

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

IJR  
CM



A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

Indexed & Listed at:

Ulrich's Periodicals Directory ©, ProQuest, U.S.A., Cabell's Directories of Publishing Opportunities, U.S.A., Google Scholar,  
Indian Citation Index (ICI), J-Gate, India [link of the same is duly available at Inlibnet of University Grants Commission (U.G.C.)],  
Index Copernicus Publishers Panel, Poland with IC Value of 5.09 (2012) & number of libraries all around the world.

Circulated all over the world & Google has verified that scholars of more than 7144 Cities in 197 countries/territories are visiting our journal on regular basis.

Ground Floor, Building No. 1041-C-1, Devi Bhawan Bazar, JAGADHRI – 135 003, Yamunanagar, Haryana, INDIA

<http://ijrcm.org.in/>

# CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	<b>FINANCIAL PERFORMANCE OF SELECTED BANKS USING CAMELS MODEL</b>  <i>Dr. S. RAJARAJESWARI &amp; K. SRINIVASAN</i>	1
2.	<b>A STUDY ON FORECASTING OF SELECTED COMMODITY FUTURES PRICE USING ARTIFICIAL NEURAL NETWORK - AN EVIDENCE FROM INDIA</b>  <i>JAYASHREE S &amp; Dr. SURESHA B</i>	9
3.	<b>COVID-19 AND LOCKDOWN: IMPACT ON MSMEs AND EXPECTATIONS FROM GOVERNMENT</b>  <i>Dr. G. R. JOSHI</i>	17
4.	<b>EVALUATING THE PERFORMANCE OF PRIVATE SECTOR BANKS USING CAMEL MODEL</b>  <i>Dr. C MAGESH, KEERTHANA. S, KIRITHIKHA GUPTA. H &amp; KRITHIKAA.V.K</i>	21
	<b>REQUEST FOR FEEDBACK &amp; DISCLAIMER</b>	28

**FOUNDER PATRON****Late Sh. RAM BHAJAN AGGARWAL**

Former State Minister for Home & Tourism, Government of Haryana  
Former Vice-President, Dadri Education Society, Charkhi Dadri  
Former President, Chinar Syntex Ltd. (Textile Mills), Bhiwani

**CO-ORDINATOR****Dr. BHAVET**

Former Faculty, Shree Ram Institute of Engineering & Technology, Urjani

**ADVISOR****Prof. S. L. MAHANDRU**

Principal (Retd.), Maharaja Agrasen College, Jagadhri

**EDITOR****Dr. PARVEEN KUMAR**

Professor, Department of Computer Science, NIMS University, Jaipur

**CO-EDITOR****Dr. A. SASI KUMAR**

Professor, Vels Institute of Science, Technology & Advanced Studies (Deemed to be University), Pallavaram

**EDITORIAL ADVISORY BOARD****Dr. CHRISTIAN EHIOBU CHE**

Professor of Global Business/Management, Larry L Luing School of Business, Berkeley College, USA

**Dr. SIKANDER KUMAR**

Vice Chancellor, Himachal Pradesh University, Shimla, Himachal Pradesh

**Dr. JOSÉ G. VARGAS-HERNÁNDEZ**

Research Professor, University Center for Economic & Managerial Sciences, University of Guadalajara, Guadalajara, Mexico

**Dr. RAJENDER GUPTA**

Convener, Board of Studies in Economics, University of Jammu, Jammu

**Dr. D. S. CHAUBEY**

Professor & Dean (Research & Studies), Uttaranchal University, Dehradun

**Dr. TEGUH WIDODO**

Dean, Faculty of Applied Science, Telkom University, Bandung Technoplex, Jl. Telekomunikasi, Indonesia

**Dr. S. P. TIWARI**

Head, Department of Economics & Rural Development, Dr. Ram Manohar Lohia Avadh University, Faizabad

**Dr. BOYINA RUPINI**

Director, School of ITS, Indira Gandhi National Open University, New Delhi

**Dr. KAUP MOHAMED**

Dean & Managing Director, London American City College/ICBEST, United Arab Emirates

**Dr. MIKE AMUHAYA IRAVO**

Principal, Jomo Kenyatta University of Agriculture & Tech., Westlands Campus, Nairobi-Kenya

**Dr. M. S. SENAM RAJU**

Professor, School of Management Studies, I.G.N.O.U., New Delhi

**Dr. NEPOMUCENO TIU**

Chief Librarian & Professor, Lyceum of the Philippines University, Laguna, Philippines

**Dr. A SAJEEVAN RAO**

Professor & Director, Accurate Institute of Advanced Management, Greater Noida

**Dr. H. R. SHARMA**

Director, Chhatrapati Shivaji Institute of Technology, Durg, C.G.

**Dr. CLIFFORD OBIYO OFURUM**

Professor of Accounting & Finance, Faculty of Management Sciences, University of Port Harcourt, Nigeria

**Dr. SHIB SHANKAR ROY**

Professor, Department of Marketing, University of Rajshahi, Rajshahi, Bangladesh

**Dr. MANOHAR LAL**

Director &amp; Chairman, School of Information &amp; Computer Sciences, I.G.N.O.U., New Delhi

**Dr. SRINIVAS MADISHETTI**

Professor, School of Business, Mzumbe University, Tanzania

**Dr. VIRENDRA KUMAR SHRIVASTAVA**

Director, Asia Pacific Institute of Information Technology, Panipat

**Dr. VIJAYPAL SINGH DHAKA**

Professor &amp; Head, Department of Computer &amp; Communication Engineering, Manipal University, Jaipur

**Dr. NAWAB ALI KHAN**

Professor &amp; Dean, Faculty of Commerce, Aligarh Muslim University, Aligarh, U.P.

**Dr. EGWAKHE A. JOHNSON**

Professor &amp; Director, Babcock Centre for Executive Development, Babcock University, Nigeria

**Dr. ASHWANI KUSH**

Head, Computer Science, University College, Kurukshetra University, Kurukshetra

**Dr. ABHAY BANSAL**

Head, Department of Information Technology, Amity School of Engg. &amp; Tech., Amity University, Noida

**Dr. BHARAT BHUSHAN**

Head, Department of Computer Science &amp; Applications, Guru Nanak Khalsa College, Yamunanagar

**MUDENDA COLLINS**

Head, Operations &amp; Supply Chain, School of Business, The Copperbelt University, Zambia

**Dr. JAYASHREE SHANTARAM PATIL (DAKE)**

Faculty in Economics, KPB Hinduja College of Commerce, Mumbai

**Dr. MURAT DARÇIN**

Associate Dean, Gendarmerie and Coast Guard Academy, Ankara, Turkey

**Dr. YOUNOS VAKIL ALROAIA**

Head of International Center, DOS in Management, Semnan Branch, Islamic Azad University, Semnan, Iran

**P. SARVAHARANA**

Asst. Registrar, Indian Institute of Technology (IIT), Madras

**SHASHI KHURANA**

Associate Professor, S. M. S. Khalsa Lubana Girls College, Barara, Ambala

**Dr. SEOW TA WEEA**

Associate Professor, Universiti Tun Hussein Onn Malaysia, Parit Raja, Malaysia

**Dr. OKAN VELI ŞAFAKLI**

Professor &amp; Dean, European University of Lefke, Lefke, Cyprus

**Dr. MOHINDER CHAND**

Associate Professor, Kurukshetra University, Kurukshetra

**Dr. BORIS MILOVIC**

Associate Professor, Faculty of Sport, Union Nikola Tesla University, Belgrade, Serbia

**Dr. IQBAL THONSE HAWALDAR**

Associate Professor, College of Business Administration, Kingdom University, Bahrain

**Dr. MOHENDER KUMAR GUPTA**

Associate Professor, Government College, Hodal

**Dr. ALEXANDER MOSESOV**

Associate Professor, Kazakh-British Technical University (KBTU), Almaty, Kazakhstan

**Dr. MOHAMMAD TALHA**

Associate Professor, Department of Accounting &amp; MIS, College of Industrial Management, King Fahd University of Petroleum &amp; Minerals, Dhahran, Saudi Arabia

**Dr. ASHOK KUMAR CHAUHAN**

Reader, Department of Economics, Kurukshetra University, Kurukshetra

**Dr. RAJESH MODI**

Faculty, Yanbu Industrial College, Kingdom of Saudi Arabia

**WILLIAM NKOMO**

Asst. Head of the Department, Faculty of Computing, Botho University, Francistown, Botswana

**YU-BING WANG**

Faculty, department of Marketing, Feng Chia University, Taichung, Taiwan

**Dr. SHIVAKUMAR DEENE**

Faculty, Dept. of Commerce, School of Business Studies, Central University of Karnataka, Gulbarga

**Dr. TITUS AMODU UMORU**

Professor, Kwara State University, Kwara State, Nigeria

**Dr. BHAVET**

Faculty, Shree Ram Institute of Engineering & Technology, Urjani

**Dr. THAMPOE MANAGALESWARAN**

Faculty, Vavuniya Campus, University of Jaffna, Sri Lanka

**Dr. ASHISH CHOPRA**

Faculty, Department of Computer Applications, National Institute of Technology, Kurukshetra

**SURAJ GAUDEL**

BBA Program Coordinator, LA GRANDIEE International College, Simalchaur - 8, Pokhara, Nepal

**Dr. SAMBHAVNA**

Faculty, I.I.T.M., Delhi

**Dr. LALIT KUMAR**

Course Director, Faculty of Financial Management, Haryana Institute of Public Administration, Gurugram

***FORMER TECHNICAL ADVISOR***

**AMITA**

***FINANCIAL ADVISORS***

**DICKEN GOYAL**

Advocate & Tax Adviser, Panchkula

**NEENA**

Investment Consultant, Chambaghat, Solan, Himachal Pradesh

***LEGAL ADVISORS***

**JITENDER S. CHAHAL**

Advocate, Punjab & Haryana High Court, Chandigarh U.T.

**CHANDER BHUSHAN SHARMA**

Advocate & Consultant, District Courts, Yamunanagar at Jagadhri

***SUPERINTENDENT***

**SURENDER KUMAR POONIA**

## **CALL FOR MANUSCRIPTS**

We invite unpublished novel, original, empirical and high quality research work pertaining to the recent developments & practices in the areas of Computer Science & Applications; Commerce; Business; Finance; Marketing; Human Resource Management; General Management; Banking; Economics; Tourism Administration & Management; Education; Law; Library & Information Science; Defence & Strategic Studies; Electronic Science; Corporate Governance; Industrial Relations; and emerging paradigms in allied subjects like Accounting; Accounting Information Systems; Accounting Theory & Practice; Auditing; Behavioral Accounting; Behavioral Economics; Corporate Finance; Cost Accounting; Econometrics; Economic Development; Economic History; Financial Institutions & Markets; Financial Services; Fiscal Policy; Government & Non Profit Accounting; Industrial Organization; International Economics & Trade; International Finance; Macro Economics; Micro Economics; Rural Economics; Co-operation; Demography; Development Planning; Development Studies; Applied Economics; Development Economics; Business Economics; Monetary Policy; Public Policy Economics; Real Estate; Regional Economics; Political Science; Continuing Education; Labour Welfare; Philosophy; Psychology; Sociology; Tax Accounting; Advertising & Promotion Management; Management Information Systems (MIS); Business Law; Public Responsibility & Ethics; Communication; Direct Marketing; E-Commerce; Global Business; Health Care Administration; Labour Relations & Human Resource Management; Marketing Research; Marketing Theory & Applications; Non-Profit Organizations; Office Administration/Management; Operations Research/Statistics; Organizational Behavior & Theory; Organizational Development; Production/Operations; International Relations; Human Rights & Duties; Public Administration; Population Studies; Purchasing/Materials Management; Retailing; Sales/Selling; Services; Small Business Entrepreneurship; Strategic Management Policy; Technology/Innovation; Tourism & Hospitality; Transportation Distribution; Algorithms; Artificial Intelligence; Compilers & Translation; Computer Aided Design (CAD); Computer Aided Manufacturing; Computer Graphics; Computer Organization & Architecture; Database Structures & Systems; Discrete Structures; Internet; Management Information Systems; Modeling & Simulation; Neural Systems/Neural Networks; Numerical Analysis/Scientific Computing; Object Oriented Programming; Operating Systems; Programming Languages; Robotics; Symbolic & Formal Logic; Web Design and emerging paradigms in allied subjects.

Anybody can submit the **soft copy** of unpublished novel; original; empirical and high quality **research work/manuscript** **anytime** in **M.S. Word format** after preparing the same as per our **GUIDELINES FOR SUBMISSION**; at our email address i.e. [infoijrcm@gmail.com](mailto:infoijrcm@gmail.com) or online by clicking the link **online submission** as given on our website ([FOR ONLINE SUBMISSION, CLICK HERE](#)).

## **GUIDELINES FOR SUBMISSION OF MANUSCRIPT**

### 1. **COVERING LETTER FOR SUBMISSION:**

DATED: \_\_\_\_\_

**THE EDITOR**

IJRCM

**Subject:** SUBMISSION OF MANUSCRIPT IN THE AREA OF \_\_\_\_\_.

**(e.g. Finance/Mkt./HRM/General Mgt./Engineering/Economics/Computer/IT/ Education/Psychology/Law/Math/other, please specify)**

**DEAR SIR/MADAM**

Please find my submission of manuscript titled ' \_\_\_\_\_ ' for likely publication in one of your journals.

I hereby affirm that the contents of this manuscript are original. Furthermore, it has neither been published anywhere in any language fully or partly, nor it is under review for publication elsewhere.

I affirm that all the co-authors of this manuscript have seen the submitted version of the manuscript and have agreed to inclusion of their names as co-authors.

Also, if my/our manuscript is accepted, I agree to comply with the formalities as given on the website of the journal. The Journal has discretion to publish our contribution in any of its journals.

<b>NAME OF CORRESPONDING AUTHOR</b>	:
Designation/Post*	:
Institution/College/University with full address & Pin Code	:
Residential address with Pin Code	:
Mobile Number (s) with country ISD code	:
Is WhatsApp or Viber active on your above noted Mobile Number (Yes/No)	:
Landline Number (s) with country ISD code	:
E-mail Address	:
Alternate E-mail Address	:
Nationality	:

\* i.e. Alumnus (Male Alumni), Alumna (Female Alumni), Student, Research Scholar (M. Phil), Research Scholar (Ph. D.), JRF, Research Assistant, Assistant Lecturer, Lecturer, Senior Lecturer, Junior Assistant Professor, Assistant Professor, Senior Assistant Professor, Co-ordinator, Reader, Associate Professor, Professor, Head, Vice-Principal, Dy. Director, Principal, Director, Dean, President, Vice Chancellor, Industry Designation etc. **The qualification of author is not acceptable for the purpose.**

**NOTES:**

- a) The whole manuscript has to be in **ONE MS WORD FILE** only, which will start from the covering letter, inside the manuscript. ***pdf. version is liable to be rejected without any consideration.***
  - b) The sender is required to mention the following in the **SUBJECT COLUMN of the mail:**  
**New Manuscript for Review in the area of** (e.g. Finance/Marketing/HRM/General Mgt./Engineering/Economics/Computer/IT/ Education/Psychology/Law/Math/other, please specify)
  - c) There is no need to give any text in the body of the mail, except the cases where the author wishes to give any **specific message** w.r.t. to the manuscript.
  - d) The total size of the file containing the manuscript is expected to be below **1000 KB**.
  - e) Only the **Abstract will not be considered for review** and the author is required to submit the **complete manuscript** in the first instance.
  - f) **The journal gives acknowledgement w.r.t. the receipt of every email within twenty-four hours** and in case of non-receipt of acknowledgment from the journal, w.r.t. the submission of the manuscript, within two days of its submission, the corresponding author is required to demand for the same by sending a separate mail to the journal.
  - g) The author (s) name or details should not appear anywhere on the body of the manuscript, except on the covering letter and the cover page of the manuscript, in the manner as mentioned in the guidelines.
2. **MANUSCRIPT TITLE:** The title of the paper should be typed in **bold letters, centered and fully capitalised**.
  3. **AUTHOR NAME (S) & AFFILIATIONS:** Author (s) name, designation, affiliation (s), address, mobile/landline number (s), and email/alternate email address should be given underneath the title.
  4. **ACKNOWLEDGMENTS:** Acknowledgements can be given to reviewers, guides, funding institutions, etc., if any.
  5. **ABSTRACT:** Abstract should be in **fully Italic printing**, ranging between **150 to 300 words**. The abstract must be informative and elucidating the background, aims, methods, results & conclusion in a **SINGLE PARA**. **Abbreviations must be mentioned in full.**
  6. **KEYWORDS:** Abstract must be followed by a list of keywords, subject to the maximum of **five**. These should be arranged in alphabetic order separated by commas and full stop at the end. All words of the keywords, including the first one should be in small letters, except special words e.g. name of the Countries, abbreviations etc.
  7. **JEL CODE:** Provide the appropriate Journal of Economic Literature Classification System code (s). JEL codes are available at [www.aea-web.org/econlit/jelCodes.php](http://www.aea-web.org/econlit/jelCodes.php). However, mentioning of JEL Code is not mandatory.
  8. **MANUSCRIPT:** Manuscript must be in **BRITISH ENGLISH** prepared on a standard A4 size **PORTRAIT SETTING PAPER**. **It should be free from any errors i.e. grammatical, spelling or punctuation. It must be thoroughly edited at your end.**
  9. **HEADINGS:** All the headings must be bold-faced, aligned left and fully capitalised. Leave a blank line before each heading.
  10. **SUB-HEADINGS:** All the sub-headings must be bold-faced, aligned left and fully capitalised.
  11. **MAIN TEXT:**

**THE MAIN TEXT SHOULD FOLLOW THE FOLLOWING SEQUENCE:****INTRODUCTION****REVIEW OF LITERATURE****NEED/IMPORTANCE OF THE STUDY****STATEMENT OF THE PROBLEM****OBJECTIVES****HYPOTHESIS (ES)****RESEARCH METHODOLOGY****RESULTS & DISCUSSION****FINDINGS****RECOMMENDATIONS/SUGGESTIONS****CONCLUSIONS****LIMITATIONS****SCOPE FOR FURTHER RESEARCH****REFERENCES****APPENDIX/ANNEXURE****The manuscript should preferably be in 2000 to 5000 WORDS, But the limits can vary depending on the nature of the manuscript.**



12. **FIGURES & TABLES:** These should be simple, crystal **CLEAR, centered, separately numbered** & self-explained, and the **titles must be above the table/figure. Sources of data should be mentioned below the table/figure. It should be ensured that the tables/figures are referred to from the main text.**
13. **EQUATIONS/FORMULAE:** These should be consecutively numbered in parenthesis, left aligned with equation/formulae number placed at the right. The equation editor provided with standard versions of Microsoft Word may be utilised. If any other equation editor is utilised, author must confirm that these equations may be viewed and edited in versions of Microsoft Office that does not have the editor.
14. **ACRONYMS:** These should not be used in the abstract. The use of acronyms is elsewhere is acceptable. Acronyms should be defined on its first use in each section e.g. Reserve Bank of India (RBI). Acronyms should be redefined on first use in subsequent sections.
15. **REFERENCES:** The list of all references should be alphabetically arranged. **The author (s) should mention only the actually utilised references in the preparation of manuscript** and they may follow Harvard Style of Referencing. **Also check to ensure that everything that you are including in the reference section is duly cited in the paper.** The author (s) are supposed to follow the references as per the following:
- All works cited in the text (including sources for tables and figures) should be listed alphabetically.
  - Use (ed.) for one editor, and (ed.s) for multiple editors.
  - When listing two or more works by one author, use --- (20xx), such as after Kohl (1997), use --- (2001), etc., in chronologically ascending order.
  - Indicate (opening and closing) page numbers for articles in journals and for chapters in books.
  - The title of books and journals should be in italic printing. Double quotation marks are used for titles of journal articles, book chapters, dissertations, reports, working papers, unpublished material, etc.
  - For titles in a language other than English, provide an English translation in parenthesis.
  - **Headers, footers, endnotes and footnotes should not be used in the document.** However, **you can mention short notes to elucidate some specific point**, which may be placed in number orders before the references.

**PLEASE USE THE FOLLOWING FOR STYLE AND PUNCTUATION IN REFERENCES:**

**BOOKS**

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

**CONTRIBUTIONS TO BOOKS**

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

**JOURNAL AND OTHER ARTICLES**

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

**CONFERENCE PAPERS**

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–23

**UNPUBLISHED DISSERTATIONS**

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

**ONLINE RESOURCES**

- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

**WEBSITES**

- Garg, Bhavet (2011): Towards a New Gas Policy, Political Weekly, Viewed on January 01, 2012 <http://epw.in/user/viewabstract.jsp>



## A STUDY ON FORECASTING OF SELECTED COMMODITY FUTURES PRICE USING ARTIFICIAL NEURAL NETWORK - AN EVIDENCE FROM INDIA

**JAYASHREE S**  
**MBA STUDENT**  
**SCHOOL OF BUSINESS MANAGEMENT**  
**CHRIST (DEEMED TO BE UNIVERSITY)**  
**BANGALORE**

**Dr. SURESHA B**  
**ASSOCIATE PROFESSOR**  
**SCHOOL OF BUSINESS MANAGEMENT**  
**CHRIST (DEEMED TO BE UNIVERSITY)**  
**BANGALORE**

### ABSTRACT

*The fluctuations in the Commodity prices have a considerable amount of attention. This paper is built on the previous research and seeks to determine whether improvements can be made in the forecasting of ten most active commodities traded on MCX. Time series data is considered for the analysis. Forecasting accuracy is a major concern for the decision-maker and the policymakers; while using the traditional Econometrics model, the researchers were not successful in determining the accurate forecast. The performance of ARIMA Model was not in good agreement for forecasting the commodity prices accurately. This research paper makes an attempt to use the Artificial Neural Network Model, which has significantly forecasted the future prices. There can be fluctuations in the prices due to the ongoing pandemic, to which we can witness huge insignificant in the forecast.*

### KEYWORDS

ARIMA, Time Series data MCX Commodities, artificial neural network, forecast.

### JEL CODES

E31, E37.

### INTRODUCTION

It is evident that the Indian commodity market has undergone forceful changes in the last two decades due to factors like the demand of metals, Oil, coal, which has increased excessively, this has contributed to the economic development. Indian economy is based on commodities and more than 70% of the total population is committed to the primary sector directly or indirectly. We can also witness a small revolution in commodity derivatives and risk management in the Indian economy.

A commodity market refers to a house where investors can trade commodities like precious metals, crude oil, natural gas, energy, and spices.

### PRICE DISCOVERY AND PRICE RISK MANAGEMENT

The future/ forward is not responsible for price advances. The Commodity Market serves as a medium for price discovery and price risk management. The actual demand and supply position, along with the market conditions, the estimate of the commodity is derived. Usually, Commodity prices are tested against the Index in understanding the unexplained variation in commodity prices. Price Discovery and Price Risk Management revolve around these factors like supply and demand, geo-political situations, Currency movement situations, economic growth, and government policies. Futures prices that are obtained on the exchanges are often used as a quotation for long term contracts indirect trade of commodity prices.

### REVIEW OF LITERATURE

Commodities are known for diversification of portfolio. Determinates the commodity prices are mostly known for its risky investments propositions along with effects of market supply and demand. These adjustments in the market are due to the uncertainty which cannot be predicted.

(Peter L.M. Goethals, 2007) Facilitate for improved decision support, artificial neural networking models comes which less time are consuming and with high reliability. This paper contributes to the freshwater ecosystem conversation and restoration management. From the analysis, the authors understand this model doesn't have communication between human activities, physical environment and hydrology, also states that the decisions taken would be uncertain in nature which are derived from this model. The model development and application on the same is the collective aspects of 26 papers which has reported on Artificial Neural Networking.

Further, for more understanding on Artificial Neural Networking, (Ferlandio Jubelito Simuangkalit, 2013) conducted their study with an objective to design the decision support system by analysing the architecture of ANN. The authors had created a model which can be set as a base for the DSS, database and user interface and elements of knowledge by using the decision support systems. The purpose of the study is providing better decision making in the field of food price stabilization, trends in future prices and better planning for the planting schedule which will result in maximum profit The conclusion of study stated that, due to lack of some facts the price fluctuations decreases in the performance of ANN model. Thereby ANN model is required to support better decision making.

On the other hand, for predictions using quantitative data using ANN (Aroshine Munasinghe, 2015) refers to existing ANN model which is termed as eminent model for predicting stock market which is dynamic in nature. For the purpose of the study closing prices of large cap sectors represented by the Swedish of OMX30 is considered. To identify the required configurations, the models which are constructed have to undergo extensive testing by statistical analysis and mean squared errors. As the result of the study, short term perspective is significant in nature from which reliable results can be drawn and no long-term perspective conclusions can be drawn due to lack of significance.

Eventually when researches had a thought to upgrade Artificial Neural Networking (Werner Kristjanpoller, 2016) brought in better improvement on forecasting oil prices volatility. The author uses hybrid model and taking financial variables into consideration. This paper covers several functions. The authors were successful in identifying ANN-GARCH model which might be successful in improvement of forecasts of volatility and spot price by replacing the traditional forecasting models. The results from the study also predicts ANN-GARCH model is 30.6% better than traditional method for forecasting prices. The author concludes, improved performance in arbitrage can be done through volatility of CoC more accurately.

Gradually predictions of Stock market prices was gaining importance, (Malav Shastri, 2018) study on predictions of stock price is an area of interest of fiscal market. For the predictions of stock prices, a technique by first calculating the sentiment scores through Naive Bayes classifier and later application of neural network on

sentiment scores and historical stock dataset. HIVE is proposed as extremely fast work and can help to simplify the work. To conclude from the observations, it has observed that accuracy was found up to 91% in the first case, and 98% in the other cases which indicated that stock price predictions model will be more effective for shorter data.

Counting on the contribution of researchers, (Siddiqui, 2019) represents his paper against the traditional econometrics models for carry out his study. He used Autoregressive Neural Network model for forecasting the daily gas price through which he believes there will be an improvement in the decision making of gas purchase using the price forecast. The authors were successful in setting a base for the improvement in significant terms in their decision making of the spot gas. Through the analysis, the author determined that longer term contracts and option prices serve as the underlying instrument is the spot price. The proposed decisions also stated that ARNN model shows around 33% improvement over the traditional ARIMA model while conducting cross validation study.

Understanding the need for forecasting the INR/USD Exchange rates, (K. Murali Krishna, 2020) Admits that exchange rates play an important role in international trade, stock and framing the imports and exports policies. The paper predicts the INR/USD exchange rates using Hybrid model which supports the ARIMA model and FFNN. The authors were successful in forecasting the INR/USD accuracy by using the developed models. From the conclusion we can understand that the predictions of exchange rates may vary between 70.8 and 71.39. Adding on we can also conclude that these predictions can help the government to frame policies for the upcoming future.

## RESEARCH GAP

Usually, time series strategies are used for the predictions of various commodities in the Commodity market. There is some work that needs to be redesigned with the help of the econometrics issue, but the usage of multivariate strategies that go above traditional regression modelling, which are constrained work in nature. This paper integrates the dearth of Multivariate forecasting and system mastering developments to provide proof of idea for the use of Neural Networks in Multivariate Commodity Futures forecasting. The conclusions may be broadly empirical and may place the brood on this course for more in depth studies.

## NEED FOR THE STUDY

In a developing country like India, Commodity serves as an important factor for generating income and the price movements in the commodities have major impact on the economic performance. Therefore, forecasting commodity prices serves as a key input for the economic development policy planning and formulations. Making attempts in forecasting various commodity prices using advanced economic models which were used for short to medium term actual commodity forecasting. It is also realized that these Commodity prices forecasts offer greater accurate predictions of the destiny course of Real Commodity charges relative to futures or other models.

## OBJECTIVES OF THE STUDY

1. To forecast the commodity prices using Artificial Neural Networking (ANN) Model and Econometrics model.
2. To compare the model with real data for its accuracy.

## METHODOLOGY

### TYPE OF RESEARCH

This research paper is quantitative research. Quantitative analysis refers to the systematic empirical study of observable phenomena by mathematical, statistical, or computational techniques. The quantitative work desire is to establish and engage phenomena-related mathematical models, theories, and hypotheses. The measuring method is important to quantitative research because it provides the fundamental network to quantitative relationships between factual observation and mathematical expression.

### PERIOD OF STUDY

Data were collected on a daily frequency from 01, April 2015 to 31, March 2020

### TYPE OF DATA

The dataset consists of ten dependents on variables and ten independent variables. The ten dependent variables are the prices of the most active traded commodities in the MCX market and the independent variables are the MCX iCOMDEX index.

The variables can be grouped under the following factors:

NATURAL GAS: Depended variable – MCX Natural Gas Price Futures

Independent variable – MCX iCOMDEX Composite

SILVER MIC: Depended variable – MCX Silver Mic Futures

Independent variable – MCX iCOMDEX Silver

GOLD PETAL: Depended variable – MCX Gold Petal

Independent variable – MCX iCOMDEX Gold

GOLD: Depended variable – MCX Gold Futures

Independent variable – MCX iCOMDEX Gold

CRUDE OIL: Depended variable – MCX Crude Oil Futures

Independent variable – MCX iCOMDEX Crude Oil

GOLD MINI: Depended variable – MCX Gold Mini Futures

Independent variable – MCX iCOMDEX Gold

NICKEL: Depended variable – MCX Nickel Futures

Independent variable – MCX iCOMDEX Composite

COPPER: Depended variable – MCX Copper Futures

Independent variable – MCX iCOMDEX Copper

ZINC: Depended variable – MCX Zinc Futures

Independent variable – MCX iCOMDEX Composite

GOLD GUINEA: Depended variable – MCX Gold Guinea Futures

Independent variable – MCX iCOMDEX Gold

### SOURCE OF DATA

The data were collected from reliable secondary sources.

### TOOLS FOR ANALYSIS OF DATA

#### Artificial Neural Networking

An artificial neuron network (ANN) is referred to as a computational model based totally at the shape and capabilities of biological neural networks. The Statistics that has movement via the network influences the form of the ANN due to the fact a neural network change - or learns, in a feel - based mostly on that input and output. ANNs are considered nonlinear statistical information modelling tools wherein the complex relationships among inputs and outputs are modelled or patterns are determined. ANN is also referred to as a neural network. An ANN contains several blessings but, one of the maxima identified of those is the reality that it is able to certainly examine from observing information sets. In this way, ANN is used as a random function approximation device.

**ARIMA**

An autoregressive integrated moving average, or ARIMA, is a statistical analysis using time series data for better understanding the records set or to predict future developments. An autoregressive integrated moving average model is a regression analysis method that gages the intensity of one dependent variable in relation to other variables that change. The objective of the model is to predict economic market behavior by examining value discrepancy within the series rather than through real values. The ARIMA model can be interpreted by assigning each of its components as follows: -

- Autoregression (AR) refers to a model displaying a changing variable that regresses at its own lagged, or prior, values.
  - Integrated (I) reflects the distinction between the raw observations to enable the time series to become stationary, i.e., data values are replaced by the difference between the data values and the previous ones.
  - Moving average (MA) refers to the relation between an observation, and a residual error of the moving average model applied to lagging observations.
- All component functions as a parameter with a standard notation. For ARIMA models, a standard notation would be ARIMA with p, d, and q, where integer values substitute for the parameters to indicate the type of ARIMA model used. The parameters can be defined as: -
- p: number of lags in the model, also known as lags.
  - d: the number of times the raw observations differ, also known as the degree of differentiation.
  - q: the average moving window size; also known as the moving average volume.

**STATISTICAL TOOLS FOR ANALYSIS OF DATA**

1. Artificial Neural Network using MATLAB
2. ARIMA using Python

**RESULTS AND DISCUSSIONS**

**ARTIFICIAL NETWORK MODEL ANALYSIS**

ANN model Using MATLAB was performed with the above mentioned specification and the results are as follows:

**NATURAL GAS**

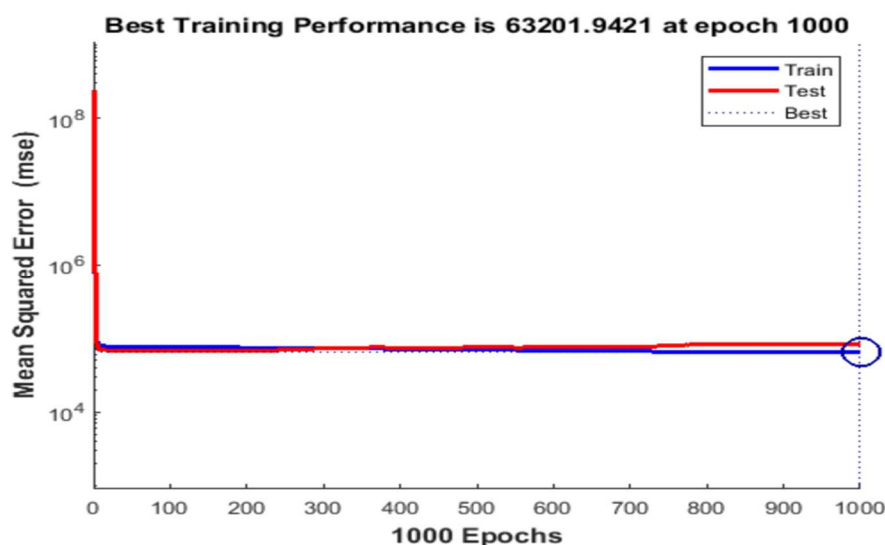
**FIGURE 1 - NEURAL NETWORK OF PERFORMANCE OF NATURAL GAS**



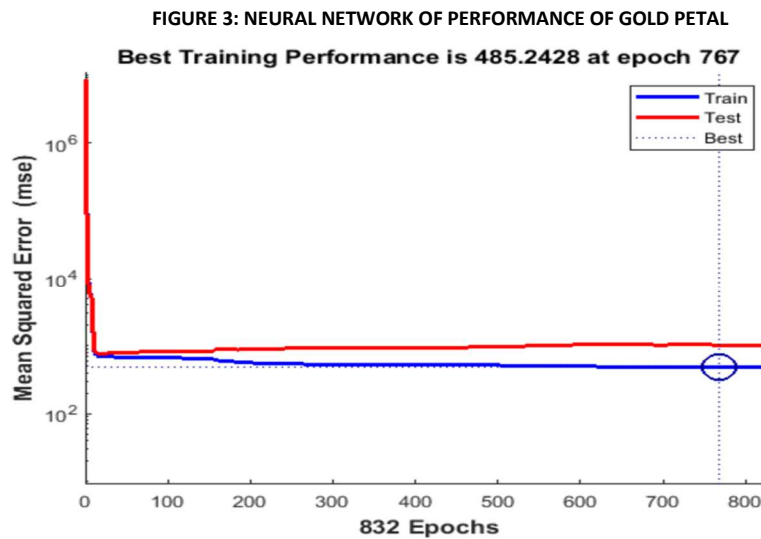
For every instance of prediction what was the amount of error observed and the least error instance is highlighted

**SILVER MICRO FUTURES**

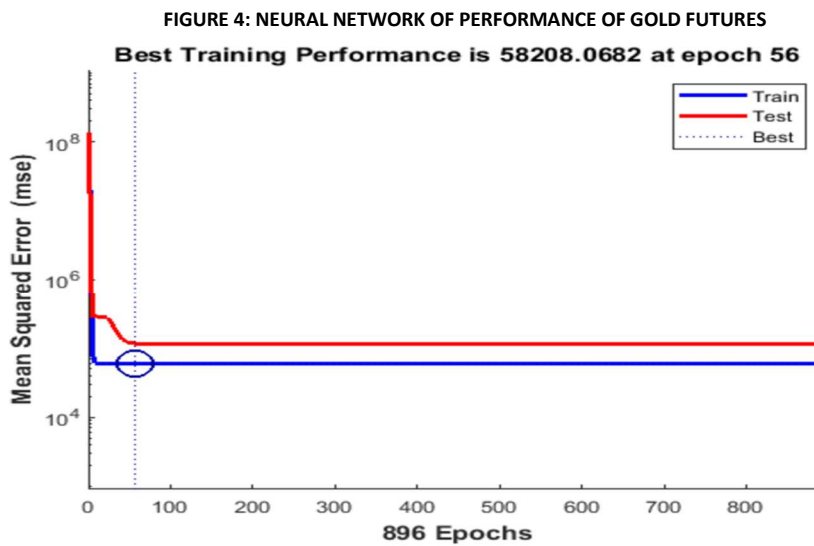
**FIGURE 2: NEURAL NETWORK OF PERFORMANCE OF SILVER MICRO FUTURES**



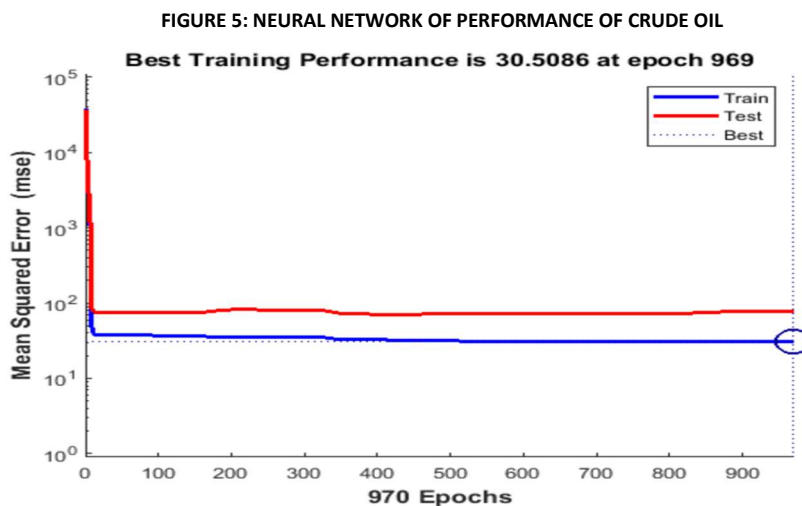
Indicates that for every instance of prediction what was the amount of error observed and the least error instance is highlighted



Every instance of prediction what was the amount of error observed and the least error instance is highlighted  
GOLD

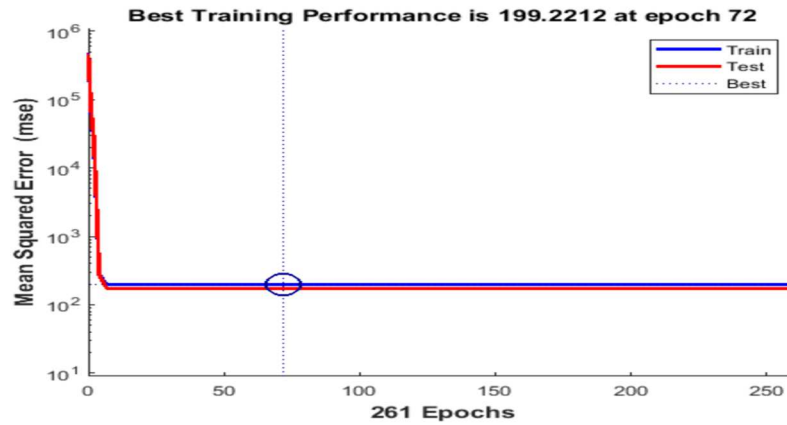


For every instance of prediction what was the amount of error observed and the least error instance is highlighted  
CRUDE OIL



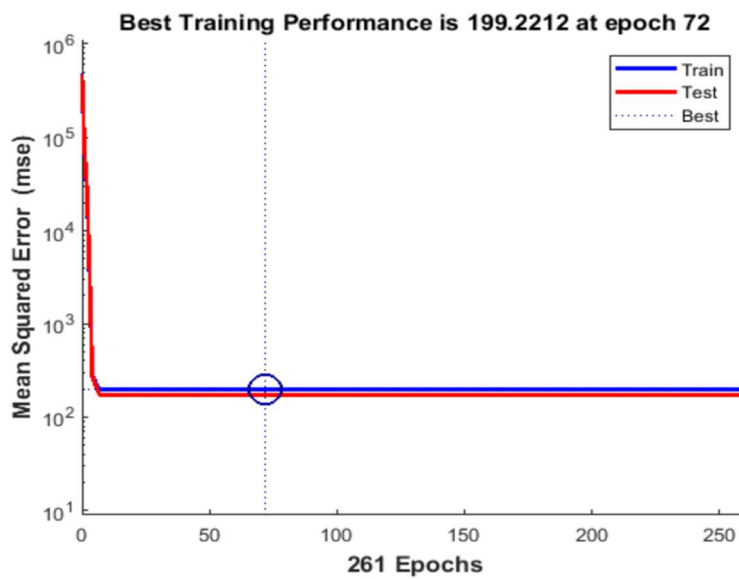
For every instance of prediction what was the amount of error observed and the least error instance is highlighted

FIGURE 6: NEURAL NETWORK OF PERFORMANCE OF GOLD MINI



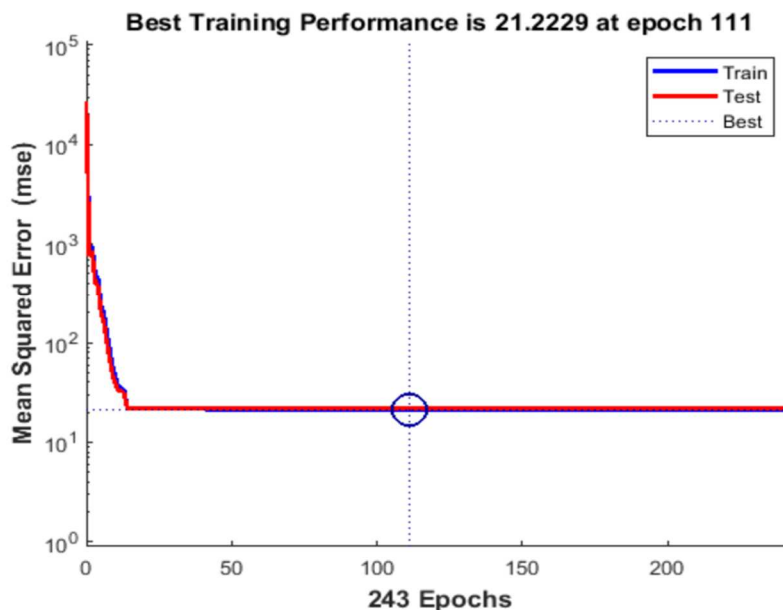
For every instance of prediction what was the amount of error observed and the least error instance is highlighted  
NICKEL FUTURES

FIGURE 7: NEURAL NETWORK OF PERFORMANCE OF NICKEL FUTURE



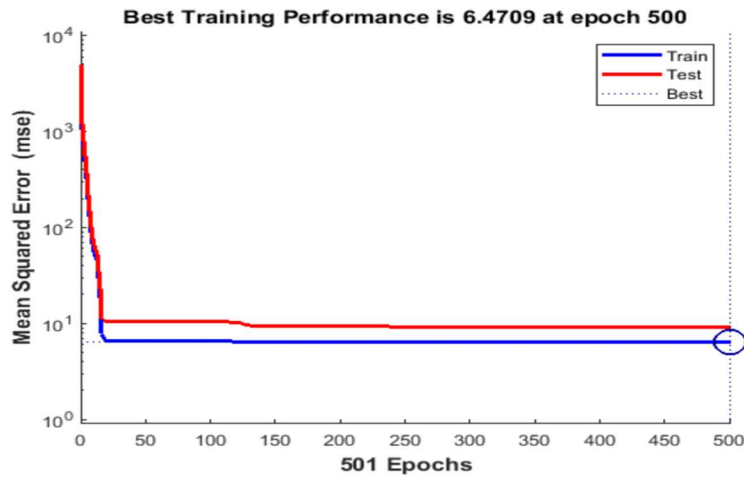
For every instance of prediction what was the amount of error observed and the least error instance is highlighted  
COPPER FUTURES

FIGURE 8: NEURAL NETWORK OF PERFORMANCE OF COPPER FUTURE



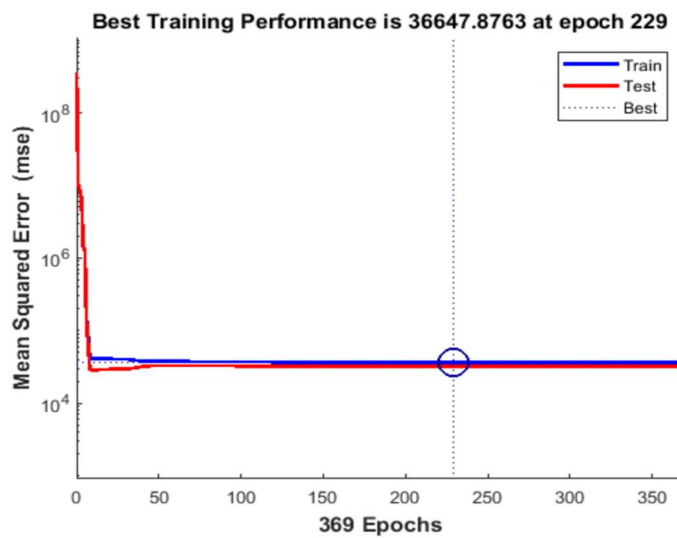
For every instance of prediction what was the amount of error observed and the least error instance is highlighted

FIGURE 9: NEURAL NETWORK OF PERFORMANCE OF ZINC FUTURE



For every instance of prediction what was the amount of error observed and the least error instance is highlighted  
GOLD GUINEA FUTURES

FIGURE 10: NEURAL NETWORK OF PERFORMANCE OF GOLD GUINEA FUTURE



For every instance of prediction what was the amount of error observed and the least error instance is highlighted  
ARIMA  
NATURAL GAS

TABLE 1: ARIMA RESULTS FOR NATURAL GAS

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	-0.0001	0.001	-0.217	0.828	-0.001	0.001
AR (1)	0.0785	0.18	0.436	0.663	-0.275	0.432
MA (1)	-0.1749	0.177	-0.989	0.323	-0.521	0.172

TABLE 2: ARIMA GOODNESS OF FIT

AIC	-5960.96
BIC	-5940.33

SILVER MICRO FUTURES

TABLE 3: ARIMA RESULTS FOR SILVER MICRO FUTURES

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	0.0011	0.001	1.922	0.055	-2.28e-05	0.002
AR (1)	0.3581	0.236	1.519	0.129	-0.104	0.820
MA (1)	-0.2607	0.243	-1.074	0.283	-0.736	0.215

TABLE 4: ARIMA GOODNESS OF FIT

AIC	-4340.430
BIC	-4321.845

GOLD PETAL

TABLE 5: ARIMA RESULTS FOR GOLD PETAL

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	-0.0001	0.001	-0.217	0.828	-2.28e-05	0.002
AR (1)	0.0785	0.180	0.436	0.663	-0.104	0.820
MA (1)	-0.1749	0.177	-0.989	0.323	-0.736	0.215

TABLE 6: ARIMA GOODNESS OF FIT

AIC	-5960.955
BIC	-5940.331

GOLD

TABLE 7: ARIMA RESULTS FOR GOLD

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	0.0007	0.000	1.662	0.097	-0.000	0.002
AR (1)	0.3943	0.170	2.318	0.021	0.061	0.728
MA (1)	-0.2909	0.176	-1.651	0.099	-0.636	0.054

TABLE 8 ARIMA GOODNESS OF FIT

AIC	-7549.144
BIC	-7528.523

CRUDE OIL

TABLE 9: ARIMA RESULTS FOR CRUDE OIL

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	-4.86e-05	0.001	-0.076	0.939	-0.001	0.001
AR (1)	-0.2096	0.445	-0.471	0.638	-1.082	0.663
MA (1)	0.1777	0.447	0.397	0.691	-0.699	1.055

TABLE 10: ARIMA GOODNESS OF FIT

AIC	-5972.122
BIC	-5951.501

GOLD MINI

TABLE 11: ARIMA RESULTS FOR GOLD MINI

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	0.0007	0.000	1.765	0.078	-7.58e-05	0.001
AR (1)	0.4267	0.205	2.080	0.038	0.025	0.829
MA (1)	-0.3654	0.210	-1.740	0.082	-0.777	0.046

TABLE 12: ARIMA GOODNESS OF FIT

AIC	-7567.087
BIC	-7546.462

NICKEL FUTURES

TABLE 13: ARIMA RESULTS FOR NICKEL FUTURES

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	6.504e-05	0.001	0.130	0.897	-0.001	0.001
AR (1)	-0.2433	0.455	-0.535	0.593	-1.135	0.649
MA (1)	0.2094	0.458	0.457	0.648	-0.689	1.108

TABLE 14: ARIMA GOODNESS OF FIT

AIC	-6591.819
BIC	-6571.194

COPPER FUTURES

TABLE 15: ARIMA RESULTS FOR COPPER FUTURES

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	-4.86e-05	0.001	-0.076	0.939	-0.001	0.001
AR (1)	-0.2096	0.445	-0.471	0.638	-1.082	0.663
MA (1)	0.1777	0.447	0.397	0.691	-0.699	1.055

TABLE 16: ARIMA GOODNESS OF FIT

AIC	-5972.122
BIC	-5951.501

ZINC FUTURES

TABLE 17: ARIMA RESULTS FOR ZINC FUTURES

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	7.24e-05	0.001	0.142	0.887	-0.001	0.001
AR (1)	0.1124	0.379	0.296	0.767	-0.631	0.856
MA (1)	-0.1577	0.376	-0.419	0.675	-0.895	0.580

TABLE 18: ARIMA GOODNESS OF FIT

AIC	-6490.495
BIC	-6469.871

GOLD GUINEA FUTURES

TABLE 19: ARIMA RESULTS FOR GOLD GUINEA FUTURES

	Co efficient	Standard Error	z	P> z	[0.025	0.975]
Constant	0.4853	0.350	1.385	0.166	-0.202	1.172
AR (1)	0.9995	0.001	1607.534	0.000	0.998	1.001

TABLE 20: ARIMA GOODNESS OF FIT

AIC	-7602.434
BIC	-7586.963



TABLE 21: COMPARISON OF ARTIFICIAL NEURAL NETWORK\_ROOT MEAN SQUARE ERROR AND ARIMA\_ROOT MEAN SQUARE ERROR

Particulars	ANN_RMSE	ARIMA_RMSE
NATURAL GAS FUTURES	6.2222	0.028380093
SILVER MICRO FUTURES	331.5237	0.338046224
GOLD PETAL FUTURES	30.3786	0.028380093
GOLD FUTURES	283.6898	0.147425588
CRUDE OIL FUTURES	7.3276	0.102923815
GOLD MINI FUTURES	260.8521	0.102249587
NICKEL FUTURES	13.7177	0.099429405
COPPER FUTURE	4.5415	0.098054914
ZINC FUTURES	2.5031	0.080524871
GOLD GUINEA FUTURES	210.8252	0.072378927

Root Mean Square Error indicates the variance of the residuals. RMSE represents the absolute fit of the model to the data and it is the most important benchmark for fit if the objective of the model is prediction.

**Artificial Neural Network:** A figure showing for every instance of prediction what was the amount of error observed and the least error instance is highlighted. Plot regression (t, y): Represent an error graph which shows what is the target value and what we received and what was the error on data. This is done for all the 10 most active commodity on the MCX.

**ARIMA:** The time series reaches stationarity with two orders of Differencing. But on looking at the autocorrelation plot for the second differencing the lag goes into the far negative zone fairly quick, which indicates the series might have been over differenced. From the forecast of commodities, the Graph, the ARIMA (1, 1, 1) model seems to give a directionally correct forecast with a variation of less than 0.005 % and the actual observed values lie within the 95 % confidence level for all the trained data and same data tested but when we split train and test data we see a small variation of close to 0.1 % But each of the predicted forecasts is consistently below the actuals. Which means, by adding a small constant to our forecast, the accuracy will certainly improve. Therefore, there is significance in the plot.

### SUMMARY OF FINDINGS

- Gold, Silver, Crude Oil, Natural Gas and Copper are the most traded commodities on the commodity market.
- Gold and silver are highly correlated in the commodities market.
- The US dollar index and Crude oil have an inverse correlation in the international commodities market.
- There are four variants in gold contracts which include Gold, Gold Mini, Gold Petal and Gold Guinea which are categorized based on lot size.
- Copper is a base metal that is significantly used in the field of infrastructure.
- Forecasting of commodities aids in evaluation to various sectors.
- India as a highest consumer of commodities like crude oil, gold and copper, the economy will have major impact due to the variation of such commodities.
- The demand for such essential commodities is expected to grow at a faster pace due to the economic growth.
- The global crisis due to the pandemic has given opportunity to various investors in the commodities market.

### CONCLUSIONS AND SUGGESTIONS

Neural Network-based modelling proved better accuracy than regression and on par accuracy as ARIMA models. While considering the capacity of the model to follow changing tendencies inside the out-of-sample forecast, Neural Network became a clear champ. Neural network indicates good capability for use in multi-variate forecasting of Commodity price. The Neural Network models used on this study have been simple feed forward models. Adding on, advanced models like Recurrent Neural Networks (RNN) and lengthy short-time period memory (LSTM) neural network models can be used in the future. Recurrent Neural network and Lengthy short time period Memory may be more appropriate for time series forecasting due to their capability to recurrently take a look at beyond data points while studying new data points.

Theoretical version on this research paper assumed no inter-dependency of the independent variables and that the dependent variable did no longer have a consequence on the impartial variables. It is also believed that, a number of the monetary market variables are depending on commodity future prices. There are few commodity futures which are selected in the MCX market to prove the idea of forecasting using Neural Networks which might empirically paintings. There will be the ongoing growth in the work for a range of Commodity futures variables and performing characteristics selection. The benefit of the fine features would appreciate the accuracy of the model.

### REFERENCES

1. Aroshine Munasinghe, D. V. (2015, October). Stock market prediction using artificial neural network. 2014 World Automation Congress (WAC), Electronic ISBN:978-1-8893-3549-0, Print ISSN: 2154-4824, Publisher: IEEE, Conference Location: Waikoloa, HI, USA, doi:10.1109/WAC.2014.6936118
2. Ferlando Jubelito Simuangkalit, L. S. (2013). Decision Support System based on Artificial Neural Networking for Food Crop Commodities Price Proecasting. Agritech, 33, 70-80.
3. K. Murali Krishna, D. M. (2020, Jan/Feb). Forecasting INR/ USD Exchange Rate using Hybrid and Neural Network Model. The Mattingley Publishing Co., Inc, 82.
4. Malav Shastri, S. R. (2018, July). Stock Price Prediction using Artificial Neural Model: An Application of Big Data. EAI Endorsed Transactions on Scalable Information Systems, Volume 6, Issue 20. doi: 10.4108/eai.19-12-2018.156085
5. Peter L.M. Goethals, A. P. (2007). Application of artificial neural networks predicting macroinvertebrates in freshwater. Aquat Ecol. 41, 491–508(2007) doi:10.1007/s10452-007-9093-3
6. Siddiqui, A. W. (2019, May). Predicting Natural Gas Spot Prices Using Artificial Neural Network. 2019 2nd International Conference on Computer Applications & Information Security (ICCAIS), Publisher: IEEE, Conference Location: Riyadh, Saudi Arabia. doi:10.1109/CAIS.2019.8769586
7. Werner Kristjanpoller, M. C. (2016). Forecasting volatility of oil price using an Artificial Neural Networking - GARCH model. Expert Systems with Applications, 65, 233-241. doi:https://doi.org/10.1016/j.eswa.2016.08.045

## **REQUEST FOR FEEDBACK**

**Dear Readers**

At the very outset, International Journal of Research in Computer Application & Management (IJRCM) acknowledges & appreciates your efforts in showing interest in our present issue under your kind perusal.

I would like to request you to supply your critical comments and suggestions about the material published in this issue, as well as on the journal as a whole, on our e-mail [infoijrcm@gmail.com](mailto:infoijrcm@gmail.com) for further improvements in the interest of research.

If you have any queries, please feel free to contact us on our e-mail [infoijrcm@gmail.com](mailto:infoijrcm@gmail.com).

I am sure that your feedback and deliberations would make future issues better – a result of our joint effort.

Looking forward to an appropriate consideration.

With sincere regards

Thanking you profoundly

**Academically yours**

Sd/-

**Co-ordinator**

## **DISCLAIMER**

The information and opinions presented in the Journal reflect the views of the authors and not of the Journal or its Editorial Board or the Publishers/Editors. Publication does not constitute endorsement by the journal. Neither the Journal nor its publishers/Editors/Editorial Board nor anyone else involved in creating, producing or delivering the journal or the materials contained therein, assumes any liability or responsibility for the accuracy, completeness, or usefulness of any information provided in the journal, nor shall they be liable for any direct, indirect, incidental, special, consequential or punitive damages arising out of the use of information/material contained in the journal. The journal, neither its publishers/Editors/ Editorial Board, nor any other party involved in the preparation of material contained in the journal represents or warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such material. Readers are encouraged to confirm the information contained herein with other sources. The responsibility of the contents and the opinions expressed in this journal are exclusively of the author (s) concerned.

## ABOUT THE JOURNAL

In this age of Commerce, Economics, Computer, I.T. & Management and cut throat competition, a group of intellectuals felt the need to have some platform, where young and budding managers and academicians could express their views and discuss the problems among their peers. This journal was conceived with this noble intention in view. This journal has been introduced to give an opportunity for expressing refined and innovative ideas in this field. It is our humble endeavour to provide a springboard to the upcoming specialists and give a chance to know about the latest in the sphere of research and knowledge. We have taken a small step and we hope that with the active co-operation of like-minded scholars, we shall be able to serve the society with our humble efforts.

### *Our Other Journals*

