ISSN: 2278-3369

International Journal of Advances in Management and Economics
Available online at: **www.managementjournal.info**

RESEARCH ARTICLE

Stock Market in Brazil: Portfolio based on Dividend Payout or Technical Analysis Based on MACD?

Braga, Robson[1,4], De Sousa, Edmilson P.[1,4], Brugni, Talles V.[1,2,3*],

[1] Accounting Department at University of São Paulo (USP), Brazil.

[2] Accounting and Stock Markets at University of São Paulo (USP).

[3] Accounting and Stock Markets at Federal University of Espírito Santo (UFES).

[4] State University of Bahia (UNEB), Brazil.

*Corresponding Author: Email: **tallesbrugni@hotmail.com**

Abstract

We identify the difference in return between a portfolio of the Ten Brazilian Companies that pay more dividends and results of investment decisions using a technical analysis indicator, the Moving Average Convergence-Divergence (MACD). Our goal was to verify whether, in the period 2008-2013, the results of the buy and hold strategy for earnings per dividend outweigh or not the speculative behavior of using technical analysis. We found evidence that decision focused on dividends are gainful. Average earnings were well above of those obtained by using the MACD, a relationship of 121.23% against 38.24%. We have identified that the results are greater when comparing the gains that would be obtained if the shares were bought at the beginning of the period and sold at the end (average of 97.54 percent). MACD results were higher than those that provided the main Brazilian stock index, the IBOVESPA, which in the period showed negative performance.

Keywords: *Returns, Dividends, MACD.*

Introduction

In General, regardless of the time you keep your investments, the goal of every investor is to obtain the best gains in order to maximize your wealth. However, it is common to have a distinct rank among those who seek to achieve that goal in the short term in comparison with those who seek in the long term.

One of the elements that distinguish investors is the time by which they intend to keep the asset in their investment portfolios [1]. In spite of the fact that all investing is considered "investors", those who make investments with the intention of keeping them for short deadlines, and seek quick gains, are referred to as speculators [2].

According to Kanitz [3] the term speculator refers to the person who can see the future or see beyond what others see. Then, in the context of stock market speculator would be the investor who can anticipate market movements and profit in times of market fluctuation [4].

Be focused on the seeking for consistent gains over a longer time interval, like long-term investors, or on the seeking for faster gains and with high volume of operations. Anyone seeking to make investments can be faced with the challenge of predicting the movement of prices in the market [5]

Graham [4] states that speculation is different from investment, because investment is done through evaluation, which aims at obtaining return with some security, while speculation would be exempt from most accurate analysis and could refer to emotional or irrational decisions, such as those identified in the work of Tomaselli and Oltramari [6].

Given that, the capital market is considered too risky [7]; some investors seek to invest their resources in lower-risk assets, such as fixed income. On the capital market a strategy would be to invest in assets with regular dividend payment history [4], which generate longitudinal gains, and are sustained by the regularity of companies in generating positive results.

For some, the consistency of a company in remunerate its investors with regular and consistent payments of dividends or other proceeds, as interest on net equity, meets the demands of long-term gains and investors seek to tailor their investments to dividend policy of companies in which choose to invest [8].

Others believe that should seek to find the timing of buying and selling, so you get fast gains, with the difference between the acquisition price and liquidation of an investment, in the shortest time, as does the speculators [4].

Among investors who make short-term investments is common the use of techniques and statistical evaluations, called technical or graphic analysis. According to Assaf Neto [9], technical or graphical analysis establishes projections about the behavior of stock prices from observed patterns in past market performance. The technical indicators aims to assist investors in interpreting trend in prices and decision-making about shares [10].

Among the technical indicators used in graphical analysis, we can mention the moving averages that are used in studies of pricing trend trackers like Moving Average Convergence-Divergence (MACD) [11]. The MACD is based on differences between exponential moving averages of certain periods to identify moments of buying and selling of an asset, based on verification of high or low trend.

Research Question and Goals

MACD is used as an instrument that seeks to optimize the operations of investment in the stock market [12]. In addition, MACD is one of the indicators used by software and platforms of operations with stocks [10], in an automated way [13], being recommended for supporting decisions on short-term operations based on technical analysis.

Thereby, there are two strategies of investment decisions: (a) investment in companies with a history of good dividend payments; and (b) by using technical indicators. From these two strategies of stock investment decisions, the present study aims to answer the following research question: The return on investment based on the use of the technical indicator MACD outperforms the investment strategy focused on dividends in the Brazilian capital market?

In previous work, Barber and down the Dean [14] studied investment decisions made through operations in home broker. Jordan and Diltz [15] verified active operations in the stock market during times of high volatility. MACD-based researches were performed by Fernandes-Blanco et al.[10], Chong, Li and Yu [16], Vidotto et al. [17], Eric et al. [12], Marques and Gomes [18]. However, these studies did not examine the relationship between the operational strategies based on the MACD in comparison with investment decisions focused on dividends. Thus, the present study brings contributions to the literature of investment strategies, especially in the Brazilian market.

Theoretical Framework

Investments in Stocks

The financial market brings together the so-called surplus and deficit agents, who seek to transact in order to allocate their resources, as investors, borrowers or lenders resources. The capital market, as part of this context, aims to allow firms to financial funding at lower cost and allows investors to promote alternative savings allocation [19].

The process of selection of investments by companies houses a decision-making dilemma for investors. Portfolio theory, advocated by Markowitz [20] suggests that the relationship between risk and return is weighted to the process of formation of an investment portfolio, suggesting diversification as a strategy to be adopted. This portfolio should take into account the return on assets, theoretically risk-free, to consider the Capital Asset Pricing Model (CAPM) to valuation of assets, as proposed by Sharpe [21]. These are fundamentals that investors can consider in selecting investments, and the use of their own analytical criteria.

With the objective of assisting in this process and pointing coherent analytical criteria, two schools of decision analysis are presented to investors: the fundamentalist and graphic technique, or as some prefer to call, which are not mutually exclusive [22].

To Penman [23], the decisions of buying and selling of an asset observe the relationship between the price of the asset and the value that the buyer sees behind the fundamentals of this asset, which is obtained by the study of information about companies. The process of access and study of information can differentiate investors in the market, and even generate more or less informed investors, the so-called informational asymmetry [24, 25].

The fundamental analysis considers the usefulness of financial information for prediction of results and profits [26]. This kind of analysis evaluates variables both internal and external to the company, which exert influence on its performance and, consequently, about the intrinsic value of their shares. The main subsidies of this criterion of analysis are the financial statements of the company and the various data and information relating to the economic sector of activity, the stock market and the economic conditions. Armed with this set of information, quantitative and financial models are applied with the goal of relating the decisions to buy or sell stocks with its market value [9].

Chong, Li and Yu [16] state that technical analysis involves the study of historical prices to predict the future movement of prices and note that the use of moving averages is one of the main indicators of technical analysis used by the market. According to Appel [11], the use of moving averages serves to soften the "noise" of short-term price fluctuations and enables investors to identify and define significant underlying trends. The use of the main technical indicators is based on moving averages.

Fernandez-Blanco et al. [10] highlight that there are two classes of main technical indicators: trend indicators and oscillators. In turn, Simões [13] considers as technical indicators and trend indicators. The technical indicators are sets of values based on periodic quotations cleared on stock market. The trend indicators approach assesses more specifically the chart behavior, with the construction of trend lines, e.g. support and resistance, denoting points of disruption of historical pricing barriers [13].

Graphics describe fluctuations in shares price and trends in stock prices, in order to identify the best opportunities for transactions [9]. Stock market operations can be performed based on studies of graphics with very different time intervals and can be so short that can be performed on the same day, as the so-called day trade operations, or negotiations of a day [15].

Investors who operate with this short-term strategy are commonly called speculators. According to Kanitz [3], the operations of this type are very risky and investors ' success lies in the ability to properly use the tools techniques and their ability to see beyond what others see, in order to obtain better earnings.

Investors who use these techniques are much more focused on points of buy and sell indicated by such indicators than in the reasons for such movements. Assaf Neto [9] comments that there is not a formal concern with the causes that determine the movement of stock prices on technical analysis, so that attention is focused on the swings presented as a way to predict the future.

Table 1 shows some of the indicators used in technical analysis or graphic, according to Simões [13].

Table 1: Technical analysis indicators

Indicator	Method of calculation	Strategy
Moving Average X Days	The average Price in the last X Days. Exponential: When the price of recent days has a greater weight in the average than the oldest. (This weight increases exponentially).	Buy when the moving average is up, or crosses the line of prices down. Sell when the moving average is a descendant or crosses the line of prices upwards.
Relative Strength Index – RSI	Average of the valuations and devaluations in the last Y Days.	Sell when RSI leaves the area of 70. Buy when RSI leaves the area of 30. (Contrary Indicator).
Rate of Change	Value of the current price The price Z days ago.	This indicator anticipates the changes of meaning of the quotation. One must therefore buy when ROC becomes ascendant. Sell when descendant becomes.
MACD Moving Average Convergence/Divergence	Difference between a medium-term exponential moving average (26 days) and a short-term (12).	Indicates a change in trend. Buy when MACD crosses the 0 value upwards. Sell when it crosses the 0 value down.

OBV On Balance Volume	If the price went up: OBV = OBV previous day + Volume. If the price came down: OBV = OBV previous day - Volume. If the price is maintained, OBV keeps.	Technical indicator that is based on the volume. The purpose of this indicator is to detect the entry or exit of large institutional investors, even if there is no great movement of prices. Buy if the OBV go up more than the price. Sell when the OBV descends.

Source: Simões [13]

About technical analysis, Chong, Li and Yu[16] highlight that it assumes that the information contained in historical prices is not properly incorporated in current prices, which would allow extraordinary gains with its use. This idea originally advocated by Ellinger [27] goes against the theory of efficient markets and the assumptions of rationality of managers. Santos and Santos [28] performed a study that discusses the limitations of the theory of efficient markets, demonstrating anomalies that refute his consistency, especially with regard to the agents' rationality vis-à-vis the information.

According to Brum [29], there are basic premises underlying technical analysis. The first states that the prices discount all good or bad expectations regarding the underlying asset. The second assumes that prices move through trends and the objective of the graphical analysis would be to study and identify these trends. Finally, the premise that this repeats the past, i.e. previous results tend to repeat itself so that it is possible to predict the next trend through historical results.

Different from technical analysis, in which data of past prices to predict your future is enough, on fundamental analysis what is evaluated are aspects relating to economic and financial situation of the company, your area of business, competitors, competitive advantages, economic conditions, among other elements [13]. For Assaf Neto [9], this analysis technique is based on the economic and financial performance of the company and in the processing of sophisticated evaluations and sectorial comparisons, as well as cyclical stock.

For better exposing some of the indicators used in fundamental analysis, table 2 shows multiple accounting-based fundamentalist indexes.

Table 2: Indicators of fundamental analysis

Indicators	Method of calculation	Strategy
PER -Price Earnings Ratio	Market Capitalisation Current Profits	Number of years until the investor to recover their investment in the company. The lower the PER, the better.
DY – Dividend Yield (%)	Dividend Paid Stock Price	Percentage of the dividend distributed in relation to the stock price. The higher the DY, better.
PBV – Price Book Value	Market Capitalization Asset – Liabilities	Ratio of the company's market value and the book value of the company. The smaller the PBV, better.
EPS – Earning Per Share	Earnings Number of shares	The increase in this indicator over time is a sign that the company is generating increasing profits.
PCF – Price Cash-Flow	Market Capitalization Cash-Flow	Measures the company's ability to generate money. The smaller the PCF, the better.

Source: Simões [13].

Assaf Neto [9] brings the Q of Tobin, an indicator used for prediction of potential appreciation of the company. It indicates the wealth added to the company by the market in response to its power to generate profits. The Q of Tobin relates the market value of a company with the replacement value of their assets. Such indicators will not be fleshed out in this study, for not being focus of this research.

MACD

The MACD indicator (Moving Average Convergence-Divergence) is in the category of technical indicators. MACD is the difference between two exponential moving averages [13]. The calculation of traditional MACD, as advocated by Appel [11], is based on the difference between an average of 26 days and a short of 12 days [10], so that:

$$MACD = EME_{(12)} - EME_{(26)} \quad \text{Eq. 01}$$

In which: $EME_{(12)}$ is the twelve-day exponential moving average and $EME_{(26)}$ is the twenty six-days exponential moving average.

After calculating the MACD, it is necessary to calculate the 9-day exponential moving average, based on the oscillations of the values of MACD, which will serve as slow signal line for construction purposes of graphic for setting out the points of buy and sell [17]. To this end, we used the equation 01, considering the exponential average of 26, 12 and 9 periods, as suggested by Appel [11].

$$EME = P_t \times K - EME_{(t-1)} \times (1-K) \quad \text{Eq. 02}$$

In which: K = 2 / (N+1); *EME* = exponential moving average; N = number of days of EME; Pt = Current price; EME (t-1) = exponential moving average of the previous day.

These three parameters (exponential average of 26, 12 and 9 days) comprise the set of evolutionary algorithms of analytical technique [10]. We build the spreadsheet with the values of the daily points of lines considering the decision criterion of MACD[1].

Chong, Li and Yu [16], highlight the decision criteria of buying and selling, which must be performed when the following parameters are achieved:

Buy: MACD(t −1) < 0 and MACD(t) > 0
Sell: MACD(t −1) > 0 and MACD(t) < 0

Appel [11] stresses that the successful investment involves two basic questions of decisions: what to buy and sell and when to buy and sell. According to him, the MACD does not indicate what to buy or sell, but rather the time to buy or sell. Typical of technical analysis, it does not matter necessarily the fundamentals, but the trend in prices.

Dividend Policy

Discussions about dividend policy and reinvestment are not new and they derive from propositions about capital structure theories proposed by Miller and Modigliani [30]. From these theories have emerged the discussions about indifference of capital structure and dividend irrelevance, as discussed Ross et al. [31]. The irrelevance of dividend payment would mean that it would not be the shareholders remuneration policy that would affect the firms' stock price, but the reasons that allowed such remuneration was made would be.

On the other hand, as Loss and Sarlo Neto [32] highlight, signaling hypothesis considers that the firm, when stopping financing with resources that it would distribute in the form of dividends, would be indicating good performance and financial health, which would influence the prices of its shares. Far from being a discussion for which sees consensus, what is certain is that shareholders want to receive dividends and are satisfied with when these companies distribute [32].

From the point of view of investors, the choice of companies that distribute dividends on a regular basis would be a decision based on the criteria of fundamental analysis, since this would require evaluating the behavior of future cash flows and the firm's ability to generate and distribute profits, being this a criterion of valuation of the firm [33]. Disregard the dividend policy and focus only on price trend indicators and MACD graphics, for example, keeps the decisions in the field of technical analysis. Doubt about which strategies would yield the investor the best results after a given period remains.

Methods

This study can be classified as exploratory. It is also characterized as being quantitative, in which data were collected, organized and interpreted by descriptive and inferential statistics as suggested by Martins and Theóphilo [34]. The goal is to compare two strategies of stock investment decisions, in order to verify if the investing option based on MACD technical indicator overcomes the strategy focused on dividends.

We collect daily closing quotations of ten companies that paid more dividends (dividend yield) or other earnings, such as interest on net equity, based on data from the Thomson Reuters, during the period from 2008 to 2013. Companies and their respective segments are presented in table 3.

Table 3 shows a high concentration of companies in the electricity and telecommunication segment. However, the reasons for this concentration are not object of discussion of this paper.

[1] The MACD facilitates the decision of buying and selling stocks when determining purchase when the MACD line crossing the signal line from bottom to top.

Table 3: list of companies that paid dividends in the period 2008 to 2013.

Firms	Segment	Code	stock type
Oi S.A.	Telecommunications	OIBR4	Preferred(PN)
Eletrobrás	Electric Energy	ELET6	Preferred(PNB)
CEMIG	Electric Energy	CEMIG4	Preferred(PN)
AES Tietê	Electric Energy	GETI4	Preferred(PN)
Taesa	Electric Energy	TAEE11	Unit (UNT)
Eternit	Construction	ETER3	Ordinary (ON)
Coelce	Electric Energy	COCE5	Preferred(PNA)
Telefônica Brasil	Telecommunications	VIVT4	Preferred(PN)
Siderúrgica Nacional	Iron and Steel Industry	CSNA3	Ordinary (ON)
Pine	Financial	PINE4	Preferred(PN)

Source: [35].

The focus of our study is to determine whether the decision to buy-and-hold, with the objective of obtaining gains from dividends, is better than the decision to operate following the signs to buy and sell proposed by the MACD.

We collect all the historical basis of daily prices of the ten companies that paid more dividends, between 2008 and 2013. The period before 2008 formed the basis for the construction of the historical series that supported the construction of the MACD chart to reflect the reality of the data since the IPO of each firm.

Figure 1 demonstrates a graphic example for viewing of the decision-making process, showing the time window of the year 2008 with the daily closing stock prices of the VIVT4 shares. The range in question highlights the rows 1 and 2 and shows two decision points, respectively moments of "buying" and "selling" as intersections of MACD and signal lines flagged for the dates September 25, 2008 and October 31, 2008. The prices of the operation would have been R$27,13 for buying and R$ 29,85 for selling.

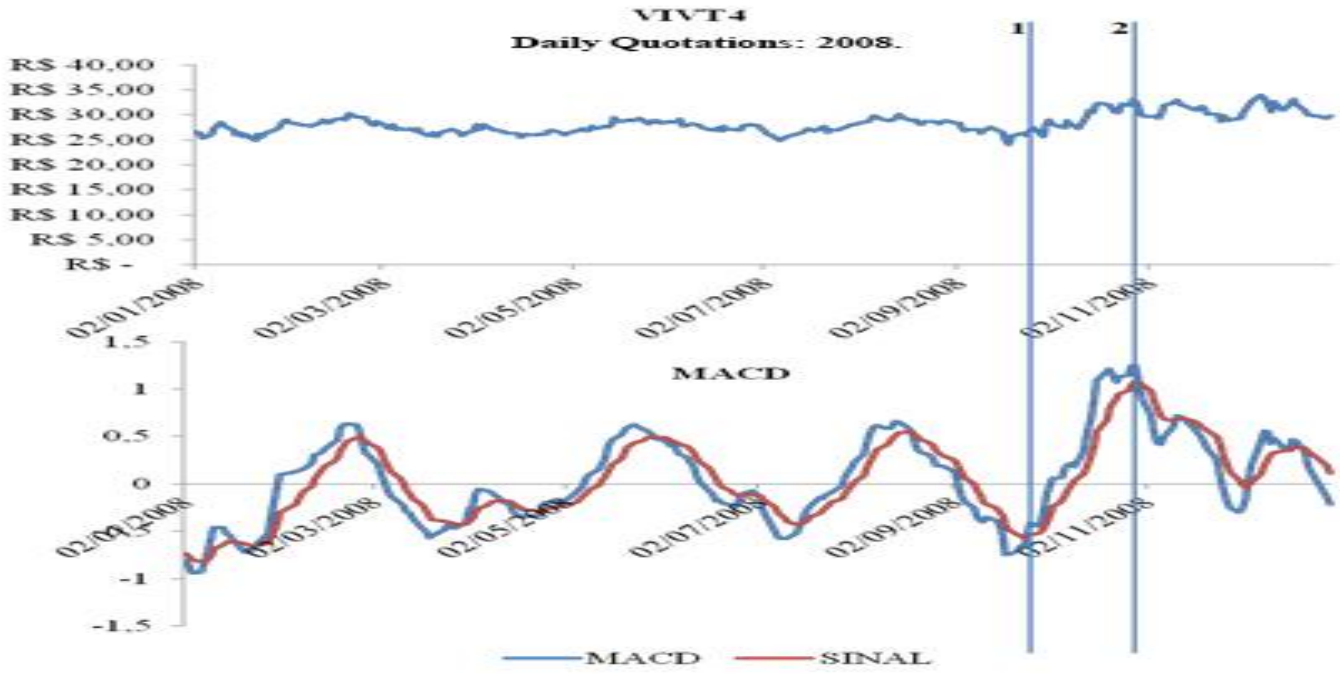

Figure 1: Chart of behavior of prices and the MACD for VIVT4 shares in the year 2008

The upper part of Figure 2 shows the behavior of prices in these respective points, while the lower part shows the MACD and signal lines and their crosses over in the period. The decisions in points 1 and 2 would represent an operation with 9.99% margin, excluding tax and operational expenses.

The identification of points of buying and selling via the graphic display, although simple by being intuitive and visual – one of the strengths of

MACD [17], can be replaced by a statistical worksheet. This procedure would be more efficient for investors, since the point of intersection is clearer, because the value of MACD and the

signal curve can be calculated, as the example of Table 4.

Table 4: Prices, MACD and signal line for TAEE11 shares

Date	Price	MACD Line	Signal line	Decision
23/04/2012	R$ 17,55	0,5243	0,6706	
24/04/2012	R$ 18,46	0,5697	0,6504	
25/04/2012	R$ 18,75	0,6218	0,6447	
26/04/2012	R$ 18,75	0,6555	0,6469	BUY
27/04/2012	R$ 19,04	0,6974	0,6570	
30/04/2012	R$ 20,40	0,8309	0,6918	
02/05/2012	R$ 20,06	0,8987	0,7332	
03/05/2012	R$ 19,81	0,9220	0,7709	
04/05/2012	R$ 19,68	0,9195	0,8006	
07/05/2012	R$ 20,56	0,9769	0,8359	
08/05/2012	R$ 20,56	1,0107	0,8709	
09/05/2012	R$ 20,53	1,0230	0,9013	
10/05/2012	R$ 20,56	1,0234	0,9257	
11/05/2012	R$ 20,25	0,9875	0,9381	
14/05/2012	R$ 20,40	0,9605	0,9426	
15/05/2012	R$ 20,56	0,9409	0,9422	SELL
16/05/2012	R$ 20,39	0,9016	0,9341	

Source: Research data, with the BM&FBovespa quotes.

For best viewing, in table 4 we demonstrate the distribution of values of TAEE11 shares in the period from 23 April to May 16, 2012. We understand that transposition of the MACD value in relation to the signal curve would indicate a decision to "buy", while the reverse would indicate a decision to "sell". In this way, on the first day the moving average of the MACD overcomes the signal line, the investor would buy the action and the sell order would be given on the first day in which the moving average of the signal line overcome MACD.

Results

We build spreadsheets similar to Table 4, with the daily prices based on the closing prices of the trading session of BM&FBovespa, in the period between the first working day of January 2008 and the last working day of December 2013. Table 5 presents the results of these operations.

Table 5: List of companies and the accumulated results with MACD method.

Stock	N.O.	P.O.	M.M.L.	O.P	A.P.O.	Accum. result
CMIG4	52	23	5,07%	29	-3,12%	20,70%
COCE5	53	25	6,59%	28	-3,37%	78,61%
CSNA3	46	16	11,62%	30	-6,58%	-33,67%
ELET6	47	17	6,70%	30	-3,81%	-9,14%
ETER3	50	20	7,56%	30	-3,66%	27,29%
GETI4	57	23	5,17%	34	-2,57%	27,19%
OIBR4	48	19	7,81%	29	-5,19%	-17,32%
PINE4	50	19	11,24%	31	-3,97%	99,15%
TAEE11	34	15	15,35%	19	-4,61%	175,24%
VIVT4	54	18	5,67%	36	-2,32%	14,37%
Mean	49	20	8,28%	30	-3,92%	38,24%
Std.dev.	6,3	3,3	3,38%	4,5	1,27%	63,01%

Source: Survey data. N.O = Total number of operations; P.O = profitable operations; A.P.O = average profit per operation; O.L = operations at a loss; A.L.L = average loss per operation.

We calculate the accumulated profit through the weighing of the results of all operations. We do not consider the opportunity cost of capital in this study. The decision to allocate the capital in other active goes through an evaluation process whose discussion goes beyond the scope of this article.

We have identified that the effectiveness, measured by the ratio of profitable operations and the total number of trades, was around 40%. The average number of profitable operations performed with the MACD was smaller than the operations at a loss. A total of 20 against 30. However, it is worth assessing the average percentage gains and losses in these operations. Profit margins also tend to be larger than the losses, which could compensate for any losing operations.

Losing operations, in turn, tend to occur when the market presents much instability or volatility. It also makes movements of ascent and descent take place so abruptly, creating what is called "false movements" of high and low, as Fernández-Blanco et al. [10] highlight. This would create a kind of "mistake" on indication given by the MACD, where the movement would not be confirmed and the method would point to the trend very "early" or "late". This may have occurred, as results of Table 5, in which one realizes that there were operations that yielded losses for the investor.

After we was found the results of operations using the MACD, we check whether these results were satisfactory in relation to decision-making strategy based on dividend payout.

Table 6: List of companies and the accumulated results with capital gains and dividends.

Stock	Initial price	Final price	Gains	Total earnings	Earnings gains	Accum. gains
CMIG4	R$ 9,51	R$ 18,90	98,74%	15,27	160,57%	259,31%
COCE5	R$ 10,78	R$ 42,52	294,43%	17,08	158,44%	452,88%
CSNA3	R$ 19,22	R$ 11,38	40,79%	8,02	41,73%	0,94%
ELET6	R$ 13,89	R$ 8,80	36,65%	8,53	61,41%	24,77%
ETER3	R$ 3,89	R$ 7,81	100,77%	4,17	107,20%	207,97%
GETI4	R$ 8,86	R$ 22,42	153,05%	11,53	130,14%	283,18%
OIBR4	R$ 9,30	R$ 7,60	18,28%	3,78	40,65%	22,37%
PINE4	R$ 9,14	R$ 14,41	57,66%	4,78	52,30%	109,96%
TAEE11	R$ 5,30	R$ 20,81	292,64%	20,26	382,26%	674,91%
VIVT4	R$ 26,66	R$ 46,34	73,82%	20,68	77,57%	151,39%

Source: survey data.

The results exposed in tables 3 and 4 reduces the need for any additional statistical test for comparison of averages. We can see clearly that for the shares examined in the period, the earnings-based strategy would allow gains much more interesting for investors. An average of 121.23% of earnings for a portfolio distributed equitably among stocks of the companies against 38.24% of the strategy focused on the MACD, based on exponential averages of 9, 12 and 26 periods.

Only for PINE4 shares, the gain with use of MACD overcame the gain with proceeds, 99.15% ratio against 52.30%, respectively. However, when considering the capital gain with the relationship between the buy and sell price, total accumulated gain would overcome the MACD gain, since they would be at 109.96%.

We also highlight two other important points about these results: i) we need to emphasize that we do not consider the gain with reinvestment of proceeds in this study. We hypothesized that the investor keeps the proceeds in cash, generating therefore zero gain on possible reinvestment thereof; and ii) we also we disregard the fact that the MACD strategy could recommend buying and selling on the ex-dividend period. For example, when evaluating the OIBR4 shares, the investor would be entitled to four of the seven streams of earnings paid during the period for having "hit" the record date. Thereby, the gains would be R$ 2.58 per share throughout the period for this asset, possibly reversing the accumulated loss with operations with these shares.

Our findings corroborate the results of studies like those of Eric et al. [12], in which the authors found that the strategy focused on MACD promoted 53.62% gains to investors against 188.39% of the buy and hold strategy. However, the same authors have shown that the results are not conclusive to obtain different results when modifying the original parameters of MACD and combining it with another technique, which was not performed in this study.

Chong, Li and Yu [16] found divergent results of MACD in the context of crisis and confirmed that the MACD can point to controversial results in more volatile markets, as proposed by Fernández-Blanco et al. [10]. Jordan and Diltz [15] noted that active investors who held short-term operations,

typically lost to the average market yield. For us, the operations with use of the MACD indicator tend towards such operations.

Using technical indicators or graphics go towards investment decisions based on active trades, as Bazerman and Moore [35] emphasize. The authors highlight that investors who rely on active operations strategy, with transactions in very short intervals, trying to hit the trend in prices, has a level of accuracy and gains much smaller than they believe and below the average of the market, not to mention the transaction costs that incur.

Our findings show that decisions on investments in shares of companies that present regularity in dividend payout policy have generated an average result higher than the strategy based on the use of the MACD technical indicator. This result was also higher if compared only the capital gain on the same companies based on the strategy of buy-and-hold.

We cannot generalize the results, since other variables were not considered in the study, as the corporate context, the economic moment in the period under study, the behavior of prices of other companies listed on the stock exchange and the use of other complementary/alternative technical indicators to MACD, besides the time window that can be expanded. These questions point not only for the limitations of our study, but signals that further studies opportunities can be realized in the capitals market.

Final Thoughts

We evaluate if the results of the stock investment decisions using the MACD were better than the results of buy-and-hold strategy aimed at earnings based on dividend payout.For this purpose, we selected the ten companies that paid more dividends in the period from 2008 to 2013. From the database of daily closing prices of the shares, we simulate the operations of buying and selling that would be made if the MACD were used.

We found favorable results to the decision focused on dividends. Average gains were superior to those obtained using the MACD, a relationship of 121.23% against 38.24%. The results also are larger when comparing capital gains that would be obtained if the shares were bought at the beginning of the period and sold at the end, 97.54% average.

Anyway, the consideration of these issues would tend to keep the validation of the strategy focused on dividends as being gainful to the database used in our study. On the other hand, this does not invalidate the MACD method. It all depends on the goals of the investor. Depending on the objectives and degree of risk that the investor wishes to try, using the MACD can enable obtaining better results than certain benchmarks. In this study, the results of the MACD were higher than those that provided the main Brazilian stock index, the IBOVESPA, which in the period showed negative performance.

These results, although it does not allow extrapolation to other samples and technical indicators, indicate that operations based on graphics and technical analysis may not result in significant gains to investors, compared with more conservative strategies such as those focused on dividends or on the simple maintenance of a long-term portfolio.

We stress that literature lacks complementary studies that use other technical indicators, including other companies, expanding the time window and using different periods from those used in this study. It is also important to assess the impact of market contexts on the behavior of technical indicators and their relationship with the fundamentals of the companies, aiming to complement the results obtained in our study.

References

1. Jegadeesh N, Titman S (1993) Returns to buying winners and selling losers: Implications for stock market efficiency. The Journal of Finance, 48(1):65-91.
2. Cavalcante Filho FDS, Misumi JY (2001) Mercado de capitais.Rio de Janeiro: Campus.
3. Kanitz S (1793) A origem do especulador. Veja. São Paulo, e, 18.
4. Graham B (2007) O investidor inteligente. Rio de Janeiro: Nova Fronteira.
5. Abu-Mostafa YS, Atiya AF (1996) Introduction to financial forecasting.Applied Intelligence, 6(3):205-213.
6. Tomaselli TR, Oltramari LC (2007) A psicologia do mercado acionário: representações sociais de investidores da BOVESPA sobre as oscilações dos preços. Estudos de psicologia, 12(3):275-283.
7. Damodaran A (1997) Avaliação de investimentos. Rio de Janeiro: Qualitymark.
8. Loss L, Sarlo Neto A (2006) O inter-relacionamento entre políticas de dividendos e de

investimentos: estudo aplicado às companhias Brasileiras negociadas na Bovespa. Revista Contabilidade & Finanças, 17(40):52-66.

9. Assaf Neto A (2014). Mercado Financeiro. 12ª ed. Atlas.

10. Fernández-Blanco P, Bodas-Sagi DJ, Soltero FJ, Hidalgo JI (2008). Technical market indicators optimization using evolutionary algorithms. In Proceedings of the 10th annual conference companion on Genetic and evolutionary computation (pp. 1851-1858). ACM.

11. Appel G (2005) Technical analysis: power tools for active investors. FT Press.

12. Erić DB, Andjelic G, Redžepagić S (2009) Application of MACD and RVI indicators as functions of investment strategy optimization on the financial market. Zbornik radova Ekonomskog fakulteta u Rijeci, časopis za ekonomsku teoriju i praksu-Proceedings of Rijeka Faculty of Economics, Journal of Economics and Business, 27(1):171-196.

13. Simões,ARCRA (2010) STOCKS: Computação Inteligente Aplicada ao Mercado Accionista. Instituto Superior Técnico, Dissertação. Lisboa.

14. Barber BM, Odean T (2002) Online investors: do the slow die first?.Review of Financial Studies, 15(2), 455-488.

15. Jordan DJ, Diltz JD (2003) The profitability of day traders. Financial Analysts Journal, 59(6), 85-95.

16. Chong TTL, Li, C, Yu HT (2008) Structural Change in the Stock Market Efficiency after the Millennium: The MACD Approach. Economics Bulletin, 7(12):1-6.

17. Vidotto RS, Migliato ALT, Zambon AC (2009) Moving Average Convergence-Divergence as a tool for deciding on investments in the stock market. Revista de Administração Contemporânea, 13(2):291-309.

18. Marques FC, Gomes RM (2009) Análise de séries temporais aplicadas ao mercado financeiro com o uso de Algoritmos Genéticos e Lógica Nebulosa. CEFET. Belo Horizonte.

19. Pinheiro JL (2006) Mercado de capitais: fundamentos e técnicas. Atlas.

20. Markowitz H (1952) Portfolio selection. The journal of finance, 7(1):77-91.

21. Sharpe WF (1964) Capital asset prices: A theory of market equilibrium under conditions of risk. The Journal of Finance, 19(3):425-442.

22. Parracho PMVA (2010) PATTERN: Identificação de Padrões em Mercados Bolsistas. Instituto Superior Técnico, Dissertação. Lisboa.

23. Penman SH (2007) Financial statement analysis and security valuation (p. 476). New York: McGraw-Hill.

24. Akerlof GA (1970) The market for" lemons": Quality uncertainty and the market mechanism. The quarterly journal of economics, 488-500.

25. Palepu K, Healy P (2007) Business analysis and valuation: Using financial statements. Cengage Learning.

26. Lopes AB, Galdi FC (2006) Financial statement analysis also separate winners from losers in Brazil. Anais do Seminário de pesquisa econômica da Fundação Getúlio Vargas.

27. Ellinger A (2000) The art of investment (Vol. 83) Wiley.

28. Santos JOD, Santos JARD (2005) Mercado de capitais: racionalidade versus emoção. Revista Contabilidade & Finanças, 16(37):103-110.

29. Brum CA (2008) Aprenda a investir em ações ea operar na bolsa via internet. Ciência Moderna.

30. Miller MH, Modigliani F (1961) Dividend policy, growth, and the valuation of shares. the Journal of Business, 34(4):411-433.

31. Ross S, Westerfield RW, Jaffe J (2002) Administração financeira: corporate finance. São Paulo: Atlas.

32. Loss L, Sarlo Neto A (2003) Política de dividendos, na prática, é importante?. Revista Contabilidade & Finanças, 14(SPE):39-53.

33. Damodaran A (1999) The dark side of valuation: firms with no earnings, no history and no comparables.

34. Theóphilo CR, Martins GDA (2009) Metodologia da investigação científica para ciências sociais aplicadas. São Paulo: Atlas, 225.

35. Bazerman MH, Moore D (2010) Processo decisório. Rio de Janeiro: Campus.