Technical Analysis Vs Fundamental Analysis: A Comparative Study of Bollinger Bands, RSI and MACD Against Fundamental Factors in Commodity Trading

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Abstract: **Introduction**: Commodity trading is integral to the global economy, influenced by a myriad of factors ranging from market sentiment to fundamental economic indicators. Traders utilize various analytical methods to predict price movements, primarily relying on Technical Analysis and Fundamental Analysis. While Technical Analysis employs statistical indicators such as Bollinger Bands, Relative Strength Index (RSI), and Moving Average Convergence Divergence (MACD) to forecast market trends, Fundamental Analysis assesses intrinsic value through economic, financial, and qualitative factors. The effectiveness of these approaches in commodity trading remains a topic of debate, necessitating a comparative evaluation to guide traders in optimizing their strategies. **Objective**: This study aims to compare the effectiveness of Technical Analysis indicators—Bollinger Bands, RSI, and MACD—against fundamental factors in predicting commodity price movements. By evaluating these methodologies within the context of key commodities such as gold, oil, and wheat, the research seeks to determine which analytical approach offers superior predictive accuracy and trading performance. **Methods**: A mixed-methods approach was employed, combining quantitative analysis of historical price data with qualitative insights from commodity traders. Historical data for selected commodities from 2018 to 2023 was sourced from financial databases and commodity exchanges. Technical indicators were calculated using platforms like TradingView, while fundamental factors were gathered from government reports and industry publications. Statistical techniques, including regression analysis and backtesting, were utilized to assess the predictive power of each technical indicator and fundamental factor. Additionally, surveys were conducted with 50 experienced commodity traders to gather qualitative data on their preferences and perceptions regarding Technical and Fundamental Analysis. **Results**: Quantitative analysis revealed that Bollinger Bands and MACD demonstrated significant predictive capabilities in volatile markets, particularly in oil and gold trading. RSI was effective in identifying potential reversal points in agricultural commodities like wheat. Fundamental factors, including inventory levels and macroeconomic indicators, showed strong correlations with long-term price movements across all studied commodities. Comparative performance metrics indicated that Technical Analysis provided more timely entry and exit signals, enhancing short-term trading performance. In contrast, Fundamental Analysis offered better predictive accuracy for long-term trends. The survey results supported these findings, with a majority of traders endorsing a hybrid approach that integrates both technical indicators and fundamental insights for optimal trading strategies. **Conclusion**: The study concludes that both Technical and Fundamental Analysis have distinct advantages in commodity trading. Technical indicators such as Bollinger Bands, RSI, and MACD are valuable for short-term trading decisions and capturing market volatility, while fundamental factors are essential for understanding long-term price trends and intrinsic value. A combined approach leveraging the strengths of both methodologies can enhance trading performance and risk management. These findings provide actionable insights for traders seeking to refine their analytical strategies in the dynamic landscape of commodity markets.

Keywords: Technical Analysis, Fundamental Analysis, Commodity Trading, Bollinger Bands, RSI and MACD.

INTRODUCTION

Commodity trading plays a pivotal role in the global economy, serving as a barometer for economic health and influencing various sectors from manufacturing to consumer goods [1]. Investors and traders employ different analytical approaches to forecast price movements and make informed trading decisions. Two predominant methodologies are Technical Analysis and Fundamental Analysis, each with its distinct principles and tools. This study focuses on comparing these two approaches by evaluating specific technical indicators—Bollinger Bands, Relative Strength Index (RSI), and Moving Average Convergence Divergence (MACD)—against fundamental factors in the context of commodity trading.

Technical Analysis is grounded in the premise that historical price movements and trading volumes can predict future price behavior. It relies heavily on chart patterns and statistical indicators to identify trends and potential reversal points [2]. Among the various technical indicators, Bollinger Bands, RSI, and MACD are widely used due to their ability to provide insights into market volatility, momentum, and trend strength. Bollinger Bands, developed by John Bollinger in the 1980s, consist of a middle moving average line and two outer bands that

represent standard deviations from the average. They help traders identify overbought or oversold conditions and potential price breakouts [3]. The RSI, introduced by J. Welles Wilder, measures the speed and change of price movements, oscillating between 0 and 100 to indicate overbought or oversold states [4]. MACD, created by Gerald Appel, is a trend-following momentum indicator that shows the relationship between two moving averages of a security's price, assisting in identifying potential buy and sell signals [5].

On the other hand, Fundamental Analysis focuses on evaluating a commodity's intrinsic value by examining related economic, financial, and qualitative factors. This approach considers elements such as supply and demand dynamics, production costs, inventory levels, geopolitical events, and macroeconomic indicators [6]. For instance, in the oil market, factors like geopolitical stability in oil-producing regions, changes in production quotas by OPEC, and global economic growth rates significantly impact prices [7]. Similarly, agricultural commodities are influenced by weather conditions, crop yields, and changes in consumer demand [8]. Fundamental Analysis provides a comprehensive understanding of the underlying factors driving price movements, offering a long-term perspective that complements the short-term focus of Technical Analysis.

The debate between the efficacy of Technical versus Fundamental Analysis has been ongoing, with proponents of each method presenting compelling arguments. Technical analysts argue that all fundamental information is already reflected in the price, making it unnecessary to delve into economic indicators [9]. They emphasize the importance of market psychology and behavioral patterns in price movements. Conversely, fundamental analysts contend that understanding the intrinsic value of a commodity provides a more accurate basis for long-term investment decisions [10]. They argue that ignoring fundamental factors can lead to misinterpretation of price signals and missed opportunities driven by underlying economic changes.

In the realm of commodity trading, integrating both Technical and Fundamental Analysis can potentially offer a more robust strategy. Studies have shown that combining these approaches can enhance prediction accuracy and trading performance [11]. For instance, a technical indicator might signal a buying opportunity, which can be corroborated by strong fundamental data such as increasing demand or favorable supply conditions [12]. However, the extent to which each method contributes to trading success varies across different commodities and market conditions, necessitating a comparative analysis to determine their relative effectiveness.

Previous research has explored various aspects of Technical and Fundamental Analysis in commodity markets. Some studies have focused on the predictive power of specific technical indicators. For example, Bollinger Bands have been found effective in capturing volatility-driven price movements in oil markets [13], while RSI has been utilized to identify potential reversal points in agricultural commodities [14]. MACD has been praised for its ability to detect trend shifts in metals markets [15]. On the fundamental side, research has highlighted the

significance of macroeconomic indicators such as GDP growth rates, inflation, and currency exchange rates in influencing commodity prices [16]. Additionally, sector-specific factors like inventory levels in the energy sector or crop reports in agriculture have been identified as critical determinants of price movements [17].

Comparative studies between Technical and Fundamental Analysis have yielded mixed results. Some research indicates that Technical Analysis can provide timely entry and exit signals, enhancing short-term trading performance [18]. Other studies suggest that Fundamental Analysis offers a superior framework for long-term investment decisions by accounting for intrinsic value and economic realities [19]. However, there is a scarcity of comprehensive studies that directly compare the effectiveness of multiple technical indicators against a broad set of fundamental factors within the same research framework, particularly in the context of commodity trading. This gap highlights the need for a detailed comparative study that evaluates the relative strengths and limitations of these analytical approaches using consistent data sets and methodologies.

The present study aims to bridge this gap by conducting a comparative analysis of Bollinger Bands, RSI, and MACD against fundamental factors in commodity trading. By focusing on a selection of key commodities such as gold, oil, and wheat, the research seeks to determine which analytical method—technical or fundamental—provides more accurate and reliable predictions of price movements. The study will employ both quantitative and qualitative methodologies, including statistical analysis of historical price data and surveys of commodity traders, to assess the effectiveness of these tools in real-world trading scenarios.

Understanding the relative effectiveness of Technical and Fundamental Analysis has significant implications for traders and investors. If Technical Analysis proves to be more effective in certain commodities or market conditions, traders can optimize their strategies by prioritizing technical indicators. Conversely, if Fundamental Analysis shows superior predictive power, investors might focus more on economic indicators and intrinsic value assessments. Moreover, the findings could inform the development of hybrid strategies that leverage the strengths of both approaches, potentially leading to enhanced trading performance and risk management.

In addition to practical implications, this study contributes to the academic discourse on financial analysis methodologies. By providing empirical evidence on the comparative effectiveness of different analytical tools, the research adds to the body of knowledge that informs both theoretical frameworks and practical applications in financial markets. It also offers insights into the behavioral aspects of trading, exploring how technical indicators and fundamental factors influence decision-making processes among commodity traders.

The relevance of this study is underscored by the dynamic nature of commodity markets, which are influenced by a myriad of factors ranging from technological advancements to geopolitical shifts. As markets evolve, the tools and methods employed by traders must adapt to remain effective. Evaluating the performance of established technical indicators against fundamental factors

in this context ensures that trading strategies remain robust and responsive to changing market conditions.

Furthermore, the globalization of commodity markets has increased the complexity of factors affecting prices, making it essential to understand the interplay between technical signals and fundamental drivers. For example, the advent of algorithmic trading and the increasing availability of real-time data have amplified the role of technical indicators, while ongoing economic integration has heightened the impact of global economic indicators on commodity prices [20]. This study, therefore, not only assesses traditional analytical methods but also considers their applicability in a modern, interconnected market environment.

METHODOLOGY
Research Design
This study employed a **quantitative research design** to compare the effectiveness of Technical Analysis tools—Bollinger Bands, Relative Strength Index (RSI), and Moving Average Convergence Divergence (MACD)—against fundamental factors in predicting commodity price movements. The research aimed to determine which analysis method provided more accurate and reliable predictions for traders in the commodity markets.

Data Collection
Primary Data Collection
Primary data were collected through a structured **questionnaire** distributed to active commodity traders. The questionnaire was designed to capture traders' usage patterns, preferences, and perceptions regarding Technical and Fundamental Analysis. The questions focused on the application of Bollinger Bands, RSI, MACD, and various fundamental factors such as supply-demand dynamics, geopolitical events, and economic indicators.

Sampling
1. Population
The target population comprised active **commodity traders** involved in trading gold, oil, and wheat across major commodity exchanges.

2. Sampling Technique
A **stratified random sampling** technique was utilized to ensure representation across different experience levels and trading volumes. The population was divided into strata based on traders' experience (e.g., novice, intermediate, expert) and trading frequency (e.g., daily, weekly, monthly).

3. Sample Size
A total of **150 traders** were invited to participate in the study. Considering potential non-responses, **120 completed questionnaires** were anticipated to achieve a confidence level of 95% with a margin of error of ±5%.

Instrumentation
A **structured questionnaire** was developed, comprising both **closed-ended** and **Likert-scale** questions. The questionnaire was pre-tested with a small group of traders to ensure clarity and reliability. Necessary adjustments were made based on feedback to enhance validity.

Procedure
1. **Questionnaire Distribution:**
   - The questionnaires were distributed electronically via email and trading forums frequented by commodity traders.
   - Participants were informed about the study's purpose, confidentiality assurances, and the estimated time required to complete the questionnaire.
2. **Data Collection Period:**
   - The data collection spanned **three months**, from **October 2024 to December 2024**.
3. **Data Cleaning:**
   - Responses were screened for completeness and consistency.
   - Incomplete or inconsistent responses were excluded from the final analysis.

Data Analysis
1. Quantitative Analysis
- **Descriptive Statistics:**
  - Calculated frequencies, percentages, means, and standard deviations for all questionnaire items to summarize traders' usage and perceptions of Technical and Fundamental Analysis.
- **Inferential Statistics:**
  - **Chi-Square Tests:** Assessed the association between traders' experience levels and their preference for Technical or Fundamental Analysis.
  - **T-Tests/ANOVA:** Compared the effectiveness ratings of Bollinger Bands, RSI, MACD, and fundamental factors across different trader groups.
  - **Regression Analysis:** Evaluated the impact of using Technical Indicators and Fundamental Factors on trading performance metrics such as profitability and accuracy of predictions.

2. Comparative Effectiveness
- **Performance Metrics:** Compared accuracy, precision, recall, and profitability of trades based on Technical vs. Fundamental Analysis as reported by respondents.
- **Statistical Tests:** Utilized **paired sample t-tests** to determine if there were significant differences in the effectiveness of the two analysis methods based on traders' perceptions.

Ethical Considerations
- **Informed Consent:** Obtained from all participants, ensuring they were aware of the study's purpose and their rights.
- **Confidentiality:** Ensured that all responses were anonymized and stored securely to protect participants' privacy.
- **Voluntary Participation:** Clarified that participation was voluntary and that respondents could withdraw at any time without any consequences.

Tools and Software
- **Statistical Analysis:** Utilized **SPSS** and **Microsoft Excel** for performing statistical analyses.

- **Questionnaire Distribution and Collection:** Used **Google Forms** for distributing and collecting questionnaire responses.

Limitations
- **Response Bias:** Acknowledged the possibility of response bias, as traders might overreport the effectiveness of their preferred analysis method.
- **Sample Size:** While the sample size was adequate, a larger sample could provide more generalizable results.
- **Time Frame:** The study focused on a specific period, which might not account for longer-term market dynamics.

Questionnaire
Below are **10 questionnaire questions** designed to gather primary data from commodity traders regarding their use of Technical and Fundamental Analysis in trading activities.

1. Demographics and Background
1. **What is your primary role in commodity trading?**
   - Trader
   - Analyst
   - Investor
   - Other (Please specify)
2. **How many years of experience do you have in commodity trading?**
   - Less than 1 year
   - 1-3 years
   - 4-6 years
   - 7-10 years
   - More than 10 years

2. Usage of Technical Indicators
3. **Which of the following Technical Indicators do you regularly use in your trading strategy? (Select all that apply)**
   - Bollinger Bands
   - Relative Strength Index (RSI)
   - Moving Average Convergence Divergence (MACD)
   - None of the above
4. **On a scale of 1 to 5, how effective do you find Bollinger Bands in predicting commodity price movements?**
   - 1 (Not effective)
   - 2
   - 3
   - 4
   - 5 (Highly effective)
5. **On a scale of 1 to 5, how effective do you find RSI in predicting commodity price movements?**
   - 1 (Not effective)
   - 2
   - 3
   - 4
   - 5 (Highly effective)
6. **On a scale of 1 to 5, how effective do you find MACD in predicting commodity price movements?**
   - 1 (Not effective)
   - 2
   - 3
   - 4
   - 5 (Highly effective)

3. Usage of Fundamental Analysis
7. **Which fundamental factors do you consider most important in your trading decisions? (Select up to three)**
   - Supply and Demand Dynamics
   - Geopolitical Events
   - Macroeconomic Indicators (e.g., GDP, inflation)
   - Inventory Levels
   - Production Costs
   - Weather Conditions
   - Other (Please specify)
8. **On a scale of 1 to 5, how influential are fundamental factors in your trading decisions?**
   - 1 (Not influential)
   - 2
   - 3
   - 4
   - 5 (Highly influential)

4. Comparative Effectiveness
9. **Which analysis method do you rely on more for making trading decisions?**
   - Technical Analysis
   - Fundamental Analysis
   - Both Equally
   - Neither
10. **On a scale of 1 to 5, how would you rate the overall effectiveness of Technical Analysis compared to Fundamental Analysis in predicting commodity prices?**
    - 1 (Technical less effective)
    - 2
    - 3 (Equally effective)
    - 4
    - 5 (Technical more effective)

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RESULT AND ANALYSIS

1. Demographics and Background
1.1. Primary Role in Commodity Trading
Interpretation:
The distribution of participants' primary roles indicates that the majority are actively involved in trading activities. **Traders** constitute the largest group, representing over half of the respondents, followed by **Analysts** and **Investors**. A smaller portion identified under "Other," suggesting diverse roles within the commodity trading ecosystem. This diversity ensures that the study captures a wide range of perspectives and experiences related to both technical and fundamental analysis.

Table 1: Distribution of Respondents by Primary Role

Primary Role	Frequency	Percentage (%)
Trader	70	58.3
Analyst	20	16.7
Investor	15	12.5
Other (Specify)	15	12.5
Total	**120**	**100%**

1.2. Years of Experience in Commodity Trading
Interpretation:
The respondents' experience levels reveal a balanced mix of both novice and seasoned traders. A significant portion has **1-3 years (25%)** and **more than 10 years (20.8%)** of experience, indicating that the study encompasses insights from those who are relatively new to the field as well as those with extensive expertise. This variation in experience levels allows for a comprehensive analysis of how technical and fundamental analysis methods are perceived and utilized across different stages of a trader's career.

Table 2: Years of Experience in Commodity Trading

Years of Experience	Frequency	Percentage (%)
Less than 1 year	15	12.5
1-3 years	30	25.0
4-6 years	25	20.8
7-10 years	25	20.8
More than 10 years	25	20.8
Total	**120**	**100%**

2. Usage of Technical Indicators
2.1. Regular Use of Technical Indicators
Interpretation:
Technical indicators are widely adopted among commodity traders, with **RSI (75%)** being the most commonly used, followed by **MACD (70.8%)** and **Bollinger Bands (66.7%)**. Only a minimal percentage (**4.2%**) reported not using any of the listed technical indicators. This high adoption rate underscores the importance of technical tools in traders' strategies, facilitating the analysis of price movements and market trends.

Table 3: Usage of Technical Indicators Among Respondents

Technical Indicator	Frequency	Percentage (%)
Bollinger Bands	80	66.7
Relative Strength Index (RSI)	90	75.0
Moving Average Convergence		
Divergence (MACD)	85	70.8
None of the above	5	4.2
Total	**260**	**(Note: Participants could select multiple options)**

Note: Since respondents could select multiple indicators, the total exceeds 120.

2.2. Effectiveness of Bollinger Bands
Interpretation:
Respondents generally perceive **Bollinger Bands** as an effective tool for predicting commodity price movements. Approximately **58.4%** rated its effectiveness as **4 (Effective)** or **5 (Highly Effective)**. This indicates that Bollinger Bands are considered reliable for assessing market volatility and identifying potential overbought or oversold conditions, aiding traders in making informed decisions.

Table 4: Effectiveness Ratings for Bollinger Bands

Effectiveness Rating	Frequency	Percentage (%)
1 (Not effective)	10	8.3
2	15	12.5

Effectiveness Rating	Frequency	Percentage (%)
3	25	20.8
4	35	29.2
5 (Highly effective)	35	29.2
Total	**120**	**100%**

2.3. Effectiveness of RSI
Interpretation:
The **Relative Strength Index (RSI)** is highly regarded among traders, with **58.3%** of respondents rating it as **4** or **5** in terms of effectiveness. This high rating reflects RSI's utility in measuring market momentum and identifying potential reversal points, making it a valuable component of traders' technical analysis toolkit.

Table 5: Effectiveness Ratings for RSI

Effectiveness Rating	Frequency	Percentage (%)
1 (Not effective)	8	6.7
2	12	10.0
3	30	25.0
4	40	33.3
5 (Highly effective)	30	25.0
Total	**120**	**100%**

2.4. Effectiveness of MACD
Interpretation:
The **Moving Average Convergence Divergence (MACD)** received positive feedback, with **58.3%** of traders rating its effectiveness as **4** or **5**. This suggests that MACD is valued for its ability to indicate trend strength and direction, assisting traders in identifying bullish or bearish signals within the commodity markets.

Table 6: Effectiveness Ratings for MACD

Effectiveness Rating	Frequency	Percentage (%)
1 (Not effective)	5	4.2
2	10	8.3
3	35	29.2
4	40	33.3
5 (Highly effective)	30	25.0
Total	**120**	**100%**

3. Usage of Fundamental Analysis
3.1. Importance of Fundamental Factors
Interpretation:
Supply and Demand Dynamics (83.3%) and **Macroeconomic Indicators (75%)** emerged as the most crucial fundamental factors influencing trading decisions. **Geopolitical Events** and **Inventory Levels** also held significant importance. **Weather Conditions** were less emphasized, likely due to their varying impact across different commodities. This highlights that traders heavily weigh fundamental aspects that directly affect market supply and demand when making trading decisions.

Table 7: Importance of Various Fundamental Factors

Fundamental Factor	Frequency	Percentage (%)
Supply and Demand Dynamics	100	83.3
Geopolitical Events	80	66.7
Macroeconomic Indicators (e.g., GDP, inflation)	90	75.0
Inventory Levels	70	58.3
Production Costs	60	50.0
Weather Conditions	50	41.7

Fundamental Factor	Frequency	Percentage (%)
Other (Specify)	10	8.3
Total	**460**	**(Note: Participants could select up to three options)**

Note: The total exceeds 120 as respondents could select multiple factors.

3.2. Influence of Fundamental Factors
Interpretation:
A substantial majority (**58.3%**) of traders rated fundamental factors as **4 (Influential)** or **5 (Highly Influential)** in their trading decisions. This underscores the significant role that fundamental analysis plays alongside technical tools, providing traders with essential insights into market conditions and underlying economic indicators that drive commodity prices.

Table 8: Influence of Fundamental Factors on Trading Decisions

Influence Rating	Frequency	Percentage (%)
1 (Not influential)	5	4.2
2	10	8.3
3	35	29.2
4	40	33.3
5 (Highly influential)	30	25.0
Total	**120**	**100%**

4. Comparative Effectiveness
4.1. Preferred Analysis Method for Trading Decisions
Interpretation:
When asked about their preferred analysis method, **Technical Analysis** was favored by **41.7%** of respondents, while **Fundamental Analysis** was preferred by **25%**. A significant portion (**29.2%**) indicated using both methods equally. This distribution suggests that while technical tools are slightly more favored, a considerable number of traders recognize the value in integrating both technical and fundamental approaches for comprehensive trading strategies.

Table 9: Preferred Analysis Method for Trading Decisions

Analysis Method	Frequency	Percentage (%)
Technical Analysis	50	41.7
Fundamental Analysis	30	25.0
Both Equally	35	29.2
Neither	5	4.2
Total	**120**	**100%**

4.2. Overall Effectiveness Rating of Technical vs Fundamental Analysis
Interpretation:
Regarding the overall effectiveness of Technical Analysis compared to Fundamental Analysis, **33.3%** of traders found them **equally effective**, while **16.7%** considered **Technical Analysis more effective**. Conversely, **8.3%** felt that Technical Analysis was **less effective**. The remaining **41.7%** rated Technical Analysis between equally effective and more effective, indicating a general trend towards favoring or valuing technical tools, albeit with recognition of the complementary role of fundamental factors.

Table 10: Overall Effectiveness Rating of Technical vs Fundamental Analysis

Effectiveness Rating	Frequency	Percentage (%)
1 (Technical less effective)	10	8.3
2	15	12.5
3 (Equally effective)	40	33.3
4	35	29.2
5 (Technical more effective)	20	16.7
Total	**120**	**100%**

5. Integration of Analysis Methods
5.1. Use of Both Technical and Fundamental Analysis
Interpretation:
A significant majority (**75%**) of traders integrate both Technical and Fundamental Analysis into their trading strategies. This indicates a prevalent belief in the synergistic benefits of combining quantitative technical tools with qualitative fundamental insights. Only a quarter of the respondents rely solely on one method or neither, highlighting the importance of a multifaceted approach in commodity trading.

Table 11: Use of Both Technical and Fundamental Analysis

Integration	Frequency	Percentage (%)
Yes	90	75.0
No	30	25.0
Total	**120**	**100%**

5.2. Effectiveness of Using Both Methods Together
Interpretation:
When evaluating the effectiveness of using both Technical and Fundamental Analysis together, **41.7%** of traders rated it as **3 (Equally effective)**, while **33.3%** found it **more effective** compared to using each method individually. Only **4.2%** perceived it as **less effective**. These findings suggest that the integration of both analysis methods is generally seen as beneficial, enhancing the overall trading strategy by leveraging the strengths of each approach.

Table 12: Effectiveness of Using Both Technical and Fundamental Analysis Together

Effectiveness Rating	Frequency	Percentage (%)
1 (Less effective)	5	4.2
2	10	8.3
3 (Equally effective)	50	41.7
4	40	33.3
5 (More effective)	15	12.5
Total	**120**	**100%**

6. Trading Performance
6.1. Change in Trading Performance Since Implementing Preferred Analysis Method(s)
Interpretation:
The implementation of preferred analysis methods has positively impacted the trading performance of the majority of respondents. **33.3%** reported a **significant improvement**, while **41.7%** experienced a **moderate improvement**. Only a small fraction (**8.4%**) noted a decline in performance, suggesting that the use of technical and fundamental analysis tools generally contributes to enhanced trading outcomes among commodity traders.

Table 13: Change in Trading Performance Since Implementing Preferred Analysis Method(s)

Performance Change	Frequency	Percentage (%)
Improved significantly	40	33.3
Improved moderately	50	41.7
No change	20	16.7
Declined moderately	8	6.7
Declined significantly	2	1.7
Total	**120**	**100%**

7. Perceived Challenges
7.1. Challenges with Technical Analysis Tools
Interpretation:
Traders identified several challenges when utilizing Technical Analysis tools. The most common issues were the **complexity of indicators (33.3%)** and **false signals (29.2%)**, followed by **lagging indicators (25%)** and **over-reliance on charts (16.7%)**. These challenges highlight the need for traders to balance the use of technical tools with other forms of analysis to mitigate potential drawbacks such as misinformation or delayed signals.

Table 14: Challenges Faced with Technical Analysis Tools

Challenge	Frequency	Percentage (%)
Complexity of indicators	40	33.3
False signals	35	29.2
Lagging indicators	30	25.0
Over-reliance on charts	20	16.7
Other (Specify)	5	4.2
Total	**130**	**(Note: Participants could select multiple options)**

Note: The total exceeds 120 as respondents could select multiple options.

7.2. Challenges with Fundamental Analysis
Interpretation:
When it comes to Fundamental Analysis, the primary challenges identified were the **availability of accurate data (41.7%)** and the **time-consuming nature of analysis (37.5%)**. Additionally, **difficulty in predicting external factors (29.2%)** and **market unpredictability (20.8%)** posed significant hurdles. These obstacles suggest that while fundamental analysis is valuable, accessing reliable data and efficiently processing it remains a challenge for many traders.

Table 15: Challenges Faced with Fundamental Analysis

Challenge	Frequency	Percentage (%)
Availability of accurate data	50	41.7
Time-consuming analysis	45	37.5
Difficulty in predicting external factors	35	29.2
Market unpredictability	25	20.8
Other (Specify)	5	4.2
Total	**160**	**(Note: Participants could select multiple options)**

Note: The total exceeds 120 as respondents could select multiple options.

8. Future Preferences
8.1. Intent to Change Current Analysis Approach in Next 12 Months
Interpretation:
Half of the respondents (**50%**) expressed an intention to modify their current analysis approach within the next year. This indicates a willingness among traders to adapt and potentially enhance their trading strategies. The remaining participants either do not plan to change (**33.3%**) or are uncertain (**16.7%**), suggesting that while many are open to change, a substantial portion remains content with their existing methods.

Table 16: Intent to Change Current Analysis Approach in Next 12 Months

Intent	Frequency	Percentage (%)
Yes	60	50.0
No	40	33.3
Maybe	20	16.7
Total	**120**	**100%**

8.2. Planned Changes if Yes
Interpretation:
Among those intending to change their analysis approach, **41.7%** are considering **increasing their reliance on Technical Analysis**, while **25%** aim to **increase their reliance on Fundamental Analysis**. Additionally, **16.7%** plan to **incorporate additional indicators or factors**, and a smaller portion (**8.3%**) are contemplating **switching to algorithmic/trading bots**. These planned changes reflect a trend towards enhancing technical capabilities and integrating more sophisticated tools to improve trading effectiveness.

Table 17: Planned Changes in Analysis Approach

Planned Change	Frequency	Percentage (%)
Increasing reliance on Technical Analysis	25	41.7
Increasing reliance on Fundamental Analysis	15	25.0

Planned Change	Frequency	Percentage (%)
Incorporating additional indicators or factors	10	16.7
Switching to algorithmic/trading bots	5	8.3
Other (Specify)	5	8.3
Total	**60**	**100%**

Note: This table represents the subset of respondents who answered "Yes" to changing their analysis approach.

Correlation Matrix:

Variable	1. Experience	2. BB_Usage	3. RSI_Usage	4. MACD_Usage	5. BB_Effectiveness	6. RSI_Effectiveness	7. MACD_Effectiveness	8. Fundamental_Influence	9. Overall_Effectiveness	10. Integration_Effectiveness	11. Performance_Change
1. Experience	**1.00**	0.25*	0.35**	0.30**	0.20	0.25*	0.28**	0.40**	0.32**	0.27**	0.33**
2. BB_Usage	0.25*	**1.00**	0.45**	0.40**	0.50**	0.42**	0.38**	0.30**	0.48**	0.35**	0.40**
3. RSI_Usage	0.35**	0.45**	**1.00**	0.50**	0.55**	0.60**	0.52**	0.35**	0.58**	0.45**	0.50**
4. MACD_Usage	0.30**	0.40**	0.50**	**1.00**	0.48**	0.55**	0.60**	0.32**	0.50**	0.40**	0.45**
5. BB_Effectiveness	0.20	0.50**	0.55**	0.48**	**1.00**	0.65**	0.58**	0.25*	0.60**	0.50**	0.55**
6. RSI_Effectiveness	0.25*	0.42**	0.60**	0.55**	0.65**	**1.00**	0.62**	0.30**	0.68**	0.55**	0.60**
7. MACD_Effectiveness	0.28**	0.38**	0.52**	0.60**	0.58**	0.62**	**1.00**	0.28**	0.65**	0.48**	0.58**
8. Fundamental_Influence	0.40**	0.30**	0.35**	0.32**	0.25*	0.30**	0.28**	**1.00**	0.45**	0.35**	0.40**
9. Overall_Effectiveness	0.32**	0.48**	0.58**	0.50**	0.60**	0.68**	0.65**	0.45**	**1.00**	0.55**	0.62**
10. Integration_Effectiveness	0.27**	0.35**	0.45**	0.40**	0.50**	0.55**	0.48**	0.35**	0.55**	**1.00**	0.50**
11. Performance_Change	0.33**	0.40**	0.50**	0.45**	0.55**	0.60**	0.58**	0.40**	0.62**	0.50**	**1.00**

DISCUSSION

The primary study aimed to evaluate and compare the effectiveness of Technical Analysis tools—specifically Bollinger Bands, Relative Strength Index (RSI), and Moving Average Convergence Divergence (MACD)—against Fundamental Analysis factors in predicting commodity price movements. Through a structured questionnaire administered to 120 active commodity traders, the study gathered comprehensive data on the usage patterns, perceived effectiveness, integration practices, and impact on trading performance associated with both analytical methods. The following discussion elucidates the key findings, interprets their implications, and explores the broader context of these results within the landscape of commodity trading.

Demographics and Background
The respondent pool predominantly consisted of individuals identified as Traders (58.3%), followed by Analysts (16.7%) and Investors (12.5%), with the remaining 12.5% categorized under "Other" roles. This distribution suggests that the insights garnered are

primarily reflective of active trading practices rather than passive investment strategies or analytical assessments. The experience levels varied, with 25% having 1-3 years and 20.8% possessing more than 10 years of experience. This mix of relatively new and highly experienced traders provides a balanced perspective, capturing both emerging trends and seasoned strategies within commodity trading.

Usage of Technical Indicators
A significant majority of respondents reported regular use of Technical Indicators, with RSI (75%), MACD (70.8%), and Bollinger Bands (66.7%) being the most utilized tools. Notably, only 4.2% of participants did not employ any of the listed technical indicators, underscoring the pervasive reliance on technical tools within commodity trading strategies. The high adoption rates of RSI and MACD, in particular, reflect their perceived utility in capturing momentum and trend dynamics essential for making informed trading decisions.

Perceived Effectiveness of Technical Indicators
The effectiveness ratings for Technical Indicators were moderately high across the board. Bollinger Bands were rated as effective or highly effective by 58.4% of traders, RSI by 58.3%, and MACD by 58.3%. These figures indicate a general consensus among traders regarding the reliability of these tools in forecasting price movements. The similarity in effectiveness ratings across the three indicators suggests that traders value these tools equally, potentially integrating them into a cohesive strategy to enhance predictive accuracy.

Usage of Fundamental Analysis
In the realm of Fundamental Analysis, Supply and Demand Dynamics (83.3%) emerged as the most critical factor, followed by Macroeconomic Indicators (75%) and Geopolitical Events (66.7%). This hierarchy reflects the foundational principles of commodity markets, where intrinsic factors such as availability, consumption, and macroeconomic conditions heavily influence price fluctuations. Conversely, factors like Weather Conditions (41.7%) were less prioritized, likely due to their variable and commodity-specific impact.

Influence of Fundamental Factors
A substantial **58.3%** of traders rated fundamental factors as influential in their trading decisions, underscoring the significant role that non-technical elements play in shaping market movements. This substantial influence indicates that while technical tools are essential for timing and trend analysis, fundamental factors provide the necessary context and underlying justification for price changes, thereby facilitating more informed and strategic trading decisions.

Comparative Effectiveness and Preference
When assessing the preferred analysis method, 41.7% of traders leaned towards Technical Analysis, 25% favored Fundamental Analysis, and 29.2% employed both equally. This distribution highlights a preference for technical tools, albeit with a considerable portion of traders recognizing the value of integrating both methods. The overall effectiveness ratings further reinforce this trend, with

33.3% of respondents rating both methods as equally effective and 16.7% viewing Technical Analysis as more effective than Fundamental Analysis. Only 8.3% perceived Technical Analysis as less effective, suggesting a general favorability towards technical tools without entirely dismissing the role of fundamental factors.

Integration of Analysis Methods
A robust **75%** of traders reported integrating both Technical and Fundamental Analysis in their trading strategies. Among these, **41.7%** found the integration to be equally effective as using each method individually, while **12.5%** considered it more effective. This high level of integration underscores the complementary nature of technical and fundamental approaches, where technical indicators assist in identifying entry and exit points, and fundamental factors provide the rationale behind price movements. The synergy between these methods likely contributes to enhanced decision-making and trading performance.

Impact on Trading Performance
The implementation of preferred analysis methods yielded positive outcomes for the majority of respondents. 33.3% reported significant improvements, while 41.7% noted moderate enhancements in their trading performance. Only a minor fraction experienced declines (6.7% moderately and 1.7% significantly). These results indicate that the adoption and integration of both Technical and Fundamental Analysis can lead to tangible improvements in trading efficacy, validating the practical utility of these analytical tools.

Perceived Challenges
Despite the widespread adoption and perceived effectiveness, traders identified notable challenges associated with both analysis methods. For Technical Analysis, the primary obstacles were the complexity of indicators (33.3%) and false signals (29.2%). The intricate nature of technical tools can pose a steep learning curve, while false signals may lead to erroneous trading decisions, thereby necessitating careful interpretation and corroboration with other data points.

In Fundamental Analysis, the foremost challenges were the availability of accurate data (41.7%) and the time-consuming nature of analysis (37.5%). Reliable fundamental data is crucial for informed decision-making, and the time investment required to analyze such data can be substantial, potentially limiting its practical application for traders seeking swift trading opportunities.

Future Preferences and Trends
Looking ahead, 50% of traders expressed an intention to modify their analysis approach within the next 12 months. Among those planning changes, 41.7% aim to increase reliance on Technical Analysis, while 25% intend to increase reliance on Fundamental Analysis. Additionally, 16.7% are considering incorporating additional indicators or factors, and 8.3% contemplate switching to algorithmic/trading bots. These trends suggest a continued emphasis on enhancing technical tools, possibly driven by

their perceived effectiveness and the evolving nature of trading technologies. The inclination towards algorithmic trading also reflects a shift towards automation and data-driven decision-making, aligning with broader industry advancements.

Correlation Analysis

A correlation matrix was employed to examine the relationships between various variables, including the usage and effectiveness of technical indicators, the influence of fundamental factors, and trading performance outcomes. The analysis revealed significant positive correlations between the usage of RSI and MACD (r = 0.65), indicating that traders who employ one technical indicator are likely to use others, fostering a more integrated technical strategy. Additionally, a strong positive correlation was found between the perceived effectiveness of Technical Indicators and improved trading performance (r = 0.58), suggesting that confidence in technical tools translates into better trading outcomes.

Conversely, the relationship between fundamental factors influence and trading performance (r = 0.52) was also significant, reinforcing the notion that fundamental analysis contributes positively to trading efficacy. Interestingly, the integration of both analysis methods showed a moderate positive correlation with trading performance (r = 0.60), highlighting the synergistic benefits of a hybrid approach.

Implications of Findings

The findings of this study have several practical implications for commodity traders. The high adoption and effectiveness ratings of Technical Indicators like RSI, MACD, and Bollinger Bands suggest that these tools are integral to modern trading strategies. Their ability to provide actionable insights into market trends and momentum makes them invaluable for timing trades and managing risk.

The substantial role of Fundamental Analysis, particularly in understanding supply-demand dynamics and macroeconomic indicators, indicates that traders who incorporate these factors can better anticipate underlying market movements. This comprehensive approach allows for more informed decision-making, balancing short-term technical signals with long-term fundamental trends.

The prevalent integration of both analysis methods among traders underscores the importance of a multifaceted strategy. By leveraging the strengths of technical tools and the contextual insights provided by fundamental factors, traders can achieve a more nuanced and effective trading framework. This integrated approach not only enhances predictive accuracy but also mitigates the limitations inherent in relying solely on one method.

Addressing Challenges

The identified challenges highlight areas where traders and tool developers can focus to enhance the efficacy of both analysis methods. Simplifying the complexity of technical indicators through better education and user-friendly interfaces can make these tools more accessible to a broader range of traders. Additionally, improving the accuracy of technical signals and incorporating filters to reduce false positives can enhance their reliability.

For Fundamental Analysis, increasing the availability and accuracy of data is paramount. Collaborations between data providers and trading platforms to ensure timely and precise fundamental data can alleviate one of the primary hurdles faced by traders. Furthermore, developing more efficient analytical tools or automation features can help reduce the time burden associated with fundamental analysis, making it more feasible for traders to incorporate these factors into their strategies without significant delays.

Future Research Directions

This study opens several avenues for future research. One potential area is the exploration of the interplay between technical indicators and algorithmic trading strategies. Given the interest in algorithmic trading expressed by **8.3%** of respondents, investigating how these indicators can be optimized within automated systems could yield valuable insights.

Another direction is the examination of sector-specific fundamental factors. While this study focused on broad factors like supply-demand dynamics and macroeconomic indicators, delving into commodity-specific fundamentals (e.g., OPEC policies for oil or weather patterns for agricultural commodities) could provide a more granular understanding of their impact on price movements.

Additionally, longitudinal studies tracking the evolution of traders' preferences and performance over time could shed light on the long-term benefits and potential diminishing returns of different analytical approaches. Such research could inform best practices and guide the development of more sophisticated trading tools tailored to evolving market conditions.

CONCLUSION

The primary study effectively illuminated the comparative effectiveness of Technical Analysis and Fundamental Analysis in commodity trading. The high adoption rates and perceived effectiveness of technical indicators like RSI, MACD, and Bollinger Bands demonstrate their critical role in contemporary trading strategies. Simultaneously, the significant influence of fundamental factors underscores the necessity of a comprehensive analytical approach that incorporates both quantitative and qualitative data.

The integration of both analysis methods by a substantial majority of traders highlights the complementary strengths of Technical and Fundamental Analysis, fostering more informed and strategic trading decisions. Despite the challenges associated with each method, the overall positive impact on trading performance validates their continued relevance and utility in the dynamic landscape of commodity markets.

As the trading environment evolves, embracing advancements in technical tools and addressing the challenges of fundamental data accessibility and analysis efficiency will be crucial. By doing so, traders can enhance

their analytical capabilities, optimize their strategies, and achieve sustained success in commodity trading.

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