Original Article

Simple Moving Average (SMA) Crossover Strategy with Buy Sell Indicator

Sabyasachi Mazumder, Sayan Neogy*, Sahana Das

School of Computer Science, Swami Vivekananda University, Barrackpore, 700121, India

Correspondence E-mail: sabyasachi2712 @gmail.com, sayanneogy2001@gmail.com, sahanad@svu.ac.in*

Abstract

This project explores the effectiveness of a Small Moving Average (SMA) crossover trading strategy implemented on the TradingView website using Pine Script. The study investigates the potential profitability of the strategy by backtesting it on historical price data for various financial instruments. The project also examines the impact of different parameter values and timeframes on the performance of the SMA crossover strategy. The findings suggest that the SMA crossover strategy can be an effective tool for identifying potential buy and sell signals, but the results are highly dependent on the specific parameter values and timeframes used. This project provides a practical example of how to implement and test a trading strategy using Pine Script on TradingView.

Keywords: *Simple Moving Average (SMA); Crossover Strategy; Stock Market Analysis; TradingView*

Introduction

In the financial markets, technical analysis is a common strategy to examine price trends and forecast future market moves (Nabriya, 2020). In technical analysis, moving averages are often used to smooth out price data's volatility and find underlying trends. In the current turbulent competitive environment, financial analysis is an essential tool to help diverse stakeholder groups make better decisions (Islam *et al*., 2022).

By averaging a predetermined number of prior prices, a moving average is created. Moving averages are of different types, simple moving averages (SMA), exponential moving averages (EMA), and weighted moving averages (WMA). The simple moving average is the moving average that is most frequently employed in technical analysis.

A straightforward and well-liked technical analysis approach based on moving averages is the SMA Crossover strategy. This strategy's fundamental premise is to spot trend changes by looking for crosses between two moving averages.

In the procedure, two moving averages—one with a shorter time frame and the other with a longer time period—are employed. The shorter-term moving average displays the price trend that has occurred more recently, while the longer-term moving average displays the trend as a whole. A buy signal is created when the shorter-term moving average crosses above the longer-term moving average, indicating that the upward price trend is beginning to take hold. When the shorter-term moving average goes below the longer-term moving average, it shows that the price trend has changed from going up to going down. This is a sell signal.

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

The SMA Crossover strategy's simplicity is one of its benefits. All levels of traders can utilize it because it is simple to comprehend and put into practice. The approach can be utilized in any time frame, from intraday to weekly or monthly, and it can be employed with any financial instrument, including stocks, currencies, commodities, and indices.

The adaptability of the SMA Crossover method is another asset. By adjusting the lengths of the moving averages utilized, traders can modify the technique to suit their unique requirements and preferences. For instance, when trading in more turbulent markets or more stable markets, traders may utilize shorter-term moving averages or longer-term moving averages, respectively.

The SMA Crossover technique does have some drawbacks, though. One of its key flaws is its tendency to produce misleading signals in choppy or sideways markets, which can result in losses for traders who blindly follow the signs. In these circumstances, it's crucial to apply additional technical analysis tools and indicators to verify the veracity of the signals the method has produced.

Another drawback is that the method has a tendency to produce whipsaws, which are losing trades that happen when moving averages cross and produce a signal but then immediately cross again in the opposite direction. This can be reduced by adding extra indicators to filter out spurious signals or by using a longer-term moving average.

In conclusion, the SMA Crossover technique is a well-liked and straightforward technical analysis method that can be utilized to spot trend changes and produce trade signals. While it offers advantages like simplicity and adaptability, it also has drawbacks like misleading signals and whipsaws that must be considered. Before using a trading strategy in real trading, it's important to come up with a good plan for managing risks and carefully evaluate how well the strategy works.

Review of Literature

The use of moving averages in technical analysis has been widely studied in literature. In general, the literature suggests that moving averages are a useful tool for identifying trends and potential buy or sell opportunities in the market. For example, a study by Wilder (1978) found that moving averages were effective in identifying trends in commodity prices, while a study by Murphy (1999) found that moving averages were useful in identifying trends in stock prices.

The Simple Moving Average Crossover strategy, in particular, has been the subject of several studies. For example, in a study by Rapach, Strauss and Zhou (2013), researchers found that the SMA Crossover strategy was effective in identifying trends in the US stock market and provided returns that were similar to those of a buy-and-hold strategy.

However, the literature also highlights some limitations and weaknesses of the SMA Crossover strategy. For example, a study by Lo and MacKinlay (1988) found that the SMA Crossover strategy performed poorly in the foreign exchange market. Another study by Garcia-Feijoo and Jensen (2014) found that the SMA Crossover strategy alone was not effective in identifying trends in the Spanish stock market.

Moving Average Convergence Divergence (MACD) approaches were utilized by Sudheer (2015) in his article titled "Trading through technical analysis: an empirical study from the Indian stock market" to determine whether a stock is technically strong or not. Investors can recognize the present trend and stock-related risk thanks to MACD.

In their paper titled "Profitability of Oscillators used in Technical analysis for Financial Market" by Naved and Srivastava (2015), the researchers look at the profitability of various oscillator types used in technical analysis on the S&P CNX Nifty 50 market index of the NSE. Commodity Channel Index (CCI), Stochastic oscillator, and RSI oscillator were the three oscillators employed by the researcher, and the results clearly show that the CCI performs better than the other two oscillators.

Peachavanish (2016), suggested a way to find the stocks with the strongest trend and momentum at any given time. The favourite equities from the Thai stock market can be used with this method.

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

One of the main criticisms of the SMA Crossover strategy is that it is a lagging indicator and may not provide early signals about future price movements. Additionally, the strategy is based on past data, which means it may not be effective in volatile market conditions. Also, the strategy may give off a lot of false signals and whipsaws, which can cause losses.

In summary, the literature suggests that the Simple Moving Average Crossover strategy can be a useful tool for identifying trends and potential buy or sell opportunities in the market. However, the strategy also has its limitations, and it is essential to be aware of them before using it. It's important to keep in mind that past performance does not guarantee future results and that research and testing are essential when using any strategy.

Methodology

The historical data for a particular stock or asset is typically analyzed in order to judge the efficiency of the Simple Moving Average (SMA) Crossover approach. The data used for the analysis should be large and cover a wide time span to ensure that the results are correct and statistically significant. The data should contain information on the stock's or asset's price and volume in addition to other crucial market data, like economic indicators.

Any item or stock that is traded on a public exchange, such as those listed on a stock exchange or a currency sold on the foreign exchange market, is the subject of research. Depending on the study question and the analysis's goals, a stock or asset is selected.

Time Frame of Analysis

Another significant factor to take into account is the time frame of analysis. The research topic and the analysis's goals will determine how long the time frame will be. When evaluating the SMA Crossover strategy's performance over a lengthy period of time, one study may use a time frame of several years, while another study may use a time range of several months.

The time frame picked for the analysis is another important consideration. The duration will change depending upon the subject of the study and the objectives of the analysis. For example, a study evaluating the SMA Crossover technique over a long time horizon might use a time horizon of several years, whereas a study evaluating the strategy over a short time horizon, for example, may use a time horizon of several months.

Implementing the plan on a back testing platform is a typical methodology. A strategy's success can be measured in terms of returns, risk, and other variables through the use of backtesting, which simulates the strategy's performance using historical data. Using historical data, the strategy is applied during the backtesting process, and trade simulations based on the rules of the strategy are run. Following that, the effectiveness of the strategy is assessed by contrasting the simulated transactions with the actual price changes of the stock or asset. Typical performance indicators used to assess the approach include:

1. Net profit: the overall gain or loss resulting from the plan
2. Annualized return: the average yearly return that the approach produces
3. A measure of risk-adjusted return is the sharpe ratio.
4. Maximum drawdown: The equity of the strategy's biggest peak-to-trough decrease.
5. Win-loss ratio: The proportion of profitable deals to unsuccessful ones

Walk-forward analysis is another technique that may be used to assess the effectiveness of the SMA Crossover approach in addition to backtesting. A more complex technique is called walk-forward analysis, which entails testing the strategy on various subsets of historical data and modifying the approach's parameters in response to the results. The robustness and dependability of the technique may be enhanced by using this method.

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

The individual stock or asset being examined, the time range, and the moving average lengths will all have an impact on the performance evaluation's outcomes. In order to determine whether the technique is solid and reliable, it is crucial to thoroughly evaluate it utilizing a number of stocks or assets, time frames, and moving average lengths. Additionally, it's important to keep in mind that past performance does not guarantee future results and that the strategy should be regularly reviewed and modified as necessary.

The risk management part of the strategy also needs to be taken into account when figuring out how well it works. Any strategy must effectively manage risk, and having a plan in place is essential. This can require putting stop-loss orders in place, diversifying the portfolio, and keeping a close eye on the portfolio's performance.

In conclusion, assessing the Simple Moving Average Crossover strategy's performance is a crucial stage in figuring out how reliable and effective it is. The approach's potential can be fully understood by conducting a thorough examination of the strategy using historical data, a variety of performance indicators, strong backtesting, and walk-forward analysis. The strategy's resilience can be increased and its performance can be better gauged by testing it in various market situations, employing a variety of stocks or assets, time periods, and moving average lengths, as well as by putting a risk management plan into place.

ALGORITHM

The "SMA Crossover Strategy" script is an indicator that produces buy and sell signals by using two Simple Moving Averages (SMA) of various lengths. The user may adjust the lengths of the two moving averages using the script's two user parameters, "Short MA Length" and "Long MA Length." The graph displays the short moving average in green and the long moving average in red.

The short and long moving averages are calculated by the script's SMA () function, SMA () function consists of the formula given below and their visualization on the chart is handled by plot() function. The buy and sell signals are produced by the if-else statements depending on the crossover of the two moving averages. When the short moving average crosses above the long moving average, a long position is taken, and when it passes below, a short position is taken.

The Formula for SMA is:

$$\mathbf{SMA = \frac{(A_1 + A_2 + A_3 + \ldots + A_n)}{n}}$$

where:
$\boldsymbol{A_n}$ = *the price of the asset at period n*
$\boldsymbol{n}$ = *the number of total periods*

In order to find probable buy or sell opportunities in the market, the Simple Moving Average (SMA) Crossover method analyses moving averages. The strategy's step-by-step algorithm is provided below:

Step 1: Choose the stock or other asset you wish to trade. Any stock or asset that is traded on a public exchange can be used with the technique.

Step 2: Decide on the analysis's time frame. The length of the time frame, which may be short term or long term, depends depend on the research topic and the analysis's goals.

Step 3: Choose the moving average lengths. The strategy typically uses a short-term moving average and a long-term moving average. The length of the moving averages will depend on the research question and the objectives of the analysis. Commonly used lengths are 50 and 200 days moving averages.

Step 4: Place the moving averages on the stock or asset's chart. Plotting will place the short-term moving average above the long-term moving average.

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Step 5: Identify the crossover points. When the short-term moving average crosses above the long-term moving average, it is a bullish signal, indicating that the stock or asset is likely to rise in value. Conversely, when the short-term moving average crosses below the long-term moving average, it is a bearish signal, indicating that the stock or asset is likely to decrease in value.

Step 6: Based on the crossover points, take action. It is a buy signal when the short-term moving average crosses above the long-term moving average. It is a sell signal when the short-term moving average crosses below the long-term moving average.

The chart of Nifty50 depicts SMA crossover Strategy applied with the Buy and Sell indicators (2023-02-16):

Figure 1: Nifty50 Chart when SMA crossover strategy is applied

Results:

All the figures [1 - 13] in this paper are taken [on 16th Feb, 2023] from Pine Script code implemented through TradingView website. Figure 1 is the chart of Nifty 50 Index in 1D time frame and this strategy is applied to.

Some sample of result of prediction of trends are shown below with their respective Performance Summary and Properties:

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Nifty50

Figure 2: Overview of Nifty50 when SMA crossover strategy is applied

Title	All	Long	Short
Net Profit	9 181.90 INR 9.18%	13 373.60 INR 13.37%	-4 191.70 INR -4.19%
Gross Profit	29 276.85 INR 29.28%	21 315.80 INR 21.32%	7 961.05 INR 7.96%
Gross Loss	20 094.95 INR 20.09%	7 942.20 INR 7.94%	12 152.75 INR 12.15%
Max Run-up	12 778.10 INR 11.34%		
Max Drawdown	3 930.60 INR 3.77%		
Buy & Hold Return	3 650 857.60 INR 3 650.86%		
Sharpe Ratio	-0.45		
Sortino Ratio	-0.602		
Profit Factor	1.457	2.684	0.655
Max Contracts Held	1	1	1
Open PL	13.10 INR 0.01%		
Commission Paid	0.00 INR	0.00 INR	0.00 INR
Total Closed Trades	173	87	86

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Total Open Trades	1	0	1
Number Winning Trades	75	46	29
Number Losing Trades	98	41	57
Percent Profitable	43.35%	52.87%	33.72%
Avg Trade	53.07 INR 2.06%	153.72 INR 4.79%	-48.74 INR -0.7%
Avg Winning Trade	390.36 INR 11.25%	463.39 INR 13.58%	274.52 INR 7.56%
Avg Losing Trade	205.05 INR 4.97%	193.71 INR 5.07%	213.21 INR 4.91%
Ratio Avg Win / Avg Loss	1.904	2.392	1.288
Largest Winning Trade	2 871.10 INR 78.23%	2 654.25 INR 78.23%	2 871.10 INR 24.12%
Largest Losing Trade	1 112.15 INR 23.46%	1 103.65 INR 23.46%	1 112.15 INR 15.07%
Avg # Bars in Trades	46	56	36
Avg # Bars in Winning Trades	77	85	63
Avg # Bars in Losing Trades	23	23	22
Margin Calls	0	0	0

Source: https://in.tradingview.com/

Figure 3: Performance Summary of Nifty 50 when SMA crossover strategy is applied

Source: https://in.tradingview.com/

Figure 4: Properties of Nifty 50 when SMA crossover strategy is applied

BankNifty

Source: https://in.tradingview.com/
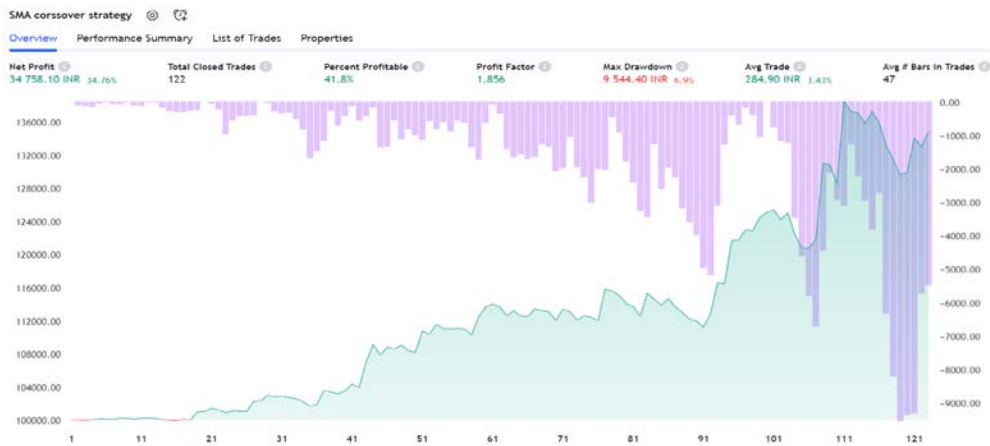
Figure 5: Overview Summary of BankNifty when SMA crossover strategy is applied.

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Overview   Performance Summary   List of Trades   Properties

Title	All	Long	Short
Net Profit	34 758.10 INR 34.76%	37 966.50 INR 37.97%	-3 208.40 INR -3.21%
Gross Profit	75 359.45 INR 75.36%	55 639.10 INR 55.64%	19 720.35 INR 19.72%
Gross Loss	40 601.35 INR 40.6%	17 672.60 INR 17.67%	22 928.75 INR 22.93%
Max Run-up	42 662.65 INR 29.93%		
Max Drawdown	9 544.40 INR 6.9%		
Buy & Hold Return	4 070 870.00 INR 4 070.87%		
Sharpe Ratio	-0.057		
Sortino Ratio	-0.127		
Profit Factor	1.856	3.148	0.86
Max Contracts Held	1	1	1
Open PL	466.20 INR 0.35%		
Commission Paid	0.00 INR	0.00 INR	0.00 INR
Total Closed Trades	122	61	61
Total Open Trades	1	0	1
Number Winning Trades	51	30	21
Number Losing Trades	71	31	40
Percent Profitable	41.8%	49.18%	34.43%
Avg Trade	284.90 INR 3.43%	622.40 INR 7.42%	-52.60 INR -0.56%
Avg Winning Trade	1 477.64 INR 15.05%	1 854.64 INR 20.36%	939.06 INR 7.48%
Avg Losing Trade ⓘ	571.85 INR 4.92%	570.08 INR 5.11%	573.22 INR 4.77%
Ratio Avg Win / Avg Loss	2.584	3.253	1.638
Largest Winning Trade	9 942.00 INR 73.02%	9 942.00 INR 73.02%	9 106.10 INR 29.62%
Largest Losing Trade	2 778.60 INR 16.13%	2 778.60 INR 16.13%	2 609.00 INR 14.43%
Avg # Bars in Trades	47	59	35
Avg # Bars in Winning Trades	74	90	52
Avg # Bars in Losing Trades	28	30	27
Margin Calls	0	0	0

Source: https://in.tradingview.com/

Figure 6: Performance Summary of Nifty 50 when SMA crossover strategy is applied

SMA corssover strategy ⚙ ⏲ ↑

Overview   Performance Summary   List of Trades   Properties

> Date range — Trading range: 2000-03-14 – 2023-02-16, Backtesting range: 2000-01-03 – 2023-02-16

> Symbol info — Symbol: NSE:BANKNIFTY, Timeframe: 1 day, Chart type: Candles, Currency: INR, Tick Size: 0.05, Precision: Default

> Strategy inputs — Short MA Length: 10, Long MA Length: 50

> Strategy properties — Initial capital: 100000 INR, Order size: 1 Contracts, Pyramiding: 1 orders, Commission: 0%, Slippage: 0 ticks
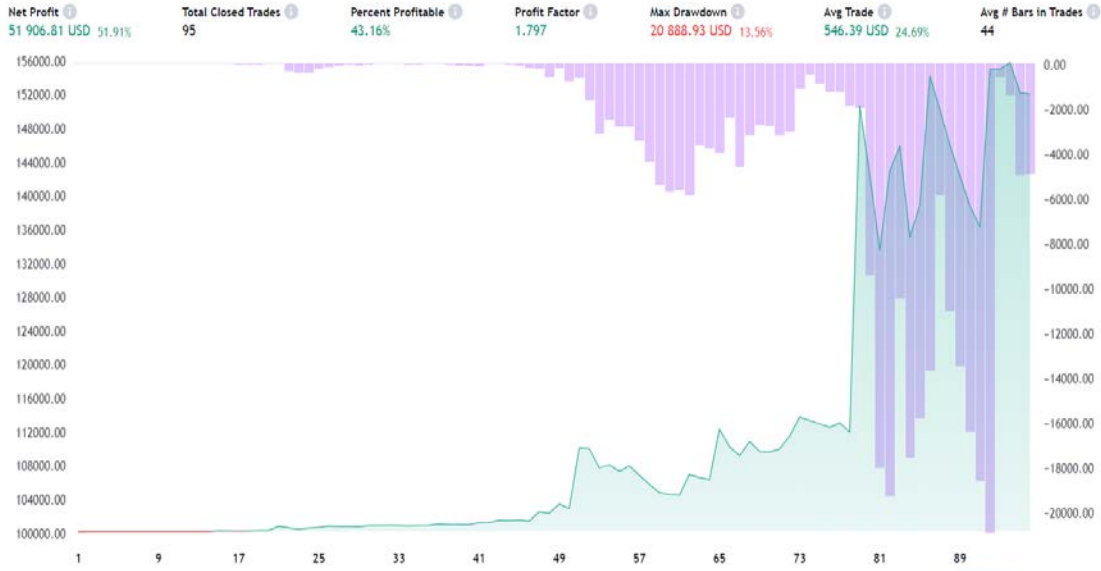
Source: https://in.tradingview.com/

Figure 7: Properties of BankNifty when SMA crossover strategy is applied

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Bitcoin

Source: https://in.tradingview.com/

Figure 8: Overview of Bitcoin when SMA crossover strategy is applied

Title	All	Long	Short
Net Profit	51 906.81 USD 51.91%	34 540.06 USD 34.54%	17 366.75 USD 17.37%
Gross Profit	117 012.66 USD 117.01%	65 657.17 USD 65.66%	51 355.49 USD 51.36%
Gross Loss	65 105.85 USD 65.11%	31 117.11 USD 31.12%	33 988.74 USD 33.99%
Max Run-up	65 303.75 USD 39.51%		
Max Drawdown	20 888.93 USD 13.56%		
Buy & Hold Return	667 027 371.26 USD 667 027.37%		
Sharpe Ratio	0.063		
Sortino Ratio	0.162		
Profit Factor	1.797	2.11	1.511
Max Contracts Held	1	1	1
Open PL	7 440.00 USD 4.9%		
Commission Paid	0.00 USD	0.00 USD	0.00 USD
Total Closed Trades	95	47	48

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Total Open Trades	1	1	0
Number Winning Trades	41	23	18
Number Losing Trades	54	24	30
Percent Profitable	43.16%	48.94%	37.5%
Avg Trade	546.39 USD 24.69%	734.89 USD 49.04%	361.81 USD 0.85%
Avg Winning Trade	2 853.97 USD 69.5%	2 854.66 USD 110.08%	2 853.08 USD 17.64%
Avg Losing Trade	1 205.66 USD 9.32%	1 296.55 USD 9.44%	1 132.96 USD 9.23%
Ratio Avg Win / Avg Loss	2.367	2.202	2.518
Largest Winning Trade ⓘ	38 753.86 USD 844.01%	38 753.86 USD 844.01%	18 648.34 USD 46.66%
Largest Losing Trade	10 813.09 USD 30.07%	8 916.72 USD 20.1%	10 813.09 USD 30.07%
Avg # Bars in Trades	44	50	38
Avg # Bars in Winning Trades	78	87	67
Avg # Bars in Losing Trades	18	15	20
Margin Calls	0	0	0

Source: https://in.tradingview.com/

Figure 9: Performance Summary of Bitcoin when SMA crossover strategy is applied

Overview   Performance Summary   List of Trades   **Properties**

> Date range   Trading range: 2011-10-29 – 2023-02-16, Backtesting range: 2011-08-18 – 2023-02-16

> Symbol info   Symbol: BITSTAMP:BTCUSD, Timeframe: 1 day, Chart type: Candles, Currency: USD, Tick Size: 0.01, Precision: Default

> Strategy inputs   Short MA Length: 10, Long MA Length: 50

> Strategy properties   Initial capital: 100000 USD, Order size: 1 Contracts, Pyramiding: 1 orders, Commission: 0%, Slippage: 0 ticks
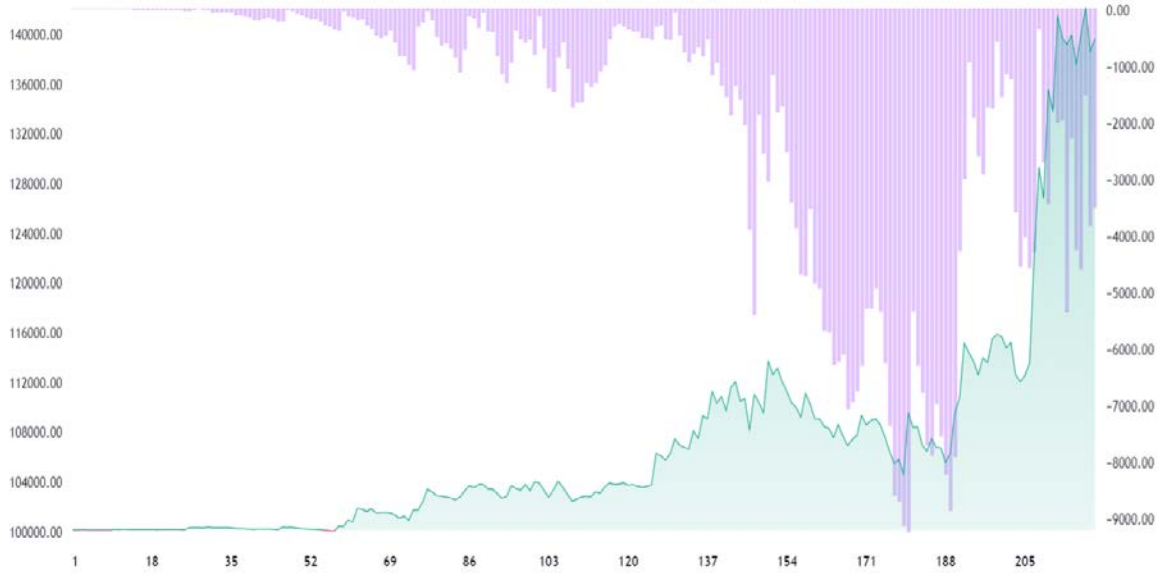
Source: https://in.tradingview.com/

Figure 10: Properties of Bitcoin when SMA crossover strategy is applied

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Sensex

Source: https://in.tradingview.com/

Figure 11: Overview of Sensex when SMA crossover strategy is applied

Title	All	Long	Short
Net Profit	39 543.55 INR 39.54%	50 115.27 INR 50.12%	-10 571.72 INR -10.57%
Gross Profit	99 189.66 INR 99.19%	72 960.82 INR 72.96%	26 228.84 INR 26.23%
Gross Loss	59 646.11 INR 59.65%	22 845.55 INR 22.85%	36 800.56 INR 36.8%
Max Run-up	46 547.24 INR 31.79%		
Max Drawdown	9 252.12 INR 8.14%		
Buy & Hold Return	49 231 665.01 INR 49 231.67%		
Sharpe Ratio	-0.128		
Sortino Ratio	-0.257		
Profit Factor	1.663	3.194	0.713
Max Contracts Held	1	1	1
Open PL	-622.68 INR -0.45%		
Commission Paid	0.00 INR	0.00 INR	0.00 INR
Total Closed Trades	219	110	109

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Total Open Trades	1	0	1
Number Winning Trades	97	60	37
Number Losing Trades	122	50	72
Percent Profitable	44.29%	54.55%	33.94%
Avg Trade	180.56 INR 2.13%	455.59 INR 5.69%	-96.99 INR -1.45%
Avg Winning Trade	1 022.57 INR 11.46%	1 216.01 INR 14.78%	708.89 INR 6.07%
Avg Losing Trade	488.90 INR 5.28%	456.91 INR 5.23%	511.12 INR 5.32%
Ratio Avg Win / Avg Loss	2.092	2.661	1.387
Largest Winning Trade	8 836.75 INR 81.25%	8 743.00 INR 81.25%	8 836.75 INR 23.59%
Largest Losing Trade	3 506.65 INR 16.71%	2 550.83 INR 16.71%	3 506.65 INR 15.1%
Avg # Bars in Trades	47	57	36
Avg # Bars in Winning Trades	75	84	60
Avg # Bars in Losing Trades	24	24	24
Margin Calls	0	0	0

Source: https://in.tradingview.com/

Figure 12: Performance Summary of Sensex when SMA crossover strategy is applied

Source: https://in.tradingview.com/

Figure 13: Properties of Sensex when SMA crossover strategy is applied

Discussion:

- The Pine Script for performing Simple Moving Average (SMA) crossover strategy implemented on the TradingView website (https://in.tradingview.com/) upon various types of index produced variety of net profit margin across them. The website basically Backtests the strategy using historical data till date. The website implements the strategy according to the code on realtime time series data on the selected Index and gives us an overview, performance summary and properties of the selected index while strategy is applied. According to the Figure 3 & 9 Performance Summaries [taken on 2023-02-16 through implementation of the code from TradingView website], while we get a Net profit of 9.18% on Nifty50, there is stark contrast on the Net profit on Bitcoin with 51.91%.

- A common technical analysis method that traders use to find prospective trading opportunities in the financial markets is the Simple Moving Average (SMA) Crossover strategy. Using two or more moving averages from various time periods is part of this method. The shorter moving average is usually faster, whereas the longer moving average is slower.

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

- The trend is likely to continue heading upward when the shorter moving average crosses above the longer moving average, which is known as a bullish indication. On the other hand, it is regarded as a bearish indicator, indicating that the trend is likely to continue moving downward, when the shorter moving average crosses below the longer moving average.

- Stocks, commodities, and currencies are just a few examples of the many financial assets to which the SMA Crossover method can be applied. It can assist traders in avoiding misleading signals and is particularly beneficial for spotting trends in markets that are not significantly trending.

- The SMA Crossover technique has certain drawbacks, though. First of all, because it is a lagging indicator, it might not offer early warnings of upcoming price swings. However, because the technique is based on historical data, it could not work well in choppy market situations. Moreover, the technique could produce a lot of false signals and whipsaws, which could result in losses.

- Traders frequently combine the SMA Crossover approach with other trading strategies, such as support and resistance levels, trend lines, or chart patterns, to get around some of the drawbacks of the SMA Crossover strategy.

- In conclusion, the SMA Crossover method may prove to be a helpful instrument for spotting prospective trading opportunities in the financial markets. To increase its efficiency, it is necessary to be aware of its limitations and combine it with other technical indicators and trading strategies. Prior to using the method in actual trading, traders should undertake adequate study and testing.

Conclusion:

The key findings of the research on the Simple Moving Average (SMA) Crossover strategy are:

1. It is indicated that according to Simple Moving Average (SMA) Crossover Strategy an indicator has been successfully developed to buy or sell Stocks using Pine Script in TradingView.
2. The SMA Crossover Strategy based buy-sell indicator can be used to identify potential trend changes in any stock or security that has a price chart that can be analyzed using technical analysis tools.

3. The SMA based Buy-sell indicator [with Short MA length =10 & Long MA length=50] in a time frame of 1 day produced a Percentage Profitability of 39% - 45 % in [9] :
    a. Nifty50 in 173 trades
    b. BankNifty in 122 trades
    c. Bitcoin(cryptocurrency) in 95 trades
    d. Sensex in 219 trades.

4. The SMA Crossover Strategy based buy-sell indicator described in this paper can find applications in different types of stocks, including:
    a. Individual stocks: Traders and investors can use the SMA crossover strategy to discover prospective trend alterations in individual stocks.

    b. Exchange-Traded Funds (ETFs): ETFs are a type of pooled investment security that holds multiple underlying assets, rather than only one. The SMA crossover strategy can be implemented to discover future buying or shorting opportunities in ETFs.

    c. Indexes: The SMA crossover strategy can also be used to discover future trend development in stock market indexes, such as the NIFTY 50 or FTSE 250.

5. The profitability of the SMA crossover strategy can depend on a number of factors such as the time-frame used, market conditions, and the specific parameters of the SMA lines. However,

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

the SMA crossover strategy tends to be most profitable when the market is trending strongly on an unidirectional order.

6. The SMA Crossover Strategy is based on the concept that when a short-term moving average (SMA) crosses over a long-term moving average (SMA), it is a positive signal, indicating that the stock or asset will probably increase in value. In contrast, when a short-term moving average crosses below a long-term moving average, it is a bearish indicator, indicating that the stock or asset's value will possibly decline.

7. Analyzing historical data for a particular stock or asset, using a backtesting platform, and monitoring the strategy's success in terms of returns, risk, and other metrics are all necessary when evaluating the strategy's performance. It's important to note that the SMA crossover strategy is not infallible and can result in losses during turbulent or volatile markets. Additionally, the profitability of the strategy can also depend on the specific securities being traded and the trader's skill in implementing the strategy effectively. Therefore, it's always important to thoroughly backtest and evaluate any trading strategy before using it with real money.

8. To make sure the approach is solid and reliable, it is advised for future research to assess the performance of the strategy using a number of stocks or assets, time frames, and moving average lengths. Also, by combining the SMA Crossover method with additional indicators or by experimenting with various time frames and moving average lengths, further research might be done on how to enhance it. How to enhance the risk management component of the plan is yet another topic for investigation.

It's crucial to remember that implementing any technique requires research and testing because past performance does not guarantee future outcomes. To improve the robustness of the strategy and gain a better knowledge of its performance, it's also crucial to analyze the approach in a variety of market situations, employing various stocks or assets, time frames, and moving average lengths, as well as putting a risk management plan into action.

Acknowledgment

Conflicts of Interest

The authors declare that they do not have any conflict of interest.

References

Garcia-Feijoo, L., & Jensen, G. R. (2014). The monetary environment and long-run reversals in stock returns. *Journal of Financial Research*, *37*(1), 3-26.

Islam, M., Dhar, P., Poddar, S., & Bhowmik, A. (2022). A Theoretical Study of Financial Literacy with Financial Analysis. *International Journal of Management and Human Science (IJMHS)*, *6*(1), 41-49. https://doi.org/10.31674/ijmhs.2022.v06i01.004

Lo, A. W., & MacKinlay, A. C. (1988). Stock market prices do not follow random walks: Evidence from a simple specification test. *The Review of Financial Studies*, *1*(1), 41-66. *https://doi.org/10.1093/rfs/1.1.41*

Mazumder, S. (2023) *SMA Crossover Strategy*, *https://in.tradingview.com/script/jo6Ep2Il-SMA-corssover-strategy/*

Murphy, J. J. (1999), *Technical Analysis of The Financial Market | A Comprehensive Guide To Trading Methods And Applications,* (pp. 195-223).

Nabriya, P. (28th August, 2020). Generating Trade Signals using Moving Average (MA) Crossover Strategy — A Python implementation. https://towardsdatascience.com/making-a-trade-call-using-simple-moving-average-sma-crossover-strategy-python-implementation-29963326da7a

Naved, M. & Srivastava, P. (2015) *Profitability of Oscillators used in Technical Analysis for Financial Market, 2*(9), 925-931. http://dx.doi.org/10.2139/ssrn.2699105

Neogy et al.

Asia-Pacific J.Mgmt. Tech. Volume 3(4) 26- 40

Peachavanish, R. (2016, March). Stock selection and trading based on cluster analysis of trend and momentum indicators. In *Proceedings of the International MultiConference of Engineers and Computer Scientists* (Vol. 1, pp. 317-321). IMECS. *https://www.iaeng.org/publication/IMECS2016/IMECS2016_pp317-321.pdf*

Rapach, D. E., Strauss, J. K., & Zhou, G. (2013). International stock return predictability: what is the role of the United States?. *The Journal of Finance*, *68*(4), 1633-1662.

Sudheer, V. (2015). Trading through technical analysis: an empirical study from Indian stock market. *International Journal of Development Research*, *5*(8), 5410-5416. *https://www.journalijdr.com/sites/default/files/issue-pdf/3916.pdf*

Wilder, J.W. (1978). *New Concepts in Technical Trading Systems. Trend Research, pp. 53-54.* *https://books.mec.biz/tmp/books/218XOTBWY3FEW2CT3EVR.PDF*