

Profitability Of Moving Averages And Candlestick Charts

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1. Introduction

One of the most important and the most controversial theories in finance is the "efficient market hypothesis" (EMH) of Fama (1970). The main premise of the EMH is that random walk is the governing force of the behaviour of the markets. This in turn rules out any benefit from technical analysis. However, recent studies by Lo (2004) suggest that market efficiency is not a static concept rather it is dynamic and consequently markets move from inefficiency to efficiency gradually. Besides, a lot of theoretical and empirical work on behavioural finance has substantiated that the assumptions on which EMH is based cannot be held in the real world, hence questioning the validity of EMH.

Lo and MacKinlay (1988) report that random walk is rarely observed in markets. In a seminal study, Lo, Mamaysky, and Wang (2000) provide evidence in favour of the effectiveness of technical analysis. They report that several technical charts can be used to improve trading decisions.

The finding that investors are not rational and there are limits to arbitrage paved the way for inclusion of investors' sentiments in asset pricing models. These sentiments are reflected in asset prices and trading activity of investors. This is the motivation for studying technical analysis for making investment decisions.

There are numerous studies which have examined the profitability of various technical indicators including moving averages and candlesticks. However, there is a lack of research which synthesizes the available knowledge on the efficacy of these indicators as tools of technical analysis. The main goal of this paper is to summarize and synthesize the findings of existing research on the profitability of moving average and candlestick charts. The rest of the paper is organised as follows. Section 2 presents the review of existing studies; and section 3 gives concluding remarks and also provides suggestions for future research.

2. Review of Literature

This section presents detailed review of existing literature on the profitability of moving averages and candlestick charts

Chong and Ng (2008) studied the technical trading rules in order to find out whether they can generate excess returns or not. They examined two commonly used indicators i.e., Relative Strength Index and MACD. They studied the data series from 1935-1994 of FT30, an index

of mills traded in London Stock Exchange. In order to avoid the problem of data snooping, they divided the data in 3 different parts where each part consisted of 5000 observations. They concluded that RSI showed predictive powers but for one period the returns were close to returns generated from buy-hold strategy while it outperformed the buy-hold strategy in other two periods. On the other hand, MACD rule outperformed the buy-hold strategy in all the three series at 5% and 10% level of significance.

Todea, Iencia and Filip (2009) investigated the profitability of moving average strategy. They identified optimum moving average from a set of 15,000 combinations of European stock markets. They analysed daily closing prices for six European stock market indices namely Austria (ATX index), Holland (AEX General), Switzerland (Swiss Market Index), France (CAC 40), Germany (CAC 40) and UK (FTSE 100) from 1997-2008. Their methodology consisted of linear and non-linear correlation windows as well as non-correlation windows. According to them their results were consistent with the Adaptive Market Hypothesis given by Andrew Lo (2004) that profitable opportunity arises from time to time. Thus, their paper proved that studying the nonlinear, episodic dependencies can help to improve the profitability of moving average strategies.

Another study was conducted by Yun (2010) to investigate the effectiveness of technical trading in Chinese stock market. The author examined daily closing prices from January 1997 to December 2009 of Shanghai Composite Index. He applied the dual moving average model in order to find out whether it is able to beat a naïve buy-hold strategy. His results were as follows: 1. the dual MAs do not show predictive abilities over the entire period. 2. MAs can be used to generate excess returns in Bear and Fluctuation market but not in Bullish market, MAs cannot be used to generate excess returns over and above buy-hold strategy. He further added returns generated by technical rules are state dependent, it should be used when bearish and fluctuation markets are prevailing and not when bullish market are in action.

Lu, Shiu and Liu (2012) investigated the profitability of candlestick charts by buying bullish (bearish) pattern and holding until bearish (bullish) pattern occurs. They used daily opening, low, high and closing prices of 50 stocks listed on Taiwan Stock exchange for a period of 6 years i.e., October 2002 to December 2008. After studying three bullish reversal patterns and three bearish reversal patterns they concluded that bullish reversal patterns were profitable in Taiwan Stock Exchange.

Dotellenaese and Mazza (2013) studied how Japanese Candlestick charts help traders to decide between market timings considering market impact costs. Using 81 European stocks they studied different candlestick patterns, to find out which pattern results in minimum timing costs. They concluded that market timing costs may not be lower when hammer like and doji patterns occur but they are significantly lower during and after the formation of doji structure. Further, they added submission strategies also resulted in lower market impact cost when based on occurrence of doji.

Lu (2014) examined the predictability of candlestick charting. He studied data consisting of all component stocks of the Taiwan Capitalization Weighted Stock Index over a period of 17 years from 1992-2009. He identified four patterns namely, one bullish reversal patterns, 2 bearish reversal patterns and 1 bearish continuation pattern that proved to have predictability power in Taiwan stock market after transaction costs. Out of sample test was conducted on Taiwan 50 index from 2002-2009. He further tested the performance of moving averages when compared to buy-hold strategy, returns from shorter period moving average were significantly positive but do not exceed transaction cost of 1%. Then he examined whether candlestick charts when combined with moving averages tends to give better results. After examining various combinations, he concluded that the combined performance of candlestick charts and moving averages gives significantly positive returns thus, producing better results.

Blau, Nguyen, and Whitby (2014) researched the information flow through stock prices in options market. Earlier studies in this area suggest that negative future stock returns could be predicted by put call ratio as well as by option volume to stock volume ratio. They compared the predictive powers of both the ratios and arrived at the following conclusions. First Put-Call Ratio is found to possess more power than Option-to-Stock Volume Ratio for forecasting daily stock returns. Second, when it comes to weekly and monthly forecasting, option-to-stock volume ratios contain more predictive power than put call ratios. After conducting several tests they arrived at the conclusion that while put-call ratio contains some predictive power for daily as well as weekly returns, the predicted returns lasts only for a short period of time. On the other hand, option-to-stock ratio has predictive power for negative daily, weekly and monthly returns.

Fang, Qin and Jacobsen (2014) studied the predictability of technical analysis, a method for forecasting the future stock prices based on past market data. They examined the profitability of 93 market indicators on S&P 500, which serves as a proxy for overall US stock market.

According to them some commonly used technical market indicators like volatility indices, advance/decline lines, short term trading, etc. does not exhibit much predictive power. They also stated, out of 93 only 30 indicators showed predictability at 10% significance level and after conducting robustness checks only 10 stands significant out of 30 indicators. They documented that return predicting models are sentiment dependent and state dependent across business cycles. They concluded that 10 technical indicators like daily NYSE advances and declines, daily new highs and alternext of NYSE, short sales volume, NYSE cumulative highs, etc proved to be market predictors in the long run but after taking into consideration transaction cost none of them proved to beat buy-hold strategy. As compared to buy and hold strategy technical indicators generally have both lower returns and lower risks. No strategy was able to generate positive Jansen's alpha and in terms of Sharpe ratio none of the technical strategies significantly outperformed the buy and hold strategy.

Da-Costa et al. (2015) studied different methods of technical analysis in order to search the strategies that help in gaining exceptional returns in financial market. They analysed techniques like MACD, Simple Moving Average, Exponential Moving Average, and Triple Screen on 198 stocks traded in Brazilian Stock Market. In order to test the power of predictability they used various combinations of periods, brokerage fees and a policy of stop loss and compared it with BH strategy. Though the findings proved to be profitable they showed a little power of predictability in the Brazilian market. Thus, according to them technical analysis failed to predict the stock prices.

In order to find out answer of what determines profitability of candlestick trading strategies Lu, Chen and Hsu (2015) studied trend and holding strategies. They examined three trend and four holding strategies. They studied 30 component stocks of Dow Jones Industrial Index from 1992 to 2012. They stated two major findings in their study. First, the type of holding period defined proved to be an important factor in determining the effectiveness of candlestick charts. Second, these trading strategies found to have predictive powers in asset returns. They concluded that eight three-day reversal patterns with Caginalp-Laurent holding strategy proved to be profitable but when compared with Marsha II-Young-Rose holding strategy the pattern was not able to beat the strategy considering 0.5% transaction cost. Running several robust checks in order to eliminate data snooping bias they further stated that candlestick charts proved to be profitable for riskier assets and they do help in identifying profitable trading opportunities.

Li, Hoi, Sahoo and Liu (2015) stated that stocks high and low prices are temporary and they may not give reliable results. On the other hand stock prices are likely to follow mean reversion phenomenon. They studied five stock datasets in order to test the capability of 'OLMAR' known as On-line Moving Average Reversion, on regional markets as well as on global indices. The chosen five datasets were i) NYSE for a period of 22 years ranging from 1962-1984 ii) the extended version of NYSE from 1985-2010 iii) Toronto stock exchange consisting of 88 stocks ranging from 1994-1998 iv) S&P500 consisting of 25 stocks ranging from 1998-2003 and v) MSCI world index a collection of global equity indices from 2006-2010. Further they stated that datasets covered important events and crisis like dot com bubble from 1995-2000 and subprime mortgage crisis from 2007-2009. Their results revealed that OLMAR consistently achieved higher returns moreover, the strategy runs extremely fast which makes it more attractive to use in the large scale real world.

Ni, Liao and Huang (2015) studied the performance of Moving Averages by including both 'wide' and 'in-depth' concerns of the investors on three major indices i.e., Dow Jones 30 index, the FTSE 100 index and the Shanghai 50 index over the period of 2005-09. Their research revealed that investors earn profit more by buying instead of short selling when dead cross is emitted. They attributed this type of results to the herding behaviour of the investors. Further they added that during golden cross days constituent stocks of DJ30 and FTSE100 are likely to earn negative returns that are attributed to the stock market overreaction. They concluded that investors can earn profit by buying SSE50 stocks as dead cross appears and by avoiding golden cross days. They stated that two important factors like herding behaviour and stock market overreaction are incorporated into technical analysis.

Zhu et al. (2015) examined the profitability of technical analysis using Shanghai Stock Exchange Composite Index. Using t-test they tested whether the returns conditioned on trading signals are significantly different from unconditional returns, and also the mean returns conditioned on buy signals are significantly different from sell signals. They studied the profitability of moving average and trading range break. They found that TRB rule outperform the MA rule and short term VMA outperforms long term VMA. According to them, the best strategy among these proved better than buy and hold when transaction cost is not considered. When transaction cost is included, the profits are eliminated. Thus, in Chinese Stock Exchange MA and TRB do not work better than buy and hold strategy.

Chen, Su, and Lin (2016) investigated how information uncertainty proves profitable in technical analysis applying moving average strategy to portfolios. They used a sample of Taiwan stock market for the same. They classified the portfolios in two categories i.e. firms issuing stock options, and firms not issuing stock options. According to them moving average strategy proved to work better than buy-hold strategy for portfolios not issuing stock options, but it did not give the same results for portfolio with option issuance. They further added that the result follows the hypothesis that there is greater information uncertainty for stocks not issuing options, so prices are likely to continue which proves better performance of MA strategy.

Chin et al. (2016) analysed the opening, high, low and closing prices of companies listed on Malaysian stock market. They examined the predictability of candlestick charting. They used skewness adjusted t-test to test the significance of candlestick returns. They gave two main conclusions (I) taking into consideration transaction costs only bullish reversal patterns prior to trend were profitable, (ii) Mostly bearish reversal pattern showed predictive power.

Lu and Shiu (2016) conducted a study on 30 component stocks of Dow Jones Industrial Average Index. They conducted a comprehensive analysis of profitability of each and every 1-day candlestick chart using data running from 1974 to 2009. They found out that candlestick charts showed high power of predictability from 1992 onwards. Thus, they concluded these patterns may prove to be profitable for Dow Jones Industrial Average stocks.

Chen, Metgalchi and Hajilee (2016) tried to examine whether trading rules like moving average have predictive power in the NASDAQ Composite Index and if they do possess predictability then which strategy should be designed to beat buy-hold strategy taking into consideration both transaction cost and risk. They studied daily closing price of the NASDAQ Composite Index from 1972-2015. They examined 5 MA strategies i.e., MA20, MA50, MA100, MA150 and MA200. After testing the strategies, they arrived at the conclusion that for MA20, MA50, MA100 the mean buy returns are positive and mean sell returns are negative with significant t-statistic. Further they added except MA200 all four strategies exhibit predictive power in NASDAQ composite index and MA100 found to have the best performance in terms of forecasting. Finally, they tested for two very popular indicators- MACD and RSI and they found that both the indicators have strong predictive power for the entire period; rather they proved to give even better results than MA100.

Using Malaysian Equity Market, Tapa, Yean, and Ahmad (2016) compared the profitability of technical analysis to conventional strategies. They used moving averages to calculate risk adjusted returns and compared it with returns from buy-and-hold strategy. They investigated both MA strategy and modified MA crossover strategy. According to their findings all the combinations of short and long MA outperforms the buy-and-hold strategy.

Chang, Jong and Wang (2017) evaluated the profitability of technical analysis compared to buy-and-hold strategy. Using variable-length moving average on stock listed on Taiwan stock exchange, they computed the returns on stocks using both technical trading and buy and hold strategy. In order to control the firm size and trading volume they grouped the sample by firm size and volume. They concluded that VMA strategy performed better than BH strategy and VMA for longer moving averages performed even better than VMA of shorter moving averages.

In order to evaluate the predictability of technical indicators Oriani and Coelho(2007) conducted a study in Brazilian stock market. They studied the impact of different technical indicators on prediction of stock closing prices based on 5 major companies in Brazilian IBovespa that highly represent the index. They used different indicators as inputs for artificial neural networks. After conducting various tests, they arrived at 2 main conclusions, first when different lagging indicators are used in isolation as inputs for neural networks proved to predict the stock prices better than the forecasts made with original data. Second when the indicators are combined together and used as an input for ANNs can improve the predictive power even more. They further added that these results paved the way for future researches in other indices as well as in other parts of the world.

3. Conclusion

The present study is an attempt to find out the importance of technical analysis for forecasting stock prices. Among many trading strategies, the study has examined only the moving averages and candlestick based strategies. For uncovering the profitability of the selected technical strategies, detail review of literature has been conducted. The analysis of the existing literature reveal that the efficacy of moving averages and candlesticks as a signal to buy and sell has been studied in developed as well as developing countries. It is observed that various studies have used a variety of moving averages ranging from simple moving average (SMA), exponential moving average (EMA) and various other combinations of

moving averages and a variety of candlesticks. It is found that moving averages based strategies are profitable in most of the cases. However, Fang et al (2014) reported that technical analysis is not useful in the US markets at least after considering transaction costs. Zhu et al (2015) found the similar results in China. After synthesizing the findings from all the studies, it can be concluded that moving averages and candlestick based trading strategies provide important signals and can be used in making investment decisions. Besides, In addition, Lu (2014) found that the combination of moving averages and candlesticks is even more profitable.

There are many studies conducted in the developing countries like Taiwan, Malaysia etc., but there is a complete lack of studies in Indian markets. Thus, there is a need to carry out research on technical analysis employing data from Indian markets. Besides, only a few studies have examined the profitability of intraday technical analysis. Thus, analysis of Indian markets using intraday data is yet another area which should be investigated by researchers.

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