have a moderate level of managerial dysfunctions and conflicts arising during their goal-setting process.

The mean scores of goal setting across CPSEs were analysed and are displayed in Fig.1.2. The total Goal Setting score was 'Moderate' for all the CPSEs indicating that all the CPSEs had a moderate level of Goal Setting Process. The opinions of executives were subjected to one-way ANOVA in order to find out the significant difference of opinion regarding Goal Setting across CPSEs.



Source: Primary Data

**Fig.1.2: Goal setting scores across CPSEs**

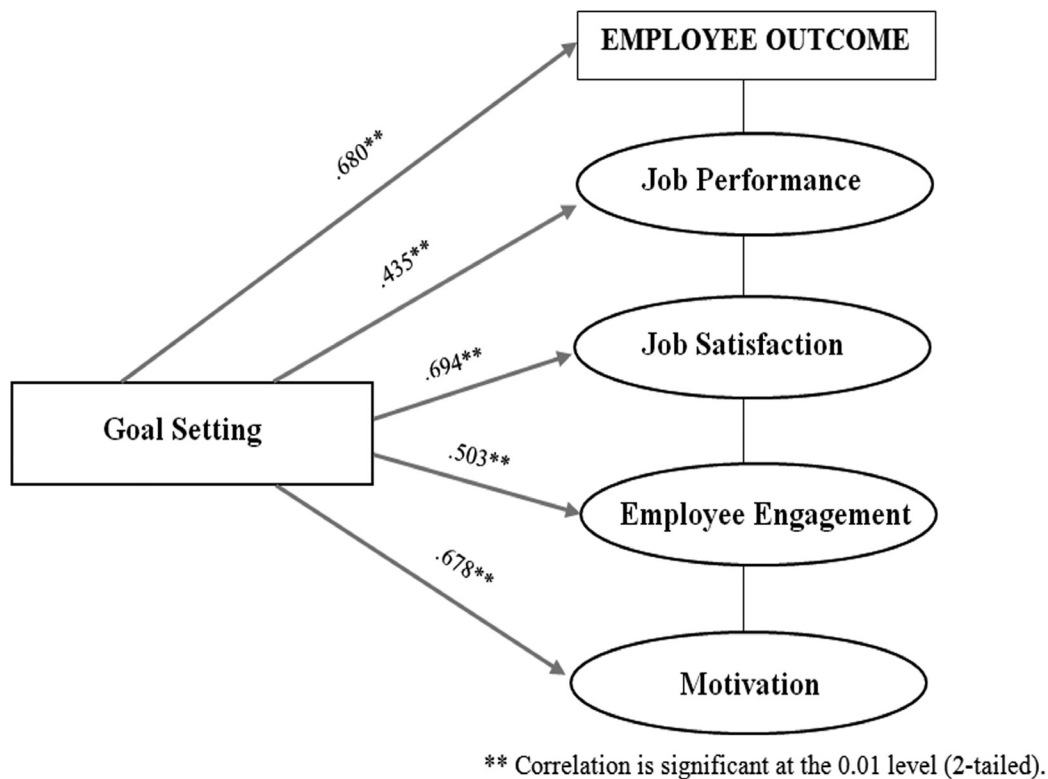
The result revealed a significant difference of means regarding goal setting ( $p=.033$ ,  $p<.05$ ) across CPSEs, implying that the executives differ in their opinion regarding goal setting across the six CPSEs.

### 5.2 The relationship between Goal Setting and Employee Outcome

Correlation analysis was used in order to find out any significant relationship between Goal Setting and Employee Outcome. The effect sizes for the coefficients were assumed as .10 to be Small/Weak, .30 to be Medium, .50 to be Strong/High and .70 and above as Very Strong correlation (Kotrlík & Williams, 2003).

Figure 1.3 below shows a 'Strong' positive correlation between Goal Setting and Employee Outcome ( $p=.680$ ,

$p<.001$ ). This indicated Goal Setting to be strongly associated with the Employee Outcome in CPSEs. Similarly, Goal Setting was found to have a significant positive correlation with the sub-variables of Employee Outcome. All the sub-variables showed a strong correlation except for only Job Performance that was found to have scored a moderately significant correlation with Goal Setting. This implied that when the quality of Goal Setting is increased, the sub-variables, viz., Job Satisfaction, Motivation and Employee Engagement increases at a higher rate and Job Performance increases in a moderate manner. Therefore, supporting H1, it can be said that at the .01 level of significance, Goal Setting was positively related to Employee Outcome.



*Source: Author's analysis*

**Fig. 1.3. Figure showing Correlation coefficients between Goal Setting and Employee Outcome.**

Again, correlation analysis between Goal Setting variables with sub-variables of Employee Outcome was carried out in order to find out any significant relationships. The results are shown in Table. 1.2.

In the case of Goal Setting variables and Employee Outcome, it can be seen that all the variables have a p-value less than .01, which indicate a significant correlation between Goal setting and Employee Outcome. Goal Clarity, Goal Rationale, Goal Efficacy, Supervisor Support,

Goal Setting in PA and Organizational Facilitation were found to have a strong positive relationship with Employee Outcome. This meant that the higher the level of these variables, the higher is the Employee Outcome. Rewards are found to have a moderate positive relationship with Employee Outcome. And the negative factors such as Goal Stress, Dysfunctional Effects of Goal and Goal Conflict is found to have a 'Weak' negative relationship indicating that the increase in these variables decreases Employee Outcome in a similar manner (Refer to Table 1.2)

**Table. 1.2. Table showing Correlation coefficients between Goal Setting Variables and Employee Outcome variables**

Goal setting variables	Employee Outcome		Job Performance		Job Satisfaction		Employee Engagement		Motivation	
	r	Sig.	r	Sig.	r	Sig.	r	Sig.	r	Sig.
Goal Clarity	.513*	.000	.404*	.000	.468*	.000	.451*	.000	.430*	.000
Goal Rationale	.565*	.000	.377*	.000	.577*	.000	.403*	.000	.563*	.000
Goal Efficacy	.577*	.000	.409*	.000	.542*	.000	.486*	.000	.527*	.000
Supervisor support	.579*	.000	.362*	.000	.621*	.000	.405*	.000	.578*	.000
Goal Setting in PA	.554*	.000	.356	.000	.579*	.000	.392*	.000	.553*	.000
Rewards	.362*	.000	.156*	.000	.412*	.000	.258*	.000	.391*	.000
Organizational Facilitation	.579*	.000	.328*	.000	.614*	.000	.438*	.000	.581*	.000
Goal Stress	-.131*	.001	-.156*	.000	-.063	.112	-.121*	.002	-.116*	.003
Dysf. Effects of Goal	-.260*	.000	-.147*	.000	-.278*	.000	-.161*	.000	-.294*	.000
Goal Conflict	-.191*	.000	-.108*	.006	-.213*	.000	-.108*	.006	-.218*	.000

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

Source: Primary Data

When the relationship between the Goal Setting variables and the sub-variables of Employee Outcome are analysed, it can be seen that all the positive aspects of Goal setting have a significant positive correlation. The strength of the co-efficient ranged from strong to weak (refer to Table 1.2). This implied that when the positive aspects of Goal setting increased, the sub-variables of Employee Outcome also increased in the given manner. Therefore, supporting H2, it can be said that .01 level of significance, the positive aspects of Goal setting are positively related to Employee Outcome variables.

When the negative aspects of Goal setting and Employee outcome variables are analysed, it can be seen that except for Goal Stress and Job Satisfaction, all the other variables are found to have a significant weak negative correlation with the Employee Outcome and its sub-variables. This implied that when these negative variables have increased, the Employee Outcome is decreased. Therefore, with the

exception mentioned above and supporting H3, it can be said that at the .01 level of significance, the negative aspects of goal setting are negatively related to Employee Outcome variables.

### 5.3 Impact of Goal Setting on Employee Outcome

The correlation analysis only helped in determining the degree of the relationship, and it was not sufficient to prove causality. As such, a regression analysis was used to measure the impact of goal setting on employee outcome. The value of  $R^2$  for Employee Outcome was found to be .463, indicating that the model explains 46.3% variance in the Total Employee Outcome; the estimated regression parameters were found to be  $\beta_0 = 1.571$ (intercept) and  $\beta_1 = .684$  (slope), indicating a positive linear relationship. This regression line can be interpreted as, when  $X = 0$ , the value of  $Y$  is 1.571.

**i.e., Employee Outcome = 1.571 + .684 × Goal Setting**

This implies that goal setting has a positive impact on Employee Outcome and that Employee Outcome increases with a better goal-setting process.

Again, Multiple Regression analysis is carried out to find out the major predictors of Goal Setting that affects Employee Outcome. With an  $R^2$  value of .576, the regression coefficients are shown in Table 1.3.

**Table. 1.3. Table showing regression coefficients.**

Coefficients <sup>a</sup>								
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.337	.132		10.109	.000		
	GOAL CLARITY	.182	.025	.220	7.189	.000	.720	1.390
	GOAL RATIONALE	.044	.025	.069	1.757	.079	.436	2.295
	GOAL EFFICACY	.161	.025	.218	6.552	.000	.607	1.649
	SUPERVISOR SUPPORT	.105	.027	.161	3.943	.000	.403	2.483
	GS_IN_PA	.032	.025	.054	1.287	.199	.380	2.630
	REWARDS	.025	.014	.053	1.744	.082	.720	1.388
	ORG FACILITATION	.173	.023	.251	7.385	.000	.584	1.714
	GOAL STRESS	-.073	.020	-.127	-3.723	.000	.578	1.730
	DYSFUNCTIONAL EFFECTS OF GOAL	-.037	.021	-.063	-1.792	.074	.546	1.831
	GOAL CONFLICT	-.064	.019	-.120	-3.293	.001	.510	1.963
a. Dependent Variable: EMPLOYEE_OUTCOME								

\* Significant at .01 level.

Source: Primary Data

The regression coefficients Table 1.3 reveals that Goal Clarity ( $\beta=.182$ ,  $p=.000<.01$ ), Goal Efficacy ( $\beta=.161$ ,  $p=.000<.01$ ), Supervisor Support ( $\beta=.105$ ,  $p=.000<.01$ ), Organizational Facilitation ( $\beta=.173$ ,  $p=.000<.01$ ), and Goal Stress ( $\beta= -.073$ ,  $p=.000<.01$ ), and Goal Conflict ( $\beta= -.064$ ,  $p=.001<.01$ ) significantly predicts Employee Outcome. The positive aspects of Goal setting such as, Goal Clarity, Goal Efficacy, Supervisor Support and Organisational facilitation were found to have a positive impact on Employee Outcome and the negative aspects such as Goal Stress and Goal Conflict were found to have a negative impact on employee outcome. This can be summarised in quadratic form as shown below;

i.e., **Employee Outcome = 1.337 + .182 × Goal Clarity + .161 × Goal Efficacy + .105 × Supervisor Support + .173 × Organisational Facilitation - .073 × Goal Stress - 0.064 × Goal Conflict**

Thus, the results from regression analysis suggest that Goal Setting significantly predicts Employee outcome and six out of the ten Goal Setting factors (i.e., Goal Clarity, Goal Efficacy, Supervisor Support, Organizational Facilitation, Goal Stress and Goal Conflict) were found to have the significant power to predict Employee Outcome.

## 6. Conclusion

Organisations nowadays rely highly on effective performance management and goal setting interventions. This study contributes to the practical and theoretical knowledge of Goal Setting and its relationship with different behavioural outcomes. The study provided information on how the employees perceived their goal-setting process and how this can be used as a tool for further policymaking. The study brought upon some interesting facts about the relationship between Goal Setting in Central

Public Sector Enterprises (CPSEs) and Employee Outcome. Firstly, the results supported the notion that executives scoring high on goal setting variables have a better understanding of the goal-setting process. Secondly, the Goal Setting process is found to be of moderate level in the CPSEs present in Assam. This raised an important question regarding the credibility of the individual goal of the executives of these profit-making CPSEs. It is argued that the targets set in CPSEs are much lower than actual achievements (Sharma, 2013; Althaf & Ramesh, 2013; Shirley, 1998; Yadav & Dabhade, 2013). Therefore, the CPSEs should attempt to re-evaluate the goal-setting process and focus on all the other factors that make the goal-setting process more effective. Thirdly, the study of possible relationships between Goal Setting and Employee Outcome leads the researcher to conclude that positive perception of Goal Setting increases Employee Outcome and all the 10-factors are significantly associated with Employee Outcome. Lastly, the significant relationships between Goal Setting and Employee Outcome found from Regression analysis revealed Goal Setting to be a significant predictor of Employee Outcome and six factors, viz., Goal Clarity, Goal Efficacy, Supervisor Support, Organizational Facilitation, Goal Stress and Goal Conflict were found to significantly predict Employee Outcome. Therefore, the CPSEs should focus more on increasing the positive aspects and reducing the effects of the negative aspects. Further, the organisations can provide the employees with high goal-specific support so that they can obtain realistic expectations with respect to goals. Thus, the conclusion suggests that Employee Outcome can be enhanced through proper goal setting and those goal-setting variables have a direct impact on Employee Outcome.

### 6.1. Limitations

The present study is limited to only six CPSEs and their executives present in Assam. As such, the data is limited to a specific sample, given that the data was collected only from the units of the organisation present in Assam. As such, the small size effects, especially in correlation analysis, was difficult to detect. Since the measurement of items is subjective, it needs to be interpreted with caution. For example, differing interpretation of items by subjects may lead to socially desirable answers, which may, in turn, lead to bias. The employee outcome is limited to behavioural aspects only.

### 6.2 Scope for future research

Future research can be done for the development and refinement of the goal-setting questionnaire. Studies can be done either in the qualitative or quantitative areas of goal setting and its relationships with other outcome variables. Given that the study conducted is limited to CPSEs only, it would be interesting to look at differences in opinions among two or more organisations, preferably between public and private organisations.

### References:

- Althaf, S. and Ramesh, G. (2013). *Management of Agency Problem through Performance Contracts—Case of Public Sector Enterprises*. Proceedings of 3<sup>rd</sup> Biennial Conference of the Indian Academy of Management, IIM Ahmadabad Institutional Repository, 2013. Retrieved from, < <http://hdl.handle.net/11718/11607> >
- Asmus, S., Karl, F., Mohnen, A., & Reinhart, G. (2015). The impact of goal-setting on worker performance empirical evidence from a real-effort production experiment. Paper presented at 12th Global Conference on Sustainable Manufacturing. *ProcediaCIRP, Elsevier*, 26, pp. 127-132. Retrieved from, < <https://www.sciencedirect.com/science/article/pii/S2212827115001626> >
- Bhattacharya, S. & Neogi, D.G. (2006). Goal Setting Tendencies, Work Motivation and Organizational Climate as Perceived by the Employees. *Journal of Indian Academy of Applied Psychology*, 32(1), pp. 61-65.
- Bipp, T. & Kleingeld, A. (2011). Goal Setting in Practice: The Effects of Personality on Perceptions of the Goal Setting Process on Job Satisfaction and Goal Commitment. *Personnel Review*, 40(3), pp. 306-326.
- Chiu, J. S., Chen, W., Lu, F. C., & Lee., S. (2006, May). The Linkage of Job Performance to Goal Setting, Team Building and Organizational Commitment in the High-Tech Industry in Taiwan. *The Journal of Human Resource and Adult Learning*, pp.130-142. Retrieved from <<http://www.hraljournal.com/Page/17James%20Shan-Kou%20Chiu.pdf> >

- Department of Public Enterprises. *Public Enterprises Survey, 2014-2015*. New Delhi: Govt. of India (2015). Web. 2<sup>nd</sup> June 2015.
- Devarajan, R., Maheshwari, S., & Vohra, V. (2018). Managing Performance: Role of goal setting in creating work meaningfulness. *The Business and Management Review*, 9(4), 261-274.
- Francois, E. J. (2014). Development of a scale to assess faculty motivation for internationalising their curriculum. *Journal of Further and Higher Education*, 38(5), pp. 641-655.
- Gay, L.R. and Diehl, P.L. (1992). *Research Methods for Business and Management*. New York, NY: Macmillan Publishing Company.
- Harter, J.K., Schmidt, F. L., & Hayes, T. L. (2002). Business-Unit-Level Relationship Between Employee Satisfaction, Employee Engagement, and Business Outcomes: A Meta-Analysis. *Journal of Applied Psychology*, 87(2), pp. 268-279.
- Hoek, M., Groeneveld, S., & Kuipers, B. (2018). Goal Setting in Teams: Goal Clarity and Team Performance in the Public Sector. *Review of Public Personnel Administration*, 38 (4), pp. 472-493.
- Kim, J.S., & Hamner, W.C. (1976). Effect of performance feedback and goal setting on productivity and satisfaction in an organisational setting. *Journal of Applied Psychology*, 61 (1), pp. 48-57
- Kotrlik, J. W. & Williams, H.A. (2003). The incorporation of effect size in Information Technology, Learning and Performance Research. *Information, Learning, and Performance Journal*, 21(1), pp. 1-7
- Koopmans, L., Bernaards, C., Hildebrand, V., Buuren, S., Beek, A. J., & Vet, H.C.W. (2013). Development of an individual work performance questionnaire. *International Journal of Productivity and Performance Management*, 62(1), pp.6-28.
- Kraetschmer, N., Sharpe, N., Urowitz, S. & Deber, R. B. (2004). How does trust affect patient preferences for participation in decision-making? *Health Expectations*, 7, 317-326.
- Latham, G.P., & Yukl, G.A., (1975). A review of research on the application of goal setting in organisations. *Academy of Management Journal*, 18(4), pp. 824-845.
- Latham, G. P., & Baldes, J. J. (1975). The Practical Significance of Locke's theory of goal setting. *Journal of Applied Psychology*, Vol 60, pp.122 – 124.
- Latham, G. P., Mitchell, T. R., & Dossett, D. L. (1978). The importance of participative goal setting and anticipated rewards on goal difficulty and job performance. *Journal of Applied Psychology*, Vol. 63, pp. 163 – 171.
- Latham, G. P., Borgogni, L., and Petitta, L. (2008). Goal Setting and Performance Management in the Public Sector. *International Public Management Journal*, 11(4), pp. 385-403.
- Lee, C., Bobko, P., Earley P.C. and Locke, E. A. (1991). An Empirical Analysis of a Goal Setting Questionnaire. *Journal of Organizational Behaviour*, Vol 12, pp. 467-482.
- Locke, E. (1968). Toward a theory of task motivation and incentives. *Organisational Behavior and Human Performance*, 3(2), pp. 157-89.
- Locke, E. A. (1982). The Ideas of Fredrick W. Taylor: An Evaluation. *Academy of Management Review*, 7(1), pp. 14-24.
- Locke, E.A. and Latham, G. P. (1984). *Goal Setting: A Motivational Technique That Works*. New Jersey: Prentice Hall.
- Locke, E. A. and Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychological Association*, 57(9), pp 705-717.
- Locke, E. A. and Latham, G. P. (1990). *A Theory of Goal Setting and Task Performance*. New Jersey: Prentice-Hall.
- Locke, E. A. and Latham, G. P. (2013). *New Developments in Goal Setting and Task Performance*. New York, NY: Routledge.
- Locke, E. A., & Latham, G. P. (2006). New Directions to Goal Setting. *Association of Psychological Science*, 15(5), 265-268.
- Locke, E. A. (1976). *Nature and Causes of Job Satisfaction*. In M. D. Dunnette (Ed.), *Handbook of industrial and organisational psychology*, pp. 1297 – 1349. Chicago: Rand McNally.

- Macdonald, S., & MacIntyre, P. (1997). The Generic Job Satisfaction Scale: Scale Development and Its Correlates. *Employee Assistance Quarterly*, 13(2), pp. 1-16.
- Medlin, B. & Green Jr. K.W., (2009): Enhancing performance through goal setting, engagement and optimism. *Industrial Management & Data Systems*, 109(7), pp.943-956.
- Misra, S. & Srivastava, Kailash B.L. (2008). Impact of Goal Setting and Team Building Competencies on Effectiveness. *Proceedings of the 4th IEEE International Conference on Management of Innovation and Technology, ICMIT*. Web. 11<sup>th</sup> Jan 2019.
- Morelli, G. & Braganza, A. (2012). Goal Setting Barriers: A Pharmaceutical Sales Force Case Study.” *The International Journal of Human Resource Management*, 23(2), pp. 312-332.
- Orpen, C. (1995). Employee job performance and relations with superior as moderators of the effect of appraisal goal setting on employee work attitudes. *International Journal of Career Management*, 7(2), pp.3 – 6.
- Shahin, A. and Mahbod, M. A. (2007). Prioritisation of Key Performance Indicators: An Integration of Analytical Hierarchy Process and Goal Setting. *International Journal of Productivity and Performance Management*, 56(3), pp. 226-240.
- Shirley, M. (1988). Why Performance Contracts for State-Owned Enterprises Haven't worked. *Public Policy for the Private Sector Note 150*. World Bank: Washington DC.
- Sharma, G. L. (2013). *A Committee Report on Public Sector Enterprises and the Memorandum of Understanding: Charting New Frontiers*. Lal Bahadur Institute of Management, New Delhi. Available at < <http://www.dpemou.nic.in/>>
- Shouksmith, G. (1989). A construct Validation of a Scale for Measuring Work Motivation. *New Zealand Journal of Psychology*, Vol 18, pp. 76-81.
- Society for Human Resource Management. (2014). *Employee Job Satisfaction and Engagement: The Road to Economic Recovery*. A Research Report by the Society for Human Resource Management. Retrieved from, <[https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/Documents/14-0028%20JobSatEngage\\_Report\\_FULL\\_FNL.pdf](https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/Documents/14-0028%20JobSatEngage_Report_FULL_FNL.pdf)>
- Tavakol, M. & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, Vol 2, pp. 53-55.
- Tremblay, M. A., Blanchard, C. M., Taylor, S., Pelletier, L. G., & Villeneuve, M. (2009). Work Extrinsic and Intrinsic Motivation Scale: Its Value for Organizational Psychology Research. *Canadian Journal of Behavioural Sciences*, 41(04), pp. 213-226.
- Yadav, R.K. & Dabhade, N. (2013). Performance management system in Maharatna Companies (a leading public-sector undertaking) of India – a case study of BHEL, Bhopal (MP.) *International Letters of Social and Humanistic Sciences*, Vol 4, pp. 49-69.

\*\*\*\*\*



---

# Earnings Management in Banking Industry: A Systematic Review of Literature

**Dr. Deepa Mangala**

Professor

Haryana School of Business, Guru Jambheshwar University of  
Science and Technology, Hisar, Haryana (125001)

Email: deepavivekbharti@gmail.com

**Neha Singla**

Junior Research Fellow

Affiliated Institution: Haryana School of Business, Guru  
Jambheshwar University of Science and Technology,  
Hisar, Haryana (125001)

Email: nehasingal2604@gmail.com

**A  
b  
s  
t  
r  
a  
c  
t**

Scams in the banking sector have diverted stakeholders' attention towards manipulated financial figures that reduce the authenticity of accounting numbers. There is an urgent need to investigate and plug the loopholes. The objective of the present paper is to review the literature on earnings management (EM) in the banking industry and to develop a conceptual framework. The review is based on 129 selected papers published between 1988 to 2019 in peer-reviewed journals. The literature is mapped on the basis of databases, publication year, country of study, number of citations, and approaches used to measure EM. The proposed conceptual framework of EM in the banking industry comprises of its determinants, approaches, consequences and mitigators.

**Keywords:** *Earnings Management, Banking Industry, Scams, Systematic Literature Review, Conceptual Framework, Loan Loss Provision*

## 1. Introduction

Collapse of banks and financial institutions have always landed the economies around the globe into trouble with a number of shocks to the stakeholders. The story starts with the collapse of the Medici Bank, founded by Giovanni di Bicci in the year 1397, in Florence in Italy. History witnessed another collapse of the Overend Gurney & Co. bank of the United Kingdom in the year 1866. During the twentieth century, banks such as the Danat-bank (1931, Germany), the Herstatt Bank (1974, Germany), the Lincoln Saving and Loan Association (1989, California), the Bank of Credit and Commerce International (1991, Pakistan), the Nordbanken (1991, Sweden) and the Barings Bank (1995, Britain) became bankrupt. The advent of the twenty-first century has made the situation worse. In the year 2008, seven prominent banks became bankrupt such as Bear Stearns (USA), Northern Rock (Britain), Lehman Brothers (USA), Washington Mutual (USA), Royal Bank of Scotland Group (Britain), ABN-Amro (The Netherlands) and Bankwest (Australia) ("List of corporate collapses and scandals," 2019).

Banks in developing countries are not far behind in this race. The recent Indian examples include the Punjab National Bank (2018) and the Punjab Maharashtra Co-operative Bank (2019). "In the last 11 fiscal years, a total of 53,334 cases of fraud were reported by banks involving a massive amount of ₹ 2.05 trillion, the RBI data said" (Press Trust of India, 2019). This has resulted in a significant increase in the percentage of bad loans (non-performing assets) from below 3% in 2006-2008 to 11.5% by 2018 (Mistry, 2019), pressurising banks to manipulate earnings. The most common element in all these scams was misreporting of financial numbers. In the case of Lehman Brothers, "A March 2010 report by the court-appointed examiner indicated that Lehman executives regularly used cosmetic accounting gimmicks at the end of each quarter to make its finances appear less shaky than they really were" ("Lehman Brothers," 2019). In another example of Punjab and Maharashtra Cooperative (PMC) Bank, "The bank misled auditors of the Reserve Bank of India (RBI) by replacing legacy accounts of the company with dummy accounts, dating back to 2008, to show a healthy balance sheet" (Roy & Panda, 2019). These collapses did not happen overnight, but were hidden initially

in the guise of window dressed financial statements. The primary reasons responsible for the collapse of banks are irregularities in financial statements, inadequate provisioning, non-recognition of NPAs, bad governance practices, etc. Earnings Management (EM) can be described as the manipulation of earnings in a desired direction by managers within the flexibility provided by accounting standards and laws to fulfil their personal motives. Though it does not violate any standard or law, it deviates from the spirit of the standard or law. This has not only downgraded banks' image but has also shattered the investors' and depositors' confidence in banking systems in general. So, it has become essential to curb the malpractice of EM.

The concept of EM has evolved over a period of time. Schipper (1989) defines EM as, "disclosure management in the sense of a purposeful intervention in the external financial reporting process with the intent of obtaining some private gain." According to Healy and Wahlen (1999), "EM occurs when managers use judgement in financial reporting and in structuring transaction to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers." Managers are supposed to apply professional judgement and ethics in accounting as the situation demands so that the financial statements report true and fair information. However, the accounting professional's judgement gets biased by personal motives, hidden corporate agendas and the flexibility provided by the regulatory environment. Magrath and Weld (2002) view EM as a value-maximising function as it helps in meeting the regulatory requirements, avoiding violation of debt covenants and achieving the analyst's expectation regarding stock prices. Dutta and Gigler (2002) found that shareholders do not find it appropriate to restrict EM as it helps in reducing the cost of low-earnings prediction by managers. Discussing the divergent views of practitioners, regulators and accounting academics, Dechow and Skinner (2000) opine that regulators and practitioners see EM as a troublesome practice that needs immediate corrective actions, while accounting academicians believe that EM does not have any significant effect on financial statements, and for small effects, investor's attention is not necessary. So, it is a matter of conflict whether EM is good or bad, and till now, there are no conclusive answers to this.

The present paper strives to provide a detailed review of literature on EM practices in the banking industry. The following sections detail the data and methodology, theme-based classification of selected articles, a conceptual framework of EM in the banking industry, research gap, and major areas for future research.

## 2. Data and Methodology

For the purpose of a systematic literature review of EM practices in the banking industry, specific databases were used to collect relevant empirical research papers. After collecting papers, inclusion and exclusion criteria were applied for the final selection of articles. The databases used were Elsevier's Science Direct, Emerald, JSTOR,

SAGE, Taylor & Francis and Google Scholar. Search for articles was done using specific keywords or strings. The search strings are: 'earnings management in banking industry', 'earnings management and bank', 'consequences of earnings management in banks' and 'bank managers' motivation for earnings management'.

Some articles were manually searched on Google Scholar from references of other papers.

The systematic search resulted in an aggregation of 503 articles, out of which 106 duplicate articles were deleted, and the remaining 397 were subjected to specified article inclusion and exclusion criteria (Table 1).

**Table 1: Article Inclusion and Exclusion Criteria**

Inclusion Criteria	Exclusion Criteria
Articles with full-text access	Articles not available as full-text
Articles published in English	Articles not published in English
Articles related to EM	Articles not related to EM
Articles published during 1988-2019	Articles not published during specified time frame.
Studies on Banking industry	Studies not on banking industry
Articles included search keywords in title/abstract/Keyword	Duplicate articles

Further, 268 articles were removed because these were either not available as full text, or were in a language other than English, or not related to EM. Few other articles dealt with EM but were not in the context of the banking industry. Further, the papers which were published before the year

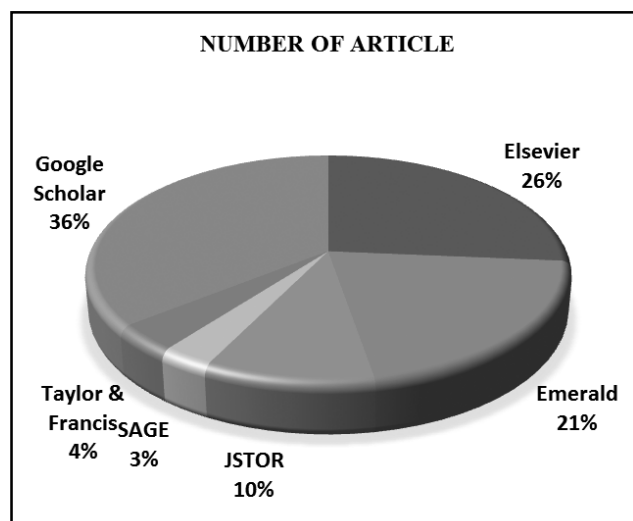
1988 or after 2019 are not included in the scope of the present study. Finally, 129 articles were selected for detailed review. The number and percentage of the included and excluded articles within the selected databases are presented in Table 2.

**Table 2: Number and Percentage of Included and Excluded Articles**

Databases	Total Articles	Included	Excluded
Elsevier's Science Direct	114	34 (29.82%)	80 (70.18%)
Emerald	92	27 (29.35%)	65 (70.65%)
JSTOR	23	13 (56.52%)	10 (43.48%)
SAGE	11	4 (36.36%)	7 (63.64%)
Taylor & Francis	24	5 (20.83%)	19 (79.17%)
Google Scholar	133	46 (34.59%)	87 (65.41%)
<b>Total</b>	<b>397</b>	<b>129</b>	<b>268</b>

## Classification of Literature

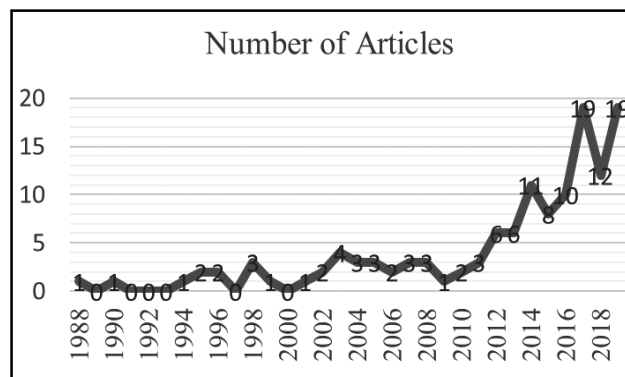
Further, classification of the selected articles (129) is done on the basis of databases, year of publication, the approaches used to detect EM, country of study and the number of citations. The articles published between 1988 to 2019 were classified according to the database (Figure 1). The richest sources of selected articles were Google Scholar and Elsevier's Science Direct, which contributed 80 articles. Emerald (27), JSTOR (13), Taylor & Francis (5) and SAGE (4) contribute 21%, 10%, 4% and 3% of the total selected articles respectively. The higher percentage of articles from Google Scholar is due to its free availability. It has articles from many databases such as Wiley, Kulwer, American Accounting Association, etc.



**Figure 1: Article Classification by Database**

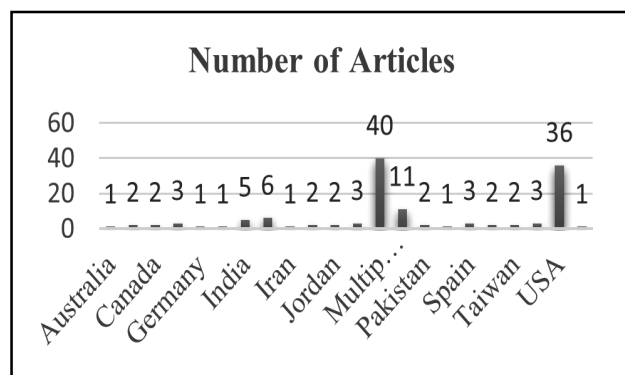
The articles are arranged on the basis of the year of publication (1988 to 2019) to pinpoint the trend of publication and development of research on EM in the banking industry (Figure 2). Only a few studies got published during the period of 1988-2010, and after 2010 the number of published research papers has increased tremendously, exhibiting that in the past decade, researchers in the area of finance and accounting have shown keen interest in explaining EM practices in the banking industry. Post 2010, banks across the globe were at the centre of controversies due to underperformance, stressed assets and governance issues. The subprime crisis further posed a question mark on the credibility of major

banks. These circumstances motivated the researchers to re-examine the issues at the heart of the problem fuelling research in the area of EM.



**Figure 2: Classification of Articles by Publication Year**

The articles are distributed on the basis of countries in which the study is conducted or from where data is collected. The country-wise classification (Figure 3) shows that the research on EM practices in the banking sector is primarily confined to 21 countries. The majority of the studies focus on a single-country approach, whereas 40 empirical papers use a multi-country approach. The multi-country studies are helpful in making cross-country comparisons of the EM behaviour of banks. Of the single-country studies, the majority (around twenty-eight percent) are conducted in the USA. There is a dearth of studies in European countries and other parts of the world, including from emerging markets.

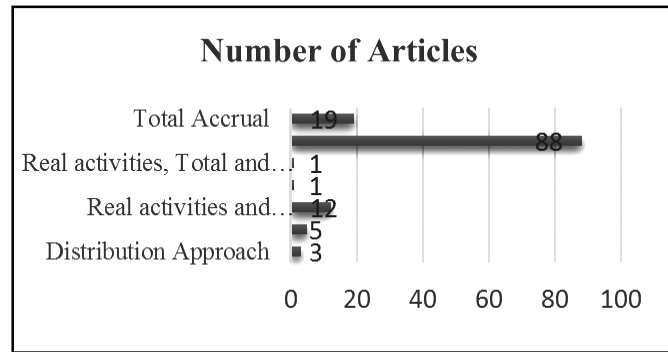


**Figure 3: Classification of Articles by Country**

The literature is also categorised on the basis of the approaches used to detect EM (Figure 4). Specific Accrual,

Total Accrual and Real Activities are the alternative approaches used. The analysis reveals that 68.21% of articles use the Specific Accrual model due to its popularity in the banking industry. This helps in identifying the important factors that have a potential impact on accruals.

Total Accrual, Real Activities and Specific Accrual approaches are also used. The 'Distribution Approach' is not popular in the banking industry because it is a relatively new approach and is primarily helpful in detecting the benchmark-beating behaviour of bank managers.



**Figure 4: Classification of Articles by Approaches of EM**

Citation of research papers denotes scholarly or intellectual use of one's research by another scholar in the same or related area. Citation analysis helps to locate the most critical and influential papers/ researchers in a specific field. The information about citations was gathered from Google Scholar in February 2020. Out of 129

selected papers, 104 have been cited. Table 3 includes papers that have more than 100 citations. Ahmed et al. (1999) is the most cited (1067 citations) article, followed by Beatty et al. (2002), Beatty et al. (1995), Laeven and Majnoni (2003), and so on.

**Table 3: List of Articles According to Citations**

S. No.	Articles	No. of Citations	S. No.	Articles	No. of Citations
1.	Ahmed et al. (1999)	1067	15.	Greenawalt & Sinkey (1988)	335
2.	Beatty et al. (2002)	916	16.	Shen & Chih (2005)	328
3.	Beatty et al. (1995)	892	17.	Kanagaretnam et al. (2003)	247
4.	Laeven & Majnoni (2003)	853	18.	Shrieves & Dahl (2003)	221
5.	Collins et al. (1995)	756	19.	Anandarajan et al. (2007)	219
6.	Wahlen (1994)	731	20.	Kanagaretnam et al. (2010a)	213
7.	Beaver & Engel (1996)	718	21.	Pérez et al. (2008)	202
8.	Moyer (1990)	624	22.	Kanagaretnam et al. (2010b)	187
9.	Bikker & Metzmakers (2005)	579	23.	Lobo & Yang (2001)	168
10.	Cornett et al. (2009)	522	24.	Kanagaretnam et al. (2011)	166
11.	Fonseca & Gonzalez (2008)	394	25.	Cohen et al. (2014)	136
12.	Beatty & Harris (1998)	377	26.	Kanagaretnam et al. (2005)	124
13.	Kim & Kross (1998)	367	27.	Bouvatier et al. (2014)	124
14.	Liu & Ryan (2006)	336	28.	El Sood (2012)	106

#### 4. Conceptual Framework of Earnings Management

A conceptual framework of EM in the banking industry was developed (Figure 5) comprising of determinants, approaches, consequences and mitigators of EM. The determinants motivate managers to practice EM. Different

approaches have been developed in the literature to detect EM. EM has far-reaching consequences on banks' performance and corporate social responsibility. Finally, mitigators were identified that ensure a check on EM.

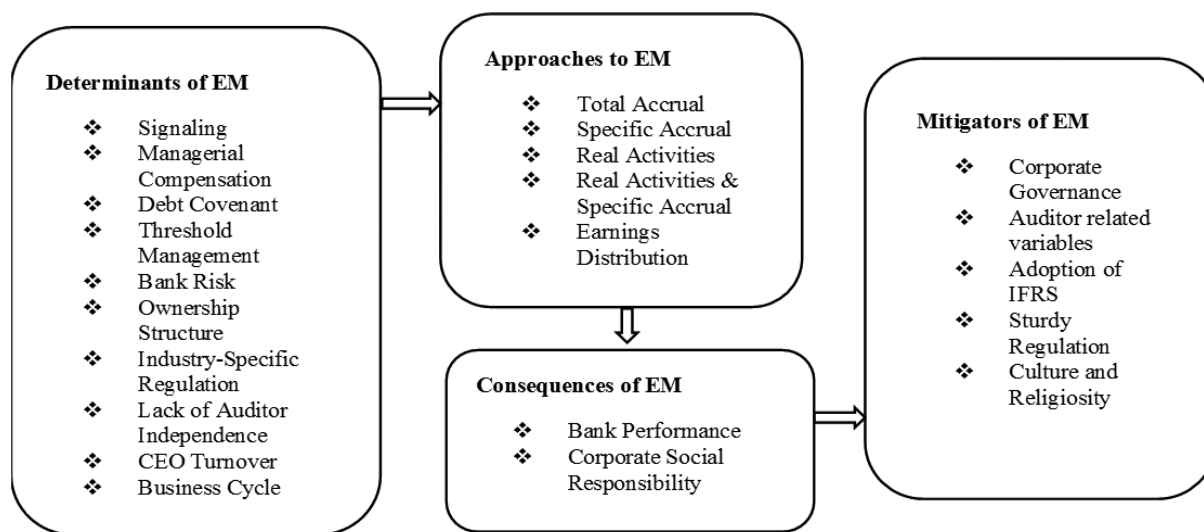


Figure 5: Conceptual Framework of EM

##### 4.1 Determinants of Earnings Management

EM is the result of the application of managerial judgement in the preparation and presentation of financial accounts. Numerous factors motivate managers to manipulate earnings like signalling, managerial compensation, debt covenants, threshold management, bank risk, ownership structure, industry-specific regulation, etc. Table 4 presents a list of articles that have investigated various determinants of EM.

**Signalling** theory was introduced by Spence (1973) and later developed by Ross (1977). In the corporate world, information asymmetry exists, which means that all the parties do not possess the same amount of information. Managers have privileged access to information, and they use this position to signal to various parties and market participants about the future prospects of the company. In the banking industry, inflated Loan Loss Provision (LLP) gives an indication to investors that banks have sufficient funds to face any unforeseen circumstances, and they regard it as a symbol of the bank's financial soundness. Wahlen

(1994) opines that an increase in LLP is viewed as 'good news' by investors. Kanagaretnam et al. (2005) conclude that though banks use discretionary LLP to emit signal about future prospects of the bank to investors, the propensity of the signal differs positively with investment opportunities and variability of earnings, and negatively with the size of the bank. Ghosh (2007) made a study on Indian banks and observed that listed and unlisted banks exhibit no significant difference in their signalling behaviour. Curcio and Hasan (2015) found that in non-Euro currency countries, banks use LLP to signal to outsiders. Abu-Serdaneh (2018) also found that the loan loss allowance is positively associated with year-ahead earnings. Contrary pieces of evidence indicate that managers do not use LLP to emit signals (Ahmed et al. 1999; Anandarajan et al. 2003; Anandarajan et al. 2007).

**Managerial Compensation** motivates managers to manipulate earnings as explained by agency theory initiated by Ross (1973) and later developed by Jensen and Meckling (1976). According to this theory, managers tend to serve their own interest over the general interest of the

company and to overcome this behaviour, compensation of managers' is attached to the firm's performance (Jensen & Meckling, 1976). This results in upward manipulation of earnings to increase current managerial remuneration and downward manipulation to increase future remuneration. Cornett et al. (2009) found that CEO pay-for-performance has a positive relation with EM. When a bank's capital adequacy ratio is close to the minimum regulatory requirement, an increase in the level of equity incentives leads to an increase in the level of EM (Cheng et al., 2011). Uygun (2013) concludes that EM is positively affected by bank executive's incentives.

Watts and Zimmerman (1986) hold **debt covenants** responsible for manipulation in accounting numbers. Debt covenants are the agreement between a company and creditors stating certain limits regarding earnings or financial ratios that a company should not breach. To avoid the violation of these agreements, managers tend to manage earnings. Kanagaretnam et al. (2003) and Kanagaretnam et al. (2004) found that debt to loan ratio is positively associated with income smoothing, and banks indulge in income smoothing through discretionary LLP to reduce the cost of external financing. In accordance with the literature, income smoothing and EM can be used interchangeably (Uygun 2013). Othman and Mersni (2014) also found a positive relation between loan to deposit ratio and discretionary LLP. Moghaddam and Abbaspour (2017) discussed a positive and significant effect of financial leverage on EM.

**Threshold Management** theory describes that managers use discretion to manipulate earnings in order to achieve a target 'threshold'. Burgstahler and Dichev (1997) suggest two thresholds: 'zero threshold' or loss avoidance and 'nil variation threshold' or avoiding the negative changes in earnings. A new variant, 'analyst expectation threshold', has been added by Degeorge et al. (1999). These thresholds create incentives for managers to manipulate earnings. Robb (1998) states that when market analysts are unanimous about the earnings forecast of the bank, the bank managers get highly motivated to manage earnings. Beatty et al. (2002) claim that public banks, when compared with private counterparts, are more actively engaged in EM by announcing more consecutive strings of increase in earnings and circumventing small earnings reduction. Shen and Chih (2005) found that banks use EM to eliminate negative variation in earnings and earnings losses.

A **bank** may face different types of **risks** like credit risk, liquidity risk, operational risk and market risk. In high-risk situations, bank managers resort to EM to hide their inefficiency or financial difficulties. Operational risk has a positive association with discretionary accruals, indicating the use of EM by managers to hide their operational deficiencies, whereas systematic risk has no significant relation with discretionary accruals, implying that general risk faced by all the sectors of an economy does not motivate banks to manage their earnings (Mohammad et al. 2011; Abaoub et al. 2013), firm-specific risk is negatively associated with EM (Mohammad et al. 2011), and total risk has no significant impact (Abaoub et al. 2013) on EM. Cohen et al. (2014) conclude that EM can successfully predict a bank's tail risk. Ozili (2017a) found that non-performing loans and loans outstanding have a positive impact on discretionary LLPs.

"The **ownership structure** is defined by the distribution of equity with regard to vote and capital, but also by the identity of equity owner" (Wahl, 2006). Different ownership structures affect EM differently. If majority shares are held by a few investors the ownership is concentrated. It is found that concentration of ownership has a positive impact on EM (Bouvatier et al., 2014; Lassoued et al., 2017; Lassoued et al., 2018), suggesting that the few controlling shareholders encourage managers to manage earnings to maximise their personal benefits. State and institutional ownership have a positive impact on EM (Lassoued et al., 2017; Lassoued et al., 2018), indicating that these investors are interested in current earnings. Family ownership has a negative impact on EM (Lassoued et al., 2017).

Rules and regulation that are specifically meant for a particular industry are referred to as **Industry-specific Regulations**. In the banking industry, various regulatory authorities, primarily the central bank, impose capital adequacy requirements to curtail the risk exposure of banks. It is found that banks use discretionary LLP to meet their minimum capital ratio requirement in order to avoid the cost associated with violating the norms (Moyer, 1990; Lobo & Yang, 2001). Ahmed et al. (1999) reported that before changes in capital regulation of banks in the USA in the year 1990, LLP had a negative association with capital ratio and subsequent to the changes, the coefficient exhibited a positive association with LLP, indicating a

declining trend of managing capital via LLP because of stricter regulations. Chipalkatti and Rishi (2007) investigated Indian banks and found that after 1999 banking reforms, the banks which are less profitable and poorly capitalised understate their non-performing assets and LLP. Another study by Ghosh (2007) on Indian banks marks that LLP is used by managers to manage capital ratio. On the contrary, Anandarajan et al. (2003) found that in the new capital ratio regulatory environment, banks do not engage in managing capital via LLP. Further, Kanagaretnam et al. (2003) noted that managers of well-capitalised banks have a higher propensity to indulge in income smoothing than managers of weakly-capitalised banks, as the well-capitalised banks are less prone to regulatory scepticism. Few studies, such as Kanagaretnam et al., 2004; Chang et al., 2008 and Pérez et al., 2008, exhibit that capital ratio does not incentivise managers to use discretionary LLP in Spanish banks.

**Auditor's independence** implies that the external auditor does not have any relation with the parties that have a financial interest in the company. Lack of auditor independence provides an opportunity for managers to manipulate earnings. Kanagaretnam et al. (2010a) found that in the case of large banks, abnormal audit fees are not linked with EM as Federal Deposit Insurance Corporation Improvement Act, 1991 holds auditors of large banks responsible for ensuring the effectiveness of internal control system. On the other hand, small banks are exempt

from these requirements resulting in strong negative relation of abnormal non-audit fees and abnormal total fees of audit paid to auditor with discretionary LLP. Jayeola et al. (2017) and Akintayo and Salman (2018) reinforce that audit independence has a positive association with EM.

**CEO Turnover** is the replacement of an existing CEO with a new one. Bornemann et al. (2015) testified that the incoming CEO reports more discretionary expenses in the turnover year irrespective of low credit risk, to blame his predecessor for poor performance. The results are stronger when the incoming CEO is an outsider as the new internally promoted CEO cannot blame his predecessor, unlike an incoming outsider CEO, because of his previous position in the company.

Different phases of growth in an economy are termed as **Business Cycle**. Many studies endorse negative relation between GDP growth and LLP (Laeven & Majnoni, 2003; Bikker & Metzmakers, 2005; Ozili, 2017a; Ozili, 2017c; Ozili & Outa, 2018) indicating that banks do not make adequate provision for bad loans in a boom period and during a recession in the economy they increase such provisions to cope with increased credit risk. Liu and Ryan (2006) reported that in a pre-boom period bank managers increase their earnings via reducing LLP and during the boom period they decrease earnings via increasing provision for loan losses. Abu-Serdaneh (2018) found no evidence of procyclicality in Jordanian banks.

**Table 4: Determinants of EM**

Determinants	References
Signalling	Wahlen (1994), Ahmed et al. (1999), Anandarajan et al. (2003), Kanagaretnam et al. (2005), Ghosh (2007), Anandarajan et al. (2007), Curcio & Hasan (2015) and Abu - Serdaneh (2018)
Managerial Compensation	Cornett et al. (2009), Cheng et al. (2011) and Uygur (2013)
Debt Covenant	Kanagaretnam et al. (2003), Kanagaretnam et al. (2004), Othman & Mersni (2014) and Moghaddam & Abbaspour (2017)
Threshold Management	Robb (1998), Beatty et al. (2002) and Shen & Chih (2005)
Bank Risk	Mohammad et al. (2011), Abaoub et al. (2013), Cohen et al. (2014) and Ozili (2017a)
Ownership Structure	Bouvatier et al. (2014), Lassoued et al. (2017) and Lassoued et al. (2018)
Industry-Specific Regulation	Moyer (1990), Ahmed et al. (1999), Lobo & Yang (2001), Anandarajan et al. (2003), Kanagaretnam et al. (2003), Kanagaretnam et al. (2004), Chipalkatti & Rishi (2007), Ghosh (2007), Chang et al. (2008) and Pérez et al. (2008)
Lack of Auditor Independence	Kanagaretnam et al. (2010a), Jayeola et al. (2017) and Akintayo & Salman (2018)
CEO Turnover	Bornemann et al. (2015)
Business Cycle	Laeven & Majnoni (2003), Bikker & Metzmakers (2005), Liu & Ryan (2006), Ozili (2017a), Ozili (2017c), Ozili & Outa (2018) and Abu-Serdaneh (2018)



#### 4.2 Approaches for Detecting Earnings Management

The application of managerial discretion is the genesis of EM. Researchers have developed different approaches to detect EM. Sun and Rath (2010) have discussed critically the approaches used to detect EM, i.e. real activities, specific accrual, earnings distribution approach, total accruals and changing accounting choices. The present paper elaborates on the EM methods used in the banking industry (Table 5).

In the **Total Accruals Approach**, Healy (1985) used the discretionary accruals model to detect EM for the first time, but he assumed the non-discretionary portion of total accrual as a constant, which led to the detection of EM with error. To overcome this limitation, Jones (1991) introduced another model which controlled the change in the non-discretionary portion of total accruals. Dechow et al. (1995) presented a new model, called the Modified Jones model, after making some modifications in the Jones model whose power to test for EM was low. Earnings have two parts; one is accruals, and the other is cash flow. Total accruals are the adjustment in cash flows as per the judgement and estimates of management and can be segregated into non-discretionary and discretionary accruals. Non-discretionary accruals refer to those adjustments in cash flows that are dictated by accounting regulations, whereas discretionary accruals refer to the adjustment in cash flow at the will of the managers but within the flexibility provided by accounting regulations (Sun & Rath, 2010). Thus, discretionary accruals are used as a measure to detect EM.

The **Specific Accrual Approach** is widely used in the banking industry. In the specific accrual model, a single accrual is used to calculate EM. In the banking industry, LLP forms a major part of total accruals and has been extensively used by researchers. "An LLP is an expense set aside as an allowance for uncollected loans and loan payments. This provision is used to cover a number of factors associated with potential loan losses, including bad loans, customer defaults, and renegotiated terms of a loan that incur lower than previously estimated payments" (Kagan, 2019). The discretionary part of LLP is used to detect EM and has a negative relation with EM. When managers want to manage earnings upward, they decrease LLP and vice-versa. Nevertheless, some studies like Beaver

and Engel (1996) use loan loss reserve to detect EM. More than 50% of studies have used this approach, thereby exhibiting its popularity in the banking industry, where single accrual (LLP) forms a major part of the total accruals portfolio.

Schipper (1989) recognised that the **Real Activities Approach** can be used to detect EM. Gunny (2010) (as cited in Ruiz 2016, p. 6) explains that real activity manipulation refers to actions of managers that cause a change in financial or investment transaction or restructuring operations with the purpose of reaching a desired level of earnings. Real EM can be done in many ways, such as (i) increasing sales through lenient credit terms, (ii) overproduction to reduce fixed cost per unit, (iii) deliberately cutting research and development expenses or advertisement expenses, (iv) selling or purchasing of securities, etc. In the banking industry, realised securities gains and losses (RSGL) is used as a measure to manipulate earnings; however, some studies exhibit that commission and fee income (CF) are also used. Greater information asymmetry in public banks gives them an incentive to indulge in EM more than private banks by manipulating securities gains and losses (Beatty & Harris, 1998). Ozili (2017b) concludes that banks manage earnings through commission and fee income.

In the **Specific Accrual and Real Activities Approach**, a combination of two approaches is used to evaluate EM. Beatty et al. (2002) developed this approach in which discretionary LLP is calculated by applying the model developed by Beatty et al. (1995), and discretionary realised securities gains and losses are calculated by applying the model developed by Beatty and Harris (1998). EM is the difference between discretionary realised securities gains and losses and discretionary LLP.

The **Earnings Distribution Approach** is a relatively new, innovative and less explored approach in the literature. Burgstahler and Dichev (1997) developed this approach. This approach is mostly used in those cases where the achievement of earnings benchmark provides greater incentives to managers. Burgstahler and Dichev (1997) and Degeorge et al. (1999) recognise three benchmarks, which are loss avoidance, positive change in earnings and analysts' consensus forecast.

The selection of the right kind of approach is a tough task for detecting EM accurately. So, one should take into consideration the pros and cons of every approach before making a final selection. McNichols (2000) concludes that in the specific accrual approach, a direct relation can be estimated between the specific accrual and explanatory factors, and it helps researchers in developing an instinct for the important factors that have a potential impact on accruals, but it can be applied to only those industries where a single accrual forms a major portion of total accruals. The total accrual approach can be applied to all industries

which is the main reason for its wider acceptability. Sun and Rath (2010) explained that managers favour the accrual approach to manipulate earnings rather than resorting to manipulation through real activities. On the other hand, the use of managerial discretion in altering real activities needs to be disclosed and hence is easily detectable. Within accruals, the total accrual approach is good as it measures the effect of various accruals in aggregate, unlike in the case of specific accrual, but in the banking industry, specific accruals approach is more useful.

**Table 5: Constructs Used as Approaches in Detecting EM**

Approach	References
<b>Total Accrual Proxy - DA</b>	Yasuda et al. (2004), Mohammad et al. (2011), Ugbede et al. (2013), Abaoub et al. (2013), Onalo et al. (2014), Geagon & Hayes (2014), Bornemann et al. (2015), Suteja et al. (2016), Parveen et al. (2016), Nawaiseh (2016), Abdulazeez et al. (2016), Kolsi & Grassa (2017), Moghaddam & Abbaspour (2017), Uwuigbe et al. (2017), Pertiwi & Violita (2017), Akintayo & Salman (2018), Abbas (2018), Lestari et al. (2019) and Mohammed et al. (2019)
<b>Specific Accrual Proxy- LLP, LLA</b>	Greenawalt & Sinkey (1988), Moyer (1990), Wahlen (1994), Beatty et al. (1995), Beaver & Engel (1996), Chen & Daley (1996), Kim & Kross (1998), Robb (1998), Ahmed et al. (1999), Lobo & Yang (2001), Ismail et al. (2002), Laeven & Majnoni (2003), Kanagaretnam et al. (2003), Anandarajan et al. (2003), Kanagaretnam et al. (2004), Zhou & Chen (2004), Bikker & Metzmakers (2005), Kanagaretnam et al. (2005), Liu & Ryan (2006), Anandarajan et al. (2007), Chipalkatti & Rishi (2007), Ghosh (2007), Fonseca & Gonzalez (2008), Pérez et al. (2008), Chang et al. (2008), Kanagaretnam et al. (2010a), Kanagaretnam et al. (2010b), Kanagaretnam et al. (2011), Cheng et al. (2011), El Sood (2012), DeBoskey & Jiang (2012), Jallow et al. (2012), Leventis et al. (2012), Leventis et al. (2013), Quttainah et al. (2013), Uygur (2013), Elnahass et al. (2014), Bouvatier et al. (2014), Kanagaretnam et al. (2014), Krishnan & Zhang (2014), Othman & Mersni (2014), Taktak & Mbarki (2014), Ahmed et al. (2014), Curcio & Hasan (2015), Kanagaretnam et al. (2015), Hassan (2015), Fernando & Ekanayake (2015), Wu et al. (2016), Mersni & Ben Othman (2016), Morris et al. (2016), Bortoluzzo et al. (2016), Adzis et al. (2016), Santy et al. (2016), Shen (2016), Ashfaq & Saeed (2017), Ozili (2017a), Ozili (2017c), García-Sánchez et al. (2017), Lassoued et al. (2017), Ujah et al. (2017), Saidu et al. (2017), Alhadab & Al-Own (2017), Bourkhis & Najjar (2017), Di Martino et al. (2017), Jayeola et al. (2017), Petriwi & Violita (2017), Pinto & Picoto (2018), Isa et al. (2018), Dal Maso et al. (2018), Lassoued et al. (2018), Ozili & Outa (2018), Abu-Serdaneh (2018), Wu et al. (2018), Farouk & Isa (2018), Fan et al. (2019), Osma et al. (2019), Ozili (2019a), Jin et al. (2019), Alhadab & Al-Own (2019), Amidu & Issahaku (2019), Di Fabio (2019), Ozili (2019b), Ozili & Outa (2019b), Pramono et al. (2019), Shen & Wang (2019), Bacho et al. (2019), Bratten et al. (2019), Mune & Kolech (2019) and Vishnani et al. (2019)
<b>Real Activities Proxy- RSGL, CF Specific Accrual and Real Activities</b>	Beatty & Harris (1998), Alves Dantas et al. (2013), Greiner et al. (2015), Ozili (2017b) and Ozili & Outa (2019a)
<b>Earnings Distribution</b>	Collins et al. (1995), Beatty et al. (2002), Shrieves & Dahl (2003), Cornett et al. (2009), Cheng (2012), Cohen et al. (2014), Grougiou et al. (2014), Elleuch & Taktak (2015), Kumari & Pattanayak (2015) Bratten et al. (2017), Kumari & Pattanayak (2017) and De Chickera & Qi (2019) Shen & Chih (2005), Blasco & Pelegrin (2006) and Wu et al. (2012)

### 4.3 Consequences of Earnings Management

Researchers have investigated the consequences of EM on banks' performance and banks' responsibility towards stakeholders in the form of Corporate Social Responsibility (CSR) (Table 6). **Bank Performance** can be estimated through various measures such as Return on Equity, Return on Assets, Earning Per Share, etc. The financial performance of banks has a negative and significant relationship with LLP (Wu et al., 2016; Ujah et al., 2017; Ashfaq & Saeed, 2017), implying that with the increase in EM, the performance of bank decreases. Alhadab and Al-Own (2017) found that in European banks, a high level of EM results in inferior performance measured through return on asset and return on equity. Umoren et al. (2018) revealed that return on assets has a negative relation with EM. On the other hand, Saidu et al. (2017) did not

find any relationship between EM and bank performance. On the contrary, Abbas (2018) marked that both income-increasing and income-decreasing EM behaviour have a positive impact on bank value. A bank uses different resources of society to run its operations smoothly; therefore, it also has a responsibility towards society in terms of providing employment and providing services or goods at reasonable rates termed as **Corporate Social Responsibility (CSR)**. Grougiou et al. (2014) found that EM and CSR are positively and significantly associated with each other, indicating that the banks that are practising EM are also actively engaged in CSR activities. Bank managers view CSR as a pre-emptive approach to build a positive image and to avert the attention of outsiders from EM activities. Pertiwi and Violita (2017) found that the quality of the CSR report of Islamic banks is not affected by the presence of EM.

**Table 6: Constructs used as consequences of EM**

Consequences	References
Bank Performance	Wu et al. (2016), Ujah et al. (2017), Alhadab & Al-own (2017), Ashfaq & Saeed (2017), Saidu et al. (2017), Umoren et al. (2018), and Abbas (2018)
Corporate Social Responsibility	Grougiou et al. (2014) and Pertiwi & Violita (2017)

### 4.4 Mitigators of Earnings Management

EM has both good and bad sides to it. Few managers use EM to further the interests of other parties instead of their own, thereby creating wealth for the stakeholders. On the contrary, bad EM practices lead to fraud (Yaping, 2005). Schipper (1989) opined that it is not advisable to eliminate EM completely. He further clarifies that if compensation contracts are removed, it would result in the lower performance of managers. Dechow and Skinner (2000) also opined that complete elimination of EM is not an adequate solution because earnings that are influenced by managerial predictions and judgement about the future are a better measure of the economic performance of a company than cash flows. Table 7 provides a list of articles that have examined the variables that help to mitigate EM.

**Corporate Governance** is a system of monitoring and controlling the actions, policies, procedures and decisions of corporations. Zhou and Chen (2004) opined that good governance experts in the audit committee, active audit committee and board of directors play a significant role in

restraining EM. Board independence is negatively associated with EM (Cornett et al., 2009; Akintayo & Salman, 2018; Oladipupo & Ademola A, 2018), though board size has no impact on EM (Akintayo & Salman, 2018; Oladipupo & Ademola A, 2018). It is seen that corporate governance has a negative association with EM (Leventis et al., 2012; Jallow et al., 2012). The presence of foreign investors can help in reducing EM. Wu et al. (2012) observed that foreign strategic investors' presence in Chinese banks reduces loss avoidance EM. Ugbede et al. (2013) while investigating Malaysian and Nigerian banks, found that Nigerian banks resort to a higher level of EM compared to Malaysian banks. Mersni and Ben Othman (2016) found that large board size, presence of audit committee and small size of Shariah Supervisory Board (SSB) play a significant role in constraining the use of discretionary LLP to manipulate earnings. Kumari and Pattanayak (2017) revealed that in public banks, the size of the board and the number of audit meetings have a negative association with EM. On the other hand, in private

banks, independence of the board and the number of committees in the board play a significant role in mitigating EM. The reasons attributed to these differences are dissimilarity of ownership structure, regulatory requirements and other environmental variables. García-Sánchez et al. (2017) found that gender diversity and the presence of financial experts on board positively influence earnings quality.

**Auditors** are the persons who examine the company's financial records and assess the integrity and reliability of financial statements. It is evident that the specialisation of the auditor in the banking industry restrains the income-increasing EM (Kanagaretnam et al., 2010b; Debokey & Jiang, 2012) and the type of auditor moderates bank's behaviour of avoiding losses and meeting or beating previous year earnings (Kanagaretnam et al., 2010b). Further, high quality of audit is also helping in mitigating EM behaviour of bank managers (Bouvatier et al., 2014; Nawaiseh, 2016). Jayeola et al. (2017) remarked that joint audit and audit specialisation negatively influence EM. **Adoption of IFRS** by banks helps in controlling EM. Onalo et al. (2014) opined that the adoption of IFRS significantly reduces EM behaviour in Malaysian and Nigerian banks. Hassan (2015) revealed that different attributes, i.e., size, growth, profitability, liquidity and leverage of a bank have no relation with earnings quality in the pre-IFRS period, but subsequent to the adoption of IFRS, all the attributes get positively related with earnings quality except leverage. Adzis et al. (2016) marked that adoption of IAS 39 (International Accounting Standards) has led to the reduction of income smoothing behaviour in Hong-Kong banks. Ozili and Outa (2018) explained that the

implementation of IFRS creates an opportunity for managers to indulge in income smoothing practices instead of curbing them.

In banks, **sturdy regulations** regarding investor protection, effective supervision, accounting disclosure, accounting enforcement, etc., would prove helpful in reducing EM. It is found that stricter requirements related to accounting disclosure (Shen & Chih, 2005; Fonseca & Gonzalez, 2008; Uwuigbe et al., 2017), stringent supervisory regulations (Bouvatier et al., 2014), restrictions on activities of banks, effective private and official monitoring, and greater protection to investors (Fonseca & Gonzalez, 2008) play a significant role in controlling EM. In the case of Euro-countries that have adopted higher protection for creditors and sound banking regulation (Curcio & Hasan, 2015), and in the case of tighter legal protection to shareholders in the Middle East and North African (MENA) countries (Bourkhis & Najar, 2017), it has resulted in acting as a constraint to manipulating earnings. Di Martino et al. (2017) found that new banking regulations have a negative association with LLP. Dal Maso et al. (2018) found that accounting enforcement is directly related to earnings quality, as the rise in accounting enforcement results in a decline in the loss avoidance and the use of discretionary LLP to manage earnings behaviour of banks. **Religiosity** shows that someone holds strong religious beliefs. The organisational structure of banks also differs across countries due to **religiosity and cultures**. Kanagaretnam et al. (2015) discerned that countries where people are highly religious are less prone to EM. Religiosity decreases the benchmark-beating EM behaviour.

**Table 7: Constructs used as mitigators of EM**

Mitigator	References
Corporate Governance	Zhou & Chen (2004), Cornett et al. (2009), Leventis et al. (2012), Jallow et al. (2012), Wu et al. (2012), Ugbede et al. (2013), Mersni & Ben Othman (2016), Kumari & Pattanayak (2017), García-Sánchez et al. (2017), Akintayo & Salman (2018) and Oladipupo & Ademola A (2018)
Auditor related variables	Kanagaretnam et al. (2010b), Debokey & Jiang (2012), Bouvatier (2014), Nawaiseh (2016) and Jayeola et al. (2017)
Adoption of IFRS	Onalo et al. (2014), Hassan (2015), Adzis et al. (2016), Santy et al. (2016) and Ozili & Outa (2018)
Sturdy Regulations	Shen & Chih (2005), Fonseca & Gonzalez (2008), Bouvatier et al., (2014) Curcio & Hasan (2015), Bourkhis & Najar (2017), Di Martino et al. (2017), Uwuigbe et al. (2017) and Dal Maso et al. (2018)
Culture and Religiosity	Kanagaretnam et al. (2015)

#### 4.5. Research Gap and Area for Future Research

Research on EM in the banking industry is still evolving. The review helped to identify research gaps or the areas related to EM that need to be explored in the banking industry. There is a dearth of research on EM by banks in developing countries like India. The results drawn from the studies in developed countries are not applicable at par to the banking system of developing countries due to differences in regulatory mechanisms and banking structures. Financial markets have globalised. Bank manager's motivations to indulge in EM and methods of manipulating earnings differ across countries. Thus, in future studies, samples can be drawn from different countries to make an international comparison of EM behaviour. The specific accrual model has been extensively used to calculate EM, whereas few studies have used a combination of models simultaneously. Researchers can use more than one approach to measure EM to assess which approach better explains EM behaviour.

#### 5. Conclusion

Manipulation of earnings in banks can badly hit the growth of an economy. When managers indulge in EM, the financial statements fail to convey accurate information about the bank's value and its risk level, and it may also not be able to provide early warning signals which may lead to bankruptcy at later stages. This paper examined EM in the banking industry through a systematic literature review. In this review paper, articles are classified on the basis of publication year, country of study, journal of publication, citation analysis etc., to give a comprehensive idea of all the articles. A conceptual framework of EM is also developed. It is concluded that bank managers take undue advantage of discretion in accounting choices to hide their inefficiencies, to increase their compensation, to avoid debt covenant violation, to signal private information to stakeholders, and there may be many other factors such as threshold achievement, bank risk, capital adequacy regulations etc. that motivate managers to indulge in EM practices. Though EM may be measured through various approaches, the most popular approach in the banking industry is the specific accrual approach in which LLP is widely taken as a proxy for EM. Further, the paper discloses that EM influences banks' profitability and reduces the reliability of the CSR report. Thus, there is a need to control and mitigate EM practices through effective corporate governance, implementation of IFRS in the true spirit, enhanced audit quality, sturdy regulations and

propagation of ethical business practices in the bank. Only good quality financial reports can help in gaining the confidence of the public and providing valuable and relevant information to the stakeholders.

#### References

- Abaoub, Ezzeddine, Kaouther Homrani, and Souha Ben Gamra. "The determinants of EM: Empirical evidence in the Tunisian banking industry (1999-2010)." *Journal of Business Studies Quarterly* 4.3 (2013): 62-72.
- Abbas, Ahmad. "EM in banking industry and its impact on the firm value." *AKRUAL: Jurnal Akuntansi* 10.1 (2018): 69-84.
- Abdulazeez, D. A., L. Ndibe, and A. M. Mercy. "Corporate governance and financial performance of listed deposit money banks in Nigeria." *Journal of Accounting and Marketing* 5.1 (2016): 1-6.
- Abu-Serdaneh, Jamal. "Bank loan-loss accounts, income smoothing, capital management, signaling and procyclicality." *Journal of Financial Reporting and Accounting* 16.4 (2018): 677-693.
- Adzis, Azira Abdul, David WL Tripe, and Paul Dunmore. "IAS 39, income smoothing, and procyclicality: evidence from Hong Kong banks." *Journal of Financial Economic Policy* 8.1 (2016): 80-94.
- Ahmed, Abubakar, Abdu Y. Mohammed, and Abdulmarooph O. Adisa. "LLP and EM in Nigerian deposit money banks." *Mediterranean Journal of Social Sciences* 5.17 (2014): 49-49.
- Ahmed, Anwer S., Carolyn Takeda, and Shawn Thomas. "Bank LLPs: A reexamination of capital management, EM and signaling effects." *Journal of accounting and economics* 28.1 (1999): 1-25.
- Akintayo, Joel S., and Salman, Ramat T. "Effects of audit quality and corporate governance on EM of quoted deposit money banks in Nigeria." *International Journal of Economics and Management Engineering* 12.6 (2018): 690-696.

- Alhadab, Mohammad M., and Bassam Al-Own. "EM and banks performance: Evidence from Europe." *International Journal of Academic Research in Accounting, Finance and Management Sciences* 7.4 (2017): 134-145.
- Alhadab, Mohammad, and Bassam, Al-Own. "EM and equity incentives: Evidence from the European banking industry." *International Journal of Accounting & Information Management* 27.2 (2019): 244-261.
- Alves Dantas, José, et al. "Securities-based EM in banks: Validation of a two-stage model." *Revista Contabilidade & Finanças-USP* 24.61 (2013): 37-54.
- Amidu, Mohammed, and Haruna Issahaku. "Do globalisation and adoption of IFRS by banks in Africa lead to less EM?." *Journal of Financial Reporting and Accounting* 17.2 (2019): 222-248.
- Anandarajan, Asokan, Iftekhar Hasan, and Ana Lozano-Vivas. "The role of LLPs in EM, capital management, and signaling: The Spanish experience." *Advances in International Accounting* 16.1 (2003): 45-65.
- Anandarajan, Asokan, Iftekhar Hasan, and Cornelia McCarthy. "Use of LLPs for capital, EM and signalling by Australian banks." *Accounting & Finance* 47.3 (2007): 357-379.
- Ashfaq, Saira, and Muhammad Ali Saeed. "Financial performance of banking industry of pakistan: The role of corporate governance index and EM practices." *Asian Journal of Scientific Research* 10.2 (2017): 97-103.
- Bacho, Muhamad Sufian Hadi Bin, Rozita Uji Mohammad, and Imbarine Bujang. "The roles of earning management, capital management and banks specific factors in estimating LLPs: Evidence from Malaysia and Indonesia." *The Business and Management Review* 10.3 (2019): 258-265.
- Beatty, Anne L., Bin Ke, and Kathy R. Petroni. "EM to avoid earnings declines across publicly and privately held banks." *The Accounting Review* 77.3 (2002): 547-570.
- Beatty, Anne, and David G. Harris. "The effects of taxes, agency costs and information asymmetry on EM: A comparison of public and private firms." *Review of Accounting Studies* 4.3-4 (1998): 299-326.
- Beatty, Anne, Sandra L. Chamberlain, and Joseph Magliolo. "Managing financial reports of commercial banks: The influence of taxes, regulatory capital, and earnings." *Journal of Accounting Research* 33.2 (1995): 231-261.
- Beaver, William H., and Ellen E. Engel. "Discretionary behavior with respect to allowances for loan losses and the behavior of security prices." *Journal of Accounting and Economics* 22.1-3 (1996): 177-206.
- Bikker, Jacob A., and Paul AJ Metzmakers. "Bank provisioning behaviour and procyclicality." *Journal of International Financial Markets, Institutions and Money* 15.2 (2005): 141-157.
- Blasco, Natividad, and Begona Pelegrin. "A new methodological approach for detecting income smoothing in small samples: An application to the case of Spanish savings banks." *Journal of Accounting, Auditing & Finance* 21.4 (2006): 347-372.
- Bornemann, Sven, et al. "Earnings baths by CEOs during turnovers: Empirical evidence from German savings banks." *Journal of Banking & Finance* 53.1 (2015): 188-201.
- Bortoluzzo, Adriana Bruscatto, Hsia Hua Sheng, and Ana Luiza Porto Gomes. "Earning management in Brazilian financial institutions." *Revista de Administração* 51.2 (2016): 182-197.
- Bourkhis, Khawla, and Mohamed Wajdi Najar. "The Effect of Ownership and Regulation on Bank Earnings Quality an investigation of the conventional and Islamic banks in MENA region." *European Journal of Islamic Finance* 6 (2017): 1-16.
- Bouvatier, Vincent, Laetitia Lepetit, and Frank Strobel. "Bank income smoothing, ownership concentration and the regulatory environment." *Journal of Banking & Finance* 41.1 (2014): 253-270.
- Bratten, Brian, Monika Causholli, and Linda A. Myers. "Fair value exposure, auditor specialisation, and banks' discretionary use of the LLP." *Journal of Accounting, Auditing & Finance* (2017): 1-31.
- Bratten, Brian, Monika Causholli, and Thomas C. Omer. "Audit firm tenure, bank complexity, and financial reporting quality." *Contemporary Accounting Research* 36.1 (2019): 295-325.



- Burgstahler, David, and Ilia Dichev. "EM to avoid earnings decreases and losses." *Journal of accounting and economics* 24.1 (1997): 99-126.
- Chang, Ruey-Dang, Wen-Hua Shen, and Chun-Ju Fang. "Discretionary LLPs and EM for the banking industry." *International Business & Economics Research Journal (IBER)* 7.3 (2008): 9-20.
- Chen, Peter, and Lane Daley. "Regulatory capital, tax, and EM effects on loan loss accruals in the Canadian banking industry." *Contemporary Accounting Research* 13.1 (1996): 91-128.
- Cheng, Qiang, Terry Warfield, and Minlei Ye. "Equity incentives and EM: evidence from the banking industry." *Journal of Accounting, Auditing & Finance* 26.2 (2011): 317-349.
- Cheng, Xiaoyan. "Managing specific accruals vs. structuring transactions: Evidence from banking industry." *Advances in Accounting* 28.1 (2012): 22-37.
- Chipalkatti, Niranjan, and Meenakshi Rishi. "Do Indian banks understate their bad loans?." *The Journal of Developing Areas* 40.2 (2007): 75-91.
- Cohen, Lee J., et al. "Bank EM and tail risk during the financial crisis." *Journal of Money, Credit and Banking* 46.1 (2014): 171-197.
- Collins, Julie H., Douglas A. Shackelford, and James M. Wahlen. "Bank differences in the coordination of regulatory capital, earnings, and taxes." *Journal of Accounting Research* 33.2 (1995): 263-291.
- Cornett, Marcia Millon, Jamie John McNutt, and Hassan Tehranian. "Corporate governance and EM at large US bank holding companies." *Journal of Corporate Finance* 15.4 (2009): 412-430.
- Curcio, Domenico, and Iftekhar Hasan. "Earnings and capital management and signaling: The use of loan-loss provisions by European banks." *The European Journal of Finance* 21.1 (2015): 26-50.
- Dal Maso, Lorenzo, et al. "The influence of accounting enforcement on earnings quality of banks: Implications of bank regulation and the global financial crisis." *Journal of Accounting and Public Policy* 37.5 (2018): 402-419.
- De Chickera, GK Suren W., and Liu Qi. "Accounting Rules on Loan Losses and Security Gains Contribute to EM for the Banking Industry in Sri Lanka." *South Asian Journal of Social Studies and Economics* 3.3 (2019): 1-16.
- DeBoskey, David Gregory, and Wei Jiang. "EM and auditor specialisation in the post-sox era: An examination of the banking industry." *Journal of Banking & Finance* 36.2 (2012): 613-623.
- Dechow, Patricia M., and Douglas J. Skinner. "EM: Reconciling the views of accounting academics, practitioners, and regulators." *Accounting Horizons* 14.2 (2000): 235-250.
- Dechow, Patricia M., Richard G. Sloan, and Amy P. Sweeney. "Detecting EM." *Accounting Review* 70.2 (1995): 193-225.
- DeGeorge, Francois, Jayendu Patel, and Richard Zeckhauser. "EM to exceed thresholds." *The Journal of Business* 72.1 (1999): 1-33.
- Di Fabio, Costanza. "Does the business model influence income smoothing? Evidence from European banks." *Journal of Applied Accounting Research* 20.3 (2019): 311-330.
- Di Martino, Giuseppe, et al. "Does the new European banking regulation discourage EM?." *International Business Research* 10.10 (2017): 45-56.
- Dutta, Sunil, and Frank Gigler. "The effect of earnings forecasts on EM." *Journal of Accounting Research* 40.3 (2002): 631-655.
- El Sood, Heba Abou. "LLPing and income smoothing in US banks pre and post the financial crisis." *International Review of Financial Analysis* 25.3 (2012): 64-72.
- Elleuch, Sarra Hamza, and Nelila Boulila Taktak. "EM and evolution of the banking regulation." *Journal of Accounting in Emerging Economies* 5.2 (2015): 150-169.
- Elnahass, Marwa, Marwan Izzeldin, and Omneya Abdelsalam. "LLPs, bank valuations and discretion: A comparative study between conventional and Islamic banks." *Journal of Economic Behavior & Organization* 103.1 (2014): S160-S173.

- Fan, Yaoyao, et al. "Women on boards and bank EM: From zero to hero." *Journal of Banking & Finance* 107 (2019): 105-607.
- Farouk, Musa Adeiza, and Muhammad Aminu Isa. "EM of Listed Deposit Banks (DMBs) in Nigeria: A Test of Chang, Shen and Fang (2008) Model." *International Journal of Finance and Accounting* 7.2 (2018): 49-55.
- Fernando, W. D. I., and E. M. N. N. Ekanayake. "Do commercial banks use LLPs to smooth their income? empirical evidence from Sri Lankan commercial banks." *Journal of Finance and Bank Management* 3.1 (2015): 167-179.
- Fonseca, Ana Rosa, and Francisco Gonzalez. "Cross-country determinants of bank income smoothing by managing loan-loss provisions." *Journal of Banking & Finance* 32.2 (2008): 217-228.
- Garcia-Sanchez, Isabel-Maria, Jennifer Martínez-Ferrero, and Emma García-Meca. "Gender diversity, financial expertise and its effects on accounting quality." *Management Decision* 55.2 (2017): 347-382.
- Geagon, Margot S., and John V. Hayes. "Evaluating EM in financial institutions." *Management and Economics Research Journal* 1 (2015): 1-12.
- Ghosh, Saibal. "LLPs, earnings, capital management and signalling: Evidence from Indian Banks." *Global Economic Review* 36.2 (2007): 121-136.
- Greenawalt, Mary Brady, and Joseph F. Sinkey. "Bank loan-loss provisions and the income-smoothing hypothesis: An empirical analysis, 1976-1984." *Journal of Financial Services Research* 1.4 (1988): 301-318.
- Greiner, Adam J. "The effect of the fair value option on bank earnings and regulatory capital management: Evidence from realised securities gains and losses." *Advances in Accounting* 31.1 (2015): 33-41.
- Grougiou, Vassiliki, et al. "Corporate social responsibility and EM in US banks." *Accounting Forum* 38.3 (2014): 155-169.
- Hassan, Shehu Usman. "Adoption of international financial reporting standards and earnings quality in listed deposit money banks in Nigeria." *Procedia Economics and Finance* 28 (2015): 92-101.
- Healy, Paul M. "The effect of bonus schemes on accounting decisions." *Journal of Accounting and Economics* 7.1-3 (1985): 85-107.
- Healy, Paul M., and James M. Wahlen. "A review of the earnings management literature and its implications for standard setting." *Accounting Horizons* 13.4 (1999): 365-383.
- Isa, Mohd Yaziz Mohd, et al. "Determinants of LLPs of commercial banks in Malaysia." *Journal of Financial Reporting and Accounting* 16.1 (2018): 24-48.
- Ismail, Abd Ghafar, and Adelina Tan Be Lay. "Bank loan portfolio composition and the disclosure of LLPs: Empirical evidence from Malaysian banks." *Asian Review of Accounting* 10.1 (2002): 147-162.
- Jallow, Kumba, Stergios Leventis, and Panagiotis Dimitropoulos. "The role of corporate governance in EM: experience from US banks." *Journal of Applied Accounting Research* 13.2 (2012): 161-177.
- Jayeola, O., T. Agbatogun, and T. Akinrinlola. "Audit quality and EM among Nigerian listed deposit money banks." *International Journal of Accounting Research* 5.2 (2017): 1-5.
- Jensen, Michael C., and William H. Meckling. "Theory of the firm: Managerial behavior, agency costs, and ownership structure." *Journal of Financial Economics* 3.4 (1976): 305-360.
- Jin, Justin Yiqiang, et al. "Economic policy uncertainty and bank earnings opacity." *Journal of Accounting and Public Policy* 38.3 (2019): 199-218.
- Jones, Jennifer J. "EM during import relief investigations." *Journal of Accounting Research* 29.2 (1991): 193-228.
- Kagan, Julia. "LLP." 9 April 2019, <https://www.investopedia.com/terms/l/loanlossprovision.asp>. Accessed 20 December 2019.



- Kanagaretnam, Kiridaran, Chee Yeow Lim, and Gerald J. Lobo. "Auditor reputation and EM: International evidence from the banking industry." *Journal of Banking & Finance* 34.10 (2010b): 2318-2327.
- Kanagaretnam, Kiridaran, Chee Yeow Lim, and Gerald J. Lobo. "Effects of national culture on earnings quality of banks." *Journal of International Business Studies* 42.6 (2011): 853-874.
- Kanagaretnam, Kiridaran, Chee Yeow Lim, and Gerald J. Lobo. "Effects of international institutional factors on earnings quality of banks." *Journal of Banking & Finance* 39 (2014): 87-106.
- Kanagaretnam, Kiridaran, Gerald J. Lobo, and Chong Wang. "Religiosity and EM: International evidence from the banking industry." *Journal of Business Ethics* 132.2 (2015): 277-296.
- Kanagaretnam, Kiridaran, Gerald J. Lobo, and Dong-Hoon Yang. "Determinants of signaling by banks through LLPs." *Journal of Business Research* 58.3 (2005): 312-320.
- Kanagaretnam, Kiridaran, Gerald J. Lobo, and Robert Mathieu. "EM to reduce earnings variability: evidence from bank LLPs." *Review of Accounting and Finance* (2004).
- Kanagaretnam, Kiridaran, Gerald J. Lobo, and Robert Mathieu. "Managerial incentives for income smoothing through bank LLPs." *Review of Quantitative Finance and Accounting* 20.1 (2003): 63-80.
- Kanagaretnam, Kiridaran, Gopal V. Krishnan, and Gerald J. Lobo. "An empirical analysis of auditor independence in the banking industry." *The Accounting Review* 85.6 (2010a): 2011-2046.
- Kim, Myung-Sun, and William Kross. "The impact of the 1989 change in bank capital standards on LLPs and loan write-offs." *Journal of Accounting and Economics* 25.1 (1998): 69-99.
- Kolsi, Mohamed Chakib, and Rihab Grassa. "Did corporate governance mechanisms affect EM? Further evidence from GCC Islamic banks." *International Journal of Islamic and Middle Eastern Finance and Management* (2017).
- Krishnan, Gopal V., and Yinqi Zhang. "Is there a relation between audit fee cuts during the global financial crisis and banks' financial reporting quality?." *Journal of Accounting and Public Policy* 33.3 (2014): 279-300.
- Kumari, Prity, and Jamini Kanta Pattanayak. "Linking EM practices and corporate governance system with the firms' financial performance." *Journal of Financial Crime* 24.2 (2017): 223-241.
- Kumari, P., and J. Pattanayak. "EM and firm performance: An insight into Indian commercial banks." *Journal of Scientific Research and Development* 2.11 (2015): 76-84.
- Laeven, Luc, and Giovanni Majnoni. "LLPing and economic slowdowns: too much, too late?." *Journal of financial intermediation* 12.2 (2003): 178-197.
- Lassoued, Naima, Mouna Ben Rejeb Attia, and Houda Sassi. "EM in Islamic and conventional banks: does ownership structure matter? Evidence from the MENA region." *Journal of International Accounting, Auditing and Taxation* 30 (2018): 85-105.
- Lassoued, Naima, Mouna Ben Rejeb Attia, and Houda Sassi. "EM and ownership structure in emerging market." *Managerial Finance* 43.10 (2017): 1117-1136.
- "Lehman Brothers." *Wikipedia*, 21 Nov. 2019, [https://en.wikipedia.org/wiki/Lehman\\_Brothers](https://en.wikipedia.org/wiki/Lehman_Brothers). Accessed 21 Nov. 2019.
- Lestari, Puji, Syaiful Azhar, and Utik Nurwijayanti. "The determinant of EM: 'Size aspect' and 'non performing loans'." *MIMBAR: Jurnal Sosial dan Pembangunan* 35.1 (2019): 104-114.
- Leventis, Stergios, Panagiotis Dimitropoulos, and Stephen Owusu Ansah. "Corporate governance and accounting conservatism: Evidence from the banking industry." *Corporate Governance: An International Review* 21.3 (2013): 264-286.
- Leventis, Stergios, Panagiotis E. Dimitropoulos, and Asokan Anandarajan. "Signalling by banks using LLPs: The case of the European Union." *Journal of Economic Studies* 39.5 (2012): 604-618.

- “List of corporate collapses and scandals.” *Wikipedia*, 20 Nov. 2019, [https://en.wikipedia.org/wiki/List\\_of\\_corporate\\_collapses\\_and\\_scandals](https://en.wikipedia.org/wiki/List_of_corporate_collapses_and_scandals). Accessed 20 Nov. 2019.
- Liu, Chi-Chun, and Stephen G. Ryan. “Income smoothing over the business cycle: Changes in banks’ coordinated management of provisions for loan losses and loan charge-offs from the pre-1990 bust to the 1990s boom.” *The Accounting Review* 81.2 (2006): 421-441.
- Lobo, Gerald J., and Dong-Hoon Yang. “Bank managers’ heterogeneous decisions on discretionary LLPs.” *Review of Quantitative Finance and Accounting* 16.3 (2001): 223-250.
- Magrath, Lorraine, and Leonard G. Weld. “Abusive EM and early warning signs.” *CPA Journal* 72.8 (2002): 50-54.
- McNichols, Maureen F. “Research design issues in EM studies.” *Journal of accounting and public policy* 19.4-5 (2000): 313-345.
- Mersni, Hounaida, and Hakim Ben Othman. “The impact of corporate governance mechanisms on EM in Islamic banks in the Middle East region.” *Journal of Islamic Accounting and Business Research* 7.4 (2016): 318-348.
- Mistry, Jigar. “Financial markets: Gatekeepers of money.” *Business Standard*, 2 August 2019, p. 9.
- Moghaddam, Abdolkarim, and Narges Abbaspour. “The effect of leverage and liquidity ratios on EM and capital of banks listed on the Tehran Stock Exchange.” *International Review of Management and Marketing* 7.4 (2017): 99-107.
- Mohammad, Wan Masliza Wan, Shaista Wasiuzzaman, and Rapihah Mohd Zaini. “Panel data analysis of the relationship between EM, bank risks, LLP and dividend per share.” *Journal of Business and Policy Research* 6.1 (2011): 46-56.
- Mohammed, Ishaq Ahmed, Ayoib Che-Ahmad, and Mazrah Malek. “Regulatory changes, board monitoring and EM in Nigerian financial institutions.” *DLSU Business & Economics Review* 28.2 (2019): 152-168.
- Morris, Richard D., Helen Kang, and Jing Jie. “The determinants and value relevance of banks’ discretionary LLPs during the financial crisis.” *Journal of Contemporary Accounting & Economics* 12.2 (2016): 176-190.
- Moyer, Susan E. “Capital adequacy ratio regulations and accounting choices in commercial banks.” *Journal of Accounting and Economics* 13.2 (1990): 123-154.
- Mune, Tesfamlak Mulatu, and Abiy Getahun Kolech. “Income smoothing via LLPs and IFRS implication: Evidence from Ethiopian banks.” *European Journal of Business and Management* 11.16 (2019): 40-52.
- Nawaiseh, Mohammad Ebrahim. “Impact of external audit quality on EM by banking firms: Evidence from Jordan.” *British Journal of Applied Science and Technology* 12.2 (2016): 1-14.
- Oladipupo, Olaoye Festus, and Ademola A. Adewumi. “Corporate governance and earning management of deposit money banks in Nigeria.” *International Journal of Scientific & Engineering Research*, 9.7 (2018): 184-199.
- Onalo, Ugbede, Mohd Lizam, and Ahmad Kaseri. “The effects of changes in accounting standards on EM of Malaysia and Nigeria banks.” *European Journal of Accounting Auditing and Finance Research* 2.8 (2014): 15-42.
- Osma, Beatriz García, Araceli Mora, and Luis Porcuna-Enguix. “Prudential supervisors’ independence and income smoothing in European banks.” *Journal of Banking & Finance* 102 (2019): 156-176.
- Othman, Hakim Ben, and Hounaida Mersni. “The use of discretionary LLPs by Islamic banks and conventional banks in the Middle East region.” *Studies in Economics and Finance* 31.1 (2014): 106-128.
- Ozili, Peterson K. “Bank EM and income smoothing using commission and fee income.” *International Journal of Managerial Finance* 13.4 (2017b): 419-439.
- Ozili, Peterson K. “Bank earnings smoothing, audit quality and procyclicality in Africa.” *Review of Accounting and Finance* 16.2 (2017c): 142-161.

- Ozili, Peterson K. "Bank income smoothing, institutions and corruption." *Research in International Business and Finance* 49 (2019a): 82-99.
- Ozili, Peterson K. "Discretionary provisioning practices among Western European banks." *Journal of Financial Economic Policy* 9.1 (2017a): 109-118.
- Ozili, Peterson K. "Impact of IAS 39 reclassification on income smoothing by European banks." *Journal of Financial Reporting and Accounting* 17.3 (2019b): 537-553.
- Ozili, Peterson K., and Erick Outa. "Bank EM using commission and fee income." *Journal of Applied Accounting Research* 20.2 (2019a): 172-189.
- Ozili, Peterson K., and Erick R. Outa. "Bank earnings smoothing during mandatory IFRS adoption in Nigeria." *African Journal of Economic and Management Studies* 10.1 (2019b): 32-47.
- Ozili, Peterson K., and Erick Rading Outa. "Bank income smoothing in South Africa: role of ownership, IFRS and economic fluctuation." *International Journal of Emerging Markets* 13.5 (2018): 1372-1394.
- Parveen, Shagufta, et al. "Impact of ownership structure on EM: Evidence from Pakistani banking sector." *Journal of Poverty, Investment and Development* 23 (2016): 24-34.
- Pérez, Daniel, Vicente Salas-Fumas, and Jesus Saurina. "Earnings and capital management in alternative LLP regulatory regimes." *European Accounting Review* 17.3 (2008): 423-445.
- Pertiwi, Dina Andayani, and Evony Silvino Violita. "The effects of earning management and financial performance on the quality of Islamic banking social responsibility report." *2nd International Conference on Indonesian Economy and Development (ICIED 2017)*. Atlantis Press, 2017.
- Pinto, Inês, and Winnie Ng Picoto. "Earnings and capital management in European banks—Combining a multivariate regression with a qualitative comparative analysis." *Journal of Business Research* 89 (2018): 258-264.
- Pramono, Sigid Eko, Hilda Rossieta, and Wahyoe Soedarmono. "Income smoothing behavior and the procyclical effect of LLPs in Islamic banks." *Journal of Islamic Accounting and Business Research* 10.1 (2019): 21-34.
- Press Trust of India. "Bank fraud at record ₹ 71,500 cr in 2018-19, says RBI." *Business Standard*, 4 June 2019, p. 4.
- Quttainah, Majdi A., Liang Song, and Qiang Wu. "Do Islamic banks employ less EM?." *Journal of International Financial Management & Accounting* 24.3 (2013): 203-233.
- Robb, Sean WG. "The effect of analysts' forecasts on EM in financial institutions." *Journal of Financial Research* 21.3 (1998): 315-331.
- Ross, Stephen A. "The determination of financial structure: The incentive-signalling approach." *The Bell Journal of Economics* 8 (1977): 23-40.
- Ross, Stephen A. "The economic theory of agency: The principal's problem." *The American Economic Review* 63.2 (1973): 134-139.
- Roy, Anup, and Panda, Subrata. "Crisis-hit PMC used dummy accounts to escape RBI attention." *Business Standard*, 30 September 2019, p.1.
- Ruiz, Cinthia Valle. "Literature review of EM: Who, why, when, how and what for." *Finnish Business Review* 21.1 (2016): 74-87.
- Saidu, Hauwa et al. "The impact of EM on financial performance of listed deposit money banks in Nigeria." *Journal of Accounting and Financial Management* 3.2 (2017): 39-50.
- Santy, Prima, Tawakkal Tawakkal, and Grace T. Pontoh. "The impact of IFRS adoption on EM in banking companies in Indonesia stock exchange." *Jurnal Akuntansi Dan Auditing* 13.2 (2016): 176-190.
- Schipper, Katherine. "EM." *Accounting horizons* 3.4 (1989): 91-102.
- Shen, Chung-Hua, and Chien-An Wang. "Do new brooms sweep clean? Evidence that new CEOs take a 'Big Bath' in the banking industry." *Journal of Emerging Market Finance* 18.1 (2019): 106-144.

- Shen, Chung-Hua, and Hsiang-Lin Chih. "Investor protection, prospect theory, and EM: An international comparison of the banking industry." *Journal of Banking & Finance* 29.10 (2005): 2675-2697.
- Shen, Lu. "Research on industry competition, ownership structure and EM: Empirical analysis based on listed bank." *International Journal of Smart Home* 10.3 (2016): 221-230.
- Shrieves, Ronald E., and Drew Dahl. "Discretionary accounting and the behavior of Japanese banks under financial duress." *Journal of Banking & Finance* 27.7 (2003): 1219-1243.
- Spence, Michael. "Job Market Signalling": The Quarterly Journal of Economics. 87.3 (1973): 355-374.
- Sun, Lan, and Subhrendu Rath. "EM research: A review of contemporary research methods." *Global Review of Accounting and Finance* 1.1 (2010): 121-135.
- Suteja, Jaja, Ardi Gunardi, and Annisa Mirawati. "Moderating effect of EM on the relationship between corporate social responsibility disclosure and profitability of banks in Indonesia." *International Journal of Economics and Financial Issues* 6.4 (2016): 1360-1365.
- Taktak, Neila Boulila, and Ibtissem Mbarki. "Board characteristics, external auditing quality and EM." *Journal of Accounting in Emerging Economies* 4.1 (2014): 79-96.
- Ugbede, Onalo, Lizam, Mohd, and Kaseri, Ahmad. "Corporate governance and EM: Empirical evidence from Malaysian and Nigerian banks." *Asian Journal of Management Sciences and Education* 2.4 (2013): 1-21.
- Ujah, Nacasius U., Jorge Brusa, and Collins E. Okafor. "The influence of EM and bank structure on bank performance." *Managerial Finance* 43.7 (2017): 761-773.
- Umoren, Adebimpe, Ikpantan, Itoro, and Ededeh, Daniel. "EM and financial performance of deposit money banks in Nigeria." *Research Journal of Finance and Accounting* 9.22 (2018): 94-100.
- Uwuigbe, Uwalomwa, et al. "Disclosure quality and EM of selected Nigerian banks." *The Journal of Internet Banking and Commerce* 22.S8 (2017): 1-12.
- Uygur, Ozge. "EM and executive compensation: Evidence from banking industry." *Banking & Finance Review* 5.2 (2013): 33-54.
- Vishnani, Sushma, et al. "EM, capital management and signalling behaviour of Indian banks." *Asia-Pacific Financial Markets* 26.3 (2019): 285-295.
- Wahl, Mike. "The ownership structure of corporations: Owners classification & typology." *EBS Review* 21.1 (2006): 94-103.
- Wahlen, James M. "The nature of information in commercial bank loan loss disclosures." *Accounting Review* 69.3 (1994): 455-478.
- Watts, Ross L., and Jerold L. Zimmerman. "Positive accounting theory." (1986).
- Wu, Chiu-Hui, Cherng G. Ding, and Cheng-Ying Wu. "On the assessment of the performance in EM for the banking industry: the case of China's banks." *Applied Economics Letters* 25.20 (2018): 1463-1465.
- Wu, Meng-Wen, et al. "Impact of foreign strategic investors on EM in Chinese banks." *Emerging Markets Finance and Trade* 48.5 (2012): 115-133.
- Wu, Yueh-Cheng, et al. "The impact of EM on the performance of ASEAN banks." *Economic Modelling* 53 (2016): 156-165.
- Yaping, Ning. "A different perspective of EM." *Canadian Social Science* 2.6 (2006): 53-59.
- Yaping, Ning. "The theoretical framework of EM." *Canadian Social Science* 2.2 (2005): 32-38.
- Yasuda, Yukihiro, Shin'ya Okuda, and Masaru Konishi. "The relationship between bank risk and EM: evidence from Japan." *Review of Quantitative Finance and Accounting* 22.3 (2004): 233-248.
- Zhou, Jian, and Ken Y. Chen. "Audit committee, board characteristics and EM by commercial banks." *Unpublished Manuscript* (2004).

\*\*\*\*\*

---

# The Impact of Extrinsic and Intrinsic Rewards on Employee Commitment in the Public Sector Manufacturing Companies in India

**Amal Jishnu H.M.**

Assistant Manager (Corporate Business Development)  
Prism Johnson Ltd  
H&R Johnson (India) Division.Mumbai.  
E mail: amal.jishnu8@gmail.com

**Dr. Hareendrakumar V.R.**

Visiting Professor  
CET School of Management  
Email: hari.vr.kumar@mail.com

## A b s t r a c t

Rewards are very critical to attracting, motivating, and retaining talents. Reward satisfaction plays a determinant role in shaping employee attitudes, those reflected in their performance. This study is intended to assess the impact of extrinsic and intrinsic rewards on employee commitment among the public sector employees in India. The sample subjects are chosen from ten public sector companies using the method of stratified random sampling and the data is analysed through Structural Equation Modelling (SEM). The results reiterated the impact of extrinsic and intrinsic rewards on employee commitment and the importance of intrinsic rewards over extrinsic rewards. The findings are beneficial to the practicing managers in formulating typical reward packages based on employee preferences by mixing extrinsic and intrinsic rewards in varying proportions.

**Keywords:** *Reward management, Total rewards, Extrinsic rewards, Intrinsic Rewards, Employee Commitment*

## 1. Introduction

The employee expectations and perceptions are rapidly changing due to the fast changes taking place in the organisational context (Stairs, 2005). A shift of employee interest from physical requirements to psychological needs is evident in the present-day literature as part of these contextual changes. Employee responses towards these changes is an area of attention of employers, and this has resulted in finding out new approaches to manage employee rewards, both extrinsically and intrinsically, so as to satisfy both physical and psychological requirements (Harter et al., 2002; Luthans, 2002; Linley et al., 2005). This realisation about the change in employee expectations, on another side, led the management to study and research the effect of employee perceptions in determining the financial performance of the organisations and the impact of people management strategies and policies on shaping employee behaviours. Employee commitment has a determinant role in ensuring customer commitment towards the organisation. It is necessary for every organisation to maintain committed employees for organisational success and wellbeing (Fischer, 2003). Rucci et al. (1998) clearly identified a strong bond between employee commitment and customer commitment within the organisation. As per their study, a five percent increase in employee commitment may cause a three percent change in customer commitment.

Traditionally reward management is supposed to attract, retain, and motivate employees in a desirable manner so as to get optimum employee performance. This connection of rewards with performance is the reason for developing the 'pay for performance strategy'. Over the last decade, employers are practising reward strategy by aligning employee performance with the organisation's strategic goals (Higgs, 2004; Brown, 2006; Gerhart, Rynes, & Fulmer, 2009). This concept is the core of strategic human resource management, where the HRM strategies are aligned with business strategies for leveraging the value of human capital for improved organisational performance (Gratton & Truss, 2003; Christainsen & Higgs, 2006). Many studies reported that performance pay is not the solution for organisational performance (Kohn, 1993; Pink, 2009; Ledford, Gerhart & Fang, 2013). According to Kohn (1993), extrinsic rewards are less effective than intrinsic rewards, and on many occasions, it seems to reduce intrinsic motivation. This finding led the researchers

to develop a comprehensive reward strategy that encompasses all the tangible and intangible rewards within a single package. This movement has resulted in developing a comprehensive rewarding system known as the Total Reward Strategy (TRS). Many professional reward management organisations such as WorldatWork (2006 and 2015); SHRM (2007); Hay Group (2008); Aon Hewit (2012); Towers Watson (2012), and many more developed their own distinct TRS models with different components and elements representing extrinsic and intrinsic forms of rewards. Herzberg's (1966) two-factor theory illustrates the dichotomous nature of rewards and their employee values. The hygiene factors of rewards consisting of the major elements of extrinsic rewards such as basic pay and benefits, by themselves, are not sufficient to motivate employees at their workplaces. Even though these factors significantly contribute to demotivation, the real motivators are the intrinsic form of rewards such as work by its content and context, career development, authority and responsibility.

This study is an attempt to examine the influence of extrinsic and intrinsic rewards in shaping employee commitment among the public sector manufacturing employees in India. This study is also intended to examine the relative importance of each category of rewards and its components. This information can be used by the management while formulating a rewarding mix that is capable of satisfying the employees optimally.

## 2. Literature Review

### 2.1 Extrinsic and Intrinsic Rewards

Rewards are very important to employees. Rewards comprise everything offered to the employees by the employer as a return to their services towards the organisation. The study of Sarvar and Abugre (2013) revealed that higher rewards and satisfied employees contribute more to organisational performance and profit. All the goals of the organisation can be achieved by offering a good rewarding system that can motivate employee (Lawler, 1993), and a well-defined rewarding system can attract, retain and motivate employees (Mc Cormic, 2015). Rewarding an employee is not merely paying salary and benefits, but it is equally concerned about non-financial rewards such as recognition, increased job responsibility, and learning and development opportunities (Armstrong, 2010).

Extrinsic rewards are the tangible and visible form of rewards offered to the individual or employee for his/her contribution to achieving something. The monetary part of rewards such as salary, incentives, bonus, etc. and benefits such as medical care, various kind of allowances, fringe benefits those have some financial content indirectly are considered as extrinsic rewards (Mottaz, 1985; Mahaney & Lederer, 2006). Extrinsic rewards are important for employees because it is instrumental to their personal, family, and social existence. Most of the employees' physical needs are satisfied with this form of rewards, and therefore it is the basic requirement for their existence. Literature shows that while employees at the lower levels of hierarchy are more concerned about extrinsic rewards, the employees at higher levels prefer intrinsic rewards (Stumpf, Tymon Jr, Favorito & Smith, 2013)

Intrinsic rewards differ from extrinsic rewards which are in tangible form. Intrinsic rewards are generally qualitative (intangible) in form and critical in motivating employees. This non-physical form of rewards which is emotionally connected to the employees comprises challenging jobs, sense of achievement, recognition, work freedom, participation in decision making, the content of authority, attracting positions in the hierarchy, etc. (Mottaz, 1985; Mahaney & Lederer, 2006). The degree of influence of these elements may differ from individual to individual. This represents the portion of rewards that satisfy an individual's psychological needs. Wherever a job is intrinsically rewarding, the individual involves with more enthusiasm and accomplishes the task more effectively (Mahaney & Lederer, 2006). Intrinsic rewards are the positive feelings an employee experiences at the workplace that energises him to do the task in a personally fulfilling manner (Deci & Ryan, 1987; Thomas & Tymon, 1997; Thomas, 2009). Thomas, Jansen & Tymon (1997) reported that when individuals get opportunities to do meaningful work with a sufficient level of freedom and choice, they feel intrinsically motivated. Tymon Jr, Stumpf and Doh (2010) argued that intrinsic rewards can improve organisational satisfaction even in low extrinsic rewards. It is possible to provide many non-financial or less financial benefits, which can bring satisfaction to the employees and better performance (Mohamood, Ramzan & Akbar, 2012). A higher level of hygiene factors (extrinsic rewards) can make good results

only with an adequate level of intrinsic rewards (Tremblay, Sire & Balkin, 2000). The study conducted by Tymon Jr., Stumpf and Doh (2010) rejects the argument of Deci and Ryan (1987) that extrinsic rewards have a tendency to reduce intrinsic motivation.

## 2.2 Employee Commitment and Reward

Employee commitment is the reflection of a psychological attachment of the employee towards his organisation that reflects in higher employee performance, increased citizenship behaviour and reduced turnover (O'Reilly & Chatman, 1986; Williams & Anderson, 1991). When employees perceive a caring approach from the side of the employer, they demonstrate committed behaviours to achieve organisational goals (Ajmal, Bashir, Abrar & Khan, 2015). Committed employees always show a willingness to accept company values and targets as their own and do whatever possible to achieve the goals (Porter, Steers, Mowday & Boulian, 1974). Allen and Meyer (1985, 1990) proposed three dimensions for employee commitment. These three dimensions of commitment refer to the relationship with an organisation that reflects on the desire of the employee to remain with the organisation and contribute more for the benefit of the organisation (Woźowska, 2014). The first dimension of affective commitment refers to the willingness and likeness of the employee to remain with the organisation due to psychological attachment towards the organisation and the need to be known as part of the organisation. Continuous commitment refers to the awareness of the individual about the cost of leaving the job for another one, and so he wants to stay with the organisation anyhow (Allen & Meyer, 1985). Normative commitment reflects in employees' determination to remain with the organisation even at bad times and it shows a moral obligation. Mehtha, Singh, and Bhasker (2010) observed employee commitment as a component of the emotional dimension of employee loyalty.

Work rewards refer to the benefits that an employee receives as part of the employment relationship from the employer and is considered as the determinant of employee commitment (Malhotra et al., 2007). Employee perceptions of reward fairness significantly influence employee attitudes, behaviours and performance (Scott, Mac Mullen, & Royal, 2011; Munir, 2016; Hareendrakumar,

2020). Turkyilmaz, Ali., Akman, Gulsen., Ozkan, Coskum., and Pastuszak (2011), and Ajmal et al. (2015) reported that both extrinsic and intrinsic rewards play a significant role in determining employee loyalty and commitment through the mediating variable of job satisfaction. The study conducted by Kokubun (2017) among the employees of Japanese companies in Thailand revealed a strong relationship between extrinsic and intrinsic rewards with employee commitment.

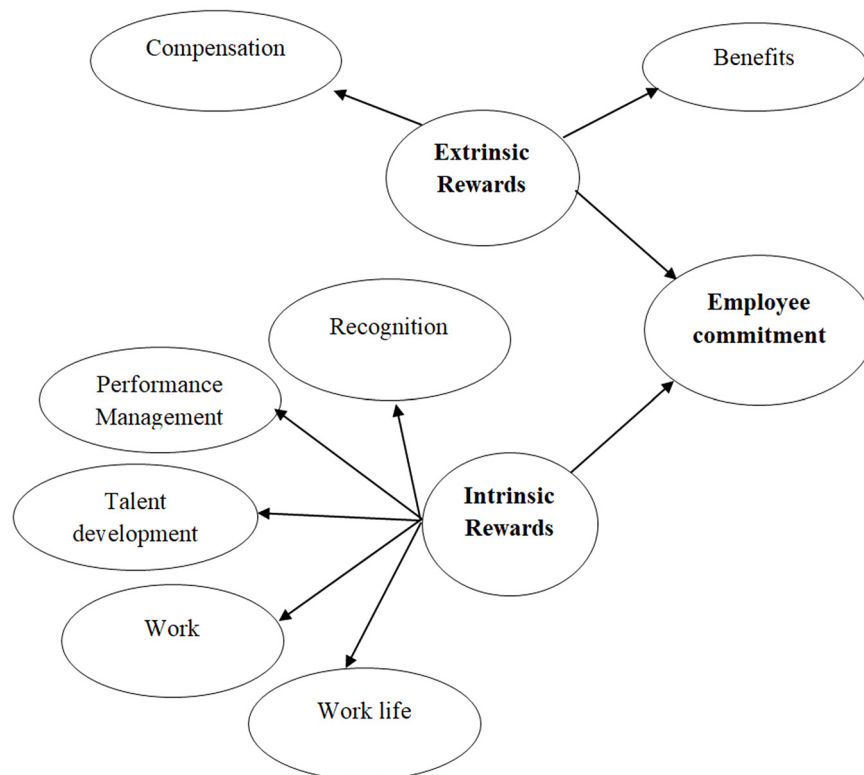
Milcovitch and Newman (2008) commented that the way in which employees are paid affects their behaviours, and a good compensation system would help the organisation to achieve its goals effectively. Mishandling of compensation issues is likely to affect employee and organisational performance due to a lack of employee loyalty (Gomez, Balkin, and Cardy, 2005). Schultz (2005) opined that rewards can induce changes in the observed behaviour of individuals and can act as a reinforcement for the behaviour that creates better rewards. Obicci (2015) observed a strong bond between extrinsic and intrinsic

rewards and employee engagement, which is a demonstration of employee commitment itself. The study of Allen and Grisaffe (2001) also supported the relation of extrinsic and intrinsic rewards with employee behaviours.

### 3. Methodology

#### 3.1 Model development

The total reward is a newer concept of rewarding employees by incorporating all the intrinsic and extrinsic elements of rewards, those that are valued by the employees, in unique proportions. To develop a conceptual model, this study adapted the Total Reward model consisting of seven dimensions developed by Hareendrakumar et al. (2020). In this model, extrinsic reward satisfaction is measured by two dimensions (Compensation and Benefits), and intrinsic reward satisfaction is measured through five dimensions (Recognition, Performance Management, Talent Development, Work, and Work-life) as shown in the



Source: prepared by the author

**Figure 1: Conceptual diagram**



conceptual model. While the two extrinsic dimensions are focused on the financial content of rewards, which are necessary to satisfy the basic needs of employees, the five intrinsic dimensions are concerned about the non-financial form of rewards, which are necessary to satisfy the psychological needs of individuals. The model hypothesises that extrinsic and intrinsic rewards positively influence employee commitment.

### 3.2 Scale development

All the scales to measure the dimensions of extrinsic and intrinsic rewards are adapted from the literature (Hareendrakumar, 2020). The scale to measure employee commitment is adapted from Meyer and Allen (1990). Thus a comprehensive instrument containing 46 items (Compensation-7, Benefits-6, Recognition-5, Performance Management-5, Talent Development-5, Work-5, Work Life-5, and Commitment- 8) have been developed to measure all the eight latent variables under study. The pilot study is conducted among the employees of a large scale public sector company at Thiruvananthapuram and found that all the constructs have reliability (Cronbach alpha) greater than 0.7.

### 3.3 Hypotheses of the study

The following two hypotheses are set to test the significance of multiple relationships between the latent variables.

**H 1:** Intrinsic Rewards significantly influences Employee Commitment in the public sector companies in India

**H 2:** Extrinsic Rewards significantly influences Employee Commitment in the public sector companies in India

### 3.4 Population and sample

The population of interest comprises all the employees working in the public sector manufacturing companies in India. The public sector manufacturing companies are grouped under various sectors such as electrical, electronics, engineering, chemical, textile, traditional, etc. The sample size is fixed at 400. The sample units are selected by following the method of stratified random sampling.

### 3.5 Research design

Even though the topic of study is qualitative in nature, a mixed approach is followed, and the data is collected in a quantitative manner. Structured questionnaires, the instrument for data collection, are served to the respondents and requested to mark their degree of agreement/disagreement in a five-point Likert scale, using numeric values ranging from 1 (strong disagreement) to 5 (strong agreement). This quantitative data collected in the form of numbers is used for statistical analysis and to test the significance of relationships between the variables.

### 3.6 Data collection

The sample data is collected from 418 employees chosen from ten public sector companies in South India. Out of 418 instruments collected, after eliminating 14 instruments with extreme values/ missing responses, 404 instruments are taken for final statistical analysis.

## 4. Analysis and Discussion

### 4.1 Demography and Descriptive Statistics

More than forty percent of the sample subjects have service of more than twenty years and are of age above forty. Hence the responses can be considered as highly reliable in revealing the realistic character of the attributes through the employee lens. As shown in Table 1, the sample comprises candidates from all levels of the hierarchy, starting from unskilled labour to senior managers and qualification ranging from matriculation to post-graduation. Most of the participants are from the non-executive category (74.6 %). Only one third belongs to the executive category. Among the total, around 25 percent are from technical backgrounds and seventy-five percent are from non-technical backgrounds.

Table 2 shows the descriptive statistics of the sample. The mean for the eight latent variables ranges from 2.6 to 3.5, and the standard deviation ranges from 0.709 to 0.986. The correlation coefficients range from 0.202 to 0.609. All the dimensions of independent variables show a good correlation with the dependent variable. The descriptive statistic shows that work and work-life are the most correlated one, among the seven dimensions, to employee commitment.

**Table 1: Demography of the sample**

Demographics		Male	percent	Female	percent	Total	percent
Category	Executive	85	35.7	44	25.4	129	31.4
	Non -executive	150	64.3	125	74.6	275	68.6
Total		<b>235</b>	<b>100</b>	<b>169</b>	<b>100</b>	<b>404</b>	<b>100</b>
Service	Below 10 years	89	37.9	64	37.9	153	37.9
	Between 10-20	40	17	45	26.6	85	21
	Above 20 years	106	45.1	60	35.5	166	41.1
Total		<b>235</b>	<b>100</b>	<b>169</b>	<b>100</b>	<b>404</b>	<b>100</b>
Age	Below 30 years	68	28.9	58	34.3	126	31.2
	Between 30-40	51	21.7	43	25.5	94	23.3
	Above 40 years	116	49.4	68	40.2	184	45.5
Total		<b>235</b>	<b>100</b>	<b>169</b>	<b>100</b>	<b>404</b>	<b>100</b>
Qualification	Matriculation	77	32.8	44	26	121	30
	Diploma	32	13.6	8	4.7	40	9.9
	Graduation	44	18.7	59	35	103	25.5
	Post. Graduation	36	15.3	47	27.8	83	20.5
	Eng. degree	46	19.6	11	6.5	57	14.1
Total		<b>235</b>	<b>100</b>	<b>169</b>	<b>100</b>	<b>404</b>	<b>100</b>

Source: Primary Data

**Table 2 Descriptive statistics and inter correlation coefficients**

Variables	Mean	S.D	1	2	3	4	5	6	7
Compensation	3.04	0.945							
Benefit	2.91	0.818	.629**						
Recognition	3.37	0.709	.401**	.486**					
Performance	2.66	0.986	.430**	.428**	.306**				
Tal dev	3.11	0.845	.352**	.348**	.431**	.555**			
Work	3.54	0.777	.202**	.314**	.585**	.331**	.507**		
Work life	3.45	0.731	.461**	.377**	.436**	.462**	.445**	.411**	
Commitment	3.05	0.781	.519**	.533**	.561**	.569**	.616**	.615**	.595**

Source: Primary Data, \*\*p &lt; .01

## 4.2 Structural Equation Modeling (SEM)

To assess the causal relationships between variables and to test the hypotheses, the method of Structural Equation Modeling (SEM) is employed using IBM SPSS Amos 22. SEM analysis comprises a two-step assessment (i) measurement model assessment and (2) structural model assessment.

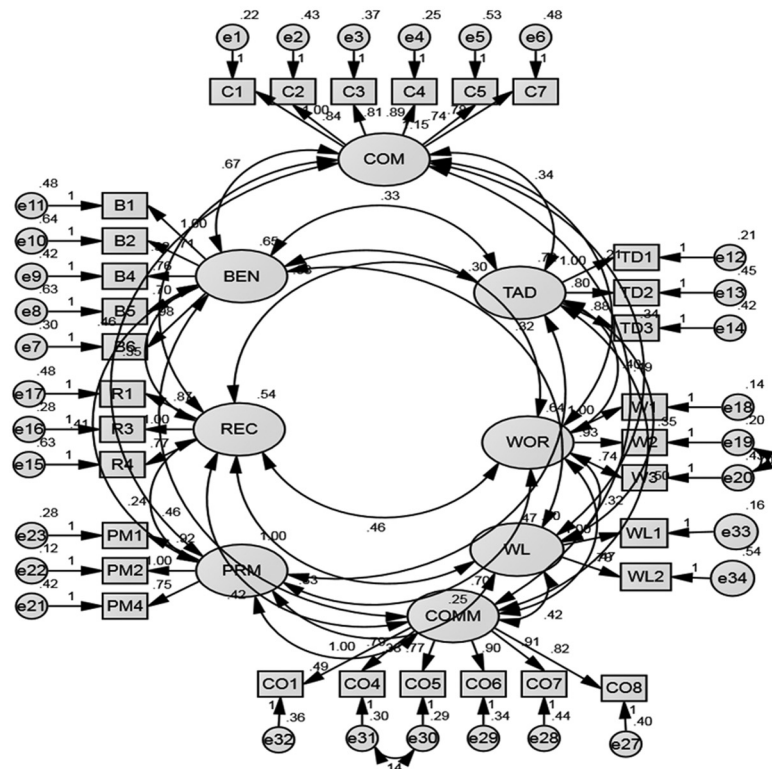
### 4.2.1 Measurement model assessment

In this first step, also known as the confirmatory analysis, the researcher develops a measurement model with all the variables under study and test for the reliability and validity of the scales used. In this study, the measurement model

has been developed with all the first-order variables and correlated, as shown in Figure 2. Prior to CFA, it is necessary to ensure the fitness of the model with the data, and this is done by comparing the fit indices with the recommended threshold values. At this stage, fifteen items (Compensation-1, Benefit-1, Recognition-2, Performance Management-2, Talent Development-2, Work-2, Work-life-3 and Commitment-2) are eliminated to achieve a sufficient level of fitness as per the recommendations. Thus the final model has only thirty-one items under the eight latent variables. The values in Table 3 show that the model is adequately fit with the data as per the recommended fit measures and good for further statistical analysis.

**Table 3: Fit indices of measurement model**

Fit measure	NFI	IFI	CFI	GFI	CMIN/df	RMSEA
Recommended	>0.9	>0.9	>0.9	> 0.9	< 3	< 0.1
Achieved	0.883	0.942	0.941	0.842	2.416	0.074



Note: COM- Compensation, BEN-Benefit, REC- Recognition, PRM- Performance management, TD-Talent development, WOR- Work, WL-Work life, COMM- Commitment

**Figure 2: Measurement model**

#### 4.22 Reliability of indicators and constructs

After ensuring the fitness of the data, the next step is to assess the reliability of the indicators and the constructs in measuring the attributes which are intended to measure. In this part, the researcher ensures whether the items and the set of items under different constructs are unidimensional in measuring the construct and whether the scale items are consistent with different time of measurement. For this purpose, the usual practice is to evaluate the factor loadings of each indicator variable to assess the indicator reliability and Cronbach Alpha and Composite Reliability (CR) to assess the reliability and internal consistency of various constructs. Factor loading above 0.5 is considered as a good measure for indicator liability (Hair, Black, Babin, &

Anderson, 2010; Kline, 2010; Mishra, 2016). Cronbach's Alpha and Composite Reliability greater than 0.7 indicates adequate reliability of constructs (Gefen, Straub & Boudreau, 2000). In this study, all the indicator variables have loadings greater than 0.5, and all the constructs have alpha and CR greater than 0.7 (Table 4). Hence it is assumed that the indicators and constructs have sufficient internal consistency and reliability in measuring the related attributes.

#### 4.2.3 Validity assessment

To assess the validity of the scale, the researcher has to examine both content and construct validities simultaneously. Content validity examines whether the scale items are capable of measuring the characteristic which the researcher intended to measure (Lawshe, 1975).

**Table 4: Reliability, Internal Consistency and Convergent Validity**

Latent variable	Item code	Factor loading	Indicator reliability	Alpha	CR	AVE
Compensation	C1	0.915	0.84	0.923	0.926	0.715
	C2	0.79	0.62			
	C3	0.838	0.70			
	C4	0.881	0.78			
	C7	0.798	0.64			
Benefit	B1	0.793	0.63	0.762	0.769	0.527
	B2	0.667	0.44			
	B3	0.713	0.51			
Recognition	R1	0.85	0.72	0.788	0.797	0.573
	R2	0.804	0.65			
	R4	0.592	0.35			
Career growth	PM1	0.874	0.76	0.868	0.872	0.7
	PM2	0.955	0.91			
	PM3	0.651	0.42			
T. Development	TD1	0.876	0.77	0.827	0.828	0.619
	TD2	0.715	0.51			
	TD3	0.760	0.58			
Work	W1	0.66	0.44	0.827	0.828	0.671
	W2	0.87	0.76			
	W3	0.90	0.81			
Work life	WL2	0.941	0.89	0.772	0.767	0.632
	WL3	0.615	0.38			
Commitment	CO1	0.799	0.64	0.874	0.898	0.596
	CO4	0.769	0.59			
	CO5	0.758	0.57			
	CO6	0.800	0.64			
	CO7	0.760	0.58			
	CO8	0.739	0.55			

In this study, the content validity is ensured with the help of the literature and collecting opinions from the practitioners of various public sector companies in Kerala. Construct validity of the scale is generally evaluated by assessing two subsets of validity measures, namely convergent validity and discriminant validity. The criterion that is generally followed to assess convergent validity is to ensure the Average Variance Extracted (AVE) as recommended for the purpose. AVE refers to the extent of variance explained by

the set of variables under a construct. AVE greater than 0.5 is regarded as a good indication of sufficient convergent validity (Fornell & Larcker, 1981; Bagozzi & Yi, 1988; Chin, 1998). To assess discriminant validity, the method is to compare the squared root of AVE of a construct with the intercorrelations of that construct with other constructs. A higher squared root of AVE than the intercorrelations ensure the discriminant validity of the construct (Fornell & Larcker, 1981).

**Table 5: Fornell-Larcker criteria for Discriminant validity**

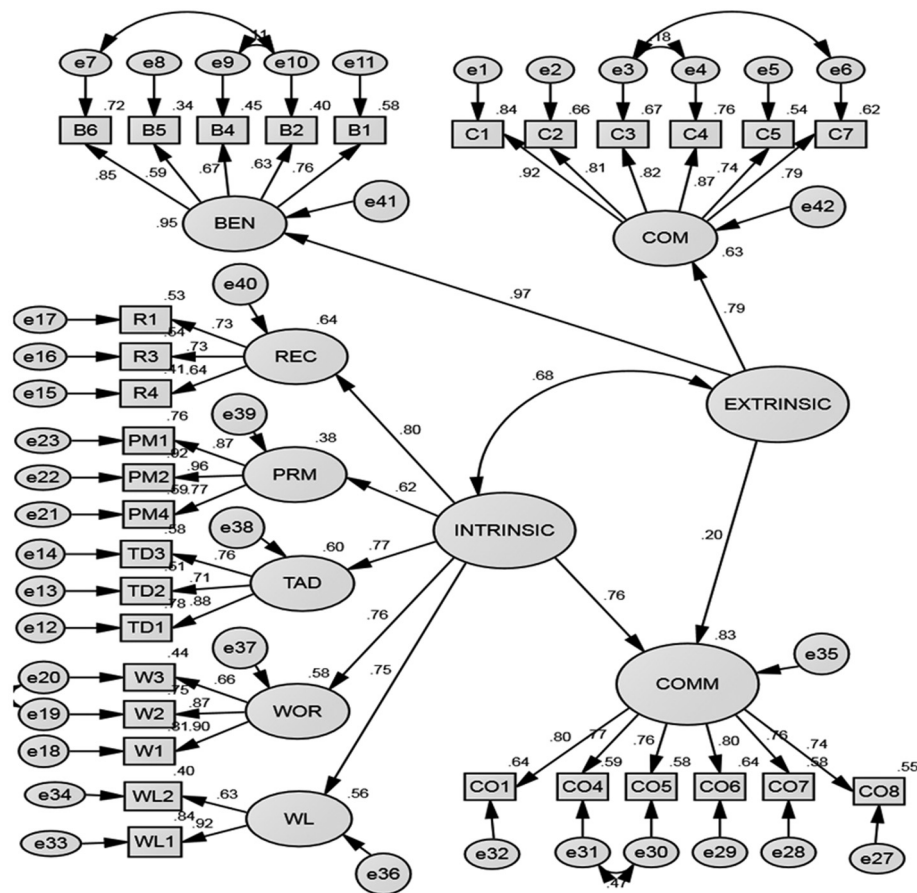
Variables	1	2	3	4	5	6	7	8
Compensation	<b>0.846</b>							
Benefit	.629	<b>0.726</b>						
Recognition	.401	.486	<b>0.757</b>					
Performance	.430	.428	.306	<b>0.837</b>				
Talent development	.352	.348	.431	.555	<b>0.786</b>			
Work	.202	.314	.585	.331	.507	<b>0.786</b>		
Work life	.461	.377	.436	.462	.445	.411	<b>0.794</b>	
Commitment	.519	.533	.561	.569	.616	.615	.595	<b>0.772</b>

Note: Bold diagonal value represents square root of AVE

In this study, all the AVE measures are > 0.5 ranging from 0.527 to 0.715 (Table 4), and the squared root of the AVE of each construct is greater than the intercorrelations of the construct with other constructs (Table 5). The compliance of these two criteria ensures adequate convergent and discriminant validity of the constructs. From Table 4, it is evident that all the indicator variables have factor loadings above 0.5, Cronbach Alpha and CR greater than 0.7 and AVE

greater than 0.5. The squared root of AVE for every construct, given as diagonal values in Table 5, is greater than the intercorrelations of that construct with other constructs. The correlation between variables shows the presence of sufficient nomological validity for the latent variables (Table 2). Figure 3 shows that there is a moderate correlation between the second-order constructs of extrinsic and intrinsic rewards ( $r = 0.68$ ).

#### 4.2.4 Assessment of Structural Model



Source: Prepared by the author

Note: COM- Compensation, BEN-Benefit, REC- Recognition, PRM- Performance management, TD-Talent development, WOR- Work, WL-Work life, COMM- Commitment

**Figure 3: Structural Equation Model for hypotheses test (with standardized regression coefficients)**

The structural model is the inner part of the Structural Equation Model that represents the multiple relationships between variables. The structural model assessment enables the researcher to interpret the causal relationships between variables and to test the hypotheses. In this multi-factor

second-order structural equation modelling, there are two exogenous variables, namely extrinsic and intrinsic rewards, and one endogenous variable, employee commitment. The various fit measures for the structural model are given in Table 6.

**Table 6: Fit measures of the Structural model**

Fit measure	NFI	CFI	GFI	CMIN/df	RMSEA
Recommended	>0.9	>0.9	> 0.9	< 3	< 0.1
Achieved	0.901	0.927	0.899	2.023	0.078

Source: Calculated by the author

Most of the fit indices are as per the recommendations, and the others are very close to the recommended values, which indicate a satisfactory or moderate fit of the data with the proposed model. The correlated exogenous variables-extrinsic and intrinsic rewards - could explain 83 percent of the variation of the dependent variable, employee commitment.

The two dimensions of extrinsic rewards showed good  $R^2$  values ranging from 0.63 to 0.95. The  $R^2$  values for the five intrinsic dimensions range from 0.38 to 0.60 (Table 7). All these measures are found significant at the level  $p < 0.001$ . The regression coefficients (standardised beta coefficients) between the first and second-order constructs are found significant at the level  $p < 0.001$  (Table 8).

**Table 7: R-square values for the first order constructs**

	Extrinsic rewards		Intrinsic rewards				
	Benefit	Compen	Recog	Performance management	Talent development	Work	Work life
$R^2$	0.95	0.63	0.64	0.38	0.60	0.58	0.56
p value	000	000	000	000	000	000	000

Table 8 shows the comparative contribution of each reward component under the extrinsic and intrinsic rewards. Among the extrinsic rewards, employee benefit is found more significant with a beta value of 0.972. As such, all the five

dimensions of intrinsic rewards are also found significant at the level  $p < 0.001$ . Recognition, Talent Development and Work are found more influential in determining employee commitment with beta values 0.80, 0.77 and 0.76, respectively.

**Table 8: Unstandardized and Standardized beta values with level of Significance**

No	Path	Estimates		
		Unstandardized	Standardized	sig
1	Compensation < ----Extrinsic rewards	1.084	0.793	***
2	Benefits <-----Extrinsic rewards	1.00	0.972	***
3	Recognition <-----Intrinsic rewards	0.858	0.798	***
4	Per. Management <----Intrinsic rewards	1.07	0.62	***
5	Talent Dev <----Intrinsic rewards	1.076	0.773	***
6	Work <-----Intrinsic rewards	0.978	0.764	***
7	Work-life <-----Intrinsic rewards	1.00	0.746	***

Source: Prepared by the author, \*\*\*,  $P < 0.001$  level (2-tailed).

The beta coefficients in Table 9 show that extrinsic and intrinsic rewards have a significant impact on employee commitment and hence the statistical conclusion is to reject the null hypotheses of no impact for the exogenous variables on the endogenous variable. This finding supports the study conducted by Obicci (2015), Ajmal et al. (2015), and Turkyilmaz et al. (2011). As far as employee commitment is concerned, the intrinsic reward is found highly influential in

comparison with extrinsic rewards with a standardised beta coefficient of 0.759 ( $p < 0.001$ ), which is two times higher than the extrinsic rewards (beta coefficient = 0.20,  $p < 0.001$ ). The regression values indicate that unit change in the intrinsic rewards would cause for 0.759 unit change in employee commitment while the same change in extrinsic rewards would cause for 0.203 unit change in employee commitment.



**Table 9: Hypotheses test results**

Hypo	Path	Estimates			Decision
		Unstandardized	Standardized	Sig	
H 1	Commitment <-- Extrinsic rewards	1.000	0.759	***	supported
H 2	Commitment <---Intrinsic rewards	0.209	0.203	***	supported

\*\*\*significant at the level  $p < 0.001$  (2-tailed).

## 5. Managerial Implication

The findings of this research are highly beneficial to the HR managers who are responsible for formulating and implementing tailor-made rewarding systems for their employees. From the results, it is clear that employee attitudes are determined mainly by non-financial rewards. It highlights the possibility of influencing employee attitudes without spending additional money. This greater importance of intrinsic rewards due to employee preference helps the managers to make good reward packages by blending more non-financial rewards with the extrinsic rewards in unique proportions. All the intrinsic rewards are highly influential on employee commitment. Hence management of public sector companies in India must give more attention to offer intrinsic motivators to attract, motivate, and retain talents with their organisation. The results of this study revealed the relative importance of each reward component to the employees, and it can be taken as a base for formulating or modifying the prevailing rewarding systems in the public sector companies in India.

## 6. Conclusion

This study once again established the strong bond between rewards and employee commitment. The management can never undermine the importance of either extrinsic or intrinsic rewards. Among the two dimensions of extrinsic rewards, employee benefits showed high significance with employee commitment (0.972,  $p < 0.001$ ). In this era, the new generation of employees is more concerned about the indirect financial rewards that provide more work comfort and security feeling to them. The results show that the employees in public sector manufacturing companies are highly concerned with their intrinsic rewards. The difference in regression coefficients between these two

predictor variables gives a vital message of employee preference towards the intrinsic rewards over the extrinsic rewards. In determining employee commitment, intrinsic rewards are three times more powerful than extrinsic rewards. This reveals the potential power of intrinsic motivation over extrinsic motivation in shaping employee attitudes at the workplace. This expectation of employees towards the intrinsic form of rewards may be the result of their higher level of satisfaction with extrinsic rewards. The regression values show that among the intrinsic rewards, performance recognition, talent development and challenging work are the highest influencers. Performance management comparatively showed a less value (0.62;  $p < 0.001$ ). This may be due to the lack of proper performance management schemes in the public sector industries.

## 7. Limitation and Scope for Further Research

This study has been conducted among the public sector employees in south India. It would be better to conduct a wide study by including more samples from North Indian states also. As the working conditions and pay patterns are different across the states, such a study will yield better results that are more reliable in a Nationwide context.

## 8. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

## References

- Ajmal, A., Bashir, M., Abrar, M., & Khan, M. M. (2015) "The Effects of Intrinsic and Extrinsic Rewards on Employee Attitudes/ ; Mediating Role of Perceived Organizational Support". *Journal of Service Science and Management*, 8(August), 461–470. Retrieved from <http://dx.doi.org/10.4236/jssm.2015.84047%0A>



- Amstrong. M. (2010). *“Human Resource Management Practice, A guide to People Management”*. Kogan Page Ltd, New Delhi, 2010.
- Aon Hewitt (2012). “Total Reward survey” [http://www.aon.com/human-capital-consulting/thought-leadership/talent\\_mgmt/2012\\_aonhewitt\\_total\\_rewards\\_](http://www.aon.com/human-capital-consulting/thought-leadership/talent_mgmt/2012_aonhewitt_total_rewards_)
- Bagozzi, R. P., & Yi, Y. (1988). “On the evaluation of structural equation models”. *Journal of the Academy of Marketing Science*, 16(1), 74–94.
- Brown, D (2006) Home Grown, People Management. 12 (17), pp 38-40.
- Chin, W.W (1998), “The partial Least Squares approach to structural equation modeling.In: Marcoulides”, G.A(Ed). *Modern Methods for business Research*, New Jersey
- Christiansen, C L and Higgs, M (2006) “The Alignment of HR and Business Strategies and its Relationship to Effective Organisational Performance”. *Henley Working Paper Series* HWP 0609, Henley Management College.
- Cronbach,L.J.(1951). “Coefficient alpha and the internal structure of tests”. *Psychometrika*, 16(3), 297–334.
- Deci, E. L., & Ryan, R. M. (1987) “Intrinsic motivation and self-determination in human behavior”. New York: Plenum Press.
- Fischer. R(2003) “Rewarding employee loyalty/ : An organizational justice approach” *International Journal of Organisational Behaviour*, 8(3).
- Fornell, C. G., & Larcker, D. F. (1981) “Evaluating structural equation models with unobservable variables and measurement error”. *Journal of Marketing Research*, 18(1), 39–50.
- Geffen, D., Rigdon, E. E., & Straub, D. W. (2011) “Editor’s comments: An update and extension to SEM guidelines for administrative and social science research” *MIS Quarterly*, 35, iii–xiv.
- Gerhart, B., S.L. Rynes, and I.S. Fulmer. 2009. “Pay for Motivation”
- Gomez – Mejia.LR, Balkin. DB, Cardy.RL (2005), *“Managing Human Resources”*, 4<sup>th</sup> Ed, Prentice Hall of India Pvt.Ltd, New Delhi.
- Gratton, L and Truss, C (2003) “The three-dimensional people strategy: Putting human resources policies into action”, *Academy of Management Executive*, 17(3), pp 74-86.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. (2010). *“Multivariate Data Analysis”* (7 Ed.). Upper Saddle River, NJ, USA: Prentice-Hall,Inc
- Hareendrakumar, V. R., Subramoniam, S., & Hussain, N. (2020). “Redesigning Rewards for Improved Fairness Perception and Loyalty.” *Vision*, 24(4), 481-495.
- Harter, J. K., Schmidt, F. L., Hayes, T. L., Immigration, U. S., & Service, N. (2002). “Business-Unit-Level Relationship Between Employee Satisfaction, Employee Engagement, and Business Outcomes: A Meta-Analysis”. *Journal of Applied Psychology*, 87 (2), 268–279. <https://doi.org/10.1037//0021-9010.87.2.268>
- Hay Group (2008), “The Hay Group Total Reward Framework,” <http://haygroup.co>
- Herzberg, F. (1966). “Work and the Nature of Man”, Cleveland, OH: World Publishing.
- Higgs, M (2004) “Future Trends in HR”. In: D. Rees and R. Mc Bain, *People Management Challenges and Opportunities*, Basingstoke: Palgrave Macmillan.
- Hulland, J. (1999). “Use of partial least squares (PLS) in strategic management research: a review of four recent studies”. *Strategic Management Journal*, 20(2), 195–204.
- Kline, R. B (2010), *“Principles and Practice of Structural Equation Modeling”*. Fourth edition (4 Ed.). New York: Guilford Press.
- Kohn, A (1993), “Why Incentive Plans Cannot Work”, *Harvard Business Review* 71(5): 54-63.
- Kokubub.K(2017), “Organizational Commitment and Rewards in Thailand, with comparison between University Graduates and Others” *Asian Social Science*. Vol. 13 (6), pp 1-19.

- Lawler, E. E. (1993). CEO Publication-93-5(225) <http://www.marshall.us.edu/ceo>
- Lawshe, C. H. (1975), "A quantitative approach to content validity", *Personnel psychology*, 28(4), 563-575
- Ledford, G. E., Gerhart, B. and Fang, M. (2013), "Negative Effects of Extrinsic Rewards on Intrinsic Motivation: More Smoke Than Fire", *Worldat Work Journal*, Second Quarter. 2013.
- Linley, P. A., Harrington, S. and Hill, J. R. W. (2005) "Selection and Development: A new perspective on some old problems", *Selection and Development Review*, 21 (5)
- Luthans, F. and Peterson, S. J. (2002). "Recognition: A Powerful but Often Overlooked, Leadership Tool to Improve Performance". *The Journal of Leadership Studies*, 7 (1), pp. 31-39.
- Mahaney, R. C. & Lederer, A. L. (2006). "The Effect of Intrinsic and Extrinsic Rewards for Developers on Information Systems Project Success", *Project Management Journal*, 37 (4), 42-54.
- Malhorta, N., Budhwar, P., & Prowse, P. (2007). "Linking rewards to commitment: An empirical investigation of four UK call centres." *International Journal of Human Resource Management*, 18(12), 2095–2017. <https://doi.org/10.1080/09585190701695267>
- McCormick, H. (2015). "Rethinking Total Rewards", *UNC Executive Development*. [www.exedev.unc.edu](http://www.exedev.unc.edu)
- Meyer, P. J., Allen, J. N. (1990). "A three-component conceptualization of organizational commitment". *Human Resource Management Rev.* 1: 61-89.
- Meyer, P. J., Allen, J. N. (1984). "Testing the side-bet theory of organizational commitment: Some methodological considerations". *Journal of Applied Psychology*. 69: 372-378.
- Milkovich, G. T., & Newman, J. M. (2008). "Compensation", 9th Ed. New York, NY: McGraw-Hill, 2008
- Mishra, P. (2016). "Business Research Methods", Oxford University Press, New Delhi, India
- Mohamood, S., Ramzan, M. & Akbar, M. T. (2012), "Managing Performance through Rewards Systems", *Journal of Education & Research for sustainable Development*, Vol. 1, on line issue. 2.
- Mottaz, C. J. (1985). "The Relative Importance of Intrinsic and Extrinsic Rewards as Determinants of Work Satisfaction", *The Sociological Quarterly*, 26 (3), 365-385.
- Munir, R. (2016). "Impact of Rewards (Intrinsic and Extrinsic) on Employee Performance with Special Reference to Courier Companies of Faisalabad City". *European Journal of Business and Management*, 8, 88-97.
- O'Reilly, C. & Chatman, J. (1986). "Organizational commitment and psychological attachment: The effects of compliance, identification and internalization on prosocial behavior". *Journal of Applied Psychology*. 71: 492-499.
- Obicci, P. A. (2015). "Influence of Extrinsic and Intrinsic Rewards on Employee Engagement (Empirical Study in Public Sector of Uganda)". *Management Studies and Economic Systems*, 2(1), 59-70.
- Pink, D. H. (2009), *Drive: "The Surprising Truth About What Motivates Us"*. New York: Riverhead Books.
- Porter, L. W., Steers, R. M., Mowday, R. T. and Boulian, P. V. (1974) "Organizational Commitment, Job Satisfaction, and Turnover among Psychiatric Technicians". *Journal of Applied Psychology*, 59, 603-609. <http://dx.doi.org/10.1037/h0037335>
- Sarwar, S., & Abugre, J. (2013). "The Influence of Rewards and Job Satisfaction on Employees in the Service Industry", *The Business and Management Review*, Vol.3(2), pp.22-32.
- SHRM (2007), "Implementing Total Rewards Strategies, A guide to successfully planning and implementing a total rewards system", *SHRM Foundations's Effective Practice Guidelines Series*.

- Stumpf, S. A., & Doh, J. P. (2010). "Exploring talent management in India/ : The neglected role of intrinsic rewards". *Journal of World Business Journal*, 45(2010)(April), 109–121. <https://doi.org/10.1016/j.jwb.2009.09.016>
- Stumpf, S.A., Tymon, W.G., Jr., Favorito, N., & Smith, R.R. (2013). "Employees and change initiatives: Intrinsic rewards and feeling valued. *Journal of Business Strategy*", 34(2), 21–29. <https://doi.org/10.1108/02756661311310422>
- Thomas, K. W. (2009). "Intrinsic motivation at work" (2nd ed.). San Francisco: Berrett- Koehler.
- Thomas, K. W., & Tymon, W. G., Jr. (1997). "Bridging the motivation gap in total quality". *Quality Management Journal*, 4(2): 80–96.
- Thomas, K. W., Jansen, E., & Tymon, W. G., Jr. (1997). "Navigating in the realm of theory: An empowering view of construct development". In Pasmore, W. A., & Woodman, R. W. (Eds.), *Research in organizational change and development*. Vol. 10 (pp.1–30). Greenwich, CT: JAI Press
- Towers Watson (2012), "Total rewards strategies for the 21<sup>st</sup> century", Towers Watson <<http://www.towerswatson.com>>
- Tremblay, M., Sire, B. and Pelchat, A. (1996). "A study of the determinants and the impact of flexibility on satisfaction with social benefits". *Working paper, HEC Montreal*
- Turkyilmaz, Ali., Akman, Gulsen., Ozkan, Coskun., Pastuszak, Z. (2011). "Empirical study of public sector employee loyalty and satisfaction". *Industrial Management & Data Systems*, III(5), 675–696. <https://doi.org/10.1108/0263557111137250>
- Tymon Jr.WG, Stumpf,S.A, Doh,J,P , "Exploring talent management in India: The neglected role of intrinsic rewards," *Journal of World Business Journal*, Vol.45(2010) pp 109-121
- Wolowska, A. (2014). "Determinants of Organizational Commitment, Organizational commitment in Meyer and Allen's three -component model". *Human Resources Management & Ergonomics*, VIII(1), 129–146.
- World at Work. (2006), "Total Rewards Model; A Frame Work for Strategies to Attract, Motivate and Retain Employees." [www.worldatwork.org](http://www.worldatwork.org).
- World at Work. (2015), " Total Rewards Model"; [www.worldatwork.org](http://www.worldatwork.org)

\*\*\*\*\*

# Dialectics of Constructed Identities as Tools of Oppression – Concept of Reverse Metamorphosis as a factor Reinforcing Ageism

**Dr. Chitra S. Nair**

Assistant Professor of Sociology  
K.N.M. Govt. College, Kanjiramkulam  
University of Kerala  
Trivandrum, Kerala, India  
Email: chitras2009@gmail.com

**A  
b  
s  
t  
r  
a  
c  
t**

Self-identities and social identities on ageing are constructed on the basis of ‘conditions’ and ‘experiences’ in the life of the aged. Using Bourdieu’s Theory of Habitus, the study tried to understand the dialectics of self and social identity constructions on subjective well being and quality of life of aged women. Qualitative analysis using narratives and photo-elicitation method was used. The study consisted of 14 elderly women aged 70 years and above living in Kerala. Results showed that perceptions about age identity have both direct and indirect impact on subjective well being. Corresponding to the nature of self-identity, both positive and negative influences are observed. Disengagements from active roles and power positions, attitude towards old age as a definite period of dependency, belief in the inevitability of ill health, pessimism about cure for health problems, fear and anxiety about miseries and unpredictability in life were the leading self-identity statements. Identity constructions, when used deliberately as a tool of oppression, results in Reverse Metamorphosis. Unlike biological metamorphosis– where the process brings life to an active, vibrant, beautiful stage till the end of life, in Reverse Metamorphosis, aged women enter into cocoons of identities and images that label their life as passive, inactive, shadeless and unattractive. Gender and widowhood add to the process by setting limits to the conditions of life. Reverse metamorphosis is reinforced through marginalisation, isolation, neglect and abuse leading to depression, poor subjective well being and reduced quality of life. Suggestions are made to use Social, Cultural, Economic and Symbolic Capitals envisaged by Bourdieu to influence the identity constructions, explore designs for Inclusive Social Spaces and gender sensitisation to reduce ageism.

**Keywords :** *Quality of life, Habitus, Reverse Metamorphosis, Ageism, Inclusive Social Spaces*

## 1. Introduction

World Health Organization explains ageism as the stereotyping, prejudice, and discrimination against people on the basis of their age. Ageism is a widespread and insidious practice that has harmful effects on the health of older adults. For older people, ageism is an everyday challenge. Overlooked for employment, restricted from social services and stereotyped in the media, ageism marginalises and excludes older people in their communities.

Ageism is everywhere, yet it is the most socially “normalised” of any prejudice and is not widely countered – like racism or sexism. These attitudes lead to the marginalisation of older people within our communities and have negative impacts on their health and well-being. In low-and middle-income countries, older people face daily discrimination and are largely invisible. Ageism leaves people excluded, considered different, restricted in what they can do or simply treated like they don’t exist. It means older people are often at risk of violence, are excluded from health services and face disproportionate levels of poverty.

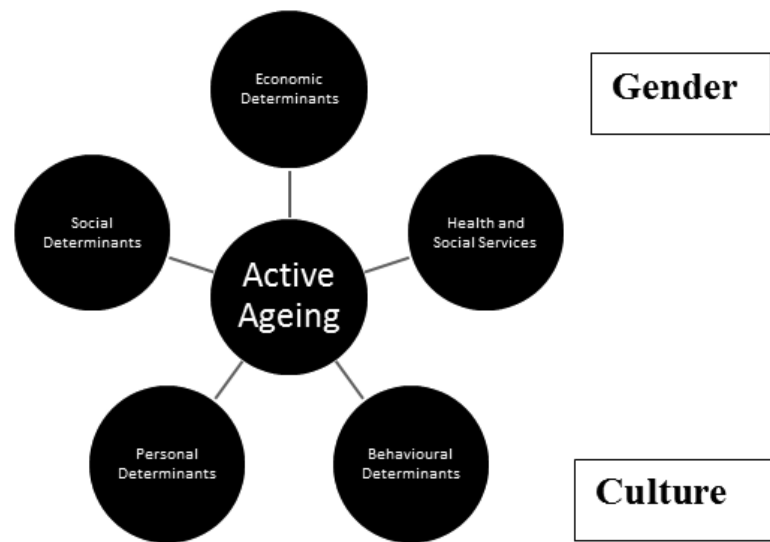
Gender is the major intersecting factor that explains discrimination, exploitation and marginalisation. Women outlive men in nearly all countries in the world. Currently, in the developed world, differences in mortality favour women at all ages and especially so at the oldest ages. In developing countries, seventy percent of females have a life expectancy at birth of more than 80 years, compared to 52 percent in developed countries, while no males have a life expectancy over 80 (Help Age International, 1996).

Gender is a powerful determinant of mental health that interacts with such other factors as age, culture, social support, biology, and violence. For example, studies have shown that the elevated risk for depression in women is at least partly accounted for by negative attitudes towards them, lack of acknowledgement for their work, fewer opportunities in education and employment, and greater risk of domestic violence. The risk of mental illness is

also associated with indicators of poverty, including low levels of education and, in some studies, with poor housing and low-income (Patel & Kleinman, 2003). Gender shapes older women’s experience of ageing, health, and ill health. Previous researches identify that ageing, gender, and health are intrinsically linked and collectively shape older women’s experience.

Elderly women, especially in Third World countries like India, face several threats. They are likely to be illiterate or poorly educated, unlikely to be employed, most likely to be widowed and dependent on others, and they suffer from malnutrition and disabling symptoms as well as report higher psychological distress. The vulnerability of the ageing women, special types of problems they are likely to encounter over the life span, and factors that marginalise them need to be better understood. There is no clear awareness as yet, of the potential contribution of ageing women to the development process as ageing women are stereotypically perceived as burdens on the national economy (Prakash, 1997). This again gives strength to the fact that ageism manifests in various forms in the life of aged women, making them vulnerable.

Humphries (1991) links women’s health status to their access to control of production. In societies where women are viewed as an economic burden, not only is their status lower, but this in turn adversely affects their access to education, food and health. The dependence of women within the family, coupled with cultural norms, promotes discrimination at a number of levels. For example, food allocation in many households often leaves women and female children undernourished. The intra- household allocation of food and its impact upon women have received little attention from gerontologists and remains a significant factor in determining the quality of later life. Long term malnourishment has severe implications for women who survive into older ages, and these are particularly significant for the contemporary developing world. The following chart shows how gender and culture are determining the concept of active ageing in the world.



**Figure 1 – Gender and Culture Determinants of Active Ageing**

*Source: Active Ageing: A Policy Framework, WHO, 2002*

International efforts span back to the Vienna Action Plan on Ageing (1982) to address the developmental potential and dependency needs of older persons, World Summit for Social Development in Copenhagen (1995) that aimed to integrate “age” into a “Society for all”, the Madrid Plan of Action on Ageing (2002) that focused on “Building a Society for all Ages”. All of these efforts were for materialising certain key areas like older persons and their development, advancing health and well being into old age, ensuring and enabling supportive environments, etc. Recently, the Sustainable Development Goals also put forward inclusive growth, good health and well being of the people, reducing gender inequalities etc., into the forefront of the global action plans. However, ageism continues to be a threat in achieving the target of active, healthy and successful ageing and the motto of adding life to years and not just years to lives.

### **The Study**

In determining the health and well being of a population, the physical and social environments play a major role along with our biological and genetic factors. Especially the socio-cultural environments hold a vital role in designing the physical and mental capacity across a person’s life

course. The accommodation and realisations of one’s own condition in old age determine the whole process by which she adapts to her environment, manipulates her conditions and overcomes the challenges. Aged people are always heterogeneous based on the conditions they are exposed to and the variation of experiences they have. Both older people and their environments will always be diverse, dynamic and changing. The interaction between both the conditions and experiences during the life course have enormous potential to decide whether or not the aged women will be successful in leading a healthy, successful, active aged life that is devoid of ageism.

In this background, the study tries to explain three major objectives. What are the conditions and experiences of the aged women that design or help to design the identities in which they live? Images of ageing exist at two levels; personal or self-identity and societal or social identity. To understand ageing holistically, it is imperative to understand how self-identity is influenced by the process of ageing and what is the mutual interaction between the two identities in the life of the aged women? This interaction related to the production and reinforcement of ageism became the third major objective of the study.

The study used a qualitative methodology. Narratives and photo-elicitation methods were depended upon. Fourteen (n=14) aged women were selected for the study out of nearly 50 aged women who were interviewed. Strength and richness of the narratives, age barrier of 70 years were the inclusion criteria adopted. Disinterest to share personal details, interference by the caretakers and blunt narratives were excluded from the study. The photo-elicitation method was carried out in two ways. One, the photographs available with the family or the aged women were used to elicit information regarding life events and identity constructions. Second, a pre-designed set of photos with images of daily used materials, dress combinations, accessories, colours, daily activities and entertainments were used to identify their preferences as well as images with which they relate themselves and old age. Secondary data involved a thorough search of research works on ageism, books, newspapers, and social media.

### Theoretical consideration

Bourdieu's theory of habitus is used to explain the dialectics of self and social identity, constructions and ageism. Bourdieu defines habitus as "A structuring structure, which organises practices and the perception of practices." (Bourdieu, 1984: 170). Habitus is the cognitive/ mental system of structures that are embedded within an individual (and/or collective consciousness) which are the internal representations of external structures. Habitus consists of our thoughts, tastes, beliefs, interests and our understanding of the world around us and is created through primary socialisation into the world through family, culture and the milieu of education. Habitus has the potential to influence our actions and to construct our social world as well as being influenced by the external. The internal and external worlds are viewed by Bourdieu as interdependent spheres and because of the fluid nature of habitus (changing with age, travel, education, parenthood etc.) It is also significant that no two individual's habitus will be the same.

The study tries to use Habitus to explain the influence of ideas of identity constructions, the impact in structuring these identities, how it varies between the two, how it cultivates mutual constructions, how it contributes to determining positive and negative conditions and experiences of well being and whether the process affects

in producing and reinforcing ageism at any level. Bourdieu's concept of habitus is intricately linked with the social structures within a specific field and is essential to a sociological analysis. Reality, according to Bourdieu, is a social concept; to exist is to exist socially and what is real is relational to those around us.

### Findings and discussions

The table given below explains the socio-demographic profile of the aged women interviewed.

**Table 1- Socio- demographic profile of respondents**

AGE GROUP	FREQUENCY
71-80	5
81-90	7
90+	2
EDUCATION	
Illiterate	5
Upto primary level	3
Upto degree level	4
Professional	2
RELIGION	
Hindus	7
Christians	5
Muslims	2
MARITAL STATUS	
Never married	1
Married	4
Widowed	7
Divorced	0
Separated	2

Perception about one's own self greatly depends on the socio-economic and demographic situations specific to the person. Earlier studies also show that the conditions of the aged women differ with respect to their age, religion, education, income, occupation, health, marital status, family support and whether living in rural or urban areas. (Karuppiyah, 2002).

The present study showed that the condition in which an aged woman lives her life course has an immense impact on her experiences with cumulative effect in later life. As women live longer, the biological process of ageing that initiates with birth in every human being receives another

dimension. Ageist connotations can be identified as the major factors. Willingly or unwillingly, aged women step into the socially constructed threshold and are forced to follow the norms of society that depicts certain things as normal or ideal for those who are aged- women, widowed, and financially dependent.

Here, influenced by the conditions and experiences in their lives, identity constructions can be observed as existing in

two ways - positive and negative. When the constructions are positive, it becomes a refuge or support for the women to age successfully. On the contrary, negative self and social identity creations prove to be a risk. Compared to positive identity constructions, what we see in a patriarchal, highly stratified society is the construction and deep-rooted existence of negative age identities.

**Table 2 – Positive and negative self-identities developed by the respondents.**

SELF IDENTITY	
POSITIVE	NEGATIVE
• Proud to be lived long	• Disengage from activities
• Readiness to adapt positively	• Step down from the power roles
• Free will exhibited	• Consider old age as period of dependency
• Follows healthy routine	• Old age is ill health
• Aged women are 'kin keepers'	• Illness in old age cannot be cured
• Learn to be more careful in money matters	• Fear and anxiety
• Give yourself engagements of one or other kind	• Unpredictability of conditions and miseries in future
• Create healthy and happy family environment	• Less control over decisions taken regarding one's own self
	• Disrespect to the age and experiences
	• Out dated – do not fit
	• Unpredictability of conditions and miseries in future

**Table 3 – Positive and negative social-identities developed by the respondents.**

SOCIAL IDENTITY	
POSITIVE	NEGATIVE
• Graced by the almighty	• Physically weak
• Respectable person	• Emotionally dependent
• Should be carefree	• Unproductive and a Financial burden
• Should follow a healthy routine	• Less skilled and less attractive
• Get timely health care	• Should remain subordinate
• Expect to give advices	• Must adjust with the conditions
• Have more free time to spent	• Should not complain
	• Reduce demands
	• Vulnerable
	• Pestering
	• Technologically incompetent
	• Impatient
	• Less adaptive
	• Falls and health complications

Narratives also showed that positive self and social identity constructions are mutually nurturing. It gives the capacity for the aged women to have high self-esteem, assertiveness

in their behaviour, feeling of fulfilment and freedom, self-sufficient and happy to gracefully embrace the changes related to ageing.



**Table 4 – Narratives and corresponding constructs by the respondents showing positive self and social identities.**

<p>“I understand that I am getting old. But that does not mean that I am unhealthy. I do all my household works. I leave the rest to god.”</p> <p>“What else is there for me to worry about? I have fulfilled all my duties. Now I have to obey my son and demand only genuine needs”.</p> <p>Constructs – Aged women can experience inner peace and fulfilment when they can understand their own limitations and come into terms with the process of aging.</p>
<p>“I do not have much demands. I have secured enough for my old age. Now until death comes, I have to live calmly”.</p> <p>Constructs – Aged women should feel satisfied with the conditions of life and stay calm. In doing so, they can find dignity and meaning in the later years when physical and biological senescence progresses.</p>
<p>“I was an atheist. But after 65, when I felt alone after my husband’s death and daughter’s marriage, I found GOD as a companion to share everything. I talk with the GOD. He is like a friend to me. I feel he is with me when I talk. After that I feel lightened”.</p> <p>Constructs – More dependent on ‘God’, but not necessarily on religion.</p>
<p>“Even when there is financial crisis, my daughter and son take care of me very well. We - my husband and me - do not have any savings. Whatever we have earned were spend for the children. We didn’t have any worries. Life will go like that.”</p> <p>Constructs – Even in low socio-economic conditions they feel supported and cared by the significant others. “I have to live without my husband since my younger ages. Had faced everything till now. I do not easily get worried by crisis. I have lived all my years through crisis. I have made them (children) realise the struggles I have been through. So expect that they will stand by me”</p> <p>Constructs – They can retrospect, face challenges in later life with optimism.</p>
<p>“I know what I want. I am still independent. I will hire according to my demands and never bother my children. But I will inform them. Because nowadays there is lot of insecurity around.”</p> <p>Constructs – Observed sense of freedom – physical, mental and economical.</p>
<p>“I have changed a lot. Earlier I used to worry a lot. Was angry almost all the time. But now there is a sense of detachment from everything. But I enjoy the solace in life.”</p> <p>Constructs – Detaching from worldly pleasures and practicing asceticism are identified as self-realisation in old age.</p>

### The Dialectics

When the identities are constructed negatively, they become risks for the survival, happiness, and well being of the aged women. These negative identities function as tools of oppression perpetuating ageism in society. Knowingly or unknowingly, standards are being set, and images are being projected in such a way that self and social identities are built at the expense of each other. At various junctures, social identity can be seen as dominating self-identity. Through this domination, social identities control the self-identity constructions in aged women. Self-identities constructed by the aged women always tend to be in

confirmation with the one projected by social identities. When this process continues for a longer period of time, it automatically reaffirms the existing ageist social identities into concrete social identities through actions and interactions. It gets normalised in society as a synonym for old age and aged women. Gender, widowhood and negative social identities perpetuate ageism through processes of discrimination, exploitation and marginalisation. In this sense, there is a vicious cycle of the structuring of ageist negative identities and processes of ageism. The processes may take the following forms:

**Table 5 – Synthesis of ageism**

<b>DISCRIMINATION</b>	<b>EXPLOITATION</b>	<b>MARGINALISATION</b>
Denying opportunities	Financial dependency	Poor allocation of resources within the family and society
Less authority compared to others	Incompetent to handle money	Neglects in health care and timely treatment
Ignoring their demands	Possessions and properties are misused	Keeping away from decision making process
Prejudiced and stereotyped image in the society	Physical limitations are exaggerated or magnified	Imposing restrictions on social gatherings, movements, etc
Abusive and discriminatory language	Emotional blackmailing	Confined within the house or even within the room
Restricting life within labelled categories	Symbolic stereotyping	

### **Negative identity constructions and Reverse Metamorphosis**

Biological metamorphosis refers to the change in anatomical and physiological form through a series of life stages. Complete adult stage is the epitome of beauty, vibrant life and happiness. What we always propagate through the concept of healthy, active, successful ageing is comparable to the life stages of a butterfly/ metamorphosis whereby life is added to ages. However, in reality, ageism is the stumbling block for the aged, especially aged women, to achieve this target. The researcher uses the concept of Reverse Metamorphosis for explaining the process due to the negative identity constructions. It is a two-way process that influences the self and social identities and the processes of ageism. Unlike simple disengagement from the active life entirely due to physiological or functional limitations resulting from the biological processes of ageing, there is a deliberate oppression of self-identities in ageism. Reverse metamorphosis starts with the self-identity pronouncing sacrifice, renunciation, passive, withdrawal from the social world. With added vulnerabilities like gender, widowhood and asset-lessness, social identity constructions project

aged women as weak, inefficient, less adaptive, burdening the young productive population, and easy prey for exploitation. The stereotyping progress into labelling and limiting conditions for the aged women within the mind, family and society. They set boundaries around themselves, indirectly leading to reaffirming the negative images. Internalised self-identities become social identity and vice versa, creating cocoons of identities that confine oneself within the barriers in an effort to confirm with the norms of social identity. Mostly this results in low quality of life and low subjective well-being.

The dominance of social identity over self-identity, when remained unchecked, leads to designing the future of identity creations. This becomes a cyclical process whereby constantly reaffirmed self-identities develop constantly oppressive social identities and vice versa. Gradually, it becomes a process of social construction that inherently bear the capacity to reduce the freedom, liberty and equality of elderly women. It emerges as an anti-democratic process that continues to oppress the already vulnerable, marginalised section of elderly women in our society.

**Table 6 – Conversations, conditions and experiences of ageism faced by aged women**

<b>Conditions</b>	<b>Experiences</b>
‘Give away the charge of kitchen’, ‘give room for active and smart family members’, ‘don’t waste time’, ‘give way, you can’t move fast’, ‘try to understand’  Self and social restrictions to withdraw from active roles	Live a passive life.  Considered as burden to family and society

Conditions	Experiences
‘It’s time for prayers’, ‘request god not to make you suffer’, ‘you are aged’, ‘it’s not suitable for the aged women’, ‘you are an aged widow’, ‘obey your son/daughter’ Imposes to take shelters in “age molds or labels.”	Socially isolated and experience loneliness
‘Vegetarianism, bhajans, temples, prayers, soft colour traditional wears, television series of bhakthi/god/devotion’ Change in tastes- dress, food, entertainments, frequency of travels.	Cocoons of age is developed. Spiritually modified space and materials Market value as ‘spiritual consumers’
‘You can wait’ Less prioritised	Neglect in resource allocation and prioritisation
‘It’s enough,’ ‘what else do you want?’ Spared with less resources	Marginalisation
‘You have lived your life, now let us live ours’, ‘we have to build our career and home’, ‘we are busy, try to understand’, ‘you always have lot of complaints’, ‘you are hard to manage.’ Lack of social support and care	Alienation

### Ageism explained by Habitus

Habitus emerges over time and acts like a durable ‘structuring structure’. It comes from practice, and it shapes practice. It predisposes people to think and act in patterned ways. In this sense, habitus can be used to explicate what are the socio-cultural underpinnings of ageism in a multicultural society like India- a risk leading to reverse metamorphosis in later life. Stereotyped age identities are so ingrained that people often mistook the feel of being marginalised as a natural process associated with ageing instead of identifying it as culturally developed. This often leads to justifying social inequality because it is mistakenly believed that some sections of the population are disposed to the finer things in life while others are not. Aged women, as a group with multiple vulnerabilities like widowhood, lack of personal financial assets, cognitive as well as physical limitations that increases with age, social and cultural constructions of subordinate power possessions, set the foundation for limiting their social world. Self-identity created on this basis becomes the foundation for constructing social identity about the aged women. Bourdieu’s concept of habitus as “a structuring

structure, which organises practices and the perception of practices” fittingly explains this situation.

### Managing Ageism and the Action Plan

Examining the WHO Strategy on a global action plan on ageing and health, we can see that the plan focuses on five strategic objectives:

- Commitment to action on Healthy Ageing in every country;
- Developing age-friendly environments;
- Aligning health systems to the needs of older populations;
- Developing sustainable and equitable systems for providing long-term care (home, communities, institutions); and
- Improving measurement, monitoring and research on Healthy Ageing.

### Application of theory

A key point within Bourdieu’s theory is that habitus constrains but does not determine thought and action. If

an individual is both reflective and aware of their own habitus, they possess the potential to observe social fields with relative objectivity. Bourdieu outlines four species of capital that are linked with habitus. Species capital is located as part of the structuring process of habitus. This can be used by individuals within the relative field as a tool for gaining dominance and power. Bourdieu breaks species capital down into:

1. **Social capital** which can be defined as the circles of friends, groups, memberships and social networks (also virtual within online communities).
2. **Cultural capital** which is an individual's knowledge, experience and connections. (Academic background, credentials and work-life).
3. **Economic capital** is the economic assets held (property owned, earning ability).
4. **Symbolic capital** is the honour, prestige and recognition relative to the individual (a veteran in a certain field, an aged person, a respectful person).

Older women can age gracefully depending on their effective utilisation of all the four capitals. They should learn new ways to build community, find spiritual and cultural interests and continue to render services even it is limited. Habitus has the potential to influence our actions and to construct our social world as well as being influenced by the external. By modifying their identity constructions, they can mould their identities to support successful, positive ageing. Society is the essential counterpart for attaining the purpose. Support for the efforts of aged women in this direction can be pragmatically achieved by restructuring age identities through inclusive age-friendly - gender-friendly initiatives done by governmental, non - governmental and community level programs.

### Conclusion

Around the globe, the fastest-growing population group is the group of people over 60 years of age. It is estimated that by 2050, one in six people will be over the age of 65. This demands the need that ageism is to be urgently tackled at every level possible, whether it is at the global, national or community level.

Describing the need for a global strategy and action plan on ageing and health, WHO recognises that it is the need of the hour. We cannot move blindfolded towards the future in an ageing population. With some of the rapidly ageing low- and middle-income countries, promoting healthy ageing and building systems to meet the needs of

older adults will be sound investments in a future where older people have the freedom to be and do what they value. (WHO, May 2016)

Creating environments that are truly age-friendly requires action in many sectors: health, long-term care, transport, housing, labour, social protection, information and communication, and by many actors – government, service providers, civil society, and older people and their organisations, families and friends. The study suggests that combating ageism, enabling autonomy, supporting healthy ageing and age-inclusive policies at all levels are certain key approaches that are relevant to all stakeholders.

### References

- Akundy, Anand (2004). *Anthropology of Aging: Contexts, Culture and Implications*. New Delhi. Serials Publications.
- Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgement of Taste*. London, Routledge.
- Bourdieu, P. (1986). 'The Forms of Capital'. *Handbook of Theory and Research for the Sociology of Capital*. J. G. Richardson. New York, Greenwood Press: 241-58.
- Humphries, Jane (1991). *The Sexual Division of Labour and Social Control – An Interpretation Volume: 23* issue: 3-4, page(s): 269-296. Issue published: September 1, 1991. Sage Journals.
- Jaiprakash, Indira (2001). *On being old and female: some issues on quality of life of elderly women in India*. New Delhi. Rawat publications.
- Karuppiah, C. (2002), "Health Problems and Health Needs of the Aged in the Villages of Tamil Nadu", in Tharabhai L., (ed)., *Ageing: Indian Perspectives*, 159-176, New Delhi: Decent Books.
- Patel, V., Kleinman A., (2003). *Poverty and common mental disorders in developing countries*. *Bulletin of the World Health Organization*, 81:609–615. 23. World Health Report.
- Prakash, I. J. (1997). *Women and Ageing*. *Indian Journal of Medical Research*. Oct;106:396-408.
- WHO (2002). *Active Ageing: A Policy Framework* (<http://www.who.int/ageing/publications/active/en/index.html>)
- WHO (2016). *Multisectoral action for a life course approach to healthy ageing: global strategy and plan of action on ageing and health*" (Document A69/17)

\*\*\*\*\*

---

# Co-Integration and Causality Among Stock Market Indices: A Study of 35 Indices Across 5 Continents

**Dr. Nisarg A Joshi**

Independent Academician and Researcher  
National Finance Head, Agrifeed, Botswana  
Email: [nisarg@nisargjoshi.com](mailto:nisarg@nisargjoshi.com)

**Mruga Joshi**

Assistant Professor  
New L. J. Commerce College, Ahmedabad, India  
Email: [mruga.joshi87@gmail.com](mailto:mruga.joshi87@gmail.com)

**A  
b  
s  
t  
r  
a  
c  
t**

This paper analyses the nature and level of interdependence of various stock markets of the world. The study explores stock market interdependencies and dynamic interactions among selected global indices. The paper also ascertains the degree of association between developed and emerging markets. The findings show that a considerable amount of interdependency exists among the Indian stock market and other global stock markets. Findings suggest that there is an association between developed and emerging markets. These results are recommended to policymakers, regulators and researchers on the one hand and firms' managers as well as investors. These results provide insights to investors for portfolio diversification.

**Keywords:** *co-integration, cross-correlation, stock markets, market efficiency, interdependence, causality, international financial markets,*

## 1. Introduction

Global capital market integration over the last thirty years has been noticed through major strategic deviations under which international investment limits were reduced, exchange control was almost eliminated, free movement of capital, humans and technology was promoted, and the fundamental structures of most worldwide markets were transformed. Such progress in markets can change the relationship among different markets across the globe. Market integration has been promoted through liberalisation, which has critical implications on investment decisions and policies.

The stock market is connected with a sharp increase in uncertainty both in developed and emerging markets. Stock market behaviour analysis offers information about the future evolution of the stock market.

The dynamics of the progress of economy is inevitable. Nowadays, there is great attention towards the analysis of linkages among global stock markets. Through financial integration, native country can be linked with international capital markets. Increasing regional integration of financial markets helps to diversify the risk. The cost of financial contagion and crisis can be avoided by global financial openness (Cyn & Jong, 2011).

Integration can be deliberated from different standpoints: first is the general integration process at the global level, and the second is the economic integration process. The general integration process explores the level of global financial integration and its impact on economic growth. Previous studies by Lane and Milesi-Ferretti (2003), Arestis and Basu (2003) and Edison et al. (2002) concluded that the impact of financial integration on economic growth is dependent on various factors such as financial growth, economic development, legal progress etc. The economic integration is more critical as it focuses on the relationship between the financial markets as part of economic integration. Such integration can change the relationship among stock prices in various countries. Such market integration leads to international diversification, which results in better benefits to investors. Integrated markets are likely to have a higher transmission of market turbulence among different countries. Few previous studies like Errunza and Losq (1985) and Jorion and Schwartz (1986)

concluded that global capital markets were moderately integrated.

The probable reason behind co-integration comes from the efficient market hypothesis (EMH). According to EMH, asset/stock prices reflect the new information arrival in the market. The change in stock prices of one market due to change in other stock indices is not constant. Hence, it is important to analyse the change in the stock price in one market due to changes in different variables in different markets. The cause of co-integration among various stock indices is due to increased global market capitalisation based on the factors like development in MNCs, advances in technology, deregulation of financial systems, increase in capital flows due to relaxed foreign exchange policies etc. Such movement of stock prices across the markets leads to superior profits and better diversification which will lead to co-integration of stock markets globally.

According to Jorion and Schwartz (1986), lower co-integration of stock prices propels the investors to take advantage of diversification by investing across various stock markets globally. Mukherjee (2007) found that the Indian stock market had very high co-integration with stock markets of the USA, Russia, Korea, Japan and Hong Kong due to the ADRs and GDRs listed by the Indian companies in these markets.

Co-integration among the stock markets can be studied to understand if there are any mutual factors that determine the returns of stocks or indices or if an individual market or stock is driven by its own fundamentals. If mutual factors are found across markets, they are perfectly correlated with each other over a long period of time and are found to be more prone to contagion and ripple effects. The study of co-integration and causality among the markets can help to reduce such risks.

Khan (2011) explained two major reasons for co-integration in his study, namely global liberalisation of capital flows and a better network of communication which made it easier for investors to invest in global markets. He also concluded that co-integration has also happened due to a financially and economically integrated world which would result in an efficient international financial scope, and various markets would not be able to show independent behaviour of prices. Other studies by Domowitz (1995),

Lee (1998), Domowitz and Steil (1999), Cybo-Ottone et al. (2000), Shy and Tarkka (2001), Hasan and Schmiedel (2004), Armanious (2007) and Nicolini (2010) confirmed that mergers, acquisitions, strategic alliances, cross-listing and other forms of restructuring and co-operative movements between various stock markets as well as derivatives indices could lead to co-integration to increase the value of stock exchanges across the world. According to Dorodnykh (2014), “co-integration is a complex process, and it depends on various macroeconomic, structural, cultural-geographical and operative forces, where different stakeholders can also affect the integration decision.”

In order to obtain the variations in the degree of integration among markets, correlations can be used as a technique to observe the discrepancies in the stock values over the years. A higher correlation can be implied as an increase in the degree of integration and can have a much significant tendency that impacts in one country can be spread to others. As such, this methodology is not found to be much informative as the correlations can be found as a result of short and long-term relationships.

Co-integration is the study of a long-term relationship or co-movements between two variables in an equilibrium setup. The co-integration relationship in stock markets indicates the presence of a common trend that connects the stock markets. The presence of co-integration between stock markets reduces the portfolio risk diversification opportunities since the co-integrated stock markets share similar investment risks. The implications of no integration between international stock markets increase the benefits of investing in different stock markets. Therefore, the International investors looking out for global investment opportunities can formulate portfolios that include securities of either single asset class or multiple classes but spread in different countries' stock markets that are not co-integrated. Further, the non-integrated stock markets have fewer implications of global news affecting their domestic stock markets. The research in stock market co-integration helps international investors, mutual fund houses and hedge funds to look for investment opportunities across international stock markets.

The studies on the co-integration between the stock markets have been a vital topic in the financial literature ever since the works of Granger (1983) formalised the concept of

co-integration. Later studies of Granger and Weiss (1983); Engle and Granger (1987) evolved into a model to test the linear relationships among the financial markets. The unfavourable events in one market cause fluctuations in stock prices. Due to the interlinkages with other markets, the fluctuations are spread as a Contagion to the interlinked markets.

The co-integrated and interlinked stock markets can lead to a worldwide crash to begin with a particular news event in one country (Roll, 1989). The studies of Arshanapalli and Doukas (1993), Masih and Masih (1997), and Kizys and Pierdzioch (2011), among others, have reported the interlinkages among developed markets of USA, Japan and Europe. The interlinkages between the US, Japan and Asian markets were evidenced by Arshanapalli et al. (1995), Anoruo et al. (2003), Asgharian et al. (2013), among others. Further, these studies attributed the decline in the stock indices after the United States stock market crash of October 1987, the Asian Financial Crisis of 1997 and the Global Financial Crisis of 2008 to co-integration and interlinkages of stock markets.

Normally, the long-term equilibrium relationship is specified by a bivariate co-integration relationship. In such a relationship, the deviation from the equilibrium relationship is found to be stationary with a mean value of zero. It can be interpreted into an application that can be assessed as a combination of two non-stationary series, which itself is stationary. According to Engle and Granger (1987), such bivariate series is considered to be co-integrated.

Such bivariate relationships can be expanded to a multivariate relationship. In such relationships, a deviation in the price factors from the long-term relationship can be created from a grouping of all the time series. Though it looks like a complicated structure, the concept remains the same. Multivariate co-integration is a long-term relationship among the non-stationary time series, and there is a combination of non-stationary time series, which is stationary. In such a situation, a bivariate relationship can lead to inappropriate results and inference.

It has been observed that co-integration is expected to be found more in larger systems than smaller ones, which can be explained as representing the broader association among

international stock markets, and these markets are integrated to a greater extent. A change in the degree of co-integration among the factors/variables can explain the long-term relationship among global stock markets. This can be achieved through the comparison of the co-integration relationship over various sub-sample periods. In this study, the multivariate approach of co-integration is adopted to investigate the co-integration of multiple countries.

## 2. Literature Review

There had been a number of studies done by various researchers over the years emphasising different parameters of co-integration such as risk, return, volatility, prices etc.

Corchy Rad and Urbain (1995) studied the relationship among various stock markets by applying the Granger causality test for the period of 1981 to 1991 and found that there was no co-integration among these stock markets. Darrat, Elkhail and Hakim (2000) studied about the integration of emerging stock markets in the Middle East. Modelling techniques such as co-integration and error correction were associated with the international stock markets, and the stock prices in each country have been equalised by the arbitrage force. They found many differences between the trading patterns, which have especially been marked in regard to the market integration at a national level. Macroeconomic shocks throughout the economy have affected the capital markets at the international level. Free-flowing information and capital across international borders are some of the levels which have characterised the foreign market integration effectively.

Schleicher (2001) observed co-integration between the Eastern European Market and the Western European Market. The study had used a VAR model with multivariate GARCH and concluded that Eastern markets were more influenced by the Western markets.

According to Brooks and Negro (2002), the international equity market has a low degree of correlation returns across the stock markets at a national level. Emerging stock markets have constituted only the data with a small fraction. They pointed out that the stock market has been considered as the benchmark portfolio in most of the cases. They emphasised on the regional perspectives of international stock markets and market integration.

Click and Plummer (2003), Majid et al. (2009) and Phuan et al. (2009) studied about the stock market integration in ASEAN after the financial catastrophe and found that the co-integration of five ASEAN markets have not been completed in an economic sense. Serwa and Subramanian (2008) studied the relationship among five stock exchanges in East Asia. He used co-integration test and Granger causality test to study the relationship and concluded that these stock exchanges were co-integrated and diversification across various markets can be beneficial in the short-term but not in the long-term.

Mukherjee and Mishra (2005) observed long-term co-integration among the Indian stock market and other Asian stock markets.

A study done by Guidi (2010) has shown contradictory results that there was no co-integration found in the Indian stock market and Asian stock markets. The study revealed that the long-term benefits of investing in India are very limited. Another study done by Chittedi (2010) observed the relationship between developed countries stock markets and the Indian stock market and found that these markets were not co-integrated. He used the Granger causality test and found a uni-directional relationship between the Indian stock market, US market and Japan, whereas the UK and Australia were found to have no causality. Nath and Verma (2003) found that there is no co-integration among three South Asian stock markets, i.e. India, Taiwan and Singapore.

Thalassinos and Thalassinos (2006) studied the integration analysis of the stock market and analysed that there were significant changes in the market integration degree among various stock markets using different econometric techniques. The EMU establishment has affected the European stock market integration highly when compared to others. They also concluded that there has been a significant relationship between the dependence of bilateral import and the degree of stock market integration.

Alagidede (2008) studied the African stock market integration with implications for portfolio diversification and international risk sharing. Integration of stock markets has tended to be more efficient when compared to the segmented markets. Co-integrating vector numbers have revealed the integration extent across stock markets. Geographical proximity has not clearly dealt with the



African stock markets. Further, they suggested that the efforts at integrating African stock markets have remained futile to date.

Tirkkonen (2008) studied the stock and bond market integration with evidence from Russian financial markets. Long-run relationships testing with the autoregressive model (VAR) has played an important role in the Russian stock market integration.

Wang and Moore (2008) studied the stock market integration for the transition economies by using time-varying conditional correlation. They found a very high level of correlation after entering to the European Union. Financial market integration has seemed to be a largely self-fuelling process, and it also has a dependence on the development of the financial sector at the existing levels.

Chen and Shen (2009) studied the co-integration among stock markets of U.K., U.S.A., Japan and Germany Markets by using Granger causality and co-integration test and found the integration among markets. Chancharat (2009) studied stock market integration by using econometric techniques such as the Co-integration test, factor analysis and GARCH models, which are found to be useful to investigate the relationship among the economic variables and the stock market integration. These techniques also have the tendency to examine whether the international stock markets have the capability to move together in the context of the stock market integration.

Erdogen (2009) concluded that co-integrated stock markets have created greater chances for global investors by discarding country-specific risks. It was found that co-integrated markets reduce the capital cost, which helps the growth of an economy. Co-integrated markets have the capability to intensify the sector effects and nullify country effects. Co-integration among developing stock markets in Asia was studied by Raju and Khanapuri (2009), and they found the existence of a high degree of co-integration among the markets used in the sample.

Baumöhl and Výrost (2010) analysed co-integration using the Granger causality test with respect to non-synchronous trading effects. They used classical mean-variance methodology and concluded that there was no significant lead-lag relationship of stock market integration in the pre

and post-crisis period. Karagöz and Ergun (2010) observed market co-integration among Balkan countries and found that economic and financial integration has helped to reduce the political risk and to promote the stability of the economy and local markets size. Yeoh et al. (2010) studied co-integration between Malaysia and Singapore stock markets. They concluded that the Malaysian stock market was having a higher degree of co-integration.

Babecký et al. (2012) studied co-integration between Chinese and Russian stock markets by using beta-convergence and sigma-convergence approaches. Bhunia and Das (2012) studied about the financial market integration from India and selected south Asian countries. The global crisis of finance has focused more attention on the linkages among the Asian countries stock market. Authors have predicted that the stock index of the Indian stock market has not co-integrated with the developed markets. Indian stock market has integrated with the mature markets effectively.

Birau and Trivedi (2013) studied stock market co-integration and contagion of emerging markets with respect to the global financial crisis. The financial system turbulence resulted in the heavy reduction on the stock market around the world. Joshi (2013) examined the co-integration among BRIC's stock indices and concluded that India had a long-term equilibrium relationship with Russia and China but not with Brazil.

Park (2013) studied co-integration among Asian stock markets and found that there was an increased correlation between the movement of assets prices, and the degree of stock market co-integration was enhanced over time from one market to another. Mohamed (2014) investigated the existence of co-integration among GCC stock markets. Most of the GCC stock markets are relatively small, closed to foreign investors, which also have led to the blocking of inflows of foreign portfolio investment effectively.

Patel (2014) proposed a study regarding the co-integration of Indian and selected Asian stock markets. This study examined the Indian stock market independence with other equity markets of Asia like Sri Lanka, Pakistan, Korea, Japan, Malaysia, China, Singapore and Taiwan. The study concluded that all Asian stock indices are first difference stationary, and there is an existence of long-term

equilibrium relationship among Asian markets. It found that the stock market of India is influenced by stock indices of China, Sri Lanka, Singapore and Japan. The major suggestion derived is that the government of India must supervise the Asian equity markets movements very closely because a crisis in any country of Asia may influence the Indian stock market performance.

Seth and Sharma (2015) studied the co-integration among the Asian and US markets by applying the Granger causality test, Johansen co-integration test and found the existence of short term and long term co-integration among the market. Mitra and Bhattacharjee (2015) found a co-integration of BSE with other markets.

Bhattacharjee and Swaminathan (2016) studied the stock market integration of India and few selected countries and found that co-integration of the Indian market with other indices have improved over the years due to liberalisation, and during the recession, the Indian market was more responsive to Asian markets.

Everaert and Pozzi (2016) studied co-integration among 19 European stock markets for a period from 1970 to 2015 by using a panel of monthly stock market returns. They developed a model of dynamic factor, which decomposes equity risk premium into a country risk factor of Europe with stochastic volatilities and time-varying factor loadings. This model was evaluated using Bayesian MCMC (Markov Chain Monte Carlo) methods. The study concluded that there was an existence of co-integration in few developed European countries from the late 1980s to early 1990s, but also neither euro area membership nor European Union has developed the integration of the stock market. Shahzad, Kanwal, Ahmed and Rehman, (2016) studied co-integration among the stock markets applying ARDL and found the existence of co-integration among the markets.

Patel (2017) explored the co-integration among 14 stock markets. The correlation analysis showed that BSE remained somewhat positively correlated. Results of the Johansen co-integration test concluded that there was a long-run relationship among selected stock markets.

Kiviet and Chen (2018) reviewed the literature on the analysis of co-integration between the price indices of

stocks or their realised returns at various markets and registered frequently recurring methodological deficiencies such as omitted regressor problems, neglecting to verify agreement of estimation outcomes with adopted model assumptions, employing particular statistical tests in inappropriate situations and, occasionally and lack of identification.

Nautiyal and Kavidayal (2018) examined cross-country returns and co-integration of 11 stock indices of developed and developing countries by using VECM and found that there was a slow but significant price adjustment and stock market co-integration was found.

### 3. Data and Methodology

#### 3.1 Data Sources

This study included closing values of daily prices of various indices from January 2005 to December 2018, which were collected from the respective websites of the stock exchanges. The stock market behaviour and the extent of co-integration were investigated among 35 stock indices from 5 continents (Africa, America, Asia, Europe and Australia) in the world. The major stock indices of the Asian markets (SENSEX, HSI, JAKARTA, KLSE, KOSPI, NIKKEI 225, NZSE50, SHANGHAI, STRAITS, TAIWAN and NIFTY), stock indices of European markets (AEX, ATX, BEL20, BIST100, CAC40, DAX, FTSE100, IBEX, OMX, OSE ALL SHARE, RTSI, SMI and STOXX50), index AORD from the Australian market and stock indices of the American market (DJIA, GSPC, IBOVESPA, IPC, MERVAL, NASDAQ, NYSE and S&P TSX) were selected for this study.

#### 3.2 Methodology and Hypothesis

This study involved a two-stage methodology. In the first part, normality, stationarity and causality of the time series were tested using statistical techniques like Jarque-Bera Statistic, ADF Test and Granger Causality Test, respectively. The hypothesis statements were developed for each test as follows.

$H_0^1$ : Stock indices prices are normally distributed.

$H_0^2$ : A Unit Root is present in the stock indices prices. (Dickey & Fuller, (1979 & 1981))

$H_0^3$ :  $x(t)$  doesn't Granger-cause  $y(t)$ . (There is no causal relationship between stock indices)

In the second part of the methodology, the focus was given to analyse the stock markets interdependencies, to ascertain the degree of association and to measure the market efficiency using various techniques like Johansen's Cointegration test, Cross-Correlation test and Hurst Exponent. Johansen's Cointegration test was used with two approaches, i.e. trace test and eigenvalue test.

$H_0^4$ : The number of co-integration vectors is  $r = r^* < k$ . (Null Hypothesis for trace test as well as eigenvalue test)

$H_0^5$ : Cross-correlation is not significantly different from zero.

$H_0^6$ : Stock price variations are independent.

## 4. Analysis and Results

### 4.1 Descriptive Statistics

The descriptive statistics of the variables under study are shown below, which include mean, median, maximum-minimum values, standard deviation, JB statistic, skewness and kurtosis. These figures are taken from the original data, daily prices and include annotations from 2005 to 2018.

**Table 1: Descriptive Statistics of sample indices**

INDICES	Mean	Median	Max	Min	Std. Dev.	Kurtosis	Skewness	JB	P Value	-	Sum	Sum Sq. Dev.	ADF Test
AEX	0.02	0.05	10.55	-9.14	1.35	11.83	0.02	9150.22	0		48.58	5161.12	-53.64*
AORD	0.02	0.05	5.51	-8.2	1.08	7.54	-0.4	2552.74	0		46.34	3379.5	-54.88*
ATX	0.01	0.07	12.77	-9.74	1.65	8.74	-0.07	3887.16	0		30.33	7673.18	-49.72*
BEL 20	0.01	0.03	9.66	-7.98	1.27	9.24	-0.002	4743.64	0		40.54	4735.71	-52.61*
BIST 100	0.05	0.08	12.89	-10.47	1.73	3.52	-0.12	1430.29	0		145.28	8310.4	-51.16*
CAC 40	0.02	0.04	11.18	-9.04	1.45	9.48	0.2	5121.59	0		46.04	6098.94	-56.55*
DAX	0.04	0.1	11.4	-7.16	1.4	9.46	0.17	5077.95	0		115.76	5713.37	-54.08*
DJIA	0.13	0.09	56.8	-30.31	4.71	34.04	2.16	116304.8	0		355.6	63093.6	-16.04*
FTSE	0.02	0.01	9.84	-8.85	1.19	11.33	0.03	8548.11	0		46.72	4181.57	-26.07*
GSPC S&P 500	0.03	0.07	11.58	-9.03	1.26	13.97	-0.09	14087.69	0		80.54	4481.09	-24.82*
HIS	0.03	0.03	14.35	-12.7	1.56	12.82	0.3	11528.07	0		72.68	6952.63	-42.74*
IBEX	0.01	0.07	14.43	-9.14	1.52	9.7	0.27	5477.53	0		32.79	6769.31	-55.05*
IBOVESPA	0.04	0.02	14.66	-11.39	1.79	8.67	0.22	3820.28	0		108.51	9044.04	-40.03*
IPC	0.05	0.08	11.01	-7.01	1.29	9.8	0.28	5444.88	0		150.65	4651.76	-53.83*
JAKARTA	0.07	0.13	7.92	-10.38	1.4	9.57	-0.47	5116.35	0		184.15	5454.53	-48.93*
JALSH	0.2	0.18	65.97	-27.65	5.5	28.34	1.63	76790.28	0		557.86	85326.7	-47.92*
KLSE	0.03	0.05	17.38	-14.42	0.93	97.95	0.8	1060287	0		70.85	2427.87	-3.76*
KOSPI	0.04	0.06	11.95	-10.57	1.31	11.36	-0.36	8290.24	0		104.01	4837.42	-58.55*
MERVAL	0.1	0.12	11	-12.15	2.02	6.41	-0.31	1406.99	0		280.33	11482.1	-52.11*
NASDAQ	0.04	0.09	11.81	-9.14	1.34	10.46	-0.06	6661.31	0		109.21	5183.12	-51.21*
NIFTY 50	0.06	0.07	17.74	-12.2	1.52	13.44	0.23	12936.76	0		167.66	6531.2	-57.46*
NIKKEI225	0.03	0.06	14.15	-11.41	1.57	10.65	-0.25	6876.55	0		74.97	6907.84	-3.76*
NYSE	0.02	0.06	12.22	-9.73	1.32	13.68	-0.16	13662.26	0		62.34	4966.89	-55.35*
NZSE50	0.03	0.07	5.99	-4.82	0.71	8.04	-0.3	2990.83	0		89.39	1390.54	-41.99*
OMX	0.04	0.08	9.01	-7.12	1.36	7.68	0.06	2614.65	0		101.82	5294.42	-49.04*
OSE	-0.02	-0.11	10.2	-8.78	1.55	9.05	0.75	4562.05	0		-65.53	6778	-54.30*
RTSI	0.04	0.08	22.39	-19.1	2.25	13.9	0.09	14179.01	0		111.13	14460.5	-52.27*
S&P TSX	0.02	0.07	9.82	-9.32	1.15	13.24	-0.47	12808.58	0		61.24	3841.13	-48.95*
SENSEX	0.06	0.09	17.34	-10.96	1.52	12.53	0.32	10688.63	0		170.96	6511.39	-49.23*
SHANGHAI	0.04	0.06	9.45	-8.84	1.75	6.77	-0.37	1744.42	0		127.04	8680.17	-52.12*
SMI	0.02	0.06	11.39	-8.67	1.15	11.91	-0.06	9590.69	0		54.3	3805.81	-26.52*
STOXX50	0.01	0.02	11	-7.88	1.45	9.19	0.17	4462.43	0		39.37	5852.77	-26.21*
STRAITS	0.02	0.03	7.82	-8.33	1.14	9.47	-0.07	5034.85	0		48.58	3735.75	-52.78*
TAIWAN	0.02	0.07	6.74	-6.51	1.21	6.56	-0.3	1531.11	0		53.59	4127.48	-50.10*
TEL AVIV	0.03	0	6.97	-10	1.16	10.47	-0.78	6836.68	0		85.47	3766.01	-53.79*

The descriptive statistics show that mean returns of most of the indices in the sample were positive though it was found that the mean daily return of the JALSH index was highest (0.2) among all the indices followed by the MERVAl index, whereas the average daily return of OSE index was lowest (-0.02) among all. The fact that the emerging markets are more volatile is evident from statistics on the standard deviation of daily returns in these markets. In general, the developed market returns are less volatile with a standard deviation lesser than the emerging markets. The South African market, though, provides the highest magnitude of maximum daily returns, along with a maximum standard deviation of 5.5, followed by Russia (2.25) and India (1.52). The Developed markets exhibit high volatility in US DJIA (4.71), and the least volatility in the developed market sample is exhibited by the Australian Market (1.08).

Skewness values of emerging markets like Russia and China exhibit an asymmetrical distribution with a long tail to the left, while India situation is near to zero exhibiting only asymmetrical distribution. In developed markets, the US stock market exhibits symmetric distribution around the average value. While other developed markets like the UK, Japan and Singapore exhibits left-skewed distribution. All the Kurtosis values of the stock markets investigated in this study display a value of more than three, showing a leptokurtic curve, which demonstrates that the distribution of stock returns in these countries contain extreme values. The values of Kurtosis accompanied by those of Jarque-Berra statistic clearly indicate that the returns of developing markets are not normally distributed. These findings are consistent with Harvey (1995) and Bekaert et al. (1998). Under large departure from normality, the mean-variance criterion given by Markowitz (1952) can lead to the application of wrong portfolio weights (Jondeau and Rockinger, 2005). For risk-averse investors, the use of sub-optimal mean-variance criterion in portfolio construction can result in substantial opportunity cost. The non-normality of returns in emerging markets, therefore, compels the international investors to use distinct and typical models for determining expected returns of portfolios comprising emerging-market assets.

#### 4.2 Examining Stationary of Variables

In order to check the co-integration, a requirement is to check that all factors are non-stationary. The ADF test was used to determine that the variables are stationary or not. AIC was used to find out that the optimal lag structure for conducting the test.

The ADF test was performed for each of the indices in the sample included. The findings of the ADF test are shown in Table 1. As can be seen from Table 1, that the p-value is less than 1% for all the variables at the 1<sup>st</sup> difference level. It was found that all the stock indices prices are non-stationary at the original level, and they are stationary at the 1<sup>st</sup> difference.

#### 4.3 Test for Causality

Granger causality test was performed to examine the causal relationship among these markets. Since co-integration—at any level—exists, the Granger causality testing is appropriate for bilateral pairs of markets. As Granger (1988) pointed out, if two variables are co-integrated, causality must exist at least uni-directional.

The Granger causality test was conducted by dividing the data into three sub-periods (Period 1: 2005 – 2009; Period 2: 2010 – 2014; Period 3: 2015 – 2018). For most of the indices, the causality remained the same during all sub-periods. But in the case of some indices, the causality was found during one sub-period (either bi-directional or uni-directional) with an index but was not found in another sub-period. In a couple of cases, it also happened that for one sub-period, causality between two indices was uni-directional, for another sub-period, it was bi-directional, and for the third sub-period, there was no causality between those two indices. This led to a very interesting change of trends during short-term Granger causality results. These results for each of the sub-period are shown in the table below. In the last column of the table, the results show bi-directional or uni-directional causality of an index with other indices for the long-term, i.e. for the entire duration of the study. These long-term results are the combination of all short-term results, which include the bi-directional and uni-directional causality of an index with other indices, which were found in all three sub-periods as mentioned below. For instance, for bi-directional causality, the ATX index causes 12 indices during 2005-2009, 13 indices during 2010-2014 and 11 indices during 2015-2018. Out of these indices, ATX causes 11 indices during all three sub-periods, which is cited as long-term causality.

From the causality analysis, it can be inferred that there is an existence of bi-directional causality. Among 35 indices, AEX index causes 14 indices, AORD causes 9 indices, ATX causes 11 indices, Bel20 causes 11 indices, CAC40 causes 11 indices, DAX causes 8 indices, DJIA causes 3 indices, FTSE100 causes 12 indices, GSPC S&P500 causes 14 indices, HIS causes 9 indices, IBEX causes 8 indices,

IBOVESPA causes 5 indices, IPC causes 9 indices, Jakarta causes 8 indices, JALSH causes 1 index, KLSE causes 12 indices, KOSPI causes 12 indices, Merval causes 8 indices, Nasdaq causes 13 indices, Nifty causes 12 indices, Nikkei225 causes 6 indices, NYSE causes 13 indices, NZSE50 causes 4 indices, OMX causes 4 indices, OSE causes 23 indices, RTSI causes 11 indices, S&P TSX causes 24 indices, Sensex causes 10 indices, Shanghai cause 1 index, SMI causes 9 indices, Stoxx50 causes 10 indices, Straits causes 12 indices, Taiwan causes 8 indices, and Tel Aviv causes 21 indices.

As far as uni-directional causality is concerned, AEX causes 15 indices, AORD causes 5 indices, ATX causes 11 indices, BEL20 causes 18 indices, BIST 100 causes 2 indices,

CAC40 causes 15 indices, DAX causes 23 indices, DJIA causes 9 indices, FTSE causes 13 indices, GSPC S&P500 causes 14 indices, HIS causes 5 indices, IBEX causes 15 indices, IBOVESPA causes 22 indices, IPC causes 19 indices, Jakarta causes 7 indices, JLSH causes 8 indices, KLSE doesn't cause any indices in one way, KOSPI causes 3 indices, Merval causes 16 indices, Nasdaq causes 15 indices, Nifty causes 7 indices, Nikkei225 causes 1 index, NYSE causes 15 indices, NZSE50 doesn't cause any indices in one way, OMX causes 15 indices, OSE causes 4 indices, RTSI causes 9 indices, S&P TSX causes 3 indices, Sensex causes 7 indices, Shanghai causes 5 indices, SMI causes 24 indices, Stoxx50 causes 14 indices, Straits causes 4 indices, Taiwan causes 1 index, and Tel Aviv causes 5 indices.

**Table 2: Results Showing Bi-directional and Uni-directional Causality**

Indices	Bi-Directional Causality with an Index which was found in all Sub-Periods 2005 – 2009, 2010 – 2014, 2015 – 2018 as well as Entire Sample Period i.e. 2005 – 2018.	Uni-Directional Causality with an Index which was found in all Sub-Periods 2005 – 2009, 2010 – 2014, 2015 – 2018 as well as Entire Sample Period i.e. 2005 – 2018.
AEX	BEL20, CAC40, DAX, GSPC S&P500, HIS, IBOVESPA, IPC, JAKARTA, Merval, NASDAQ, NYSE, S&P TSX, SMI, TEL AVIV (14)	ATX, ABEX, JALSH, KLSE, KOSPI, NIFTY 50, NIKKEI 225, NZSE50, OMX, OSE, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (15)
AORD	DAX, DJIA, HIS, IPC, NIFTY50, OSE, S&P TSX, SENSEX, TEL AVIV (9)	KLSE, KOSPI, NIKKEI 225, NZSE50, TAIWAN (5)
ATX	GSPC S&P500, JAKARTA, Merval, NASDAQ, NIFTY50, NYSE, OSE, RTSI RUSSIA, S&P TSX, SENSEX, STRAITS (11)	AORD, DJIA, HIS, JALSH, KLSE, KOSPI, NIKKEI 225, NZSE 50, SHANGHAI, TAIWAN, TEL AVIV (11)
BEL 20	AEX, CAC40, GSPC S&P500, IBOVESPA, KLSE, Merval, NASDAQ, NYSE, S&P TSX, STOXX50, TEL AVIV (11)	AORD, ATX, DJIA, FTSE100, HIS, JAKARTA, JALSH, KOSPI, NIFTY 50, NIKKEI 225, NZSE50, OMX, OSE, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (18)
BIST 100		Merval, STOXX50 (2)
CAC 40	AEX, BEL20, DAX, GSPC S&P500, NASDAQ, NYSE, OSE, S&P TSX, SMI, STOXX50, TEL AVIV (11)	AORD, ATX, HIS, IBEX, JAKARTA, KLSE, KOSPI, NIFTY 50, NIKKEI 225, NZSE50, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (15)
DAX	AEX, AORD, CAC40, FTSE100, IBEX, KOSPI, NIFTY50, SENSEX (8)	ATX, BEL20, DJIA, GSPC S&P500, HIS, IBOVESPA, IPC, JAKARTA, JALSH, KLSE, Merval, NASDAQ, NIKKEI 225, NYSE, NYSE, OMX, OSE, RTSI RUSSIA, S&P TSX, SHANGHAI STOXX50, STRAITS, TAIWAN, TEL AVIV (23)

DJIA	AORD, RTSI RUSSIA, TAIWAN (3)	HIS, KOSPI, NASDAQ, NIKKEI 225, NYSE, NZSE50, SENSEX, SHANGHAI, STRAITS (9)
FTSE100	DAX, GSPC S&P500, IBOVESPA, IPC, NASDAQ, NYSE, NIFTY50, NZSE50, OSE, S&P TSX, SMI, TEL AVIV (12)	AORD, ATX, HIS, JAKARTA, KLSE, KOSPI, NIKKEI 225, OMX, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (13)
GSPC S&P500	AEX, ATX, BEL20, CAC40, FTSE100, IBEX, KLSE, KOSPI, NASDAQ, OSE, S&P TSX, SMI, STOXX50, TEL AVIV (14)	AORD, IBOVESPA, JAKARTA, JALSH, Merval, NIFTY 50, NIKKEI 225, NZSE50, OMX, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (14)
HIS	AEX, AORD, IPC, KOSPI, Merval, OSE, S&P TSX, STRAITS, TEL AVIV (9)	JAKARTA, KLSE, NIKKEI 225, NZSE50, TAIWAN (5)
IBEX	DAX, GSPC S&P500, JAKARTA, NASDAQ, NYSE, OSE, S&P TSX, TEL AVIV (8)	AORD, ATX, DJIA, HIS, JALSH, KLSE, KOSPI, NIFTY 50, NIKKEI 225, NZSE50, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TEL AVIV (15)
IBOVESPA	AEX, BEL20, FTSE100, STOXX50, TEL AVIV (5)	AORD, ATX, CAC40, DJIA, HIS, IBEX, JAKARTA, JALSH, KLSE, KOSPI, Merval, NIFTY 50, NIKKEI 225, NZSE50, OMX, OSE, RTSI RUSSIA, S&P TSX, SENSEX, SHANGHAI, STRAITS, TAIWAN (22)
IPC	AEX, AORD, FTSE100, HIS, KLSE, NIKKEI225, NZSE50, OSE, TEL AVIV (9)	ATX, BEL20, CAC40, IBEX, IBOVESPA, JAKARTA, JALSH, KOSPI, Merval, NIFTY50, NYSE, OMX, RTSI RUSSIA, S&P TSX, SENSEX, SHANGHAI, STOXX50, STRAITS, TAIWAN (19)
JAKARTA	AEX, ATX, IBEX, NIFTY 50, OSE, SENSEX, SMI, TEL AVIV (8)	AORD, KLSE, KOSPI, NIKKEI 225, NZSE50, SHANGHAI, TAIWAN (7)
JALSH	STOXX50 (1)	AORD, DJIA, HIS, KLSE, KOSPI, NIKKEI225, SENSEX, TEL AVIV (9)
KLSE	BEL20, GSPC S&P500, IPC, NASDAQ, NIKKEI225, NYSE, NZSE50, OSE, S&P TSX, SMI, STRAITS, TAIWAN (12)	
KOSPI	DAX, GSPC S&P500, HIS, Merval, NASDAQ, NIFTY50, NIKKEI225, NYSE, OSE, S&P TSX, SENSEX, TEL AVIV (12)	KLSE, NZSE50, TAIWAN (3)
Merval	AEX, ATX, BEL20, HIS, KOSPI, NIFTY50, STRAITS, TAIWAN (8)	AORD, CAC40, FTSE100, IBEX, JAKARTA, JALSH, KLSE, NIKKEI225, NZSE50, OMX, OSE, S&P TSX, SENSEX, SHANGHAI, STOXX50, TEL AVIV (16)
NASDAQ	AEX, ATX, BEL20, CAC40, FTSE100, GSPC S&P500, IBEX, KLSE, KOSPI, OSE, S&P TSX, STOXX50, TEL AVIV (13)	AORD, HIS, IBOVESPA, JAKARTA, JALSH, Merval, NIFTY50, NIKKEI225, NZSE50, OMX, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (15)

NIFTY 50	AORD, ATX, DAX, FTSE100, JAKARTA, KOSPI, Merval, OSE, RTSI RUSSIA, S&P TSX, SENSEX, STRAITS (12)	HIS, KLSE, NIKKEI225, NZSE50, SHANGHAI, TAIWAN, TEL AVIV (7)
NIKKEI225	IPC, KLSE, KOSPI, OSE, S&P TSX, STRAITS (6)	NZSE50 (1)
NYSE	AEX, ATX, BEL20, CAC40, FTSE100, IBEX, KLSE, KOSPI, OMX, OSE, S&PTSX, STOXX50, TEL AVIV (13)	AORD, HIS, IBOVESPA, JAKARTA, JALSH, Merval, NASDAQ, NIFTY50, NIKKEI225, NZSE50, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (15)
NZSE50	FTSE100, IPC, KLSE, RTSI RUSSIA (4)	
OMX	NYSE, OSE, S&P TSX, TEL AVIV (4)	AORD, ATX, HIS, JAKARTA, JALSH, KLSE, KOSPI, NIFTY50, NIKKEI225, NZSE50, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (15)
OSE	AORD, BEL20, CAC40, FTSE100, GSPC S&P500, HIS, IBEX, IPC, JAKARTA, KLSE, KOSPI, NASDAQ, NIFTY50, NIKKEI225, NYSE, OMX, RTSI RUSSIA, S&P TSX, SENSEX, STOXX50, STRAITS, TAIWAN, TEL AVIV (23)	DJIA, JALSH, NZSE50, SHANGHAI (4)
RTSI RUSSIA	ATX, DJIA, NIFTY 50, NZSE 50, OSE, S&P TSX, SENSEX, SHANGHAI, SMI, TAIWAN, TEL AVIV (11)	AORD, HIS, JAKARTA, JALSH, KLSE, KOSPI, Merval, NIKKEI225, STRAITS (9)
S&P TSX	AEX, AORD, ATX, BEL20, CAC40, FTSE100, GSPC S&P500, HIS, IBEX, KLSE, KOSPI, NASDAQ, NIFTY 50, NIKKEI 225, NYSE, OMX, OSE, RTSI RUSSIA, SENSEX, SMI, STOXX, STRAITS, TAIWAN, TEL AVIV (24)	JAKARTA, NZSE50, SHANGHAI (3)
SENSEX	AORD, ATX, DAX, JAKARTA, KOSPI, NIFTY 50, OSE, RTSI RUSSIA, S&P TSX, STRAITS (10)	HIS, KLSE, NIKKEI225, NZSE50, SHANGHAI, TAIWAN, TEL AVIV (7)
SHANGHAI	RTSI RUSSIA (1)	HIS, KLSE, KOSPI, NZSE50, STRAITS (5)
SMI	AEX, CAC40, FTSE100, GSPC S&P500, JAKARTA, KLSE, RTSI RUSSIA, S&P TSX, STRAITS (9)	AORD, ATX, BEL20, DAX, DJIA, HIS, IBEX, IBOVESPA, IPC, JALSH, KOSPI, Merval, NASDAQ, NIFTY50, NIKKEI225, NYSE, NZSE50, OMX, OSE, SENSEX, SHANGHAI, STOXX50, TAIWAN, TEL AVIV (24)
STOXX50	BEL20, CAC40, GSPC S&P500, IBOVESPA, JALSH, NASDAQ, NYSE, OSE, S&P TSX, TEL AVIV (10)	AORD, ATX, HIS, JAKARTA, KLSE, KOSPI, NIFTY50, NIKKEI225, NZSE50, RTSI RUSSIA, SENSEX, SHANGHAI, STRAITS, TAIWAN (14)
STRAITS	ATX, HIS, KLSE, Merval, NIFTY 50, NIKKEI 225, OSE, S&P TSX, SENSEX, SMI, TAIWAN, TEL AVIV (12)	AORD, JAKARTA, KOSPI, NZSE50 (4)
TAIWAN	DJIA, KLSE, Merval, OSE, RTSI, RUSSIA, S&P TSX, STRAITS, TEL AVIV (8)	NZSE50 (1)
TEL AVIV	AEX, AORD, BEL20, CAC40, FTSE100, GSPC S&P500, HIS, IBEX, IBOVESPA, IPC, JAKARTA, KOSPI, NASDAQ, NYSE, OMX, OSE, RTSI RUSSIA, S&P TSX, STOXX50, STRAITS, TAIWAN (21)	BIST100, KLSE, NIKKEI225, NZSE50, SHANGHAI (5)



#### 4.4 Co-integration Test

The Johansen (1988, 1991, 1995) efficient maximum likelihood test was used to examine the existence of a long-term relationship among indices. A model of the Johansen procedure was used: the one with a linear trend in level and intercept in the co-integrating equations (CE). This version was found to be more appropriate to our data since we have trending series with stochastic trends. The test was performed using a formulation of a VAR model with lag length determined according to AIC and Akaike's Final Prediction Error (FPE). Determination of co-integration rank ( $r$ ) depends on the values of eigenvalue and trace statistics.

Maximum likelihood estimators of the co-integrating vectors for an autoregressive process were derived by Johansen (1988) and Johansen and Juselius (1990) by considering the following equation.

$$X_t = \alpha\beta'_1 X_{t-1} + \dots + \alpha\beta'_k X_{t-k} + \delta_t + \varepsilon_t \quad (1)$$

VAR model can be estimated at the first level difference, i.e. 1(1), a majority of time series variables are non-stationary at level 1(0). The above-mentioned equation (1) of Johansen and Juselius (1990) can be represented by introducing a first level difference operator as follows:

$$\Delta X_t = \Gamma \Delta X_{t-1} + \dots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \delta_t + \varepsilon_t \quad (2)$$

$\Pi$  Matrix can be used to trace co-integration. The first level difference, i.e. 1(1), might be preferred when all  $X_t$  values are found to have unit roots which can be determined if  $p \times p$  matrix has rank 0.

The Johansen co-integration test was performed for the set of 35 stock exchanges to investigate the integration of these markets as a group. Analysis using the multiple

equations was based on a VAR model, which is required before constructing a related VECM system. The VAR model of order 2, which was chosen according to AIC, contains a  $5 \times 1$  vector that contains logarithms of the share price index of the five markets. The multivariate approach examined the existence of a co-integrating vector in the stochastic matrix and a sequence of hypotheses test using maximum likelihood methods, establishing the greatest possible number of vectors within the system. In this study, the null hypotheses assumed for each row of numbers: zero and at most one co-integrating equations. The alternative hypothesis states one, co-integrating equations, respectively, for each row. As long as trace statistics exceed critical values at 5 or 1 percent, the alternative hypothesis was accepted (the null hypothesis was rejected).

Table 3 shown co-integration between the SENSEX and other indices. At  $r=0$ , the trace statistic was higher than the critical value at 5 percent; therefore, the null hypothesis of no co-integration was rejected. The result implied that there was at most one co-integrating equation between the two variables. The findings of the co-integration test of BSE and WALSH were consistent with the finding of the correlation analysis, which determined that the relationship between movements in the two stock markets was strongly positive. Positive co-integration was compatible with the concept of stock market integration, which assumed a similarity in securities offerings and the ability of investors from each market to hold investments in all securities.

As illustrated in Table 3, trace statistics and Eigenvalue statistics indicated one co-integrating vector at the 5 percent significance level among the markets. Since the trace statistic exceeds the 5 percent critical value, it is possible to reject the null hypothesis of no co-integrating vectors, indicating that there are one or more co-integrating equations.



Table 3: Results of Co-integration Test for All Indices

SENSEX		No. of C.E.	Eigen Value	Trace		Eigen Value	Maximum Eigen value	
				Trace statistic	P value		Max Eigen statistic	P value
<b>AEX</b>	Co-integration exists	None *	0.212	1351.49	15.49	0.21	756.68	14.26
		At most 1 *	0.171	594.81	3.84	0.17	594.81	3.84
<b>AORD</b>	Co-integration exists	None *	0.202	1286.75	15.49	0.20	715.60	14.26
		At most 1 *	0.165	571.15	3.84	0.17	571.15	3.84
<b>ATX</b>		None *	0.186	651.52	3.84	0.19	651.52	3.84
<b>BEL20</b>	Co-integration exists	None *	0.204	1319.03	15.49	0.20	724.04	14.26
		At most 1 *	0.171	594.99	3.84	0.17	594.99	3.84
<b>CAC40</b>	Co-integration exists	None *	0.226	1406.52	15.49	0.23	809.95	14.26
		At most 1 *	0.172	596.57	3.84	0.17	596.57	3.84
<b>DAX</b>	Co-integration exists	None *	0.237	1393.08	15.49	0.24	857.08	14.26
		At most 1 *	0.156	536.0	3.84	0.16	536.00	3.84
<b>FTSE 100</b>	Co-integration exists	None *	0.212	1343.86	15.49	0.21	753.17	14.26
		At most 1 *	0.170	590.69	3.84	0.17	590.69	3.84
<b>GSPC S&amp;P500</b>	Co-integration exists	None *	0.212	1327.57	15.49	0.21	754.65	14.26
		At most 1 *	0.165	572.92	3.84	0.17	572.92	3.84
<b>HIS</b>		None *	0.180	630.31	3.84	0.18	630.31	3.84
<b>IBEX</b>	Co-integration exists	None *	0.221	1386.11	15.49	0.22	792.90	14.26
		At most 1 *	0.171	593.21	3.84	0.17	593.21	3.84
<b>IBOVESP A</b>	Co-integration exists	None *	0.211	1319.72	15.49	0.21	751.49	14.26
		At most 1 *	0.164	568.24	3.84	0.16	568.24	3.84
<b>IPC</b>	Co-integration exists	None *	0.203	1290.95	15.49	0.20	721.30	14.26
		At most 1 *	0.164	569.65	3.84	0.17	569.65	3.84
<b>JAKARTA</b>	Co-integration exists	None *	0.202	1267.78	15.49	0.20	713.77	14.26
		At most 1 *	0.160	554.01	3.84	0.16	554.01	3.84
<b>KLSE</b>	Co-integration exists	None *	0.200	1222.10	15.49	0.20	709.71	14.26
		At most 1 *	0.149	512.39	3.84	0.15	512.39	3.84

<b>KOSPI</b>	Co-integration exists	None *	0.216	1336.86	15.49	0.22	771.27	14.26
		At most 1 *	0.163	565.59	3.84	0.16	565.59	3.84
<b>MERVAL</b>	Co-integration exists	None *	0.203	1265.24	15.49	0.20	716.89	14.26
		At most 1 *	0.159	548.35	3.84	0.16	548.35	3.84
<b>NASDAQ</b>	Co-integration exists	None *	0.214	1326.42	15.49	0.21	762.90	14.26
		At most 1 *	0.163	563.52	3.84	0.16	563.52	3.84
<b>NIFTY50</b>	Co-integration exists	None *	0.209	1336.12	15.49	0.21	745.85	14.26
		At most 1 *	0.169	590.27	3.84	0.17	590.27	3.84
<b>NIKKEI 225</b>	Co-integration exists	None *	0.208	1306.12	15.49	0.21	739.48	14.26
		At most 1 *	0.164	566.64	3.84	0.16	566.64	3.84
<b>NYSE</b>	Co-integration exists	None *	0.217	1347.0	15.49	0.21	774.32	14.26
		At most 1 *	0.165	572.68	3.84	0.16	572.68	3.84
<b>OSE</b>	Co-integration exists	None *	0.199	1285.4	15.49	0.19	704.11	14.26
		At most 1 *	0.168	581.29	3.84	0.17	581.29	3.84
<b>RTSI RUSSIA</b>	Co-integration exists	None *	0.201	1248.2	15.49	0.20	709.13	14.26
		At most 1 *	0.156	539.09	3.84	0.16	539.09	3.84
<b>S&amp;P TSX</b>	Co-integration exists	None *	0.213	1335.53	15.49	0.21	758.64	14.26
		At most 1 *	0.166	576.89	3.84	0.17	576.89	3.84
<b>SMI</b>	Co-integration exists	None *	0.217	1328.89	15.49	0.22	774.62	14.26
		At most 1 *	0.161	554.27	3.84	0.16	554.27	3.84
<b>STOXX50</b>	Co-integration exists	None *	0.226	1405.28	15.49	0.23	812.84	14.26
		At most 1 *	0.171	592.44	3.84	0.17	592.44	3.84
<b>STRAITS</b>	Co-integration exists	None *	0.203	1265.37	15.49	0.20	717.80	14.26
		At most 1 *	0.159	547.57	3.84	0.16	547.57	3.84
<b>TAIWAN</b>	Co-integration exists	None *	0.199	1283.93	15.49	0.20	705.77	14.26
		At most 1 *	0.167	578.15	3.84	0.17	578.15	3.84
<b>TEL AVIV</b>	Co-integration exists	None *	0.203	1278.76	15.49	0.20	716.70	14.26
		At most 1 *	0.163	562.06	3.84	0.16	562.06	3.84

#### 4.5 Cross-Correlation and Serial Correlation

Correlation is one of the simplest but most widely used tools used by portfolio managers in making asset allocation decisions. The correlation analysis revolves around the

measure of strength or degree of linear association between two variables. Correlation structure across stock markets returns gives a preliminary idea of stock market linkages. Stock markets sharing high correlation

coefficients can be interpreted as those having significant linkages. On the other hand, low correlation reflects the separation property of stock markets and, therefore, the existence of an opportunity to diversify risk. Further, markets in the common region are more correlated because these markets are more prone to get influenced by their regional news and developments and also because of reasons such as trade and economic ties. The correlation structure of emerging and developed markets has been examined to detect preliminary evidence on potential diversification benefits in the region.

One of the procedural issues to be handled in the context of the log return correlation matrix in the table is the existence of timing difference or difference in trading hours between emerging stock markets and select developed stock markets, especially for the US stock market. Remaining all the markets taken in the sample interact within a single day of each other because all the emerging markets under study operate in the same time zone. On account of this, the contemporaneous correlation among the US market and the selected markets is not of much importance. Therefore, the correlation matrix is derived, taking into account the one day lagged returns for the US market. The same approach is followed for subsequent analysis of return data throughout the study.

The examination of the correlation structure of log returns from Table 4, 5 and 6 gives the following important findings:

The emerging markets exhibit mixed correlation coefficients with each other and also with select developed stock markets. At the same time, it can be observed that in general, however, the emerging equity markets share low correlation coefficients (less than 0.50) during the whole sample period. The Russian stock market exhibits high correlation coefficients with developed stock markets such as Japan as well as the UK and USA, positive correlations with both India and China, and having a negative correlation with Singapore. In an emerging market context, both India and China stock markets are having a relatively low degree of correlation coefficients with other counterparts.

The Indian stock market exhibits significant correlation coefficients with Singapore and with the Japanese stock markets. The lowest correlation coefficients with respect

to the Indian stock market is with Germany's (European) stock market, and India does not share a negative correlation with any index. Chinese stock market exhibit negative correlation coefficients with respect to US and European stock markets. This indicates that the Chinese market is by far the most isolated market in the region, which further is an indication of potential diversification benefits. The developed US stock market has a positive correlation coefficient with emerging market Russia followed by India and China.

Sensex and Nifty Index are positively correlated with all the indices. Sensex is highly correlated with other stock market indices, i.e. STRAITS (0.562) and HIS (0.536). It indicates that Sensex, BIST100, SMI and DAX indices following the same trend. There is a low positive correlation existing between Sensex and BIST100, SMI and DAX.

The below table is representing the test result of cross – Correlation between Developing Countries and Developed Countries. In this table, all the sample countries' stock returns are compared with the US stock return. In these cross-correlation tests, the results data is significant at 1% levels.

In the case of developed countries, Germany cross-correlation test results, most of the values of the lags are positive, which shows the positive association of Germany stock return with the USA stock return. It is clear that the Germany stock returns and the US stock returns move together. We can say that the Germany stock return is dependent on the US stock return. In the case of the UK, cross-correlation test results, 7 lags values are positive out of 11, which shows the positive association of the UK stock market with the USA stock market. It is clear that the UK stock market and US stock market move together. We can say that the UK stock market is dependent on the US stock market.

The cross-correlation results of Japan and Canada show that there are mostly negative lags values that show a negative association with the US stock return. We can say that Japan and Canada stock markets are not dependent on the US stock market. The cross-correlation results of France and Italy show that there are mostly positive lags values that show a positive correlation with US stock return. It is clear that France and Italy stock markets move with the US stock market.

In the case of developing countries, the cross-correlation results of India and Malaysia show that there are mostly positive lags values that show a positive correlation with US stock return. It is clear that the Bangladesh and Malaysia stock market is related to the US stock market. In the case of Turkey, the cross-correlation test clearly shows that the

Turkey stock market was not associated with the US stock market. The Egypt stock return, Pakistan stock return, and the Indonesia stock return show that there are many negative lags values that show a negative association with US stock return. The findings and inference of the cross-correlation are shown in the table below.

**Table 4: Findings and Inference of High Correlation of Indices**

<b>Highly Correlated <math>\geq 0.50</math></b>	
Bel20	FTSE100
CAC40	FTSE100 and Bel20
IBEX	FTSE100, Bel20 and CAC40
S&P TSX	FTSE100
NASDAQ	FTSE100, Bel20, CAC40, IBEX and S&P TSX
OMX	FTSE100, BEL20, CAC40, IBEX
HIS	AORD and STRAITS
NIFTY50	STRAITS and HIS
IBOVESPA	FTSE100, Bel20, CAC40, S&P TSX, Nasdaq, NYSE and OMX
ATX	FTSE100, Bel20, CAC40, IBEX, NYSE and OMX
KOSPI	AORD, STRAITS and HIS
OSE	FTSE100, CAC40, OMX and ATX
Sensex	STRAITS, HIS and Nifty50
Nikkei225	AORD, STRAITS, HIS and KOSPI
GSPC S&P500	FTSE100, BEL20, CAC40, S&P TSX, NASDAQ, NYSE, OMX and IBOVESPA
IPC	FTSE100, BEL20, CAC40, S&P TSX, NASDAQ, NYSE, OMX, IBOVESPA and S&P500
AEX	FTSE100, BEL20, CAC40, IBEX, NASDAQ, NYSE, OMX, IBOVESPA, S&P500, ATX, OSE and IPC
RTSI Russia	FTSE100, BEL20, CAC40, OMX, ATX and AEX
Merval	Nasdaq, NYSE, IBOVESPA, S&P500 and IPC
JLSH	DJIA
STOXX50	FTSE100, BEL20, CAC40, IBEX, NASDAQ, NYSE, OMX, IBOVESPA, S&P500, ATX, IPC, AEX, RTSI RUSSIA
TAIWAN	AORD, STRAITS, HIS, KOSPI and NIKKEI225
NZSE50	AORD

**Table 5: Findings and Inference for High Degree of Anti-correlation**

<b>Highest degree of Anti-correlation</b>	
KOSPI	DAX
BIST100	FTSE100, CAC40, NASDAQ, AEX
DJIA	NIKKEI225, BIST100, JAKARTA
JLSH	BIST100
TAIWAN	DAX

**Table 6: Findings and Inference for Low Degree of Anti-correlation**

<b>Lowest degree of Anti-correlation</b>	
DAX	FTSE100
KLSE	S&P TSX
TEL AVIV	S&P TSX
OSE	DAX
NIKKEI225	DAX and S&P TSX
BIST100	IBOVESPA and IPC
JLSH	DAX
NZSE50	SMI

To examine if there is a problem of serial correlation, the Durbin Watson statistics of the model is 2.141974, which infers that there is no problem of serial correlation. Regression is spurious if the residual of the regression is auto-correlated, i.e. they are not stationary at level. Autocorrelation among residuals is checked using a correlogram of residuals and unit root test; estimates of Q-statistics are statistically insignificant for all 36 lags. This means the null hypothesis of no autocorrelation cannot be rejected, i.e. confirming the non-spurious regression model.

Stationary estimates (using ADF-Test) of residual shows that the residuals of the estimated function are stationary at the  $I(0)$  order of integration. Thus if the variable is integrated of the same order and the linear combination among them is stationary, indicating the presence of co-

integration. This finding implies the existence of a long-run equilibrium relationship among the variables. In this case, OLS estimation is consistent, and there is no problem of spurious regression and  $t$ , as well as  $F$  statistics, are valid.

#### **4.6 Hurst Exponent Analysis**

There is a basic assumption in theories of quantitative finance that the changes in stock prices are independent. Such changes can be exhibited using Brownian motion. For this purpose, Hurst exponent analysis is used as a test for independence in time series data. Hurst exponent value of 0.5 explains that the time series is independent. But predetermined Brownian motion data will give a value of Hurst exponent, which can be higher or lower than 0.5. Such values can be wrongly inferred as evidence of long-term memory in the case of the absence of a proper test.

Based on the Hurst exponent value  $H$ , a time series can be classified into three categories.

- (1)  $H=0.5$  indicates a random series.
- (2)  $0<H<0.5$  indicates an anti-persistent series.
- (3)  $0.5<H<1$  indicates a persistent series.

Mean-reversion is an attribute of a time series that is anti-persistent. Mean-reversion shows the reverse movement

of the previous value. In the case of the Hurst Exponent, the characteristic of mean-reversion improves when the value of  $H$  moves towards 0. On the other hand, a persistent time series reinforces the trend of the previous value. The persistent trend improves when the value of  $H$  moves towards 1. The majority of the time series are found to be persistent when the Hurst exponent value is more than 0.5.

**Table 7: Results of Hurst Exponent Analysis**

Indices	H for Return	H Return result
AEX	0.5915	Persistence
AORD	0.5765	Persistence
ATX	0.5494	Persistence
BEL20	0.6933	Persistence
BIST100	0.5389	Persistence
CAC40	0.6085	Persistence
DAX	0.5962	Persistence
DJIA	0.6328	Persistence
FTSE100	0.5154	Random walk
GSPC S&P 500	0.6363	Persistence
HIS	0.5746	Persistence
IBEX	0.5201	Persistence
IBOVESPA	0.4861	Anti persistence
IPC	0.4825	Anti persistence
JAKARTA	0.6050	Persistence
JLSH	0.4423	Anti persistence
KLSE	0.5141	Random walk
KOSPI	0.5440	Persistence
MERVAL	0.6491	Persistence
NASDAQ	0.5361	Persistence
NIFTY 50	0.5003	Random walk
NIKKEI 225	0.5110	Random walk
NYSE	0.5983	Persistence
NZSE 50	0.6226	Persistence
OMX	0.6231	Persistence
OSE	0.5802	Persistence

Indices	H for Return	H Return result
RTSI RUSSI	0.5000	Random walk
S&P TSX	0.4952	Anti persistence
SENSEX	0.5205	Random walk
SHANGHAI	0.6967	Persistence
SMI	0.6169	Persistence
STOXX50	0.6040	Persistence
STRAITS	0.6902	Persistence
TAIWAN	0.5677	Persistence
TEL AVIV	0.6688	Persistence

It can be found that out of a total of 35 indices in the sample, 25 indices follow persistence trend, 6 indices follow a random trend, and the remaining 4 indices follow an anti-persistence trend. In a persistent time-series, an increase in values will most likely be followed by an increase in the short term, and a decrease in values will most likely be followed by another decrease in the short term. A random trend means there is no correlation between observations and future observations. Series of this kind are very difficult to predict. In the anti-persistence trend, an increase will most likely be followed by a decrease and vice versa. This means that future values have a tendency to return to a long-term mean.

## 5. Conclusion

The study has analysed the co-integration among 35 stock indices across the globe. This study explored the stock market interdependencies and dynamic interactions using the co-integration test and found that co-integration exists between the Indian Stock Market (Sensex) and other indices. As the trace statistic was higher than the critical value at 5 percent; therefore, the null hypothesis of no co-integration was rejected. The result implied that there was at most one co-integrating equation between the two variables.

A Co-integration test was performed for the set of 35 stock exchanges to investigate the integration of these markets as a group using multiple equations based on a VAR model. Trace statistics indicated at least one co-integrating vector at the 5 percent significance level among the markets.

This study also ascertained the degree of association between developed and emerging markets. Cross-correlation was used to ascertain the association and found that out of 35 indices, there were 23 indices that were highly correlated with one or more indices. There were 5 indices that had a high degree of anti-correlation, and 8 indices had a low degree of anti-correlation. The findings of the correlation analysis determined that the relationship between movements in the two stock markets was strongly positive.

This study also found bi-directional as well as uni-directional causality among the stock market indices. The Hurst Exponent analysis found that out of the total of 35 indices in the sample, 25 indices follow the persistence trend, 6 indices follow the random trend, and the remaining 4 indices follow the anti-persistence trend.

### 5.1 Research Implications

This study contributes in the following ways. First, co-integration can be considered companionable to the perception of integration of financial markets. This accepts homogeneity in investment avenues, and the stakeholders across different markets will be able to make investments in a wide range of securities.

The co-integration among the stock indices show that enhanced profits from international diversification are possible as the returns from various stock markets are not perfectly correlated. Based on the correlation results, institutional and foreign investors can take advantage of

the diversification benefits from the markets that have a weak correlation. Therefore, the investors who diversify their portfolio across various countries can improve the portfolio's expected return without increasing the risk of the portfolio. FIIs and individual investors can use this study to understand the correlation structure and interdependence of the global stock indices for better and effective portfolio diversification.

Further, these results are recommended to policymakers, regulators and researchers on the one hand and firms' managers as well as investors on the other. FIIs, HNIs, individual, institutional, and public investors can make decisions regarding their investments based on co-integration among the markets, which may be of short as well as long-run. These results provide insights to the investors for portfolio diversification which can help reduce the systematic risk of the portfolio.

## 5.2 Limitations of the Study

This study is constructed on the secondary data of stock market indices which included daily closing prices. This study does not involve the weekly or monthly prices, which can be used for further analysis, such as seasonality in stock indices.

One of the procedural issues to be handled in the context of the log return correlation matrix is the existence of timing difference or difference in trading hours between emerging stock markets and select developed stock markets, especially for the US stock market. Another limitation of the study is that it does not cover event-specific co-integration.

## 5.3 Scope for Further Research

The study has further scope of research. The dependency of each market to other markets can be studied using the Regression analysis. The analysis of dependency can help in taking the investment in a better way. The effect of volatility among markets can also be analysed.

## References

- Alagidede, P. (2008). "African Stock Market Integration: Implications for Portfolio Diversification and International Risk Sharing." *Proceedings of the African Economic Conferences*. Tunis.
- Anoruo, E, Ramchander, S and Thiewes, H. (2003). "Return dynamics across the Asian equity markets." *Managerial Finance*, 29 (4), 1-23.
- Arestis, P. and Basu, S. (2003). "Financial Globalisation and Regulation." Levy Economics Institute Working Paper No. 397.
- Armanious, A.N.R. (2007), "Globalisation effect on stock exchange integration". *Paper presented at Meeting of Young Researchers Around the Mediterranean*, Tarragona, May 3-4, <http://dx.doi.org/10.2139/ssrn.1929045>
- Arshanapalli, B and Doukas, J. (1993). "International stock market linkages: Evidence from the pre and post-October 1987 period." *Journal of Banking & Finance*, 17 (1), 193-208. [https://doi.org/10.1016/0378-4266\(93\)90088-U](https://doi.org/10.1016/0378-4266(93)90088-U)
- Arshanapalli, B., Doukas, J. and Lang, L.H.P. (1995). "Pre- and post-October 1987 stock market linkages between US and Asian markets." *Pacific Basin Finance Journal*, 3 (1), pp. 57-73.
- Asgharian, H., Hess, W. and Liu, L. (2013). "A spatial analysis of international stock market linkages", *Journal of Banking & Finance*, 37 (12), 4738-4754.
- Babecký, J. Komarek, L. and Komárková, Z. (2013). "Convergence of Returns on Chinese and Russian Stock Markets with World Markets: National and Sectoral Perspectives." *National Institute Economic Review*, 223, 16-34.
- Baumöhl, E. and Výrost, T. (2010) "Stock Market Integration: Granger Causality Testing with Respect to Non-synchronous Trading Effects." *Finance a Uver: Czech Journal of Economics and Finance*, 60 (5), 414-425.
- Bekaert, G, Erb, C.B., Harvey, C.R., and Viskanta, T.E. (1998). "Distributional characteristics of emerging market returns and asset allocation." *Journal of Portfolio Manager*, Winter, 102-116.
- Bhattacharjee S. and Swaminathan A. M. (2016). "Stock Market Integration of India with Rest of the World: An Empirical Study." *Indian Journal of Finance*. 10 (5), 22-32. DOI: 10.17010/ijf/2016/v10i5/92934



- Bhunia, A. and Das, A. (2012). "Financial Market Integration: Empirical Evidence from India and Select South Asian Countries." *Afro Asian Journal of Social Sciences*, 3 (3/1).
- Birau, R. and Trivedi, J. (2013). "Emerging stock market integration and contagion in the context of global financial crisis." *International Journal of Mathematical Models and Methods in Applied Sciences*, 7, 828-836.
- Brooks. R. and Del Negro, M. (2002a). "The Rise in Co-movement across National Stock Markets: Market Integration or IT Bubble?" Federal Reserve Bank of Atlanta Working Paper 2002-17a.
- Brooks. R. and Del Negro, M. (2002b). "International Stock Returns and Market Integration: A Regional Perspective." International Monetary Fund Working Paper 02/202.
- Brooks. R. and Del Negro, M. (2002c). "International Diversification Strategies." Federal Reserve Bank of Atlanta Working Paper 2002-23.
- Chancharat, S. (2009). "Stock market Integration – An Overview." *NIDA Economic Review*, 4 (2), 23-35. DOI: 10.14456/der.2009.1
- Chen, S. and Shen, C. (2009). "Can the nonlinear present value model explain the movement of stock prices?" *International Research Journal of Finance and Economics*, 23 (23), 155-170.
- Chittedi, K. (2010). "Global Stock Markets Development and Integration: with Special Reference to BRIC Countries." *International Review of Applied Financial Issues & Economics*, 2 (1), 18-36.
- Click, R. and Plummer, M. (2005). "Stock market integration in ASEAN after the Asian financial crisis." *Journal of Asian Economics*, 16, 5-28.
- Cybo-Ottone, A., Di Noia, C. and Murgia, M. (2000), "Recent developments in the structure of securities markets". *Brookings-Wharton Papers on Financial Services*.
- Cyn-Young P. and Jong-Wha L. (2011). "Financial Integration in Emerging Asia: Challenges and Prospects." Asian Development Bank
- Dickey, D.A. and Fuller, W. A. (1981). "Likelihood ratio statistics for autoregressive time series with a unit root." *Econometrica*, 49, 1057-1072. DOI: 10.2307/1912517
- Dickey, D.A. and Fuller, W.A. (1979). "Distribution of the estimators for autoregressive time series with a unit root" *Journal of the American Statistical Association*, 74 (366a), 427-431. DOI: 10.2307/2286348
- Domowitz, I. (1995). "Electronic derivatives exchanges: implicit mergers, network externalities and standardisation". *The Quarterly Review of Economics and Finance*, 35(2). 163-175.
- Domowitz, I. and Steil, B. (1999). "Automation, trading costs, and the structure of the trading services industry". *Brookings-Wharton Papers on Financial Services*.
- Dorodnykh E. (2014). "Determinants of stock exchange integration: evidence in worldwide perspective". *Journal of Economic Studies*, 41(2). 292 - 316. <http://dx.doi.org/10.1108/JES-08-2012-0111>
- Edison, H.J., Levine, R., Ricci, L.A., and Slok, T., (2002). "International Financial Integration and Economic Growth." International Monetary Fund Working Paper, 02/145.
- Engle, R., and Granger, C. (1987). "Co-Integration and Error Correction: Representation, Estimation, and Testing." *Econometrica*, 55 (2), 251-276. DOI: 10.2307/1913236
- Errunza, V. R., and Losq, E., (1985). "International asset pricing under mild segmentation: Theory and Test." *Journal of Finance*, 40 (1), 105-124.
- Everaert, G. and Pozzi L. (2016), "Time-varying stock market integration and institutions in Europe: a Bayesian dynamic factor analysis." Working paper.
- Granger C. (1983). "Co-Integrated Variables and Error-Correcting Models." unpublished UCSD Discussion Paper, 83-13.

- Granger, C. and Weiss, A. (1983). Time Series Analysis of Error-Correcting Models. In: S. Karlin, T. Amemiya, and L. Goodman, (Eds.), *Studies in Econometrics, Time Series, and Multivariate Statistics*, (pp. 255-278) Academic Press, New York.
- Granger, C. W. J. (1988). "Causality, co-integration, and control." *Journal of Economic Dynamics and Control*, 12 (2-3), 551-559. doi:10.1016/0165-1889(88)90055-3
- Guidi, F. (2010) "Co-integration relationship and time varying co-movements among Indian and Asian developed stock markets". Munich Personal RePEc Archive, No. 19853. <https://mpa.ub.uni-muenchen.de/19853/>
- Harvey, C.R. (1995). "Predictable risk and returns in emerging markets." *Review of Financial Studies*, 8 (3), 773-816. <http://www.jstor.org/fcgi-bin/jstor/listjournal.fcgi/08939454>
- Hasan, I. and Schmiedel, H. (2004), "Networks and equity market integration: European evidence". *International Review of Financial Analysis*, (13), 601-619.
- Johansen S. (1988). "Statistical Analysis of Cointegration Vectors." *Journal of Economic Dynamics and Control*, 12 (2-3), 231-254. [https://doi.org/10.1016/0165-1889\(88\)90041-3](https://doi.org/10.1016/0165-1889(88)90041-3).
- Johansen S. (1991). "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models," *Econometrica*, 59 (6), 1551-1580. DOI: 10.2307/2938278 <https://www.jstor.org/stable/2938278>
- Johansen, S. (1995). *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*, OUP Catalogue, Oxford University Press.
- Johansen, S., and Juselius K. (1990). "Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, 52 (2), 169-210. <https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x>
- Jondeau, E., and Rockinger, M., (2005). "Conditional asset allocation under non-normality: How costly is the Mean-Variance criterion." HEC Lausanne. *FAME Research Paper Series*, rp132
- Jorion, P. and Schwartz, E. (1986). "Integration versus segmentation in the Canadian stock market." *Journal of Finance*, 41, 603-613.
- Joshi S. S. (2013). "Correlation and Co-integration of BRIC Countries' Stock Markets." *Indian Journal of Finance*, 7 (4), 42-48.
- Karagöz, K. and Ergun, S. (2010). "Stock Market Integration among Balkan Countries." *MIBES Management of International Business and Economics Systems Transactions*, 4 (1), 49 - 59.
- Khan T. A. (2011). "Cointegration of International Stock Markets: An Investigation of Diversification Opportunities". *Undergraduate Economic Review*, 8(1), 1-50.
- Kiviet, J. and Chen, Z. (2018). "A critical appraisal of studies analysing co-movement of international stock markets." *Annals of Economics and Finance*, 19 (2), 151-196.
- Kizys, R. and Pierdzioch, C. (2011). "Changes in the International Co-movement of Stock Returns and Asymmetric Macroeconomic Shocks." *Journal of International Financial Markets, Institutions, and Money*, 19, 289-305
- Lane, P.R. and Milesi-Ferretti, G.M. (2003). "International Financial Integration, Staff Papers". 50, 82-113, International Monetary Fund.
- Lee, R. (1998). "What is an Exchange? The Automation Management and Regulation of Financial Markets". *Oxford University Press*, New York, NY.
- Majid, M., Meera, A., Omar, M., and Aziz, H. (2009). "Dynamic linkages among ASEAN-5 emerging stock markets." *International Journal of Emerging Markets*, 4 (2), 160-184.

- Markowitz, H. (1952). "Portfolio selection." *The journal of finance*, 7 (1), 77-91. <https://doi.org/10.1111/j.1540-6261.1952.tb01525.x>
- Masih, A., and Masih, R. (1997). "On the temporal causal relationship between energy consumption, real income, and prices: Some new evidence from Asian-energy dependent NICs Based on a multivariate co-integration/vector error correction approach." *Journal of Policy Modelling*, 19 (4), 417-440.
- Mitra, A. and Bhattacharjee, K. (2015). "Financial Interdependence of International Stock Markets: A Literature Review." *Indian Journal of Finance*, 9 (5), 20-33. DOI: <http://dx.doi.org/10.17010/ijf%2F2015%2Fv9i5%2F71447>
- Mukherjee, D. (2007). "Comparative Analysis of Indian Stock with International Market", *Great Lakes Herald*, 1 (1), 39-71.
- Nath, G. and Verma, S. (2003). "Study of common stochastic trend and co-integration in the emerging markets: A case study of India, Singapore and Taiwan" (NSE Research Paper No. 72). Mumbai, India: National Stock Exchange.
- Nautiyal N. and Kavidayal P. C. (2018). "A VECM Approach to Explain Dynamic Alliance Between Stock Markets." *Indian Journal of Finance*. 12 (11), 49-64. DOI: <http://dx.doi.org/10.17010/ijf%2F2018%2Fv12i11%2F138203>
- Nicolini, G. (2010), "L'integrazione dell'exchange industry Europea", *EIF-e book*.
- Park, J. W., (2013). "Co-movement of Asian stock markets and the U.S. influence." *Global Economy and Finance Journal*, 3, 76-88.
- Patel, R. (2017). "Co-Movement and Integration Among Stock Markets: A Study of 14 Countries." *Indian Journal of Finance*. 11 (9), 53-66 DOI: <http://dx.doi.org/10.17010/ijf%2F2017%2Fv11i9%2F118089>
- Patel, S. (2014). "Causal and Co-Integration Analysis of Indian and Selected Asian Stock Markets" *Drishtikon: A Management Journal*, 5 (1), 37-52.
- Phuan, S. Lim, K. and Ooi, A. (2009). "Financial Liberalization and Stock Markets Integration for Asean-5 Countries." *International Business Research*, 2 (1), 100-111.
- Raju, A. and Khanapuri, H. (2009). "Regional Integration of Emerging Stock Markets in Asia: Implications for International Investors." *The Journal of Investing*, 18, 31-39.
- Schleicher, M. (2001). "The Co-movements of Stock Markets in Hungary, Poland and the Czech Republic." *International Journal of Finance & Economics*, 6, 27-39.
- Seth, N. and Sharma, A. (2015). "International stock market efficiency and integration: evidences from Asian and US markets." *Journal of Advances in Management Research*, 12 (2), 88-106.
- Shahzad, J., Kanwal, M., Rehman, M. and Ahmad, T. (2016). "Relationship between developed, European and South Asian stock markets: a multivariate analysis." *South Asian Journal of Global Business Research*. 5 (3), 385-402. [doi.org/10.1108/SAJGBR-01-2015-0002](https://doi.org/10.1108/SAJGBR-01-2015-0002)
- Shy, O. and Tarkka, J. (2001), "Stock exchange alliances, access fees and competition". *Bank of Finland Working Paper* No. 22/2001.
- Subramanian, U. (2008). "Cointegration of Stock Markets of East Asia." *European Journal of Economics, Finance and Administrative Sciences*, 14, 84-92.
- Tirkkonen, V. (2008). *Stock and bond market integration: Evidence from Russian financial markets*, (Master's Thesis), Lappeenranta University of Technology.
- Wang, P. and Moore, T. (2008). "Stock Market Integration for the Transition Economies: Time-varying Conditional Correlation Approach." *Manchester School*, 76 (1), 116-133. <https://doi.org/10.1111/j.1467-9957.2008.01083.x>
- Yeoh, B., Hooy, C. and Arsad Z. (2010). "Time-varying world integration of the Malaysian stock market: A Kalman filter approach." *Asian Academy of Management Journal of Accounting and Finance*, 6 (2), 1-17.

\*\*\*\*\*

## SCMS JOURNAL OF INDIAN MANAGEMENT

SCMS New Campus, Prathap Nagar  
Muttom, Aluva-683 106, Kochi, Kerala, India  
Ph: 91-484-262 3803 / 262 3804 / 262 3885 / 262 3887 Fax: 91-484-262 3855  
E-mail: [editor@scmsgroup.org](mailto:editor@scmsgroup.org)  
Website: [www.scms.edu.in/journal](http://www.scms.edu.in/journal)

### Aims and Scope

The *SCMS Journal of Indian Management* is a blind peer-reviewed Journal. The Journal deems it its mission to submit to the readers fresh fruit of management thoughts and rich cream of current innovative research. The format of the Journal is designed reader-friendly. The academia and the corporates have an easy access to the Journal.

The Journal looks for articles conceptually sound, at once methodologically rigorous. The Journal loves to deal knowledge in management theory and practice individually and in unison. We wish our effort would bear fruit. We hope the Journal will have a long life in the shelves catering to the needs of b-students and b-faculty.

- ♦ Proposals for articles that demonstrate clear and bold thinking, fresh and useful ideas, accessible and jargon-free expression, and unambiguous authority are invited. The following may be noted while articles are prepared.
- ♦ What is the central message of the article you propose to write? Moreover, what is new, useful, counterintuitive, or important about your idea?
- ♦ What are the real-world implications of the proposed article? Can the central message be applied in businesses today, and if so, how?
- ♦ Who is the audience for your article? Why should a busy manager stop and read it?
- ♦ What kind of research have you conducted to support the argument or logic in your article?
- ♦ What academic, professional, or personal experience will you draw on to make the argument convincing? In other words, what is the source of your authority?
- ♦ The manuscript of reasonable length shall be sent to the Editor—*SCMS Journal of India Management* (Both for postal and electronic submission details are given here under).

### The manuscript should accompany the following separately:

- ♦ An abstract (about 100 words), a brief biographical sketch of above 100 words for authors describing designation, affiliation, specialization, number of books and articles published in the referee journals, membership on editorial boards and companies etc.
- ♦ The declaration to the effect that the work is original and it has not been published earlier shall be sent.
- ♦ Tables, charts and graphs should be typed in separate sheets. They should be numbered as Table 1, Graph 1 etc.
- ♦ References used should be listed at the end of the text.
- ♦ Editors reserve the right to modify and improve the manuscripts to meet the Journal's standards of presentation and style.
- ♦ Editors have full right to accept or reject an article for publication. Editorial decisions will be communicated with in a period of four weeks of the receipt of the manuscripts.
- ♦ All footnotes will be appended at the end of the article as a separate page. The type script should use smaller size fonts.
- ♦ An Author/Co-author shall submit only one article at a time for consideration of publication in the Journal. The author/co-author can send another article only on hearing from the editor whether it is accepted / rejected.
- ♦ The author getting one article published in the Journal has to wait for two years to get another published

### Submit the manuscript to:

[editor@scmsgroup.org](mailto:editor@scmsgroup.org)

The submission must be in the form of an attachment with a covering letter to be sent as e-mail.

## SCMS JOURNAL OF INDIAN MANAGEMENT

SCMS New Campus, Prathap Nagar  
Muttom, Aluva-683 106, Kochi, Kerala, India  
Ph: 91-484-262 3803 / 262 3804 / 262 3885 / 262 3887 Fax: 91-484-262 3855  
E-mail: [editor@scmsgroup.org](mailto:editor@scmsgroup.org)  
Website: [www.scms.edu.in/journal](http://www.scms.edu.in/journal)

### Ethical Guidelines for Authors

The Author shall present an accurate and complete account of the research performed. The corresponding author must have obtained the approval of all other authors for each submission. Ghost authors are not permitted. The material in the submission shall be original. The material based on prior work, including that of the same author/s shall be properly attributed by proper citation. The author shall have the obligation to notify the editor immediately should any one of the statements in this list ceases to be true.

### Ethical Guidelines for Peer Reviewers

The Peer reviewer shall review manuscripts for which they have the subject expertise required to carry out a proper assessment. Peer reviewers shall respect the confidentiality of peer review and shall not reveal any details of the manuscript under review and of its review. Peer reviewers shall be objective and constructive in their reviews.

### Ethical Guidelines for the Editor

The Editor shall actively seek the views of authors, readers, reviewers, and editorial board members about ways of improving the journal's success. The Editor shall support initiatives designed to reduce academic misconduct. The Editor shall support initiatives to educate researchers about publication ethics. The Editor shall provide clear advice to reviewers. The Editor shall require reviewers to disclose any potential competing interests before agreeing to review a submission. The Editor shall encourage reviewers to comment on ethical questions and possible research misconduct raised by submissions.

The Journal abides by the The Best Practices Guidelines of COPE (COMMITTEE ON PUBLICATION ETHICS) for Editors, Authors, and Peer Reviewers.

© SCMS Journal of Indian Management, SCMS New Campus, Prathap Nagar, Muttom, Aluva-683106, Kochi, Kerala, India

Ph: 91-484-262 3803 / 262 3804 / 262 3885 / 262 3887 Fax: 91-484-262 3855, Website: [www.scms.edu.in](http://www.scms.edu.in)  
E-mail: [editor@scmsgroup.org](mailto:editor@scmsgroup.org) Journal Website : [www.scms.edu.in/journal](http://www.scms.edu.in/journal)

All rights reserved. No part of this publication may be reproduced in any form without the written consent of the publisher. School of Communication and Management Studies and SCMS Journal of Indian Management assume no responsibility for the views expressed or information furnished by the authors. Edited and published by the Editor for and on behalf of SCMS and printed at Maptho Printings, Cochin-683104.

## SCMS Journal of Indian Management Subscription Form

Name :

Address :

City :

Zip Code :

Country :

E-mail :

Phone :

Draft Number :

DD in favour of SCMS  
payable at Cochin

Subscription Rates	1 Year	2 Years	Per Issue
	2000 (\$100)	3600 (\$150)	500 (\$30)

### Payment Details :

Please find below our bank details. You can transfer the subscription and report.

Bank Name : State Bank of India, Kalamassery

A./c No : 30090816337

IFSC Code : SBIN0010110

Account Name : School of Communication and Management Studies.

Mail the bank transfer details and mailing address to [editor@scmsgroup.org](mailto:editor@scmsgroup.org)

### For all communications contact :

Editor, SCMS Journal of Indian Management,

SCMS New Campus, Prathap Nagar,

Muttom, Aluva - 683106, Kochi, Kerala, India.

Phone: 91-484-262 3803 / 262 3804 / 262 3885 / 262 3887

Fax: 91-484-262 3855

Website: [www.scms.edu.in](http://www.scms.edu.in) , E-mail: [editor@scmsgroup.org](mailto:editor@scmsgroup.org)





Story of an entrepreneur who built up a set of high quality academic institutions in a totally hostile and challenging environment. A model for entrepreneurship in any situation.



By Prof. N.C. George  
Price ₹ 895/-

Copies can be had from the Publication Department, SCMS Group of Educational Institutions, Cochin-683106.



SCMS COCHIN SCHOOL OF BUSINESS

## PGDM OF SCMS COCHIN SCHOOL OF BUSINESS

**ACBSP (US)  
ACCREDITED  
B. SCHOOL**

**SCMS COCHIN  
SCHOOL OF BUSINESS**

**-The first  
accredited, AIU  
recognized and  
ISO certified  
business school in  
Southern India**

- ◆ Recognized as equivalent to MBA by the Association of Indian Universities (AIU).
- ◆ Centrally air-conditioned world-class campus, an excellent team of 56 full time faculty, well-stocked library, full-fledged computer centre, superior teaching aids etc.
- ◆ Academic tie-ups with Foreign Universities to give the programme global focus and innovation. Nine faculty members from the universities of USA, Australia & Switzerland teaching full course at SCMS, Cochin School of Business
- ◆ Dewang Mehta National Award for excellence in leadership training systems
- ◆ Impact Marketing National Award for integration of exceptional communication skill development system
- ◆ The only recipient of a grant for track record in performance from AICTE
- ◆ Ranking within the first 25 B.Schools in the A++ category
- ◆ Only B.School which has a University approved Research Centre for PhD in Management
- ◆ Only B.School in India to establish a Chair for Climate Change
- ◆ SCMS-Cochin School of Business is now one of the seven ACBSP (US) accredited B-Schools in India.

**For information, please visit our website <[www.scms.edu.in](http://www.scms.edu.in)>**



# SCMS COCHIN SCHOOL OF BUSINESS

PRATHAP NAGAR, MUTTOM, ALWAYE, COCHIN-683106, KERALA, Ph: 0484 - 2623803/04, 2623885/87, Fax: 0484-2623855

Email: [editor@scmsgroup.org](mailto:editor@scmsgroup.org), Website: <[www.scmsgroup.org](http://www.scmsgroup.org)>

Journal Website: <[www.scms.edu.in/journal](http://www.scms.edu.in/journal)>

ISSN-0973-3167



\*0973-3167\*