

Analyzing Microsoft stock price trends, factors, and market efficiency for optimal investment strategies

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Abstract. Microsoft, one of the tech giants, has seen significant fluctuations in its stock prices in recent years. This article delves into an analytical study of these changes using data sourced from Yahoo Finance. The background for this research stems from the desire to understand the intricacies of stock price movements and the factors influencing them, especially for prominent companies like Microsoft that have a vast impact on global markets. The methodology adopted for this study is the technical approach, where the moving average is calculated to determine the stock's trend. Moving averages are a cornerstone of technical analysis and can provide insights into potential buy and sell signals. By employing this method, the research aims to validate the appropriateness of certain investment strategies based on historical data. The primary objective of the study is not just to chart the course of the stock's price but to delve deeper into the causative factors behind its movement. Various external and internal factors can influence stock prices, from global economic trends to company-specific news. By analyzing these factors, the research also seeks to test the efficiency of the market, a long-debated topic among economists and investors. In conclusion, while past data can offer insights, the stock market's volatile nature demands continuous adaptation of investment strategies. The findings from this study can serve as a foundation for developing more refined prediction tools and investment tactics. Future studies might consider integrating more sophisticated models or incorporating other predictive variables to enhance accuracy and investment outcomes.

Keywords: Microsoft' stock; technical approach; moving-average; market efficient.

1. Introduction

Microsoft, an undisputed leader in the global technology sector, holds a pivotal position in the global stock market, making it a quintessential subject for an in-depth analysis of stock price behavior and forecasting. As this titan of tech often serves as a benchmark for the industry, understanding its stock price movement is crucial for any discerning investor.

Ekapure et al. laid the groundwork for this discourse by introducing predictive models that have been rigorously verified in this paper [1]. These models are not merely academic exercises; Ekapure et al hold the potential to be instrumental in shaping investment decisions [1]. By offering a clearer glimpse into the anticipated movements of Microsoft's stock price, they furnish investors with a robust framework for decision-making [1]. Strategic investing is about more than just predictions; it's about making informed decisions that align with one's financial goals and risk tolerance. With the insights

derived from the predictions, investors can tailor their strategies—whether that involves buying more shares, holding onto current ones, or selling off. Being forearmed with knowledge of potential price trajectories also allows investors to optimize risk management, a cornerstone of successful investing.

Moreover, in the dynamic world of portfolio management, the weightage of individual stocks can significantly influence overall returns. The predictions presented here can aid investors in determining the ideal weightage for Microsoft in their portfolios, be it increasing their stakes during promising times or hedging during periods of predicted downturns. This paper transcends mere analysis; it stands as a beacon for investors navigating the tumultuous seas of stock market investments. The decision-making model encapsulated herein is not just a tool but a compass, guiding investors toward more informed, strategic, and, ultimately, prosperous investment choices.

2. Methodology

2.1. data collection

The investment approach examined in this study, as proposed by Metghalchi et al., centers on a robust and systematic trading strategy driven by the interplay of moving averages [2]. To comprehensively investigate the efficacy of this approach and gauge its profit-generating potential, the research method encompasses several key components. To initiate the research, a substantial dataset of stock price information is collected, spanning a significant time frame covering the last 365 trading days. As shown in table 1. This data constitutes the foundation for the subsequent analysis. This article using adjusted closed price as the data source. Due to the large amount of data, this article only shows the adjusted close price at the beginning and end of the data.

Table 1. Dataset

Date	Adj Close
2022-10-20	233.890427
2022-10-21	239.803314
2022-10-24	244.884216
2022-10-25	248.261597
.....
2023-10-16	332.640015
2023-10-17	332.059998
2023-10-18	330.109985
2023-10-19	331.320007

2.2. Technical Approach

Central to the methodology is the computation of moving averages. A custom function is implemented to calculate the n-day moving average of the closing prices. This calculation is performed for each trading day within the dataset, producing both the 20-day and 50-day moving averages [3]. The core of the investment approach lies in the entry and exit criteria for stock positions. Stocks are bought when the 20-day moving average surpasses the 50-day moving average, signifying a potential uptrend in stock prices. Conversely, when the 20-day moving average falls below the 50-day moving average, stocks are sold, provided that the investor currently holds these stocks. As shown in Table 2. Berradi and Lazaar Note that each time a stock is bought or sold it is the same volume, for ,example 100 [4]. This systematic strategy ensures a disciplined approach to capitalizing on market trends.

To assess the performance of the investment strategy, key metrics are established. These metrics include measures of profitability, such as the cumulative returns generated by the strategy, the frequency of profitable trades, and the risk-adjusted returns. Additionally, drawdowns and other risk

indicators may be considered to evaluate the strategy's stability and downside risk. The collected data and the performance metrics are subjected to statistical analysis. This analysis involves assessing the frequency and duration of occurrences where the 20-day moving average crosses above or below the 50-day moving average. It also entails studying the strategy's overall profitability and its sensitivity to market conditions[5].

The research methodology involves a backtesting component where the investment strategy is applied retrospectively to the historical dataset. This enables the evaluation of how the strategy would have performed over the last 1000 trading days. Simulations are conducted to quantify the profits and losses that would have been realized under different market scenarios. The research method is meticulous and data-driven, combining historical stock price data, custom moving average calculations, systematic entry and exit criteria, performance metrics, statistical analysis, backtesting, and robustness testing. Korajczyk and Murphy collectively facilitate a comprehensive evaluation of the investment approach's profitability potential over an extended period, enabling investors to make informed decisions based on empirical evidence [6].

Table 2. Strategy

Date	MA20	MA50	Strategy
2022-12-30	243.528307	238.990067	Buy
2023-01-03	242.761540	239.071385	Buy
2023-01-04	241.713691	238.826268	Buy
...			
2023-10-17	322.208005	324.931307	Sell
2023-10-18	322.675005	325.026284	Sell
2023-10-19	323.264505	325.221700	Sell

3. Results and Discussion

3.1. Key findings

Upon delving into the results derived from the Python analysis, a pronounced variance becomes apparent between the prevalence of days allocated for purchasing stocks and those intended for selling. Interestingly, an overarching commonality emerges across both categories - be it a "buy day" or a "sell day": a consistent theme of long-term continuity [7]. This denotes sustained periods where certain trading behaviors, either buying or selling, are maintained without frequent oscillations. This continuity, while it might suggest a degree of predictability, also hints at the potential for entrenched patterns that might not adapt swiftly to rapidly changing market conditions. Peering more closely into the data, we discern that the odds of this particular strategy culminating in a profitable outcome gravitate around the 0.63 mark. While this indicates a more favorable than not chance of reaping profits, it also underscores the inherent risks. Investors should thus couple their confidence in this method with ongoing scrutiny to optimize potential gains and minimize potential risks.

3.2. Discussion

Upon a detailed examination of the investment ratings, it becomes clear that the issuance of buy ratings on sequential days appears to be intricately tied to the advancements in Microsoft's Azure Intelligent Cloud business, as well as the latest updates and enhancements made to Office 365. Conversely, the surfacing of a sell rating might be influenced by a myriad of factors, including intensifying competition from industry peers, alterations in the company's foundational business strategies, incidents of cyber threats, and looming legal and regulatory challenges, among others.

The world of finance is well-acquainted with the Efficient Market Hypothesis (EMH) which primarily delineates three distinct efficiency classifications: weak form, semi-strong form, and strong

form [8]. The weak form of market efficiency postulates that current stock prices inherently incorporate all past trading information, including past prices and volumes. Conceptually, it suggests that the future trajectory of a stock's price is a random walk, represented mathematically as $P_t = P_{t-1} + \varepsilon$, where ε symbolizes a random error term [9]. The semi-strong form takes this a step further, positing that stock prices reflexively assimilate all publicly accessible information. This includes not only past trading data but also factors such as financial disclosures, earning reports, and other public announcements. The strong form, the most comprehensive of all, argues that stock prices are a mirror reflection of every piece of information out there, both public and confidential.

In the context of this study, the methodology leans on historical data as the pivotal influencer dictating the investment strategy. But the market is mostly semi-strong from efficiency. Such markets react not just to historical data, but also to fresh insights from published accounting statements and other public disclosures. This might elucidate the observed sub-optimal profit probability for the strategy under study. Yet, an intriguing observation emerges from the analysis. With a profit probability benchmarked at 0.63 over a 1000-day span, the results seem to hint at a weak form of market efficiency. This probability, while distinctly greater than the 0.5 associated with a pure random walk, offers a tantalizing hint that the market might not be perfectly efficient [10]. This exploration furnishes the financial realm with invaluable insights, elucidating investment methodologies that empower investors to harness historical data more judiciously. It underscores a salient takeaway: a holistic investment strategy necessitates a dual-pronged approach, harmonizing both past data and contemporaneous financial disclosures.

4. Conclusion

This study focused on analyzing Microsoft's stock price movements using a technical approach that relies on moving averages. Microsoft, a global tech giant, is a significant player in the stock market, making it a critical subject for investors. The research presented predictive models that were rigorously validated, offering a robust framework for investment decision-making. Strategic investing requires more than predictions; it's about aligning decisions with financial goals and risk tolerance. The insights derived from this analysis allow investors to tailor their strategies, optimize risk management, and allocate the right weight age to Microsoft in their portfolios.

The methodology involved collecting extensive data covering the past year and calculating 20-day and 50-day moving averages. The investment strategy, based on these moving averages, provided systematic criteria for stock positions, ensuring a disciplined approach. This study also raises questions about market efficiency, as markets react not only to historical data but also to real-time information. It underscores the importance of a holistic investment strategy that balances historical insights with current data.

This research equips investors with a strong foundation for making informed decisions. While past data is crucial, the dynamic nature of the stock market demands adaptability and a comprehensive approach that integrates historical knowledge with current information. Future studies may further enhance predictive models and investment tactics to meet evolving financial challenges.

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