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Trading Strategy on the Future Mini S & P 500

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Abstract

This paper applies a trading strategy to the future mini S & P 500 by means of technical analysis indicators. There are four trading strategies used with the NinjaTrader platform. The objective is to determine the most effective strategy that obtains gains in both long position and short position. The results show that the best trading strategy achieves an effectiveness of 67% in the long entries and 59% in the short entries and the lower earnings strategy has a 29% long entry effectiveness and in the short entries of 35%.

Keywords: trading strategy, technical analysis, S & P 500.

INTRODUCTION

The technical analysis is widely used by any type of investor, from a novice trader with a computer in your home to the institutions that move the market, you do not need to complete a full university career on finance to invest in the stock market, because the simplicity of This method allows a variety of opportunities accessible to the entire public [1].

Technical analysis is one that is based on past prices, indicators, charts, negotiated volume and any other information available from the past to identify trends and patterns that have great potential to be preserved in the future [2]. The fundamental analysis on the other hand aims to know the intrinsic value of the assets in the stock market but through a general framework, studying the participants market agents, the situation of the company, historical financial statements and thus compare with the values offered in the market and make an investment decision [3]. The main difference is then that the fundamental analysis is based on economic factors while the technical analysis is based on information from the past to determine the value of the asset [4]. However, due to the technological development and the availability of information, more and more investors are using the technical analysis and they go from long-term investment with fundamental analysis to short-term investment, even intraday with the use of indicators and systems automated [5].

The technical analysis has been integrated mainly with the use of software and algorithms that allow the application of automated strategies in the stock market. Petropoulos [6] creates an automated trading system with the use of prediction algorithms applicable to 10 currency pairs in the FOREX market, all related to the US dollar (USD), using information from the last 15 years to prove the efficiency of the algorithm in different types of market. With this research it was found that the annual return of the investment can be up to 18%, in addition to the great approach to the predictions of trends in the market.

There are sophisticated algorithms used for trading such as heuristics, genetic algorithms, metaheuristics, taboo search, hybrids, among others [7]. Additionally, they are applied to any type of market, they are even adaptable to any type of temporality, it can be in monthly graphs or in second graphs [8]. However, these automated trading systems are not always profitable. Wang, Yu, and Cheung [9] proposes a test called Performance-based Reward Strategy (PRS) to determine which trading rules (140 in total) presented higher annual returns using moving averages and range breaks for different periods. The results were not positive, the trading system was not consistent, this result is attributed to the scarcity of variables to determine the weights assigned to each of the trading rules and the components that make them up.

The objective in this paper is to apply technical analysis, propose trading rules based on indicators to take intraday positions in the market in search of profitability and determine the effectiveness of the trades.

MATERIALS AND METHODS

The analyst uses the tools that best suit the model of his operation and the objective he seeks with this model, for the strategy presented in this document an analysis based on tick charts or transactions will be made. The trading platform NinjaTrader was used to carry out the trading strategy applied to the future of the mini S & P500.

Types of chart

The main tool of the technical analyst are the graphs, the most basic are those that represent the changes in the price of a certain stock market value, although, because every day more information is offered about the markets in the stock market. As the main tool, the analyst has a variety of graphs to perform his study, the most used is the daily bar chart where each bar represents the movements made of the price of some asset [10],

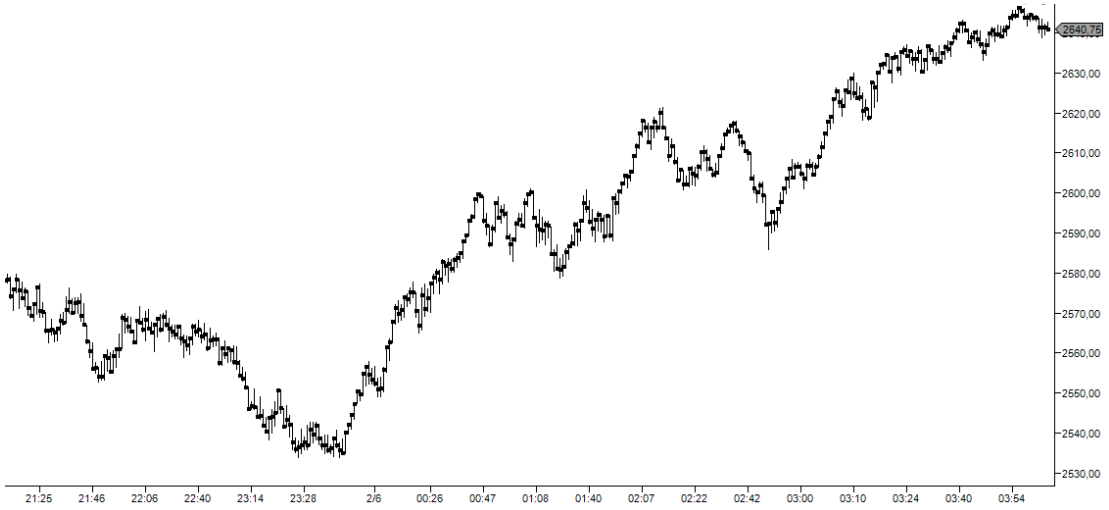

Figure 1. 610 ticks for the future mini S & P 500.

other graphs used with great frequency, these are line graphs, point graphs, candlestick graphs, Renko graphs, Heiken Ashi graphs, Kagi graphs and tick or transaction graphs.

The tick graphs unlike most other graphs is not formed according to a period of time, the time is irrelevant in this graph presents the same number of ticks either in an hour as in a day since what generates the Tick graph is the number of transactions that are made. For example, a tick chart of 610 transactions is made up of bars representing the price variation every 610 transactions regardless of contract size. This characteristic related to volume is what makes the use of tick charts for intraday trading suitable. Figure 1 shows an example of a tick graph; on the horizontal axis it is observed that the number of bars does not depend on time.

Indicators for technical analysis

The indicators in technical analysis are commonly used and discussed, with these opportunities are sought and rules, systems or strategies of purchase / sale are created in the market to obtain a benefit [11]. Technical indicators transform the historical data of prices such as opening price, the highest, the lowest, closing price, or volume to yield a series of time that allows to find patterns, anomalies, trends or determine relationships with other information or series [12]. Next, the indicators that will be used to design the investment strategy are presented.

A. Simple Moving Average (SMA)

The simple moving average is the indicator used in the technical analysis, this indicator helps to smooth the strong or random fluctuations that the price makes. It is an indicator that follows the trend because it is based solely on past price data. It is calculated as equation 1 [13].

$$SMA_{t,n} = \frac{1}{n}\sum_{i=t-n+1}^{t} P_i \qquad [1]$$

$SMA_{t,n}$ is the simple moving average of n periods in time t and P_i is the closing price at time t.

This indicator is used in multiple strategies, to determine the purchase / sale entry rule of the system, the exit rule or using different means to find crosses and thus determine trend changes [14].

B. Exponential Moving Average (EMA)

The exponential moving average complies with the same function as the simple moving average, that is, it offers a smoothing of the price action for a period. The only difference is that the EMA gives more importance to the latest data obtained by what is more suitable to find trends than the SMA [14]. The EMA can be calculated with equation 2.

$$EMA_n = \frac{2}{k+1} * P_{t-1} + \left(1 - \frac{2}{k+1}\right) * EMA_{n-1} \qquad [2]$$

k is the number of periods, n is the position of the current period observed, P_{t-1} is the closing price in the previous position, and EMA_{n-1} is the exponential moving average for the previous period.

C. Moving Average Convergence Divergence (MACD)

The MACD is a basic difference between two simple moving averages, one with period n_1 and another with period n_2 where the first average is expected to be more short-term and the second long-term average, ie $n_1 < n_2$ [15]. To calculate the MACD, equation 3 is applied.

$$\text{MACD}\ (n_1, n_2) = \text{SMA}\ (n_1) - \text{SMA}\ (n_2) \qquad [3]$$

The interpretation of this indicator is that the higher MACD, the price or information being analyzed has risen more strongly for the last n_1 periods compared to the last n_2 periods. Otherwise, the lower the MACD, indicates that the price or information of interest has decreased more strongly in the last n_1 periods compared to the last n_2 [15]. Most analysts use the

means of periods 12 and 26 because these values include daily and weekly values [10].

The MACD indicator searches for convergences and divergences by means of moving averages. The convergences are movements that the indicator has in the same sense as the price has, on the other hand, the divergences occur when a significant movement of the price in one direction is not represented in the same way and in the same sense in the indicator [12].

There are two types of divergences, regular divergences and hidden divergences. The regular divergences give a signal of a possible change of trend, for example, in an uptrend the divergence occurs when the price is making increasing minimums, but the indicator performs increasingly smaller minimums. This will be the signal for a possible downtrend change. On the other hand, the hidden divergences give a confirmation signal of the current trend, for example, in a downtrend, the price makes ever smaller and the indicator shows a higher maximum [12].

In the lower part of figure 2 the MACD indicator is shown, while the upper part represents the price action of a certain value in the stock market. At the beginning a regular divergence is observed that changes the direction of the bearish trend, the price makes lower minimums but the MACD performs higher minimums. For the second part, the same regular divergence occurs, but changing the direction of an uptrend, the price is making higher highs but the MACD has lower maximums.

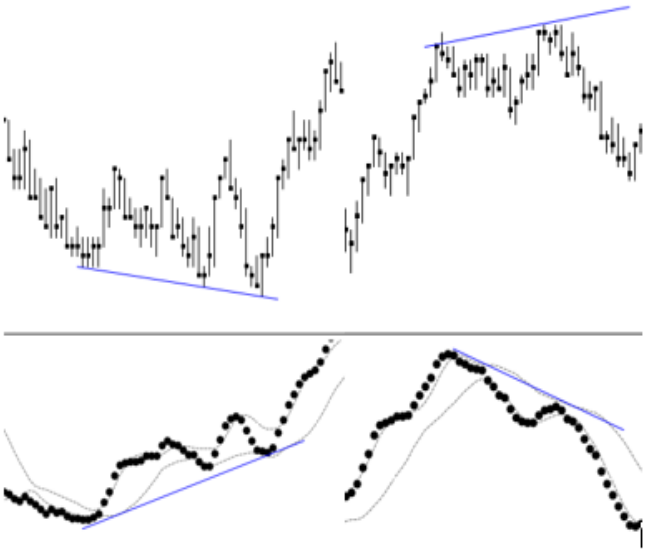

Figure 2. Regular divergence in bearish and bullish trend.

D. Keltner Channel

The Keltner channel is an indicator formed by three lines whose objective is to limit the price, the central line (which will be called midband) that is calculated as with an exponential moving average, and two lines, upper (upperband) and inferior (lowerband), these outer lines are calculated as a variation of the center line based on the ATR (Average True Range). Because the midband is an exponential moving average, the Keltner channel is a trend indicator and being related to the ATR, the width of the bands will give an indication of the volatility of the market, the wider the channel, market is volatile [10].

Equations 4, 5 and 6 shows how the Keltner channel is calculated.

$$Midband = \text{EMA}(n_1) \quad [4]$$

$$Upperband = \text{EMA}(n_1) + (k * \text{ATR}(n_2)) \quad [5]$$

$$Lowerband = \text{EMA}(n_1) - (k * \text{ATR}(n_2)) \quad [6]$$

EMA (n_1) is an exponential average of n_1 periods, ATR (n_2) is the average range of n_2 periods; and k is a constant.

Figure 3 is an example of how the graph will be in which trades will be analyzed.

Figure 3. 610 ticks of the future mini S & P 500 with indicators.

In Figure 3, the yellow line is a simple moving average of 20 periods, green line is a simple moving average of 80 periods, gray lines are the Keltner Channel indicator of 52 periods, k of 3.5 and ATR of 10 periods, and the time series at the bottom is the MACD with $n_1 = 12$ and $n_2 = 26$.

After having the configuration of Figure 3, the next step is to go through all the days from which you want to do the analysis and identify the trades that were presented according to the strategy, to this information you add the type of trade, if it was short or long and whether it was a winner or not. Table 1 presents the conditions of participation in the market based on the indicators outlined above, these trading rules will be applied to the future of the S & P500 index in a tick graph of 610 transactions per bar for the period from January 1 of 2017 and on January 1, 2018.

Table 1. Trading strategy.

Name of the trade	Conditions to enter long	Conditions to enter short
Twenty	Closing price > upper band SMA (20) crosses over the SMA (80) MACD positive (> 0) The entry is taken with a purchase limit order in the SMA (20)	Closing price < lowerband SMA (20) crosses below the SMA (80) MACD negative (<0) The entry is taken with a limit order of sale in the SMA (20)
Eighty	Closing price increasingly lower compared to previous bars SMA (20) greater than midband MACD positive (> 0) The entry is taken with a purchase limit order in the SMA (80)	Closing price increasingly higher compared to previous bars SMA (20) less than midband MACD negative (<0) The entry is taken with a limit order of sale in the SMA (80)
Mid-one	MACD greater than 0.3 SMA (20) crosses over the SMA (80) The entry is taken with a purchase limit order in the midband	MACD less than 0.3 SMA (20) crosses below the SMA (80) The entry is taken with a limit order of sale in the midband
Divergent	The price reaches the last pivot made but fails to pass it hard below. Closing price higher than SMA (20) The MACD presents the highest minimum in the price pivot The entry is taken with a purchase limit order in the SMA (20)	The price reaches the last pivot made but fails to pass it with force above. Closing price less than SMA (20) The MACD presents the lowest maximum in the price pivot The entry is taken with a limit order of sale in the SMA (20)

Figures 4, 5, 6 and 7 show the mid-one, twenty, eighty and dive trades, respectively, where the blue circle represents where the trade entry should be.

Figure 4. Example of trade Mid-one in long

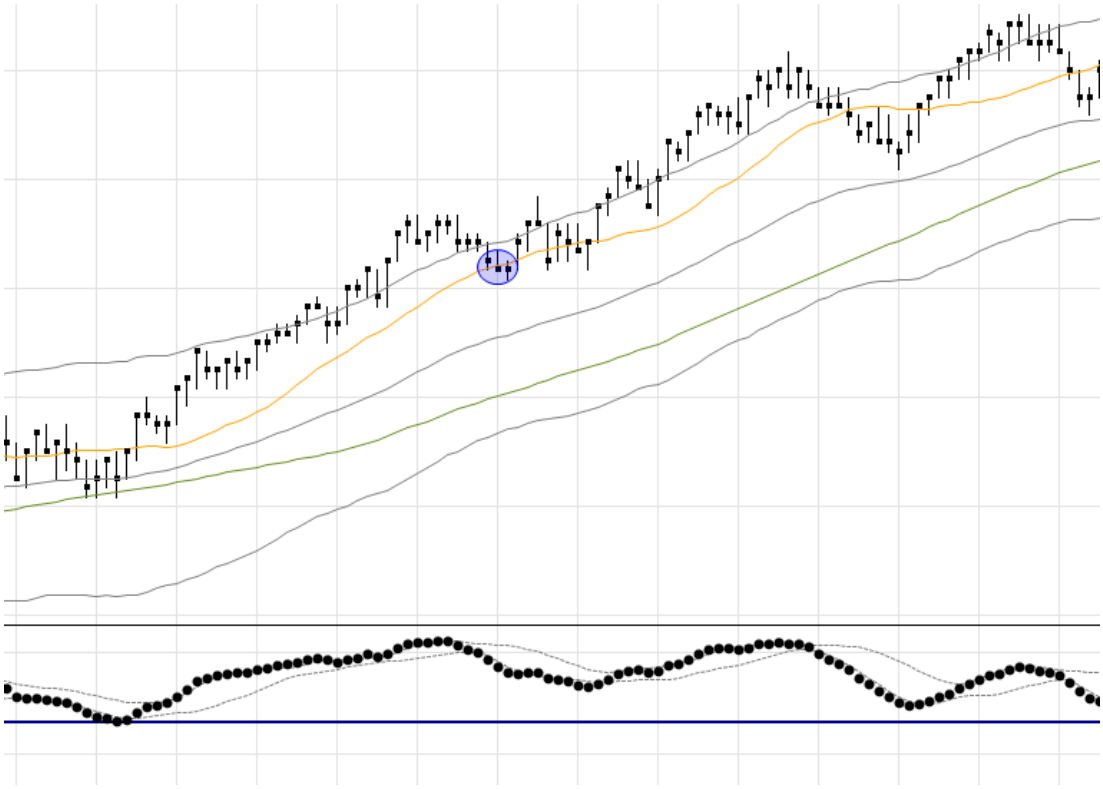

Figure 5: Example trade Twenty in long.

Figure 6. Trade example Eighty in short.

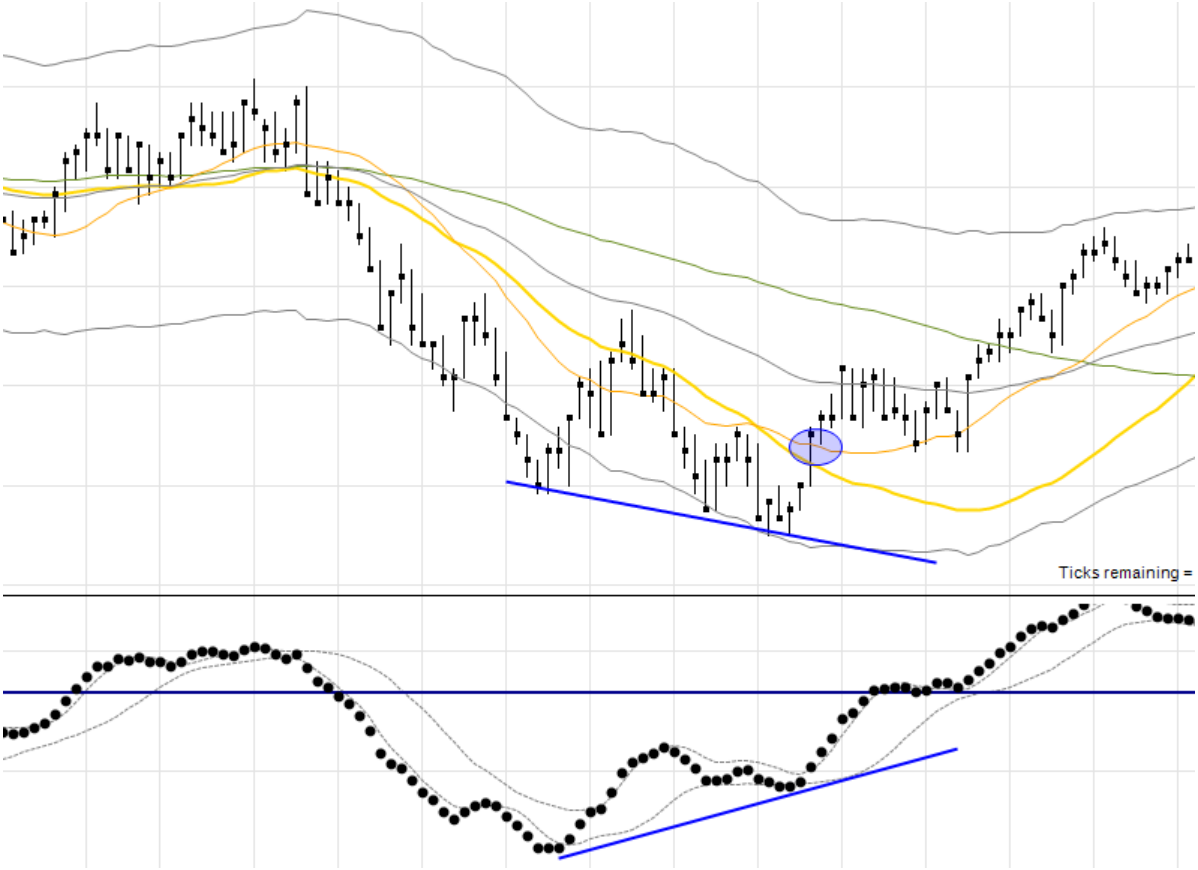

Figure 7. Example of trade Divergent long.

RESULTS

Table 2 presents the results obtained by analyzing the trades with the number of positions that were presented both in purchase and sale and the percentage of effectiveness of these.

Table 2: Results of the trading strategy.

Name of the trade	Number of positions	Effectiveness
Twenty	Long: 523 Short: 634	Long: 34% Short: 62%
Eighty	Long: 94 Short: 87	Long: 29% Short: 35%
Mid-one	Long: 439 Short: 374	Long: 47% Short: 56%
Divergent	Long: 256 Short: 237	Long: 67% Short: 59%

The trade that presented the highest percentage of effectiveness is the Divergent, this effectiveness is translated as the percentage of times that the trade generated profitability. On the other hand, for a period of 1 year this trade generated 493 investment signals, that is in one day this trade is presented on average 1.35 times, this is a good figure for performing intraday trading. Another important characteristic of this trade is that it adapts to any type of market, either lateral or trend, because being based on the MACD indicator, the difference of simple moving averages will be insignificant for slight movements of the market, which translates into few signs of investment and will be significant to trend markets, which present higher probabilities of profit for the trade. Considering these results, the Divergent trade is one of the best presented to build an investment strategy for the future mini S & P500.

Analyzing now the trade Eighty, this is the trade with the lowest amount of positions both in purchase and sale with a total of 181, in addition, it was also the trade that showed the least effectiveness with an average of 32%. This is possibly because when the price of the asset reached the 80-period moving average, it generally continued in the same direction due to a global trend change. With these characteristics, it is considered that the simple 80-period moving average is not a good indicator to create market entry strategies and that it needs to be complemented with other indicators or market information.

Finally, the Twenty and Mid-one trade showed similar characteristics, both had more than 500 investment signals on average for the year analyzed, and their average effectiveness exceeds 50%, this is a good indication to take advantage of the leverage generated by the futures market and obtain higher returns. However, we must be careful with the trade Twenty in option of purchase because its effectiveness with respect to the sale option decreases considerably.

CONCLUSIONS

The use of technical indicators to create investment strategies is widely studied and developed by investors, one of the reasons is that there are infinite combinations to throw signals that can be created and markets where they can be applied. In this document we analyzed 4 types of trades applied to the future mini S & P500 which were formed by one or more indicators whose integrated values showed both purchase and sale positions. It was found that the Divergent, Mid-one and Twenty trades based on their frequency per day and their effectiveness are good candidates for forming investment strategies, however, for a possible future study a variable gain / loss ratio can be evaluated, because in this case these values were fixed and sometimes limited the profitability of the trade. Finally, the use of algorithms to evaluate the portfolios is proposed, if the strategy is well defined and a broad study is desired, the algorithms will be a good ally to perform evaluations in the past, in other markets, adjust the indicators or the lost profit ratio.

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