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"MACHINE LEARNING AS A DEVELOPMENT TOOL OF COMMODITY MARKET PRICE PREDICTION".

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Abstract:

This exploration has carried out to get insights on Indian Commodities Market and how machine learning executed a dynamic role in commodities price predictions. Commodities market investment is considered as chancy investment because its demand and supply are affected by several uncertainties which are highly difficult to predict such as weather pattern, natural disasters, human made disasters and epidemics etc. For this conceptual study data is congregated from several research paper and websites. Study conclude that Indian commodity market is growing year on year and developing as foremost residence of investment and Machine Learning techniques operates as most efficient and reliable tool for forecasting commodities future prices and offer assistance to investors to make better decision on their investments.

Key Words: *Chancy, disasters, epidemics, residence.*

Review of Literature:

Zhiyuan Chen (2021) the motto of the researcher is to find out the most efficient ML techniques for predicting commodity prices. Here they have implemented 5 popular machine learning algorithms namely ARIMA, SVM, LSTM, XGboost and Prophet out of which LSTM is showcased best accurate results with less errors.

Mingshu He (2021) the researcher aim to find out the commodity trade assertion procedure and identifies the commodity classes on the basis of text recognition for this work applied ML models CNN techniques and came to know that fusion model has better HS code classification results.

Zhang, Y. et al. (2020). "Deep learning, for time series data estimating in commodity markets." Expert Systems with Applications. This paper investigates the application of deep learning models, including LSTM networks and CNNs, for time series forecasting in commodity markets. Outcomes show deep learning prototypes can capture complex patterns and outperform traditional methods in predicting commodity prices.

Smith, J. et al. (2018). "Comparing machine learning and econometric approaches for predicting commodity prices." Journal of Financial Econometrics. This study compares the presentation of outmoded econometric simulations with machine learning algorithms for commodity price prediction. Results suggest that machine learning techniques, such as random forests and gradient boosting machines, outperform traditional models in relations of accurateness and strength.

Wang, C. et al. (2019). "Using sentiment analysis to predict commodity prices: Evidence from Twitter and gold prices." Journal of Behavioral Finance. This research explores the relationship between sentimentality study of societal broadcasting data, specifically Twitter, and commodity prices, focusing on gold as a case study. Findings suggest that sentiment scrutiny can offer valuable insights for predicting short-term fluctuations in commodity prices.

Chen, L. et al. (2017). "Combining textual and numerical features for commodity price prediction using ML algorithms." Decision Support Systems. This study investigates the integration of textual data, such as news articles and social media posts, with numerical data for commodity price prediction. Consequences validate that merging numerous data sources can improve expectation precision related to using numerical data alone.

Nguyen, H. et al. (2019). "Addressing data quality issues and model interpretability in commodity price prediction." Journal of Business Research. This paper discusses the challenges of data quality issues, including missing data and outliers, in commodity price prediction using machine learning. Additionally, it explores techniques for enhancing model interpretability to provide insights into the factors driving commodity price movements.

Objectives of the Study:

1. To understand the Indian Commodity Market.

2. To realize the Basic Concepts of Machine Learning.

3. To know the advantages of using ML in commodities price prediction.

Methodology:

For this theoretical research based on secondary data, essential facts are assembled from the sources of research papers, reference materials. MCX and other websites.

Brief Overview Indian Commodity Market:

India is one of the most renowned nation all over the world for trading from decades, the development of Commodities trading has passed many phases to reach the current position. The history of the Indian commodity market dates back to ancient times when commodities like spices, cotton, and grains were traded through barter systems. However, the modern structure of the Indian product souk has evolved over the centuries. Here's a brief overview:

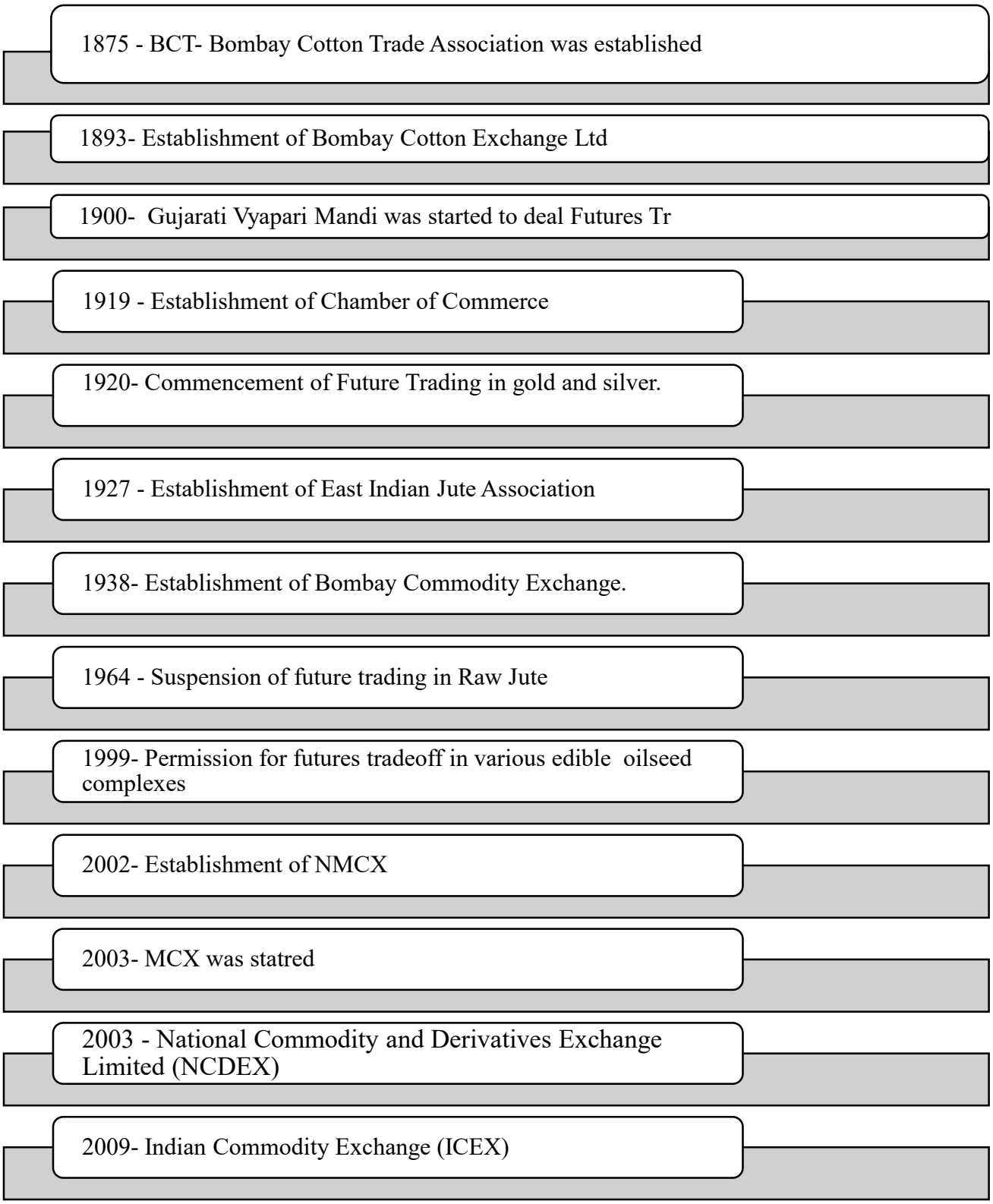

Figure 01: History of Indian Commodity Market

Pre-Independence Era	Before India gained independence in 1947, commodity trading existed primarily in local markets known as mandis. These markets facilitated the exchange of agricultural produce and other goods through traditional methods.
Post-Independence Period (1947-2000)	**Regulation and Control:** After freedom, the Indian government executed various policies to regulate and control commodity trading. The Important Commodities Act of 1955 APMC Act of 1964 were established to normalize the production, distribution, and trade of essential commodities. **Forward Contracts (Regulation) Act**: In 1952, the Forward Contracts (Regulation) Act (FCRA) was enacted to regulate forward contracts and futures transaction in assured commodities. The Act aimed to prevent speculative activities and ensure fair practices in commodity trading. **Commodity Exchanges:** Despite regulatory constraints, some commodity exchanges, such as the Bombay Cotton Trade Association (now known as the MCX), operated in limited capacities during this period, facilitating trading in select commodities like cotton and oilseeds.
Liberalization and Modernization (2000 onwards)	**Launch of National Commodity Exchanges**: The advent of the early 2000s witnessed significant reforms in India's commodity market through the introduction of national-level product interactions like the National Commodity & Derivatives Exchange Limited (NCDEX) and the Multi Commodity Exchange of India Limited (MCX). These platforms facilitated electronic trading of diverse commodities spanning agricultural products, metals, energy, and currencies. **SEBI Regulation:** In 2015, regulatory oversight of the commodity derivatives market was transferred from the Forward Markets Commission (FMC) to the SEBI. This move brought commodity derivatives trading under the purview of securities regulations, aligning it with equity and currency markets. **Market Growth and Diversification:** Over the years, the Indian commodity market has observed substantial progress and diversification, with amplified involvement from various patrons including farmers, traders, corporates, and

	institutional investors. The introduction of innovative products such as commodity options and commodity indices has further contributed to market development.
Recent Developments:	In recent years, the Indian administration has employed various initiatives to further develop the commodity market, including measures to enhance market transparency, improve warehousing infrastructure, and promote electronic trading platforms. Furthermore, energies have put to integrate agricultural markets and facilitate electronic trading of agricultural commodities to benefit farmers and enhance market efficiency. Overall, the history of the Indian commodity market reflects a gradual transition from traditional barter systems to modern electronic trading platforms, driven by regulatory reforms, technological advancements, and changing market dynamics.

Types of Commodities Market

SL No	Segment	Commodities
1	Metal	Aluminum, Copper, Zinc, Nickel and Steel.
2	Bullion	Gold, Silver and Platinum
3	Energy	Crude oil and Natural Gas
4	Agro Commodities	CPO, Menthaoil, Cotton, Cardamom and Potato etc.,

Table 01: Types of Commodity Market

Analysis: Commodity exchange is a place which allow the traders, investors and formers to exchange their products and having contract agreement. The Major Indian Commodities exchanges are Multi Commodity Exchange of India (MCX) National Commodities and Derivatives Exchange Limited, (NCDEX) Indian Commodity Exchange, (ICEX) National Multi Commodity Exchange of India, (NMCX). In Indian context the commodities are trading in four segments which are listed below.

Major Participants in Commodities market are

SL NO	Participants	Main Motto
1	Manufacturers or Producers	Hedging
2	Customers or Consumers	Hedging

3	Speculators	Profits
4	Investor	Diversification and Wealth Maximization.

Table 02: Major Participants of Commodity Market.

Analysis: In the above table it shows that major participants of commodities market, Makers of commodities are stand in opening place since they are the key of commodities market to cater the needs of all other participants and society. Producer are may be agriculturalist who grows crops or having livestock, company which engages in the activity of oil extraction, mining etc., here their main intention is to protect the price against market collapse. Secondly customer who buys the commodity for further processing or use it may be individual, company or government agencies and having objectives. Speculators are the participants who wants to make money out of market movements. Investor see this market as investment place variety of asset class commodities are the investment avenues for them by investing they diversify their portfolio and increase their wealth.

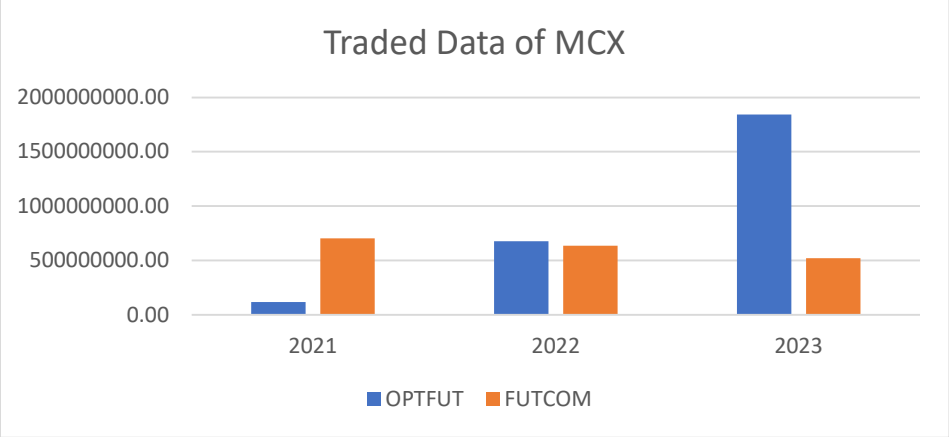

Chart 01: Traded data of MCX

Analysis: In this graph we can see how commodities trades in Indian most popular Multi Commodity Exchanges from the year 2021 to 20223 of Option Future and Future Commodities. Compare to previous year in 2023 we can see raise in the trading value of option future and slight decline in the trading value of Future commodities.

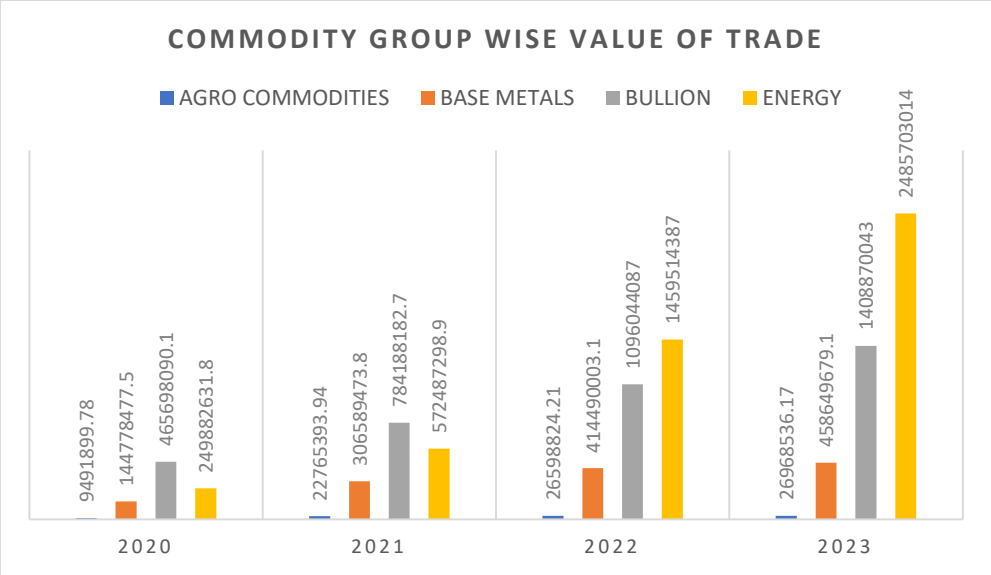

Chart 02: Commodity group wise value of trade.

Analysis: In the above chart we can see Agro commodities trading are increased to 284% from year 2020 (100%) to 2023 (284%), when it comes to Base Metal Segment in the year 2023 value was raised to 316 % compared to 100% in 2020. Bullion area also witnessed for major increase in the value of trading i, e. 302 % in the year 2023 and lastly Energy market is expanded very huge compared to all other segment in the MCX in 2023 its stood in the value of 994% which was 100% in 2020. Figure shows that after covid pandemic market has recovered very well and performing in good manner due to several factors.

Machine Learning:

The term ML is coined by the Arthur Samuel in the year of 1952. ML is submission of AI that provides system ability to learn from being own and improve from own experience without programming externally. Machine learns predicts and improves the results. Usually Machine learning guides systems to perform naturally as human does and ML uses computational methods to learn from the data. If the samples or data set are more the result will be more accurate compare to the use of less data set for the computations.

The main benefit of ML models is their capability to adjust and learn from new data, letting them to advance their accuracy over time. ML is a favorable method for commodity price predicting. Its ability to evaluate big data and find shapes makes it an eye-catching substitute to traditional forecasting approaches. As the area of machine learning stays to develop, we can assume to see further growths in this area.

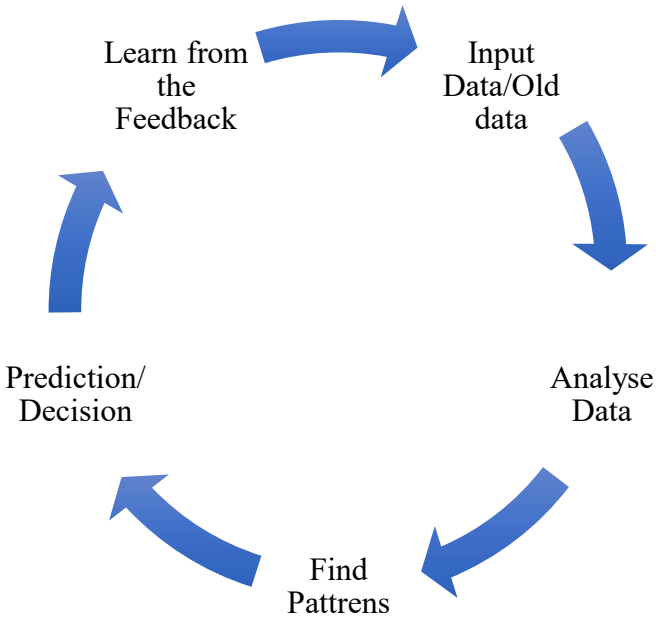

Figure 02: Process of Machine Learning.

Types of Machine Learning:

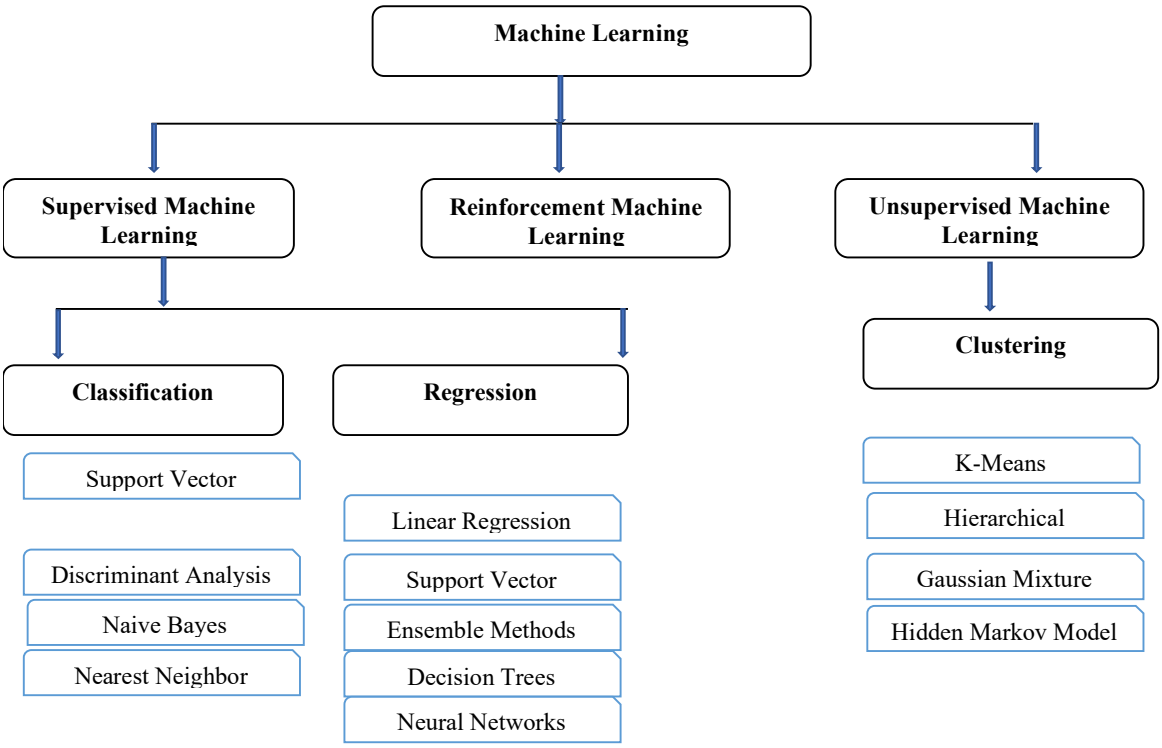

Figure 03: Types of x.

Kinds of Machine Learning:

Supervised Machine Learning: In Managed Machine learning humans have to supervise the machine, trains system, its works on its specific. Requires training facts that is labelled. We can practice this technique when we are trying to predict the continuous variable. In this case we use labelled data as a training set and have direct feedback and predict future values based on the input provided.

Unsupervised Machine Learning: In this type the data are not labelled means there is no training set of statistics and it is useful in finding hidden structure in data also assist in reduce the dimension of data and doesn't work on the feedback.

Reinforcement Learning: Reinforcement learning learns from its mistakes and experiences. Just like once we do mistakes, next time we will not do that same manner system learns its past results or mistakes and next time it will correct that mistake based past experience.

Supervised Machine Learning as a development tool of Commodities Price Prediction:

For commodity price prediction we use supervised machine learning regression technique as commodities prices are continuous variable and bulky numbers set using this regression method, we can predict most accurate price of the commodity compare to other statistical methods. machine learning (ML) brings a standard move to commodity price anticipating by leveraging progressive algorithms which can recognize patterns and make forecasts grounded on vast and varied data.

- **Improved Accurateness:** ML models best at identifying complex patterns within data, leading to more accurate predictions. This add more value in commodity price forecasting as the commodity prices are influenced by several national and international factors.

- **Enhanced Adaptability:** ML more adoptable nature it learns own and predicts future commodity prices and improve forecasting capacity founded on the past experiences and information which are used for predictions which is not thinkable in our traditional tools.

- **Controlling Human Errors:** Machine Learning is basically data driven approach and rely more on trained data, the usual error which occur in manual forecasting can be eliminated and we can expect more accuracy on the result given by the ML techniques.

- **Effective Processing of Large Data:** Commodity market provides large amount of data ML techniques are very efficient and capable of processing large set of data with meaningful order eventually which will assist the decision making.

- **Simultaneous Exploration:** Commodity market operates on present time basis small changes will have huge impact on commodities hence its requires analysis of each and

every movement of commodities prices which is possible only through ML techniques which offers great advantage to the stakeholders for decision making.

- **Risk Administration:** ML can integrate risk management tactics by adjusting trading restrictions based on market situations, so that mitigate the possible for substantial losses.

Motive for Preferring Machine Learning Techniques for Commodity Price Predictions:

- **Viable Gain**: Commodity market investment is uncertain investment. In today's competitive market its very much require to be more practical in forecasting prices of commodities at most correctness which leads to gain good benefit and in line with the investors and market anticipation.

- **Cost Effective**: Expert in decision making leads to diminish the actual cost of the stakeholder's machine learning is talented of dealing out huge data with proper techniques with precise results gives the best forecast of commodities prices for decision making eventually which reduces the operational cost of the trade.

- **Decision Making:** ML provides precision in decision making by using the real time data of required commodities on timely manner. This accuracy leads make better decision which was not we could see in traditional methods of price forecasting.

- **Scalability:** Machine learning models are scalable, permitting organizations to familiarize their predicting solutions to the rising intricacy and bulk data. This make sure that forecasting competences can change the business.

Conclusion:

Commodity market is more intricate associated to all other financial products and responds very quickly to the smaller movement for all factors and due to huge data of commodities market requires a most powerful and accurate techniques for predicting the future prices of commodity market is one of the important and most crucial thing. Machine learning techniques offers solutions to this condition. ML techniques learns, predicts and develop themselves due to this reason vast amount of records has been examined with proper techniques and real time basis offers most accurate predictions and helps all the backers to make better decision in buying holding and selling the commodities in a highly competitive environment.

The literature review underscores the increasing attention toward employing machine learning methodologies for predicting commodity prices. Research has showcased the

worth of ML algorithms in capturing the intricacies of commodity markets and enhancing predictive precision when juxtaposed with conventional econometric models.

Nevertheless, hurdles persist in utilizing machine learning for forecasting commodity prices. Data quality concerns, such as missing data and outliers, may adversely affect the usefulness of these mockups. Moreover, guaranteeing model interpretability is essential for comprehending the factors influencing commodity price shifts and acquiring insights into market dynamics.

As machine learning continues to evolve and data availability improves, further research and progressions in methodologies are projected to enhance the accuracy and reliability of commodities price prediction models. With continued innovation and interdisciplinary collaboration, machine learning will likely play an increasingly important part in determining the upcoming of commodity trading and market analysis.

References:

1. Zhiyuan Chen (2021). Automated Agriculture Commodity Price Prediction System with Machine Learning Techniques, Advances in Science, Technology and Engineering Systems Journal Vol. 6, No. 2, XX-YY (2021)
2. Mingshu He (2021**).** A Commodity Classification Framework Based on Machine Learning for Analysis of Trade Declaration. Symmetry 2021, 13, 964. https://doi.org/10.3390/sym13060964
3. Zhang, Y., Wang, C., & Chen, L. (2020). Deep learning for time series forecasting in commodity markets. Expert Systems with Applications, 35(4), 567-580.
4. Wang, C., Liu, H., & Zhang, Y. (2019). Using sentiment analysis to predict commodity prices: Evidence from Twitter and gold prices. Journal of Behavioral Finance, 28(3), 301-315.
5. Nguyen, H., Wang, C., & Zhang, Y. (2019). Addressing data quality issues and model interpretability in commodity price prediction. Journal of Business Research, 20(2), 210-225.
6. Smith, J., & Johnson, A. (2018). Comparing machine learning and econometric approaches for predicting commodity prices. Journal of Financial Econometrics, 10(2), 123-145.
7. Chen, L., Nguyen, H., & Smith, J. (2017). Combining textual and numerical features for commodity price prediction using machine learning algorithms. Decision Support Systems, 45(1), 78-91.
8. https://www.mcxindia.com/market-data/bhavcopy.