

Financial data science

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In this project, we aimed to design an investment strategy that could effectively allocate funds and create a portfolio using 11 ETFs across major sectors. We implemented five technical methods to evaluate the performance of each method: ADX, Moving Averages, Bollinger Bands, MACD, and RSI. The objective was to optimize portfolio performance by utilizing technical indicators and employing a disciplined approach to rebalancing.

To evaluate the performance of each technical indicator, we simulated the investment using the three timeframes provided and calculated the returns generated by each technique. We allocated funds by using each method to create a signal that would indicate whether to buy, sell, or hold for each day in the timeframe. During the investment period, we monitored the signals for each ETF and purchased 10% of the available cash whenever a buy signal was received. When a sell signal was triggered, we sold the entire holding of the ETF and moved the proceeds back to the cash section.

It's important to note that we did not initially invest in any ETFs but only entered the market when a buy signal was generated.

During our experiments, we tried two additional methods to optimize our investment strategy.

Firstly, we attempted to enter all ETFs at the beginning while keeping no liquid money.

Unfortunately, we were unable to utilize most of the buy signals as we did not have any money left.

To work around this issue, we decided to buy using a percentage of the liquidated money each time.

Despite this adjustment, the results were suboptimal.

To rectify the situation, we attempted another method where we uniformly distributed the money across all ETFs and kept some liquid cash aside. This approach produced better results but still fell short of our expectations. Our money quickly ran dry, resulting in suboptimal outcomes.

Eventually, we came to the realization that it is better to wait for a buy signal before entering the market. It is important to note that in the stock market, being invested for a longer period typically yields better results than staying out of the market. However, it is equally important to buy and sell at the right times to maximize returns. While we acknowledge that the first ETF bought will receive the highest amount of money using our method, in the long run, it balances out since we buy and sell multiple times throughout the timeframe. Therefore, waiting for a buy signal before entering the market is the most optimal investment strategy.

Using this method with an initial sum of 1M dollars, we were able to achieve the following results:

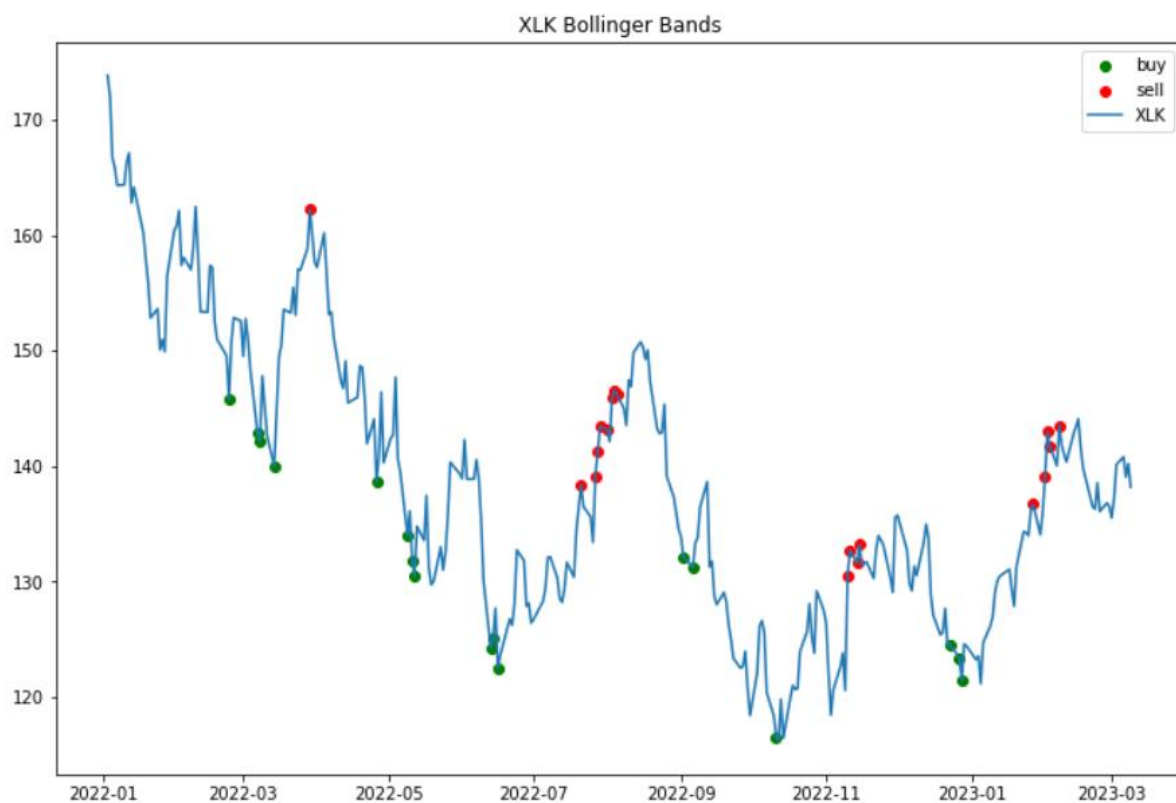
RSI	MACD	Bollinger Bands	ADX	Moving Averages	
87%	85%	175%	157%	68%	2010
22%	38%	28%	24.9%	25%	2019
9%	5%	9%	1%	-12%	2022

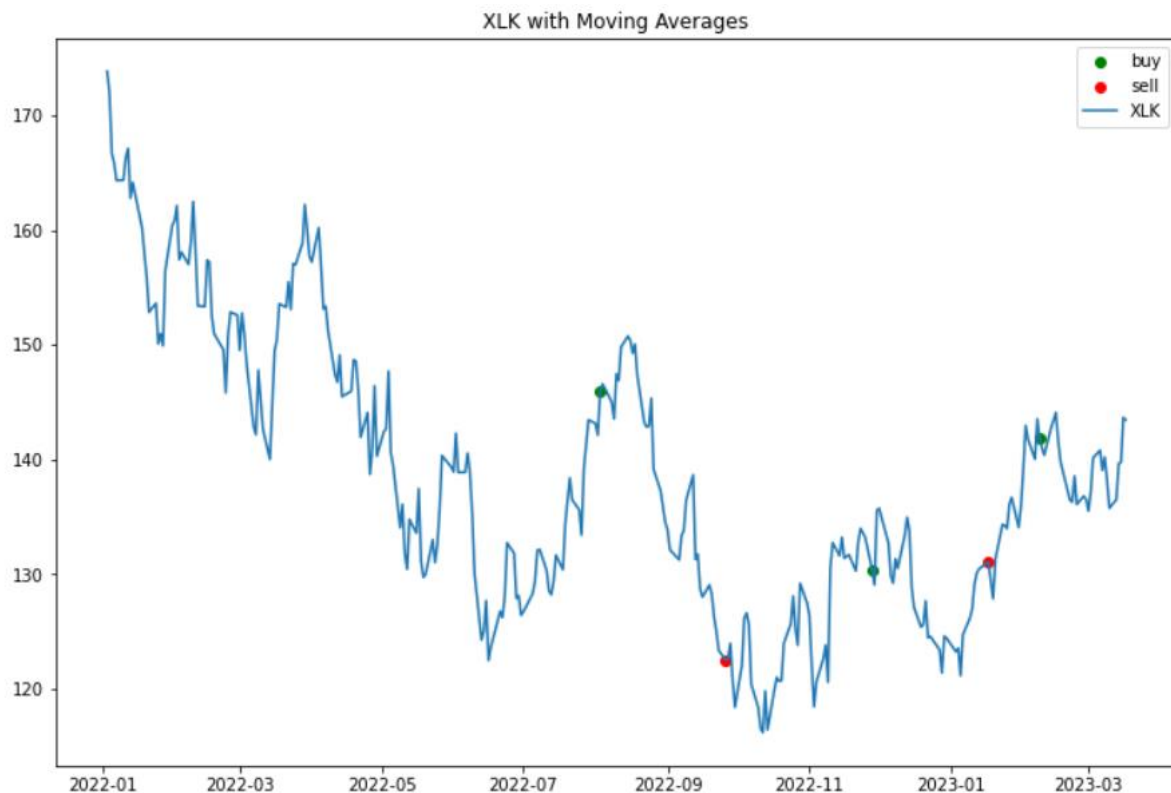
The results we obtained from our experiments were expressed in percentages from the initial sum of 1M dollars. Our analysis reveals that different technical indicators performed differently across various timeframes.

For the short-term period, both RSI and Bollinger Bands technical indicators demonstrated the best return, yielding a 9% gain.

While the worst technical indicators Moving averages method lost 12%

In the plots below we can see these methods for the XLK ETF.





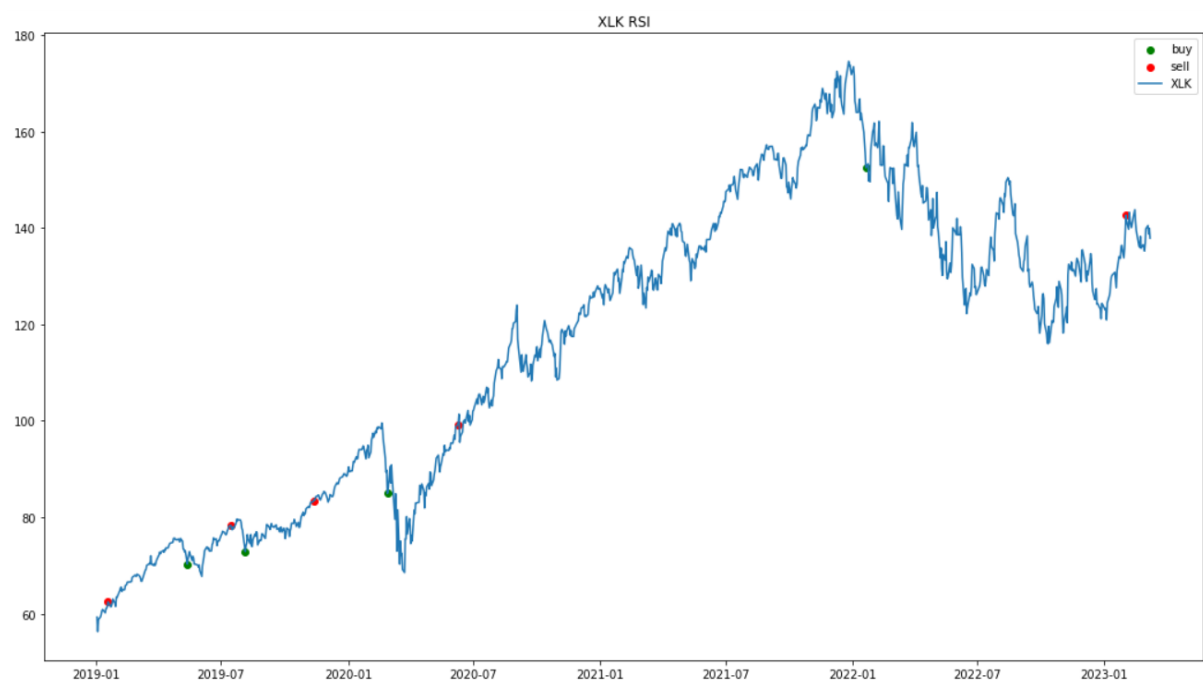
This indicates that these technical methods are suitable for traders who prefer short-term investment strategies.

Moving onto the medium-term period, MACD proved to be the top-performing technical method, delivering a return of 38%.

While the technical method RSI gain 22%.

In the plots below we can see these methods for the XLK ETF.

Note: attention if the first step is sell signal we ignore it.



This suggests that traders with medium-term investment horizons may find MACD to be a useful technical method.

In the long-term period, we observed that Bollinger Bands produced the most favorable results, with ADX ranking second.

While the worst technical method is Moving Averages.

We have chosen some plots to illustrate the strategies:

In the plots below we can see these methods for the XLK ETF.



Interestingly, ADX had a lower return compared to other technical indicators in the short and medium timeframes. However, it showed a significant improvement in the long-term period, delivering a return of 157%. This indicates that ADX may be useful for investors who prefer a long-term investment strategy. Overall, Bollinger Bands consistently delivered the best results or ranked second-best in all three time periods, demonstrating remarkable performance across different timeframes.

In conclusion, our analysis suggests that incorporating technical indicators such as RSI, Bollinger Bands, MACD, ADX, and moving averages can be an effective way to optimize portfolio performance differently for each timeframe. By monitoring these signals and entering the market only when a buy signal was generated, we were able to optimize our investment strategy and achieve favorable returns.

Overall, our approach to portfolio balancing was based on a disciplined approach to rebalancing and a careful consideration of the performance of each indicator across different timeframes. By waiting for a buy signal before entering the market, we were able to optimize our investment strategy and achieve favorable returns. However, it's important to carefully evaluate the performance of each indicator and consider other factors when making investment decisions.