A COMPREHENSIVE STUDY OF THE MACD INDICATOR FOR ASSESSING MOMENTUM AND PRICE TRENDS IN SELECTED STOCKS

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ABSTRACT

The Moving Average Convergence Divergence (MACD) indicator is widely used in technical analysis to evaluate price trends and momentum in financial markets. This study presents a comprehensive examination of MACD's effectiveness in analyzing selected stocks, aiming to provide investors with actionable insights to enhance trading decisions. By applying MACD calculations on historical stock price data, the research identifies key trend signals, momentum shifts, and potential buy/sell points. The analysis demonstrates how MACD can serve as a reliable tool to interpret market movements, improve timing in trading strategies, and mitigate risks. Findings highlight the indicator's strengths and limitations, offering practical recommendations for investors seeking to integrate MACD into their decision-making frameworks.

1. INTRODUCTION

In the realm of stock market investing, technical indicators play a pivotal role in guiding traders through the complexities of price movements and market momentum. Among these, the Moving Average Convergence Divergence (MACD) indicator has gained prominence due to its ability to capture both trend direction and momentum shifts through the relationship of moving averages. MACD is particularly valued for its simplicity and its dual function as a trend-following and momentum oscillator.

Despite its widespread use, the practical application of MACD in different market conditions and across various stocks requires careful analysis to understand its predictive strengths and limitations. This study focuses on a comprehensive evaluation of the MACD indicator applied to a selection of stocks, aiming to elucidate how effectively it reflects market trends and momentum changes. By interpreting MACD signals such as crossovers, divergences, and histogram patterns, investors can better time their entries and exits, reducing exposure to market volatility.

The objective of this research is to provide an informed analysis of MACD's utility in real-world trading scenarios, thereby aiding investors in making well-grounded decisions in the dynamic stock market environment.

2. LITERATURE REVIEW

Eric, Andjelic, and Redzepagic (2009) tried to find out the prediction of stock prices at Belgrade Stock Exchange Inc. for the period from 2004 to 2008. They found that the application of the MACD in upward trends provides better results with a faster combination of moving averages. They concluded that trading based on signals of the MACD indicators at downward trend yields with smaller losses in the case of use of longer moving averages of the MACD. At the lateral trend of stocks market price movement, trading based on the MACD indicators" signal largely depends on volatility in the period under observation. In the case of small price volatility, the MACD signals are not much useful, while in the reverse case significant profits may be achieved even if the price remains at the same level as at the beginning of the period under observation.

Pandya (2013) selected the daily stock prices of the five information technology (IT) sectors for two years, listed at the Bombay Stock Exchange and National Stock Exchange. They tested the share prices in the seven technical analysis tools in the papers. In context to the MACD, they found that one out of four sample companies showing a bearish trend in the future. He suggested holding or sell as the

MACD was almost parallel to the zero lines and for the remaining three companies he recommended holding or buy as the MACD crossed zero lines.

Pradipbhai (2013) tried to find out whether a simple moving average (SMA) based MACD or an exponential moving average (EMA) based MACD generates better profit for an investor. He tried to find out which of the moving averages would bring out the better buy or sell signal to an investor. He concluded that the EMA based MACD brought a higher return and trustable signals to an investor.

Rosillo, Fuente, and Brugos (2013) to examined the result of the application of the indicators Relative Strength Index (RSI), Moving Average Convergence Divergence (MACD), Momentum, and Stochastic in different companies of the Spanish continuous market. By using these indicators, it is intended to give purchase and sale recommendations to small investors. The generation of great capital gains depends on the type of stock exchange and the indicator which is being used. Besides, this research solves the problems in case of ambiguity, in the indicators, for the traders.

Chong, Ng, and Liew (2014) found that MACD with other technical analysis tools could generate an excess return from the Milan Comit General and the S&P/TSX Composite Index. They tested the returns for the total five leading stock markets of the world, namely, DAX 30, DJIA, Nikkei 225 with above mentioned two indices. The buy and sell signals for the Milan Comit General and the S&P/TSX Composite Index from the MACD were seen as highly significant.

Anghel (2015) applied the concept of MACD on daily share prices of 1336 companies of 75 countries from 2001 to 2012. He applied a bootstrap based analysis to validate his estimators. He concluded that the efficient market hypothesis (EMH) could not be rejected at a general level for the world stock markets using the MACD as a trading rule.

Mahajan (2015) tested and applicability of MACD and Relative Sensitive Index (RSI) for profitable return from the National Stock Exchange of India. They concluded that optimized MACD and PSI indicators are more profitable than buy-hold strategy and standard MACD and RSI.

Halilbegovic (2016) investigated the validity of MACD as the „magic wand" when solely used for investment trading decision making. The paper found that it is not possible to generate a consistent, considerable, and sustainable profit using MACD in an investment decision process.

Ahmar (2017) tested the reliability of the MACD as a technical analysis tool. He also developed his technical analysis tool in his paper naming „Sutte Indicator" using the closing price, the lowest price, and the highest price of the stock for a day. He concluded from the Mean Absolute Percentage Error (MAPE) result that his „Sutte Indicator" performed better than MACD and Simple Moving Average (SMA).

Inumula (2017) found that an application of standard MACD and RSI indicators contribute to earning an extra income then the buy and hold strategy is statistically rejected at a 5 percent level of significance means that the buy and hold strategy is more profitable than the standard MACD and standard RSI indicators. He tested the six sectors of stock prices in the Indian stock markets and concluded that better profit optimization by an investor could be brought out by using the MACD technique.

Wang and Kim (2018) in their paper modified the way of using the exponential moving average (EMA) while calculating MACD. They used the changing weight based on the historical volatility in the stock price. They combined the historical volatility index with the MACD and developed a new measure, MACD-HVIX. They compared the accuracy between a MACD histogram and a MACD-HVIX histogram and found that the accuracy of using the MACD-HVIX histogram is 55.55 percent higher than that of the MACD histogram when used the buy-andsell strategy. When used the buy-and-hold strategy for 5 and

10 days, the prediction accuracy of MACD-HVIX was 33.33 percent and 12 percent higher than that of the traditional MACD strategy, respectively. They found that the new indicator was more stable.

3. METHODOLOGY

The main objective of the paper is to find out an application of Moving Average Convergence Divergence (MACD) in the Nepalese stock market. For this purpose, the paper has used the daily closing index (NEPSE Index) of Nepal Stock Exchange Limited, from the fiscal year 1998-99 to the fiscal year 2019-20, covering 4,875 trading days.

The paper has followed the formula developed by Gerald H. Appel (1979) to calculate the value of MACD. The formula is as follow:

$$MACD = \left[\{Close\ index - EMA_{Previous\ period(12\ days)}\} \times \frac{2}{n+1} + EMA_{Previous\ period(12-days)} \right]$$
$$- \left[\{Close\ index - EMA_{Previous\ period(26-days)}\} \times \frac{2}{n+1} \right.$$
$$+ EMA_{Previous\ period(26-days)} \right]$$

where, EMA= Exponential Moving Average for period „n" n= Number of days which is 12 days and 26 days

MACD generates two kinds of signals. They are:

• Signal Line Crossovers: a bullish crossover occurs when MACD turns up and crosses above the signal line. A bearish crossover occurs when MACD turns down and crosses below the signal line.

• Center Line Crossovers: a bullish centerline crossover occurs when MACD moves above the zero lines to turn positive. At this time a BUY signal is generated. A bearish centerline crossover occurs when MACD moves below the zero lines to turn negative. At this time, a SELL signal is generated.

Similarly, the signal line = 9 days exponential average of MACD line (2) while the "signal" line is derived as a 9 day exponential average of the MACD line. This 12/26/9 is a standard and at the same time „original recipe" combination of periods, some technicians decide to modify this original combination and make their customized combinations.

A "signal-line crossover" occurs when the MACD and average lines cross; that is when the divergence (the bar graph) changes sign. The standard interpretation of such an event is a recommendation to buy if the MACD line crosses up through the average line (a "bullish" crossover), or to sell if it crosses down through the average line (a "bearish" crossover). The signal strength (from weakest to strongest, respectively) depends on the position where the crossover happens. The deeper below the zero lines the crossover happens, the stronger the buy signal it is. (Halilbegovic, 2016).

The MACD histogram was developed by Thomas Aspray in 1986. The histogram or, "bar chart" included in the background of the MACD displays the difference between the MACD and the signal line. The interpretation is based on the zero-line or the signal line. When the MACD is above the signal line, the bar is positive. When the MACD is below the signal line, the bar is negative. The actual height of the bar is the difference between the MACD and the signal line itself. Mathematically, it is defined as:

MACD Histogram= MACD Line – Signal Line

4. DATA ANALYSIS AND DISCUSSION

4.1. Interpretation of the MACD and the Signal Line for NEPSE Index

The figure 1 shows the relation of the MACD and the Signal Line for the NEPSE daily index. Figure 1 clearly shows the bullish trend and the bearish trend for the NEPSE Daily Index. The figure above shows the majority of the time, the return from the daily trading at NEPSE shows the bearish trend (3279 days) with the indicator below the signal line.

This shows that only 34.74 percent of the trading days during the sample period saw the bullish trend at NEPSE, and the remaining days were seen following the bearish trend. Similarly, 265 days had shown the MACD is parallel to a signal line, and a crossover took place. During the crossover, the bullish trend of the market turned in to the bearish and vice-versa. This shows that only 5.44 percent of the trading days during the study period had shown the trend signal by the signal line as per MACD analysis.
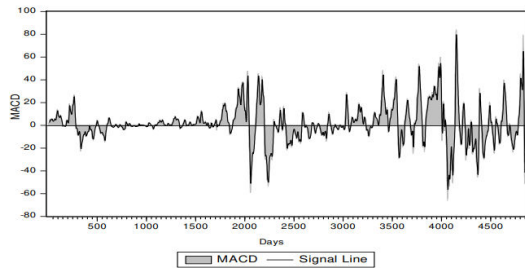
Fig.1 MACD and Signal Line for NEPSE Daily Closing Index

4.2. Interpretation of the MACD Histogram for NEPSE Index

The figure 2 shows the MACD Histogram for the NEPSE daily index. MACD histogram appears in the chart. The MACD histogram is also designed to identify the convergence, divergence, and crossover. However, the MACD histogram is a difference between the MACD line and the signal line. When MACD is above the signal line, the MACD histogram also is also seen above the signal line. The indicator is negative when MACD is below its signal line. Negative values increase as MACD diverges further from its signal line (to the downside). Conversely, negative values decrease as MACD converges on its signal line. The slant divergence in the histogram shows the quick change is the trend of the NEPSE. The signal line is also a zero-line. The histogram above the signal line shows the uptrend of the market and vice-versa.
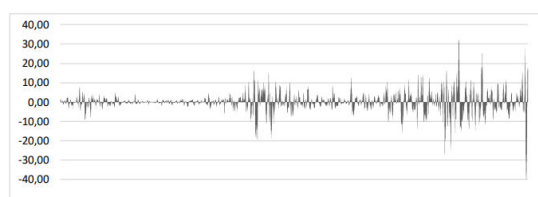

Fig. 2 MACD Histogram for NEPSE Daily Closing Index

The high number of divergences and convergences in the MACD histograms reflects the scenario of overbought or oversold during a particular period. Hence, the actual upcoming signal from the market is reflected when the height of the histogram starts to decline.

5. CONCLUSION

This study confirms that the Moving Average Convergence Divergence (MACD) indicator is a valuable tool for assessing price trends and momentum in selected stocks. Through detailed analysis of historical price data, MACD demonstrated its capability to signal trend reversals, confirm momentum shifts, and identify potential buying and selling opportunities. However, its effectiveness varies with market volatility and the specific characteristics of individual stocks, highlighting the need for complementary indicators and contextual understanding.

Investors are advised to incorporate MACD as part of a broader technical analysis toolkit, combining it with other indicators and fundamental insights to improve the robustness of trading strategies. The study also underscores the importance of adapting MACD parameters to fit the trading style and asset class. Ultimately, when used judiciously, MACD can enhance investor confidence and contribute to more informed and timely trading decisions.

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