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Profitability Assessment of Technical Trading Rules in BRICS Stock Markets

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Abstract

The stock market is a significant part of the financial sector, and choosing the right stock is essential to maximise returns. Many investors use technical analysis to predict future price movements based on past data. This study aims to predict the profitability of technical indicators in the BRICS nations' stock markets from April 2024 to March 2025. The study evaluates the randomness of the BRICS nations' stock market and found that they follow a trend rather than a random pattern. Furthermore, the study examines the reliability and sensitivity of technical indicators and found that the stochastic oscillator is highly sensitive, while the Bollinger Band is highly reliable. The study also found a negative correlation between reliability and sensitivity, indicating that both are important for achieving sufficient profit.

Keywords: Technical Analysis, Technical Indicators, BRICS Nations, Efficiency Run Test, Spearmen's Rho Correlation

Introduction

In today's world, it's common for people to invest in the stock market to make money through capital gains, but selecting the right stocks can be challenging. If the wrong securities are chosen, losses can occur (Johnson, 2003 & Kendall, 2003). To choose the right securities, there are two approaches: technical analysis and fundamental analysis. Both of these approaches are used to analyse price movements and predict fluctuations in securities (Sadhwani, 2022). Technical analysis is a commonly used approach around the world, which involves analysing past market data, such as price and volume, to identify patterns and trends that can help predict future market movements. Technical analysis is based on the principle of the Dow hypothesis (Murphy, 1999) the ultimate goal of this approach is to estimate the future price assets, which can be used to make trading decisions. Therefore, technical analysis can be formulated as a pattern recognition problem, where the historical price data serves as the input and the estimated price trend serves as the output (Teiexia, 2010).

The current or past price of a security is considered the best indicator of the future price of the security. It relies heavily on financial charts, data, and statistics to uncover an investment's strengths or possible weaknesses and forecast trends to help analysts (The Street). It can be used in various time frames ranging from intraday (1 minute, 5 minutes,15 minutes, 30 minutes, etc.) to daily, weekly, monthly, and yearly (Bhartiya, 2021). In some cases, it is a mix of psychological and logical, which means the market is driven by the psychology of the investor 90% of the time and 10% of the time logical factors affect the market. Consequently, predicting price movement in the stock market is generally believed to be difficult, but it can be possible through technical analysis indicators (Baliyan, Rathii, 2019). The traditional buy & sell strategy was developed with the aid of technical indicators, and it has proven to be more efficient and to generate favourable returns on both short- and long-term investments (Inumula, et al., 2019). It seems to have short-term and long-term analysis which primarily includes internal market data, price & volume (Manickamahesh, Antony, Kumar, Singh, 2021). According to a study conducted by Kim and Lee

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(2018), and Zhu and Wei (2017) technical analysis is a useful and effective tool for predicting stock returns in various international markets, including the United States, Japan, Korea, and China. Many traders have found technical analysis to be a useful tool for risk management, which can be a key challenge. Once a trader understands the concepts and principles of technical analysis, it can be applied to any market, making it a flexible analytical tool (Daily FX).

Technical analysis is a widely used approach for investment decision-making that involves analysing market data such as price and volume to predict future market movements. Numerous studies have been conducted on the effectiveness of technical analysis, with some supporting its use while others question its effectiveness. In the study by Tamini and Saadeh (2017), it was found that technical analysis can provide profitable trading opportunities, but its success rate is highly dependent on the time period and the market in which it is applied. Similarly, a study by Fang et al. (2018) found that technical analysis can provide insights into market trends and can be useful in identifying trading opportunities in the Chinese Stock Market. However, other studies have found little evidence to support the use of technical analysis. A study by Basu and Pal (2017), and Luukkonen et al. (2018) found that technical analysis was not effective in predicting stock returns in India. Despite its popularity, Technical Analysis has also been subject to criticism, particularly for its reliance on past market data and potential for generating false signals. However, as research continues to explore the effectiveness of Technical Analysis and its integration with new technologies, it remains a valuable tool for investors in making informed investment decisions.

There has been a substantial amount of research conducted in previous years on the profitability of technical indicators. For example, one study predicts the stock price of the auto sector using technical indicators and reveals that the prediction accuracy of our proposed model is comfortably acceptable. Its results outperform the buy-and-hold stock trading strategy (Goswani, 2020). A simulation conducted to examine the optimisation of Technical Indicators for better profits in the Indian Stock Market found that the Moving Average Convergence Divergence and the RSI help investors to reduce the trading cycle of investment with better profits in the long run (Inumula et al., 2019). Further, Khan and Shukla (2019) examined the profitability of Technical Indicators with the help of optimal deep learning, evaluated the model for taking a buy-sell decision, and in the end, it got made a satisfactory result, which means mean prediction accuracy achieved using the proposed model was 59.25% across the number of stocks.

Prasetijo (2017) detected buy-and-sell signal of Indonesia Stock Exchange with Bollinger Band and Parabolic SAR indicators and found that the best strategy for up-trending and sideways trends contributed (17.06% and 1.19%) by the Bollinger Band respectively. Moreover, Naved (2013) understands the importance of technical indicators with the help of the Indian Stock Market and it demonstrates that these indicators, namely Moving Averages, Moving Average Cross Rules, and Moving Average Convergence Divergence, are the tools for successful trading and profit generation. Manickamahesh, Antony, Kumar and Singh (2021) explain that, while introducing Technical Indicators, the Bollinger Band is a highly profitable indicator with a 70.2% success rate. It provides greator reliability compared with other indicators, and ROC generates the maximum number of buy signals, which means the combination of indicators can get high returns from the stock market Selling stocks via Technical Indicators.

Similar studies have examined the profitability of Technical Indicators. For example, Manjula and Shastri (2014) examine the profitability of RSI and Simple Moving Average with the help of the Pharmaceutical Industry. Rjumohan (2019) and Hongxing, Huidong and Chen (2006) examine trading strategies in stock market trading practice. Sadhwani (2019) examines the profitability of RSI and MACD applied on the Indian Stock Exchange. Thomas (2014) demonstrates the profitability of RSI, Moving Average Crossover, Fibonacci Retrenchment, and Stochastic Oscillator with python. Mayur (2015) analyses the conceptual framework of Technical Indicators, Lavanya (2018) provides the evidence regarding efficiency of Technical Indicators through the analysis of the stock of the Pharmaceutical Industry. Umaprabha and Malavika (2015), Jabeen and Jabeen (2017), Berry and Sulochna (2017), and Thanekar and Shaikh (2021) These literature review supports that RSI and Moving Average are the most successful indicator of the market. They provide accuracy of gain high returns.

However, some studies have reported negative results for certain Technical Indicators. For instance, a study by

Poon and Granger (2017) analysed the effectiveness of 22 popular technical indicators across various markets and found that the majority of the indicators did not generate significant returns after transaction costs. Additionally, Baig and Siraj (2018) examined the performance of 14 Technical Indicators in the Pakistani Stock Market and concluded that none of the indicators performed consistently. A few studies support the fact that investors usually take the decisions of buying or selling stocks through technical indicators. Although such indicators may influence stock prices instantaneously negatively and positively, these effects are not permanent most of the time. A recent global-index study analysed classic technical-analysis signals across 63 major world stock-market indices until end 2023. The authors found that traditional indicators such as Relative Strength Index (RSI), Commodity Channel Index (CCI), Williams %R (W%R), and others exhibited varying accuracy across markets and proposed new "vanguard" indicators that, for some indices, outperform classic ones (Kral-Grabka & Podgórski, 2025).

In a 2025 study focused on Indonesian sharia-compliant stocks (IDX-MESBUMN17), combining RSI with Bollinger Bands produced a markedly higher signal-accuracy (≈ 87.5%) compared to using either indicator alone (RSI ≈ 65.6%, BB ≈ 70.2%) (Irwansyah, Jaya & Nasrullah 2025). A 2024 empirical analysis of stock price "fair-value gaps" for Nepalese commercial banks applied multiple indicators, including RSI, MACD, Bollinger Bands, Simple Moving Averages (MA), and Fibonacci Retracement, and found that technical analysis can effectively detect potential price reversals, indicating the usefulness of diversified indicator sets (Subedi 2024). A 2024–2025 study integrating technical indicators (MA, RSI, Bollinger Bands) with ensemble learning models (Random Forest, Gradient Boosting, Support Vector Regression, ARIMA) reported enhanced predictive performance compared to baseline models, suggesting that combining classic indicators with machine-learning techniques may yield superior forecasting accuracy (Jose et al., 2024). A 2025 investigation comparing the effectiveness of Moving Average (MA) and RSI found nuanced results depending on market conditions and volatility, suggesting that MA and RSI remain important baseline tools for technical analysis but their efficiency varies across contexts (Singh 2025). In the domain of machine-learning-based forecasting, a 2025 hybrid model study employed traditional technical indicators as input features and reported significantly improved performance (lower RMSE/MAPE, better out-of-sample generalisation) compared to non-indicator models, indicating that classical technical indicators still add value even in advanced forecasting frameworks (Fozap et al., 2025).

Previous studies have reported significant results on the effectiveness of Technical Indicators in predicting market trends. However, these studies have not thoroughly examined the reliability of these indicators and have only used a few indicators at a time. As a result, the effectiveness of the market cannot be fully examined with limited indicators. To address this gap, the proposed study tries to investigate the success of Technical Indicators and determine the optimal time to buy and hold securities in the market. Unlike previous studies that have only used a limited number of indicators, the study employs a comprehensive set of indicators including Moving Average Convergence Divergence, Relative Strength Index, Bollinger Band, Rate of Change, William % Range, Stochastic Oscillator, and Commodity Change Index to analyse the market. Therefore, this study significantly contributes to the literature by filling this gap and offering a more comprehensive understanding of the effectiveness of Technical Indicators in predicting market trends.

The study aims to identify buy signals for selected stocks in BRICS countries and examine the reliability and sensitivity of technical indicators to make profitable investment decisions. Also, examine the relationship between reliability and sensitivity and determine which indicators are the most profitable for BRICS nations. By analysing the market efficiency of BRICS countries and evaluating their past and present performance, investors/traders can predict future performance using Technical Indicators. This information can help investors distinguish which country is performing well and which one's not.

Data and Methodology

Sample and Data Collection

The present study adopts a quantitative, analytical research design to explore the predictive performance and trading efficiency of prominent technical indicators in the BRICS stock markets. Daily closing price data for the benchmark indices of Brazil, Russia, India, China, and South Africa were obtained from secondary financial databases for the

period from 1 April 2024 to 31 March 2025. Nine widely adopted technical indicators were applied to generate systematic buy signals: the Relative Strength Index, Moving Average Convergence Divergence, Rate of Change, Commodity Channel Index, Average Directional Index, Stochastic Oscillator, Williams Percentage Range, and Bollinger Bands. The Runs Test was conducted to check the randomness and weak-form efficiency of each market, while sensitivity and reliability measures were calculated to evaluate the frequency and profitability of indicator-based trading recommendations. Furthermore, Spearman's Rank Correlation was used to assess the interrelationship between sensitivity and reliability in showing the possible trade-offs in indicator performance. All data processing and statistical analyses were carried out using Microsoft Excel and IBM SPSS to ensure robustness, replicability, and the empirical validity of the findings. These are as follows:

Table 1: Stock Exchange of BRICS Nations

Country	*Exchange*	*Index Name*	*No. of Companies*	*Year of Index*
Brazil	BM & F BOVESPA	IBOVSPA	64	1988
Russia	MOSCOW stock exchange	MICEX	50	1997
India	National stock exchange	NIFTY	50	1996
China	Shanghai stock exchange	SHCOMP	1274	1990
South Africa	Johannesburg stock exchange	JSE	170	1995

Source: Bloomberg.

Table 2: Mathematical Formula of Technical Indicators

Stock Technical Indicators	*Mathematical Formula*
RSI	$100 - \left[\left(\frac{100}{1+\left(\frac{AG}{AL}\right)}\right)\right]$
SO	$\%K = \left[\frac{C_{t-Lp}}{Hp-Lp}\right]*100$
WPR	$\%K = \left[\frac{Hp-C_t}{Hp-Lp}\right]*100$
MACD: most common is 12/26	[(12 – *day EMA*) – (26 – *dayEMA*)]
CCI	$\frac{\left(M^t - SMA_n(M^t)\right) / \left(0.015\sum_{i=1}^{n}\lvert M_{t-i+1} - SMA_n(M^t)\rvert\right)}{n}$
ADX	$100*\frac{(DI_n^+ - DI_n^-)}{(DI_n^+ - DI_n^-)}$ $DI_n^+ = {100 * EMA_n(DM^+)}/{ATR_n}$ $DI_n^- = {100 * EMA_n(DM^-)}/{ATR_n}$
ROC	$\frac{(C_t - C_{t-n})}{C_{t-n}}$
BB	Upper band= $MA + D\sqrt{\frac{\sum_{i-1}^{n}(Y_i - MA)2}{n}}$ Lower band= $MA - D\sqrt{\frac{\sum_{i-1}^{n}(Y_i - MA)2}{n}}$

Table 3: Technical Indicator Range and Prediction

	Range		*Prediction*	
Technical Indicator	*Lower*	*Upper*	*Sell*	*Buy*
RSI	0	100	<70	>30
SO	0	100	<20	>80
WPR	0	-100	0 to -20	-80 to -100
ADX	0	100	<20	>40
ROC	Below 0	Above 0	negative	Positive
CCI	-INFINITY	INFINITY	<100	>-100
BB	MACD and BB do not have any upper and lower limits			
MACD				

Results and Discussion

Table 4: Run Test on BRICS Nation

Countries	*Z- Score*	*Sig.*
Bovespa	-15.556	0.000
JSE	-16.869	0.000
MOEX	-16.422	0.000
NIFTY 50	-16.809	0.000
SSE 50	-14.457	0.000

Source: Author computation.

Computation of Technical Indicators

Table 5: (Relative Strength Index) RSI

Countries	*Buy*	*Profits*	*Success%*
Bovespa	59	28	47.5
JSE	41	19	46.3
MOEX	15	10	66.7
NIFTY 50	61	36	59
SSE 50	11	4	36.4
	37.4	Accuracy	51.2

Source: Author computation.

Table 6: (Bollinger Band) BB

Countries	*Buy*	*Profits*	*Success%*
Bovespa	13	8	61.5
JSE	10	7	70
MOEX	21	11	52.4
NIFTY 50	15	9	60
SSE 50	8	5	62.5
	13.4	Accuracy	61.3

Source: Author computation.

Table 7: (Rate of Change) ROC

Countries	*Buy*	*Profits*	*Success%*
Bovespa	126	62	49..2
JSE	92	55	59.7
MOEX	86	45	52.3
NIFTY 50	61	26	42.6
SSE 50	152	83	54.6
	103.4	Accuracy	51.68

Source: Author computation.

Table 8: (Average Directional Index) ADX

Countries	*Buy*	*Profits*	*Success%*
Bovespa	97	47	48.4
JSE	20	8	40
MOEX	72	37	51.4
NIFTY 50	183	95	51.9
SSE 50	30	13	43.3
	80.4	Accuracy	47

Source: Author computation.

Table 9: (Moving Average Convergence Divergence) MACD

Countries	*Buy*	*Profits*	*Success%*
Bovespa	121	67	55.3
JSE	137	64	46.7
MOEX	122	62	50.8
NIFTY 50	118	70	59.3
SSE 50	128	49	38.2
	125.2	Accuracy	50.06

Source: Author computation.

Table 10: (William Percentage Range) WPR

Countries	*Buy*	*Profits*	*Success%*
Bovespa	105	54	51.4
JSE	76	45	59.2
MOEX	26	17	65.3
NIFTY 50	21	15	71.4
SSE 50	200	90	45
	66.6	Accuracy	58.5

Source: Author computation.

Table 11: (Commodity Channel Index) CCI

Countries	*Buy*	*Profits*	*Success%*
Bovespa	58	33	56.8
JSE	43	15	34.8
MOEX	70	36	51.4
NIFTY 50	77	40	51.9
SSE 50	24	13	54.2
	54.4	Accuracy	49.8

Source: Author computation

Table 12: (Stochastic Oscillator) SO

Countries	*Buy*	*Profits*	*Success%*
Bovespa	133	64	48.1
JSE	93	50	53.7
MOEX	124	64	51.6
NIFTY 50	181	93	51.3
SSE 50	167	89	53.3
	139.6	Accuracy	51.6

Source: Author computation.

Table 13: Overall Sensitivity of All Indicators in BRICS Nation

Indicators	*Sensitivity*	*Ranking*
RSI	37.4	7
MACD	125.2	2
ROC	103.4	3
CCI	54.4	6
ADX	80.4	4
SO	139.6	1
WPR	66.6	5
BB	13.4	8

Source: Author computation.

The findings of Table 13 suggest that the Stochastic Oscillator (SO) is highly sensitive (139.6), generating numerous profitable buy signals in BRICS countries. In contrast, Bollinger Bands have lower sensitivity (13.4), indicating that they generates fewer profitable buying signals. The results indicate that investors in BRICS countries can mitigate their risk of loss, suggesting that the Stochastic Oscillator is a more effective investment tool.

Table 14: Overall Reliability of All Indicators in BRICS Nation

Indicators	*Reliability*	*Ranking*
RSI	51.2	5
MACD	50.06	6
ROC	51.68	3
CCI	49.8	7
ADX	47	8
SO	51.6	4
WPR	58.5	2
BB	61.3	1

Source: Author computation.

In Table 14, it is found that the Bollinger Band indicator has the highest reliability rate of 61.3% compared to other indicators in the BRICS countries. This suggests that investors can effectively use Bollinger Bands to determine optimal trading times, reduce market risk, and potentially earn significant profits. Conversely, the Average Directional Index (ADX) shows the lowest reliability rate of 47%, indicating that it may not be useful for investment decisions. Although all of these indicators can be helpful for trading, they have a relatively low probability of consistently generating accurate and profitable signals.

Correlation Between Sensitivity and Reliability

Table 15: Spearmen's Rho Correlation

		Sensitivity	*Reliability*
Sensitivity	Correlation coefficient	1.000	-.238
	Sig.(2-tailed)		0.570
	N	8	8
Reliability	Correlation coefficient	-.238	1.000
	Sig. (2-tailed)	.570	
	N	8	8

Source: Author computation.

Table 15 indicates a negative Spearman's rho coefficient (-0.238) between sensitivity and reliability, implying that both are needed to achieve a satisfactory level of profitability. This means that if investors focus on sensitivity or reliability individually, they may not be able to achieve the desired level of profit. Furthermore, the negative correlation between sensitivity and reliability suggests that as one of these factors improves, the other may decline, indicating a trade-off between them. Therefore, a careful analysis of both sensitivity and reliability is required to achieve the best possible results.

Conclusion

From the above analysis, it can be concluded that the stock market is extremely volatile, and an investor can lose a significant amount of savings with a small change. To reduce the impact of risk, technical analysis can be used as a tool to accurately predict the direction of share prices in the future. To further mitigate such risk, technical analysis can be used as a tool to predict future stock prices with greater accuracy. Technical Indicators are widely used by traders to identify opportunities in the market. Although several types of indicators are commonly used, these indicators help traders identify levels of support and resistance and measure their consistency over time. Based on the preceding analysis, the study shows that the Stochastic Oscillator provides the highest number of buy signals, and Bollinger Bands provides the highest success rate in generating profit. The results demonstrate the effectiveness of technology in reducing trading losses and increasing profit rates. The techniques developed in this study offer traders an advantage over their competitors and can significantly reduce risks associated with speculation. By utilising these findings, traders can reduce their exposure to speculative risks and gain significant exposure to the technical indicator segment. Overall, Technical Analysis and the use of indicators have become increasingly essential tools in the stock market, and their influence is likely to continue to grow in the future.

Practical Implementation of the Study

The practical implementation of the research on technical indicators in BRICS stock markets involves a comprehensive set of well-established technical indicators: RSI, MACD, Bollinger Bands, ROC, CCI, Average Directional Index (ADX), SO, and Williams %R. These are tools investors and traders use to define buy and sell signals based on previous price trends and market behaviour, given that BRICS stock markets are trending rather than random. The study also focuses on the balance between sensitivity, which refers to the frequency of the buy signal an indicator generates, and reliability, which is understood as the likelihood of those signals leading to profitable outcomes. For example, SO was found to be the most sensitive, while Bollinger Bands showed the highest levels of reliability for all BRICS countries. This may therefore mean that a combination of different indicators might result in optimal trade timing and consequently enhance profitability with adequate risk management.

Practical applications of such findings relate to systematic trading strategies whereby investors monitor these signals through easily accessible tools like Microsoft Excel or other statistical software to make informed trading decisions. It supports risk mitigation, improves the accuracy of prediction, and can be tailored to different horizons of trading-from an intraday to a long-term perspective-in Brazil, Russia, India, China, and South Africa. Overall, this study reinforces the value of diversifying technical indicators in decision frameworks to improve returns and reduce losses in BRICS stock investments, and positions technical analysis as a crucial investment strategy in emerging markets.

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