

Robot test to evaluate the supersignals of the technical analysis in the stock market*Teste de robô para avaliar os supersinais da análise técnica no mercado de ações***Recebimento: 20/04/2020 - Aceite: 20/07/2020 - Publicação: 01/08/2020****Processo de Avaliação: *Double Blind Review***Flavio Luiz de Moraes Barboza¹

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The purpose of this study was to analyze the Supersignals of the Technical Analysis, seeking to elucidate the process of buying and selling assets. Through the analysis, the positive and negative aspects of the Supersignals use were investigated, since it is a little explored technique, because it is very recent. The research is carried out through a bibliographical review that retakes concepts such as Dow Theory, Efficient Market Hypothesis and Technical Analysis. In this direction, the present study is justified by its contribution to future research

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on the proposed theme, besides fomenting discussions in light of the studies of trading rules. We concluded that the Supersignals of the technical analysis can function efficiently, however, they do not represent a completely effective index if applied alone.

Keywords: Stock trading; Financial market; Automated trading; Supersignals; Technical analysis.

RESUMO

O presente estudo teve como intuito analisar os Supersinais da Análise Técnica, buscando elucidar o processo de compra e venda de ativos. Por meio da análise, foram averiguados os aspectos positivos e negativos do uso Supersinais, uma vez que se trata de uma técnica pouco explorada, por ser muito recente. A investigação se dá através de uma revisão bibliográfica que retoma conceitos como Teoria de Dow, Hipótese de Mercado Eficiente e Análise Técnica. Nessa direção, o presente estudo justifica-se por sua contribuição para pesquisas futuras sobre a temática proposta, além de fomentar discussões à luz dos estudos de estratégias. Concluiu-se que os Supersinais da análise técnica podem funcionar com eficiência, entretanto, não representam um índice completamente eficaz se aplicados isoladamente.

Palavras chave: *Negociação de ativos; Mercado financeiro; Negociação Automatizada; Supersinais; Análise Técnica.*

1. INTRODUCTION

The stock market moves billions of moneys a day, among buying, selling, and speculating shares. Several brokers and companies specializing in investments instruct people about the stock market and how to invest. Researchers in the field use some strategies to analyze assets for buying and selling; one of them is technical analysis.

Technical analysis (TA) is the dynamic study of the actions of a certain company. According to Achelis (2000), TA is a way of studying market trends, to predict the future price of shares, using graphics as the main tool.

The popularization of TA encourages the debate on its validity. There are those who give credit to this method believing that prices follow a pattern, and besides, those who argue that the behavior of prices is random. The second group believes in what can be called the Efficient Market Hypothesis, in which the price of assets reflects every information (FAMA, 1970). For Bruni and Fama (1998), prices always reflect the information available, given that the market is made up of rational investors. Based on this assumption, the possibility of abnormal gains is eliminated.

Despite of that, Frankel, and Lee (1998) and Piotroski (2000) insisted on the possibility that could be possible to use analyzes to predict future prices of the asset. They argue that greater gains are the result of investigating market imperfections. And among the scholars who follow this analytical line of stock markets, Martins (2010) not only promotes the study of TA, but also developed the concept of Supersignals, as a new indicator, arising from the mixture of the best signs and concepts of TA.

In this sense, this research aims to study and analyze the Supersignals of TA, in order to elucidate the purchase and sale of shares in a profitable way. Specifically, we aim to identify the positive and negative points of the Supersignals technique; and develop criteria and trading rules to evaluate its effectiveness in favor of assisting analysts in their investment strategies.

The present study is justified by encouraging discussions in the light of the studies of the technical trading rules and their contribution to research on finance, which is still scarce. These considerations point to the relevance of the research when systematizing information regarding the analysis of strategies in the stock market.

The research is organized in four parts, the first of which consists of a Related Literature, in which the theme involving the Efficient Market Hypothesis, Dow Theory, Technical Analysis and Supersignals is explained. Subsequently, we describe in the Methodology section our analysis made by an algorithm that employ an automated trading rule based on Supersignals. Section 4 presents the results and discuss whether these supersignals really contribute for improving gains in the trades. Finally, the final considerations and reflections.

2. LITERATURE REVIEW

The present work is based on theories that study the behavior of assets in the economy, whether there is agreement with the predictability of future prices. It is pertinent to elucidate fundamental concepts of the financial market. One of them, the Efficient Market Hypothesis, based on Fama (1965, 1970), disagrees with the possibility of anticipating future values. Another concept is Dow Theory, elaborated by Charles Henry Dow and organized by Rhea (1932), which states that the omen of prices is possible.

It is also appropriate to explain about Technical Analysis, based on the studies of Murphy (1986), one of the main schools of thought on financial markets. Such an explanation is necessary because it is based on the theoretical assumptions of TA that the concept of Supersignals emerges, a term coined by Martins (2010).

2.1. Efficient Market Hypothesis

To what extent can past asset prices influence your future prices? This is the question made by Fama (1965) and reverberated by scholars of the financial market today. Some scholars discredit predictability and judge price behavior as independent. These are the ones who believe in the efficient market hypothesis. According to Lo (2007), this theory assumes that the market has information that is efficiently distributed, avoiding the possibility of operating with privileged information, and thus it would not be possible to predict changes in the price of a given asset if such changes were correctly incorporated. in asset prices.

The Efficient Market Hypothesis (HME) arose from studies by Fama and Samuelson in the 1960s, from a probabilistic model of price change. They concluded that the future price does not follow a correlation with past prices. Therefore, this theory presupposes fair competition, considering that no single agent could significantly impact prices, with no abnormal gain or loss beyond the adjustment of the asset.

Fama (1970) presents three versions of the HME: weak hypothesis, semi-strong hypothesis and strong hypothesis. In the first, it is considered that the prices negotiated for the shares reflect all the available historical information. In the second hypothesis, the semi-strong, the author states that, in addition to the prices reflecting all the available historical information, they also change instantly to reflect the new information. The third form, the

strong hypothesis, states that prices instantly reflect even inside information, that is, all market information would be accounted for in the price of a share, and no type of analysis would be able to offer an advantage to investors.

The three conditions sufficient for the efficiency of the markets advocated by Fama (1970) consider a market in which everyone agrees with the implications of current information on current prices and future price distributions for each stock; there are no costs for stock transactions; all information is available, free of charge, to all market participants (FAMA, 1970).

Therefore, the share price fully reflects all the information available in a market that presents the conditions mentioned above. There are no studies that present objective answers as to the legitimacy of the hypotheses. There are favorable arguments and strong criticisms, to be studied by those interested in investments, to formulate their own conclusions.

In this sense, the Efficient Market Hypothesis can be recognized as one of the most important ideas about finance, although it provokes many controversies. The present study will not delve into this discussion, since it is based on Technical Analysis, a theory that opposes the hypotheses.

2.2. Dow Theory

The Americans Charles Henry Dow and Edward D. Jones in 1880 joined together to build the firm Dow Jones & Company, the financial publisher through which they published the Customer's Afternoon Letter that was distributed on Wall Street (LEITE e SANVICENTE, 1995). Due to the great success of the periodical, Dow reached the position of editor of the first edition of the Wall Street Journal and started to publish articles on the price behaviors that he observed in the capital market.

Dow's texts were very well accepted by the Wall Street community, which spurred the creation of a certain indicator, working together with partner Jones. Then, the Dow Jones Industrial Average index emerged, still pointed out today as the main stock index in the United States and the world. What we now report as Dow's Theory received its name after the death of Charles Dow, when his articles were compiled to support a thesis. It can be claimed that the theory was developed by Charles Dow, when publishing his editorials, refined by

William Peter Hamilton, who inherited his studies, and organized by Robert Rhea, author of the book *Theory of Dow*, published in 1932.

The work still influences the way investors from all over the world interpret and interact with the financial market and the behavior of assets. The material that began to be developed more than a hundred years ago is the matrix of most of the technical analysis and clarifies six fundamentals, considered essential in the performance of investors who wish to use technical analysis.

According to Murphy (1986), the six basic principles of the theory can be stated as follows: "the prices already discount everything", "the market has three trends", "the primary trend has three phases", "a trend lasts until confirmed otherwise", "The volume of securities should confirm the trend" and "the trends should confirm each other".

The indices already discount everything: The indices already incorporate events that may affect supply and demand - except, of course, natural disasters and any other unpredictable events. However, even unpredictable cases are quickly assimilated into the action of values.

The market has three trends: Dow has three trends: primary, secondary, and tertiary. Primary trends, also called main trends, usually last for more than a year, even going on for several years, in some cases. Secondary trends, also known as intermediaries, represent corrections to the primary trend, and usually last for weeks or months. Finally, tertiary, or minor trends represent short-term fluctuations. Here a somewhat didactic illustration is established, which uses the scenery of the sea: the primary trend corresponds to the tides, the secondary one is represented by the waves and, finally, tertiary would be the wave.

The primary trends have three phases: Dow established that an upward trend would exist when the successive peaks and valleys were higher than the previous ones. Primary, upward trends go through three phases: accumulation, public participation, and distribution. Accumulation is the time to purchase the asset, since the market has already assimilated the bad information that kept the trend down and starts showing signs of upward trend. Better-prepared investors take advantage of this moment. The public participation phase is when many investors who follow trends start to buy the asset, causing significant increases to occur. The distribution occurs when the media start to disclose the gains of the asset on the stock exchange, which leads to greater growth in public participation. At this time, investors

who have entered the accumulation phase can dispose of their positions and profit; that is, the well-prepared leave.

A trend lasts until confirmed to the contrary: Dow says that when it assumes an upward or downward trend, validity occurs until effective signs of reversal appear.

The volume should confirm the trend: In an upward trend, while the market is moving according to the main direction, the volume of securities traded continues to grow, except during corrections. In a downward trend, the opposite occurs.

The averages must confirm each other: The averages to which Dow refers are also called indices. They do not diverge, as they follow the same direction. To confirm the trend, the averages must remain in the same direction; otherwise it may be a sign of reversal. In the context, the author mentioned the Dow Jones Industrial and Dow Jones Transportation indices.

Charles Dow's publications and the later organization of Dow's Theory by Robert Rhea revolutionized the perspective of the financial market and served as the basis for traditional technical analysis, to be elucidated later.

2.3 Technical Analysis

According to Murphy (1986), TA is a focus on predicting markets based on the study of the past, human psychology, and the law of probabilities. Also known as Graphical Analysis, this branch of financial market studies is based on monitoring asset prices over time.

Botelho (2003) states that it is more about art than exact science, whereas technical analysis is dedicated to studying, analyzing and interpreting the current behavior of the mass, that is, the average of the opinions of all buyers and sellers in the market. It is necessary to find signs capable of helping the search for the price trend, thus, human behavior is studied. According to Pring (2002), technical analysis identifies the reversal of a trend in its initial stage and follows this trend until the weight of the evidence shows or proves that the trend has reversed.

For Edwards and Magee (2001), such an analysis can be defined as a science of records, usually in graphic form, of the effective history of transactions (price changes, transaction volumes, etc.) of a stock or market index, which deduces likely future trends. The

main purpose of technical analysis is to identify and make use of trends. According to Goldberg and Nitzsch (2001), most successful technical trading models are based on following trends.

Short-term fluctuations in the asset market can generate large profits at times when there is a lot of uncertainty on the part of investors. It can profit only those who are prepared to identify both moments of continuity and moments of trend reversal. In this context, the concepts of tops and bottoms are applied. For Martins (2010), the top is the succession of new highs by some candles until we have two low highs in a row, leaving a 'mountainous' formation behind, and bottom is the reverse, are the lowest lows followed until we have two lows more high, leaving a 'valley' formation behind.

In the words of Noronha (1995), both concepts are defined as price levels where purchases and sales, respectively, are strong enough to interrupt - and possibly reverse - a downward or upward process. Thus, tops are resistance zones and bottoms, support zones. Support and resistance are concepts in constant oscillation when we consider that, if the price falls and exceeds the support line, it automatically becomes a resistance line.

The reason why supports and resistances exist is directly linked to people's memory, as stated by Noronha (1995), Individuals remember that when a certain asset reached a certain price level, it rose or fell, and so it continues your purchase or sale going on.

2.4. Supersignals

The Brazilian Carlos Martins developed a study entitled "The Supersignals of Technical Analysis" (2010), to merge the best signs and concepts of graphic analysis in a single indicator. Supersignals formulate an analysis that can be applied to any chart, however, according to the idealist himself, it is more convenient for daily charts.

Supersignals born out of technology's ability to automate decisions that previously only humans were able to make. Martins (2010), creator of the concept, claims that the intention was not to cancel the participation of the human operator, although some markets take this attitude. According to the author, his desire was to enhance the analysis of people who like to invest and be part of the stock market, because, with the Supersignals, dozens of analyzes are made using the same time necessary to do just one with the common indicators.

The analysis technique is able to identify a purchase, make the volume check and mark a buy signal on the chart. Thus, it is possible to make the programming in the indicator itself (MARTINS, 2010). As they present more confirmation rules, the Supersignals suggest a better performance than studies using automated computational strategies.

3. METHODOLOGY

The methodology adopted was based on the assumptions of exploratory research, supported by descriptive research, whose methodological procedure was the analysis of tests based on the theory of Supersignals, recommended by Martins (2010).

The technical procedure used was based on the use of a robot, operated on the MetaTrader 5 investment platform, in the strategy simulation mode, that is, without the application of real money. The robot is an algorithm created by programmers to respond if any action happens in the market. Illustratively, a person can put a robot to "work" for him, through programming to buy a certain stock if the price tends to increase and sell if the price probably falls. For the effective functioning of the platform, define input parameters is a crucial point, which must consider the time pattern, as well as the input value.

The time pattern, also called timeframe, indicates the regularity of a graphic when generating a candle (or bar). Each candle represents the share price in the given period, providing four prices: open, minimum, maximum, and close. The entry value is measured in number of shares and indicates the number of shares the investor would trade the share. For example, if you put quantity 1 on the platform, it will mean a lot of shares and if you place 100, it will be a hundred lots of shares.

Returning to the assumptions of Martins (2010), supersignals are analyzes to be applied to any type of asset. However, as MetaTrader 5 works with different stocks, the indices used for carrying out market tests were those of Bovespa. After choosing the index, it is necessary to configure some fields for the effective functioning of the platform, with the following elements, namely:

1) Date: customize the moment when the robot performs the analyzes. Such a tool is used when the analysis is performed in a certain past period.

2) Forward: customize the moment when the robot will have to perform the analysis. Such a tool is used when the analysis is done "forward", that is, in real time.

3) Execution: choice of platform latency and how the results will be evaluated. Always selecting the “every tick is based on a real tick” mode, thus demonstrating that every tick that was given in a non-simulation environment will be given on the platform. The platform understands this operation because the historical prices are recorded, being used only when a test is carried out in each period.

4) Optimization: this criterion is necessary only in cases of running the robots with a few more algorithms, which was not used by this study.

As the system implies that, at the first moment the algorithm run, the investor is out of the market, the first sign will always be a buy. From there, any movement between the closing price and the three lines studied in the supersignals that are no longer favorable to the purchase of the asset, will cause the robot to exit the market. After this exit, the robot waits for another signal to re-enter the market, buying or selling the shares.

According to Martins (2010) supersignals work better in purchases than in sales, which was used as a parameter for carrying out the tests. Also according to the author, the supersignals technique is not evaluated according to the risks that each action presents, in this sense, the operator must be in constant contact with the tool, since after the tool releases the signal, whoever performs the action is the operator.

After the robot has finished running on the platform, analyzes of all transactions carried out are delivered, such as the number of entries and exits from the market, the percentage of correct and error purchases and sales, among other information.

The work is demonstrated by assets that are traded by Ibovespa, which were chosen based on their proportion of shares in the Brazilian market. Assets with a high number of shares comprising the theoretical portfolio were used and, in most cases,, it was compared with another asset in the same sector. The assets, separated by sector, are shown in Table 1:

Table 1 - Assets used to test the profit/loss of the Supersignals

Sector	Company	Code
Industrial Goods / Transportation Materials	EMBRAER	EMBR3
Cyclical Consumption / Trade	LOJAS AMERICANAS	LAME4
	LOJAS RENNER	LREN3
Cyclic Consumption / Civil Construction	MRV	MRVE3
Financial and others / Finance	BRABESCO	BBDC4
	ITAUUNIBANCO	ITUB4
	SANTANDER	SANB11
Financial and other / Miscellaneous Financial Services	BMFBOVESPA	BVMF3
	CIELO	CIEL3
Basic Materials / Mining	VALE	VALE3
Oil, Gas and Biofuels	PETROBRAS	PETR4
Telecommunication	TIM	TIMP3
Public Utility / Electric Power	CEMIG	CMIG4
	CPFL ENERGIA	CPFE3

Source: Prepared by the author.

The high number of assets that were studied is partly because there is not much research on the technical analysis of supersignals the market, i.e., the test was done in various sectors to investigate effectiveness. Emphasizing that all assets that have no comparatives, are the largest in their respective sector.

Regarding the number of bars on which the study was carried out (timeframes), we used several different types of timeframes and two totally different time frames for the assets. The timeframes used were: M1 (one minute), M5 (five minutes), M15 (fifteen minutes), H1 (hourly), Daily, and Weekly.

The two scenarios are the analyses of one and ten years, with the first on the period from 01/01/2017 to 11/14/2017 and the second interval comprises 11/20/2007 – 11/20/2017. Finally, any analysis, regardless of the asset, timeframe or scenario used, simulated trades of 100 shares.

4. RESULTS ANALYSIS

The analysis, which is based on robot tests in the Metatrader 5 software using the 14 assets mentioned above, in which we analyzed the functioning of the technical indicator (supersignals of the technical analysis), was carried out in two totally different scenarios, short and long term. The historical data used were in relation to the period from 01/01/2017 to 11/14/2017 in the first analysis and from 11/20/2007 to 11/20/2017 in the second analysis.

In each scenario analyzed, we performed 2 analyzes. The first analysis was made in a more general way, only with the percentage of profit or loss that each asset gave us as a

response if we used the supersignals for the stipulated period. The second analysis was based on the indication of the best effectiveness of the supersignals, being considered more effective in purchasing operations than in sales.

The first scenario analyzed was the short term, in the period from 01/01/2017 to 11/14/2017. The first analysis of the scenario showed that the indexes responded better to a lower number of bars, that is, the lower the number of timeframes, the greater profit many assets had. Figure 1 depicts the outcomes.

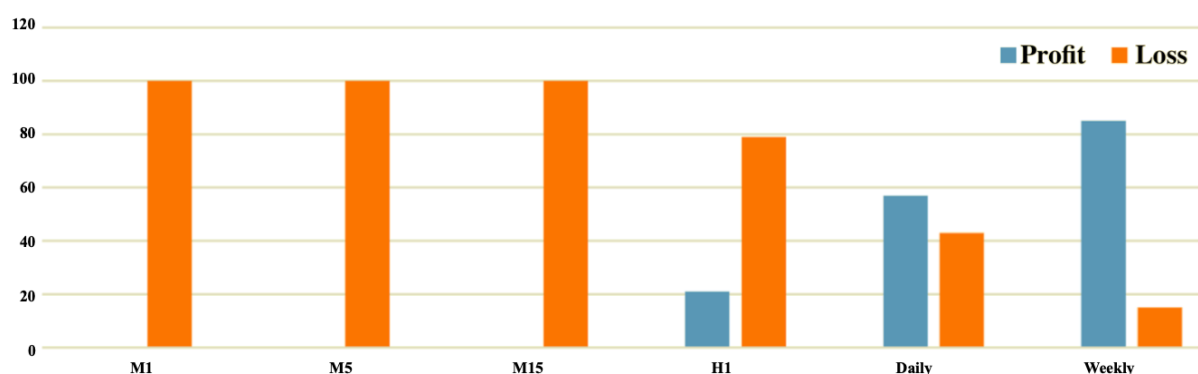


Figure 1 - Percentage of Profit or Loss in 1 year of use of Supersignals.

Source: Adapted from Metatrader 5 by authors.

In the first 3 timeframes, in which bars are generated in times M1, M5 and M15, we had a 100% loss, that is, of the 14 assets studied, all had a gross loss greater than the gross gain. In the next timeframe, which generates bars hourly, we saw an improvement, where losses decreased, and the first assets had positive total net income. From 14 assets, only 3 generated profit at the end of the period studied, which did not exceed R \$ 320.00 and even though it is proportionally low, it demonstrates that the Supersignals can work as a strategy in the stock market. Moving forward, daily and weekly timeframes showed good responses in more than 50% of the assets. This shows that in the annual study period, it is more effective to use timeframes with more time spacing, that is, that generate fewer bars per period. In the daily timeframe, 57% (8/14) of the assets showed total net profit and in the weekly, 85% (12/14) showed a positive response to the study. In the first, which also did not generate exorbitant profits, we had a maximum return of R\$ 327.00. The last timeframe, on the other hand, proves to be more profitable, with a net profit of R\$ 605.00 (0.6%).

Soon after, in the second analysis, the relationship between positive and negative transactions of purchases and sales made by the robot was verified using the supersignals of the technical analysis. This analysis was divided into 2 stages. The first, to verify the total purchases and sales of each stock, regardless of the timeframe used, was performed with the sum of all purchases and sales of all timeframes, analyzing the percentage of positive and negative transactions. The second, analyzed by timeframe, was not considered the asset studied, but the responses by period. Tables 2 and 3 indicate the robot results report:

Table 2 - Sell Orders - Robot Operation 1 Year

Stock	Timeframe						Accumulated Profit	Relative Gain/Loss (%)	Number of orders
	M1	M5	M15	H1	Daily	Weekly			
BBDC	(R\$ 5.429,00)	(R\$ 1.474,00)	(R\$ 775,00)	(R\$ 905,00)	(R\$ 142,00)	R\$ 0,00	(R\$ 8.725,00)	(8,73)	4432
BVMF	(R\$ 5.179,00)	(R\$ 1.285,00)	(R\$ 84,00)	(R\$ 551,00)	(R\$ 38,00)	(R\$ 38,00)	(R\$ 7.955,00)	(7,96)	4456
CIEL	(R\$ 5.570,00)	(R\$ 848,00)	(R\$ 48,00)	R\$ 114,00	R\$ 151,00	(R\$ 189,00)	(R\$ 6.390,00)	(6,39)	7698
CMIG	(R\$ 3.884,00)	(R\$ 452,00)	(R\$ 66,00)	(R\$ 10,00)	R\$ 119,00	R\$ 126,00	(R\$ 4.367,00)	(4,37)	4548
CPFE	(R\$ 8.628,00)	(R\$ 4.087,00)	(R\$2.707,00)	(R\$ 604,00)	(R\$ 17,00)	R\$ 0,00	(R\$16.043,00)	(16,04)	7118
EMBR	(R\$ 4.663,00)	(R\$ 1.371,00)	(R\$ 875,00)	(R\$ 986,00)	(R\$ 179,00)	R\$ 0,00	(R\$ 8.074,00)	(8,07)	4479
ITUB	(R\$ 5.307,00)	(R\$ 1.165,00)	(R\$ 505,00)	(R\$ 244,00)	(R\$ 65,00)	R\$ 119,00	(R\$ 7.167,00)	(7,17)	4398
LAME	(R\$ 5.261,00)	(R\$ 625,00)	(R\$ 432,00)	R\$ 396,00	R\$ 185,00	(R\$ 119,00)	(R\$ 5.856,00)	(5,86)	4323
LREN	(R\$ 6.686,00)	(R\$ 1.510,00)	(R\$ 947,00)	(R\$ 655,00)	(R\$ 535,00)	R\$ 0,00	(R\$10.333,00)	(10,33)	4511
MRVE	(R\$ 5.261,00)	(R\$ 1.184,00)	(R\$ 356,00)	(R\$ 191,00)	(R\$ 4,00)	R\$ 68,00	(R\$ 6.928,00)	(6,93)	4449
PETR	(R\$ 4.282,00)	(R\$ 660,00)	(R\$ 297,00)	(R\$ 120,00)	(R\$ 56,00)	(R\$ 22,00)	(R\$ 5.437,00)	(5,44)	4207
SANB	(R\$ 5.330,00)	(R\$ 1.314,00)	(R\$ 209,00)	(R\$ 533,00)	R\$ 117,00	R\$ 389,00	(R\$ 6.880,00)	(6,88)	4221
TIMP	(R\$ 4.847,00)	(R\$ 1.099,00)	(R\$ 525,00)	(R\$ 233,00)	(R\$ 63,00)	(R\$ 114,00)	(R\$ 6.881,00)	(6,88)	4687
VALE	(R\$ 4.360,00)	(R\$ 1.448,00)	(R\$ 812,00)	(R\$ 123,00)	(R\$ 341,00)	(R\$ 5,00)	(R\$ 7.089,00)	(7,09)	3879

Source: Adapted from Metatrader 5

We can draw some conclusions about the assets studied with these tables. The first is that with the thought of not caring about timeframes, the results are not encouraging, as adding all the periods analyzed in a year using the supersignals on all assets to assess whether the purchased transactions are actually more profitable than sales transactions, we verify that this does not happen. In only 2 of the 14 assets we had a higher profitability in transactions purchased than in those sold. Although this has occurred and even though the operations sold are higher than those purchased, until then, this does not show an encouraging result. The asset that had the best percentage of profitability in all timeframes, was 0.45% in operations purchased from Lojas Renner.

Table 3 - Buy Orders - Robot Operation 1 Year

Stock	Timeframe						Accumulated Profit	Relative Gain/Loss (%)	Number of orders
	M1	M5	M15	H1	Daily	Weekly			
BBDC	(R\$ 5.720,00)	(R\$ 1.530,00)	(R\$ 44,00)	(R\$346,00)	R\$ 403,00	R\$ 375,00	(R\$ 6.862,00)	(6,86)	6286
BVMF	(R\$ 6.067,00)	(R\$ 1.685,00)	(R\$ 664,00)	(R\$237,00)	R\$ 236,00	R\$ 294,00	(R\$ 8.123,00)	(8,12)	6691
CIEL	(R\$ 6.978,00)	(R\$ 1.370,00)	(R\$ 195,00)	(R\$170,00)	R\$ 176,00	(R\$236,00)	(R\$ 8.433,00)	(8,43)	6975
CMIG	(R\$ 5.741,00)	(R\$ 510,00)	(R\$ 274,00)	(R\$122,00)	R\$ 21,00	R\$ 106,00	(R\$ 6.520,00)	(6,52)	6730
CPFE	(R\$ 8.829,00)	(R\$ 3.828,00)	(R\$2.863,00)	(R\$918,00)	R\$ 110,00	R\$ 241,00	(R\$ 16.087,00)	(16,09)	9762
EMBR	(R\$ 5.007,00)	(R\$ 2.365,00)	(R\$1.078,00)	(R\$712,00)	R\$ 11,00	R\$ 158,00	(R\$ 8.993,00)	(8,99)	6492
ITUB	(R\$ 9.472,00)	(R\$ 2.023,00)	(R\$ 915,00)	R\$ 82,00	(R\$159,00)	R\$ 368,00	(R\$ 9.119,00)	(9,12)	6536
LAME	(R\$ 6.814,00)	(R\$ 1.239,00)	(R\$ 602,00)	(R\$366,00)	(R\$ 47,00)	(R\$424,00)	(R\$ 9.492,00)	(9,49)	6442
LREN	(R\$ 6.926,00)	(R\$ 920,00)	(R\$ 559,00)	R\$ 502,00	R\$ 63,00	R\$ 454,00	(R\$ 7.386,00)	(7,39)	2334
MRVE	(R\$ 6.814,00)	(R\$ 1.106,00)	(R\$ 413,00)	(R\$ 3,00)	R\$ 69,00	R\$ 357,00	(R\$ 7.910,00)	(7,91)	6362
PETR	(R\$ 5.562,00)	(R\$ 1.072,00)	R\$ 64,00	(R\$172,00)	(R\$196,00)	R\$ 50,00	(R\$ 6.888,00)	(6,89)	6265
SANB	(R\$ 6.026,00)	(R\$ 1.532,00)	(R\$ 280,00)	(R\$113,00)	(R\$189,00)	R\$ 216,00	(R\$ 7.924,00)	(7,92)	6100
TIMP	(R\$ 5.787,00)	(R\$ 1.151,00)	(R\$ 173,00)	(R\$270,00)	R\$ 186,00	R\$ 185,00	(R\$ 7.010,00)	(7,01)	6555
VALE	(R\$ 6.640,00)	(R\$ 919,00)	(R\$1.067,00)	R\$ 443,00	R\$ 327,00	R\$ 392,00	(R\$ 7.464,00)	(7,46)	6037

Source: Adapted from Metatrader 5

After the first conclusion, however, we must evaluate the timeframes separately, going to the second stage of the study. We found that in analysis 1 about half of the periods studied had 100% negative returns and the rest of the analysis had significant improvements, we also analyzed this other side of the bought and sold transactions.

Table 4 - Analysis of 1 year in Buy and Sell of Brazilian stocks in six timeframes.

Timeframe	Sell Orders		Buy Orders	
	Raw Gain (Loss)	Relative (%)	Raw Gain (Loss)	Relative (%)
M1	(R\$ 74.687,00)	- 74,69	(R\$ 89.383,00)	- 89,38
M5	(R\$ 18.522,00)	- 18,52	(R\$ 21.250,00)	- 21,25
M15	(R\$ 9.618,00)	- 9,62	(R\$ 9.063,00)	- 9,06
H1	(R\$ 4.645,00)	- 4,65	(R\$ 2.062,00)	- 2,06
Daily	(R\$ 868,00)	- 0,87	R\$ 1.011,00	1,01
Weekly	R\$ 215,00	0,22	R\$ 2.536,00	2,54

Source: Adapted from Metatrader 5

The second stage demonstrates, from the tables, how the technical analysis depends a lot on how each asset will be evaluated. Despite not showing such an apparent change, the tables show that the purchasing indices are much closer to sales transactions and in the period M15, H1, Daily and Weekly, it exceeded the operations sold. The biggest difference was 2.32% in weekly operations. In addition, some Weekly operations had few transactions and ended up generating 100% profitability, despite the low added value.

The results found in the 1 year analysis to evaluate the effectiveness of the technical analysis supersignals in the stock market using 14 different assets, show that the investor before actually using this tool, must simulate several scenarios with the value that will be

invested, to evaluate the risks and possible gains of your investment. This indicates that the use of an automated trading strategy in the stock market can generate profit and that in the case of these assets studied with the annual analysis, it would be best to try the actions on the timeframes with the least number of bars, that is, daily or weekly. . However, most responses were negative regarding supersignals and even when positive, they did not generate a relatively high profit for 1 year of investment.

The second scenario analyzed was the long-term one, from 11/20/2007 to 11/20/2017, which used the same analyzes and timeframes as scenario I. This scenario, based on the decade, had a different return compared to the previous one. Figure 2 shows that positive results started to appear in previous timeframes and that the period that had generated the most positive net results, was not so positive at the end of 10 years.

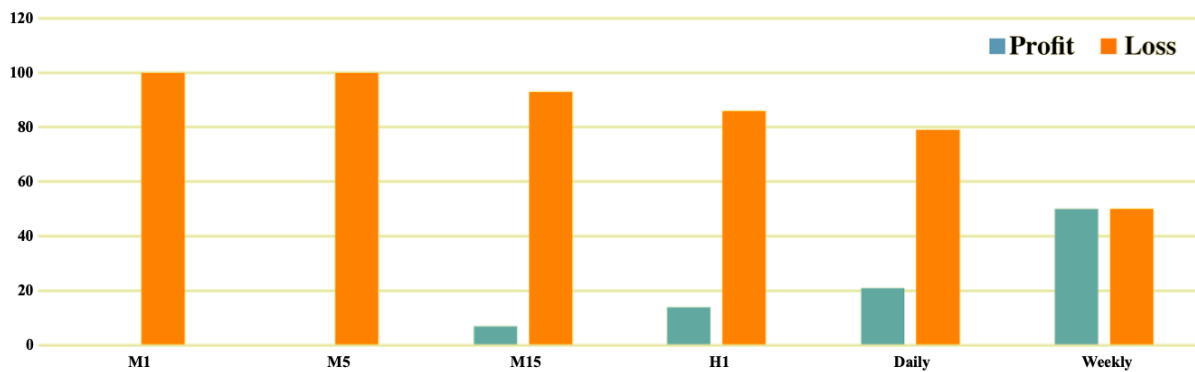


Figure 2 - Percentage of Profit / Loss in 10 years of use of Supersignals

Source: Prepared by the author.

Even in the longest testing period, timeframes M1 and M5 continued to impair all studied assets. This demonstrates that the closing of the market as one of the indices that most "judge" the appearance of the supersignal, may be hindering the automated strategy, because the more bars the analyzes show, the greater the loss generated. Unlike the first scenario, the M15 timeframe generated profit, totaling 7% of positive results, that is, 1 asset among the 14 generated positive net result. H1, Daily and Weekly, as shown above, generated positive results, as in the analysis made for 1 year. Although they generated a positive result, they were lower than the first ones, being 13, 21 and 50%, respectively. Regarding the monetary value, two results called attention, the first, in the shares of VALE and PETR studying the

period H1, the net profit of R \$ 4,563.00 (4.56%) and R \$ 2,361.00 (2, 36%), respectively and weekly, with a final net profit of R \$ 1,311.00 (1.31%) on Lojas Renner shares.

In the first step of the second analysis, looking at the graphics generated by Metatrader, we see that the pattern of the analysis made with the period of 1 year is the same. The total percentage of profitable operations is low, both for purchases and sales and does not generate many positive results. However, as we can see in the tables below, we had some surprises that generated a lot of positive indexes, both in sold and bought transactions. In the first one, we have the operations sold from CEMIG and PETROBRÁS, generating 1.073% to 1.707% profitability, which was not seen in any annual timeframe, which reached only 0.45%. In addition, the total sum of the Petr4 option sold was 4% profitable.

Table 5 - Sell Orders - Robot Operation 10 Years

Stock	Time frame				Accumulated Profit	Relative Gain/Loss (%)
	M15	H1	Daily	Weekly		
BBDC	(R\$ 3.198,00)	(R\$ 2.444,00)	(R\$ 987,00)	(R\$ 847,00)	(R\$ 7.476,00)	(7,48)
BVMF	(R\$ 2.725,00)	(R\$ 1.316,00)	(R\$ 1.032,00)	(R\$ 50,00)	(R\$ 5.123,00)	(5,12)
CIEL	(R\$ 3.321,00)	(R\$ 1.534,00)	(R\$ 420,00)	R\$ 73,00	(R\$ 5.202,00)	(5,20)
CMIG	(R\$ 2.648,00)	(R\$ 748,00)	(R\$ 49,00)	R\$ 1.073,00	(R\$ 2.372,00)	(2,37)
CPFE	(R\$ 9.261,00)	(R\$ 2.440,00)	(R\$ 1.730,00)	(R\$ 24,00)	(R\$ 13.455,00)	(13,46)
EMBR	(R\$ 4.175,00)	(R\$ 2.096,00)	(R\$ 874,00)	R\$ 454,00	(R\$ 6.691,00)	(6,69)
ITUB	(R\$ 1.995,00)	(R\$ 1.332,00)	(R\$ 942,00)	(R\$ 1.836,00)	(R\$ 6.105,00)	(6,11)
LAME	(R\$ 4.239,00)	(R\$ 685,00)	(R\$ 871,00)	(R\$ 512,00)	(R\$ 6.307,00)	(6,31)
LREN	(R\$ 4.684,00)	(R\$ 1.934,00)	(R\$ 1.286,00)	R\$ 117,00	(R\$ 7.787,00)	(7,79)
MRVE	(R\$ 2.270,00)	(R\$ 719,00)	R\$ 627,00	(R\$ 335,00)	(R\$ 2.697,00)	(2,70)
PETR	R\$ 936,00	R\$ 1.707,00	R\$ 1.098,00	R\$ 259,00	R\$ 4.000,00	4,00
SANB	(R\$ 4.129,00)	(R\$ 2.585,00)	(R\$ 1.240,00)	R\$ 312,00	(R\$ 7.642,00)	(7,64)
TIMP	(R\$ 5.133,00)	(R\$ 1.292,00)	(R\$ 315,00)	(R\$ 35,00)	(R\$ 6.775,00)	(6,78)
VALE	(R\$ 902,00)	R\$ 1.046,00	(R\$ 643,00)	(R\$ 952,00)	(R\$ 1.451,00)	(1,45)

Note: Profit M1 and M5 need greater computational capacity for analysis. Source: Adapted from Metatrader

In the second one, we had the options purchased from BOVESPA and LOJAS RENNER weekly, and VALE every hour, which drew a lot of attention. Although the accumulated profitability all gave negative values, in the timeframes mentioned we had 0.9% to 3.51% profitability, which really shows a significant improvement of the other graphs.

Table 6 - Purchased Operations - Robot Operation 10 Years

]	Timeframe				Accumulated Profit	Relative Gain/Loss (%)
	M15	H1	Daily	Weekly		
BBDC	(R\$ 4.749,00)	(R\$ 244,00)	R\$ 81,00	R\$ 338,00	(R\$ 4.574,00)	(4,57)
BVMF	(R\$ 2.654,00)	(R\$ 693,00)	(R\$ 117,00)	R\$ 994,00	(R\$ 2.470,00)	(2,47)
CIEL	(R\$ 3.394,00)	(R\$ 646,00)	R\$ 194,00	R\$ 564,00	(R\$ 3.282,00)	(3,28)
CMIG	(R\$ 4.133,00)	(R\$ 221,00)	(R\$ 393,00)	(R\$ 86,00)	(R\$ 4.833,00)	(4,83)
CPFE	(R\$ 8.604,00)	(R\$ 1.999,00)	R\$ 6,00	R\$ 417,00	(R\$ 10.180,00)	(10,18)
EMBR	(R\$ 5.744,00)	(R\$ 1.138,00)	(R\$ 849,00)	R\$ 475,00)	(R\$ 7.256,00)	(7,26)
ITUB	(R\$ 3.129,00)	(R\$ 567,00)	R\$ 3,00	R\$ 243,00	(R\$ 3.450,00)	(3,45)
LAME	(R\$ 4.844,00)	(R\$ 1.073,00)	R\$ 413,00	(R\$ 550,00)	(R\$ 6.054,00)	(6,05)
LREN	(R\$ 3.745,00)	(R\$ 56,00)	(R\$ 14,00)	R\$ 1.194,00	(R\$ 2.621,00)	(2,62)
MRVE	(R\$ 3.191,00)	R\$ 14,00	(R\$ 261,00)	(R\$ 122,00)	(R\$ 3.560,00)	(3,56)
PETR	(R\$ 646,00)	R\$ 654,00	(R\$ 524,00)	(R\$ 338,00)	(R\$ 854,00)	(0,85)
SANB	(R\$ 4.121,00)	(R\$ 848,00)	(R\$ 212,00)	R\$ 529,00	(R\$ 4.652,00)	(4,65)
TIMP	(R\$ 6.018,00)	(R\$ 1.455,00)	R\$ 58,00	R\$ 14,00	(R\$ 7.401,00)	(7,40)
VALE	(R\$ 6.065,00)	R\$ 3.517,00	R\$ 868,00	(R\$ 226,00)	(R\$ 1.906,00)	(1,91)

Note: Profit M1 and M5 need greater computational capacity for analysis. Source: Adapted from Metatrader 5

In the second stage of analysis II, we will again analyze by timeframe, regardless of the asset.

Table 7 - Analysis of 10 years in Buy and Sell of Brazilian stocks in six timeframes.

Timeframe	Sell Orders		Buy Orders	
	Raw Gain (Loss)	Relative (%)	Raw Gain (Loss)	Relative (%)
M15	(R\$ 47.744,00)	- 47,74	(R\$ 61.037,00)	- 61,04
H1	(R\$ 16.372,00)	- 16,37	(R\$ 4.755,00)	- 4,76
Daily	(R\$ 8.664,00)	- 8,66	(R\$ 747,00)	- 0,75
Weekly	(R\$ 2.303,00)	- 2,30	R\$ 3.446,00	3,45

Source: Adapted from Metatrader 5

In the second stage of analysis II, we reached the same conclusion as the second stage of the first analysis. as we evaluated by timeframe, the percentages of positive indexes grow a lot and again the purchase operations have grown and in the last periods (H1, Daily and Weekly) exceeded the sales operations in percentage of profitability. The answer that scenario II showed us is very similar to the first, since every investor who uses the supersignals of technical analysis will have to evaluate their desired assets and timeframes a lot.

5. CONCLUSION

In this paper, the hypothesis of an efficient market and stock price forecasts based on technical analysis were discussed. The first indicates that there is no way to predict asset prices on the stock market. This fact is explained by the fact that the asset is priced by several factors and only someone with privileged information can try to predict this new price. The second, based on Dow's Theory, is based on the technical analysis of forecasting of movements of assets in the stock market. Starting from the second assumption and using this current of thought, an automated trading method was evaluated based on the supersignals of technical analysis, by Martins (2010).

The method used by means of a robot, performed tests on 14 assets using two scenarios, short and long term (analysis of 1 and 10 years, respectively). The results, of 1 and 10 years were similar, both in values and trends. Evidence that the supersignals of technical analysis can work, however alone is not an index capable of letting investors sleep without worry.

Another observation made was in relation to the tests made from Metatrader 5, where the purchase operations have a profit power equal to or many times less than the sales operations. Again, if it were crossed with another index, we could have another alternative of gain.

In this study, we had some impediments regarding the study and testing. The supersignals of technical analysis, being a relatively recent theory, have not yet been studied and there are not many tests using robots by investors. In addition, other limitations are the applicability, as it was applied only in the Brazilian asset market, and the use of technology to have a more improved response, as for example in the second analysis of 10 years, no computer available to the study ran the M1 timeframes and M5, which generated more than 300 thousand lines and 156mb per asset, requiring greater computational capacity to perform the complete analysis.

The tests carried out showed that the supersignals can help to generate profits, however in the tests we obtained only 30% of profitability power, that is, it would be better used if more indexes were added to cross the robot. From the profitability that the supersignals obtained, we saw that the majority tests were generated with longer timeframes, which can be useful for supporting decisions and encourage future studies either. The

combination with other indicators would also improve the robot's performance.

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