Profitability of Technical Analysis Rules in Emerging and Developed Markets: Review

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This study aims at reviewing the theoretical foundations and literature reviews for technical analysis approach, to examine the ability of this approach to predict the future stock value in both the emerging and developed financial markets. On reviewing several studies in emerging markets and as a result of financial inefficiency, the simplest technical trading rules are able to predict the future stock value. In contrast, the application of these same simple rules (models) for technical analysis results in inaccurate predictions in developed financial markets, however, with the use of some complex models, such as neural network, genetic algorithm, genetic programming, and chartist analysis system for trading (CAST), and technical analysis applied models, the result is so clear in the predictability of the future stock value using the technical analysis approach in developed financial markets. So it can be concluded that the technical analysis is profitable in both emerging and developed financial markets. The study recommended that research and study try to reach the best and most accurate technical analysis models that can be applied in both emerging and developed financial markets, which can then be generalized.

Keywords: technical analysis, emerging markets, developed markets, stock value

Introduction

Brock, Lakonishok, and LeBaron (1992) are pioneers who set the successful investment strategy relying on technical analysis, where they have tested most two common technical trading rules (moving average and trading range break "resistance or support levels"). The real beginning of these two strategies goes back to more than 60 years. Ex, the pioneer of support and resistance levels strategy is Wyckoff (1910), followed by Schabacker (1930) and Neill (1930), while the moving average strategy has been discussed by Gartely (1930).

The importance of using the technical analysis method as a result of the lack of efficiency in the organization, the weakness of some of the legal systems of a number of markets, lack of information, financial reports, and the extent of availability in the financial markets, in addition to the small size of some of the financial markets, are reflected by both the capitalization of financial market index and the number of registered companies in the market. All of the forgoing is part of the emerging financial markets properties (Bekaert & Harvey, 2003; Kraeussl & Roelofs, 2008). In addition to what has been illustrated by Damodaran (2009) and Gimpel (2010), there are a number of market risks as a result of political and economic factors which have made the technical analysis method to get an important ability to predict those risks compared to

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other methods. Damodaran (2009) stated that information gaps and accounting standards have made a significant fluctuation in emerging markets compared to developed markets.

This is definitely inconsistent with the theories that have been classified by Glen (2005) into four hypotheses, namely: the efficient market hypotheses, the random walk theory, the noise theory, and chaos theory. The theory of efficient markets was defined as "security prices fully reflect all available information" (Fama, 1991, p. 1575) and Mabhunu (2004, p. 5) explained that the random walk theory: "All it means is that period-to-period price changes should be statistically independent and un-forecast-able, if they are properly anticipated". Under these theories, technical analysis is worthless, as it is the market that is inefficient, whenever it is possible to predict the future stock value, and vice versa even though the market was efficient in its weak form (Marshall & Cahan, 2005). From the foregoing, it is clear that the concept of technical analysis can be expressed by Chen (2010, p. 2) that is "the study of how past and present price action in a given financial market may help determine its future direction".

In this paper, study reached theoretically that can predict the future stock value by using the technical analysis in the different financial markets (developed and emerging). Despite the weakness of the technical analysis methods to predict under the theory of efficient financial markets even in a weak form, this study shows that by using simple technical analysis methods with advanced operations research models (such as genetic algorithm, genetic programming, and neural networks) can overcome the deficiencies or weakness of technical analysis and then increase the predictive ability of the different levels of financial efficiency. This will be explained in the following points.

Literature Review

Herein a number of previous studies in both emerging and developed markets will be shown, to reach the credibility or unreliability of the technical analysis approach to predict the stock value (prices or returns), using a number of different technical analysis models.

In the Emerging Markets

In a study of emerging markets by Bessembinder and Chan (1995) in order to study the feasibility of trading rules of technical analysis in Asian stock markets, during the period (1975-1989), where they evaluate whether the changes in many Asian stock market indices can be predicted by some simple forms of technical analysis or not.

They concluded that some of the technical trading rules acquire great importance in the ability to predict price changes, so if the Asian stock market is inefficient relatively, the technical analysis may be able to exploit the lack of this efficiency. The results explained that these rules can be quite successful in emerging markets in Malaysia, Thailand, and Taiwan; however, these rules have had explanatory or illustrative power in some developed markets, such as Hong Kong and Japan. Finally, this study concluded that the inefficient financial market is featured by high predictive ability.

It has already had an impact in that. Bessembinder and Chan (1998) have linked the financial market efficiency with returns generated by technical analysis, depending on what they have done in 1995 and finally they concluded that the inefficient financial market is characterized by high predictive ability.

In a study aimed at testing the technical trading strategies in emerging stock market, it has made a study via Ratner and Leal (1999) to study and examine the potential profit of the 10 technical trading rules "moving

average long-term (VMA)" in 10 of the emerging securities markets in both Latin America and Asia in the period from January 1982 until April 1995. Results have emerged Taiwan, Thailand, and Mexico as the markets in which it was found that technical trading strategies may be profitable, they did not find any strong evidence of a profit in other markets. However, they found that 82% of the trading rules tested in groups predict true changes in the returns series.

Gunasekarage and Power (2001) aimed to perform technical analysis on the performance of one group of technical trading rules "simple moving average (SMA)" in four of the emerging financial markets in South Asia, along with the study of the implications of the results of the efficient market hypothesis in the weak form. Results indicate that the technical trading bases predictability in these markets, where it refers to the possibility of achieving the returns through the study of the moving average of the values which are equivalent to those values that are obtained through the use of hold and buy strategy, which raises the value of the excess returns for investors in different markets in South Asia, thus it is consistent with the results of the study via Ratner and Leal (1999).

In a study by Tian, Wan, and Guo (2002) aimed at studying the efficiency of financial markets and the returns from trading technical rules, and by application on both the developed markets (US stock markets) and emerging markets (China's stock markets), which one of the markets has the technical trading rules better able to predict changes in prices and increase in the returns based on the rules of the market under the different levels of efficiency?

By applying the simple trading rules of technical analysis during the period that preceded 1991 for both the American and Chinese stock indices and comparing them together to test their prediction, the results indicate that, for the American market before 1975, there was a feasibility of the technical analysis rules and the ability to predict excess returns and prices changes; whereas from 1975 to 1991, these rules are useless significantly in the result of increased US market efficiency as reflected in the inability to predict by technical trading techniques using historical data. Therefore, this study supports the technical strategies in its capacity to predict excess returns and changes in earnings during the study period in the Chinese stock market, even with the trading costs.

In the Chinese stock market, Li and Chen (2003) aimed at testing the importance of predictive ability of returns, by using the 39 shares listed on the stock trading Shenzhen (SZSE) and the total index SZSE, this sample covering the period from 15 August, 1994 to 22 August, 2002. It was relying on the proposed model (autoregressive model AR (1)). The study results in the inability of technical analysis to predict the movements of future stock returns in the Chinese stock markets and this result is contrary to the views of the inefficiencies in the market for China, which is based on the total market data rather than individual firms data, and thus contrasts with previous studies in other emerging markets.

Atmeh and Dobbs (2006) aimed to reach a performance of the moving average rules in Amman stock exchange and use the time series of daily market index of Jordan during the period from 1 January, 1992 to 30 July, 2001. The results of this study indicate that technical analysis can predict the changes in stock prices and that this evidence is consistent with other studies in emerging markets (e.g., Bessembinder & Chan, 1995; 1998; Ratner & Leal, 1999).

Kung and Wong (2009) aimed at studying the profitability of technical analysis in the Singapore stock market before and after the Asian financial crisis. This study is interested in knowing whether these procedures have led to less profitability for investors who use technical rules to deal in securities or not.

The findings show that the three trading rules (simple moving average, dual moving average, and trading range breakout "resistance and support levels") continuously lead to the creation of the highest annual returns in the period from 1988 to 1996, before the Asian financial crisis, compared to the period from 1999 to 2007 after the reform period; these results indicate that the efficiency of the stock market in Singapore has improved significantly because of the procedures that have been applied after the Asian financial crisis.

In a study by Chen, Huang, and Lai (2009) aiming at studying the extent of predictability and validity of technical analysis in eight of the Asian stock markets, they used bootstrap tests to determine whether there is any supreme technical trading base among the technical trading rules, which are determined by Sullivan, Timmermann, and White (1999),[1] and the application during the period from January 1975 to October 2006, taking into account the biases which explore relevant data, the impact of asynchronous trading, and transaction costs.

As a result of this study, when the bias asynchronous transactions and transaction costs are ignored, the best strategies were the moving average rules. On the opposite, when taking into consideration the transaction costs, the most profitable rules move to those that rely on moving averages in the long term.

Xavier, Massoud, and Chien (2010) attempted to test four technical trading indicators (i.e., moving average indicators, relative strength index "RSI", moving average convergence and divergence "MACD", and momentum trading strategy) in the Mexican stock exchange, and by using daily closing price data in the Mexican IPC index, and the daily returns account as changes in the logarithms of IPC index, during the period from 1 January, 1988 to 30 June, 2009. Findings for all four indicators showed that all the differences in the buy-sale were positive (except MACD) and the value of *t*-stat for these variations was highly significant, which leads to the rejection of null hypothesis of equality of the average returns buying days with average returns the days sales.

In a study by Assaleh, El-Baz, and Al-Salkhadi (2011) aiming at using the two models to predict stock prices, the first model has been developed using neural networks and the evolution of the second model using polynomial classifiers, by using daily closing prices of two of the leading financial stock market in Dubai during the period from April 2000 to March 2006.

They concluded that both models achieved great results by mean absolute error percentage (MAEP) in the prediction about 1.5% MAEP in the predictions of the next day, 2.5% MAEP in the predictions of the second day, and about 4% MEAP in the forecast of the third day, and the accuracy of forecasts of the two models was noticeable; it was estimated that about 60% of the expected values for the first day, 50% of the expected values for the second day, and 35% of the expected values for the third day, were all situated within the (-1% to +1%) relative to the values of the actual three days.

Finally, in a study by Wafi, Hassan, and Mabrouk (2015), they aimed at comparing between the credibility of technical analysis and fundamental analysis in forecasting the stock value in the Egyptian stock exchange, applying in 37 non-financial companies during the time from 1998 to 2009 and using pooled cross sectional and time series analysis. The conclusion referred to the technical analysis approach as achieving better results in the prediction of stock values compared to the fundamental analysis approach. Wafi et al. (2015) explained

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[1] Where noted to that there are more than 7,846 popular/common technical trading rules, which have been tested for profitability after excluding biased data and taken into account.

that this result corresponds to some of the studies that have been applied in emerging financial markets; it is clear from the foregoing that the technical analysis rules are effective and high ability to predict the stock value, and this is because of the lack of financial efficiency in these markets, making the application of the simple technical trading rules are feasible and profitable.

In the Developed Markets

Brock et al. (1992) purposed to highlight the technical analysis and they assumed two bases: moving average-oscillator and also resistance and support levels for trading, by application in the Dow Jones Index, where they used time series data during the period from 1897 to 1986. According to the findings, the results refer to supporting these technical analysis strategies and getting the returns from buying and selling indicators and can be relied upon to predict the returns that go up or down from the normal returns.

Gencay (1998) sought to study the predictability of non-linear returns of securities from the past returns alongside with those that arise from the simplest forms of technical trading rules, the linear and nonlinear data, and the application on the daily data consisting of a sample of 22 non-financial companies in the US financial market, and the daily Dow Jones Industrial in the period from 1897 until 1988, by using (AR) model and the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model.

The results concluded the existence of predictive ability for non-linear stock returns; the study indicates improvement in the prediction of volatility in the Great Depression years and in the turbulent years from 1980 to 1988; and the performance of these rules is more moderate in the period from 1939 to 1950, which was in no clear direction, either in the positive or the negative direction.

Lo, Mamaysky, and Wang (2000) targeted direct support of technical analysis, so they have suggested systematic and automatic approach for recognition of technical analysis models using non style-parametric Kernel regression and applying it to a large number of US stocks during the period from 1962 to 1996 to evaluate the effectiveness of technical analysis and through the experimental distribution compared unconditional daily stock returns conditional distributions. The result reached supports the efficacy of technical analysis.

According to study of Kwon and Kish (2002) which aimed at comparing the strategies for technical trading and the predictive ability of returns, they did an experimental study extension of the work of Brock et al. (1992), by using the NYSE and NASDAQ indices, for daily NYSE index data begin from 1 July, 1962 to 31 December, 1996, in addition to the division of this period into three sub-samples (1962-1972, 1973-1984, and 1985-1996), and for the daily NASDQ index data beginning from 2 January, 1973 to 31 December, 1996, in addition to the division of this period into two samples subgroups (1973-1984 and 1985-1996).

After the application of technical trading rules that have been used by Brock et al. (1992), the results have found that when the application is in the various sub-samples, the results showed the ability of the models to predict in the first and second periods (i.e., 1962-1972 and 1973-1984), these results look mostly like the full sample (1962-1996), which showed the ability of the models to predict, in contrast, predictability in the third period (i.e., 1986-1996) disappeared for the NYSE index. Then for the NADAQ index results concluded that the last sub-period (i.e., 1985-1996) refers to the complete weakness of the technical trading rules compared to the full period (i.e., 1973-1996) and this may mean that the market has become more efficient in information dissemination in recent years because of the developments in information technology, and perhaps that explains the fact that the technical trading rules value much higher in small stocks than large stocks.

Marshall and Cahan (2005) aimed to search for an answer to the following question: Does technical analysis benefit in stock markets that have characteristics indicate that it may be inefficient? To answer this question, they applied it on the New Zealand stock market, which is characterized by its small size. It has limitations on short-selling, the lack of coverage analyst market, and the inability of the internal trade rules; all these considerations may make the New Zealand stock market less efficient than the overseas markets, so it is possible that the technical analysis remains worth in the New Zealand stock exchange.

Following the same technique pursued by Brock et al. (1992) and the use of 12 popular technical trading rules, data from 1 January, 1970 to 31 December, 2002 were applied in the NZSE 40 index. The results reached in the returns of technical analysis in New Zealand follow a similar pattern to those of developed markets, where technical analysis was not profitable in the New Zealand market. This result is inconsistent with those used in the market studies of a similar nature (i.e., an emerging market).

As seen from the above that the technical trading rules in previous studies in developed markets achieved returns as before 1980s, but after technological developments and the transparency of information, as well as the large size of the market, the technical trading rules have become characterized as useless. On the bright side, there are studies that support the strength of technical analysis in developed markets (Brock et al., 1992; Lo et al., 2000).

Kutsurelis (1998) attempted to test neural networks ability to predict future trends compared with the traditional forecasting methods and by application in the daily trading indicators of the US financial market data, including S&P 500 during the period from 1 March, 1991 to 18 August, 1998. The study was based on the work done by Gately (1996) in his book *Neural Networks for Financial Forecasting*. This study reached to confirm the authenticity of Gately and also described the neural network development, which has made probability 93.3% of the expected rising market and probability of 88.7% of the expected market decline in the S&P 500 index. The results concluded that neural networks have the ability to predict in developed financial markets, if the individual investor trained properly, he can benefit from the use of this tool in the prediction.

In a paper by Pai and Lin (2005) which aimed at setting up a model to predict the future stock price relying on the previous stock prices, they suggested combining the autoregressive integrated moving average model (ARIMA*)* and the support vector machines (SVMs) model in one model so as to predict stock prices, by using data of US stocks prices to examine the performance of proposed model during the period from 21 October, 2002 to 31 December, 2002, in addition to another period to prepare a model for prediction of 2 January, 2003 to 28 February, 2003 to test the predictive capacity of proposed model.

The results showed that the proposed model presented improves greatly compared with the prediction performance of the individual ARIMA model or individual SVMs model for forecasting stock prices, as it is in theory and practice, and it is clear that prediction resulting from the two similar models reduces the expected errors (Granger, 1989; Krogh & Vedelsby, 1995). Pai and Lin (2005) also showed that the combined simple of the best individual models was not necessary to produce the best results, so the composite choice for the excellent standards for the valuation model is a great importance.

According to a study by Mallick, Lee, and Ong (2008), it applied genetic programming as a way to be trading rules in stock markets, compared with the most popular technical trading rules (MACD), and the application on the 30 shares listed in Dow Jones Industrial Average (DJIA) index, during the period from 3 January, 2000 to 30 December, 2005. Statistical evidence has shown that genetic programming trading rules provided greater returns for buy and hold strategy better than signals resulting from (MACD) trading rule.

In the Spanish stock market, Rodríguez-González, García-Crespo, Colomo-Palacios, Guildrís-Iglesias, and Gómez-Berbís (2011) targeted to use modern technique called chartist analysis system for trading (CAST), a set of solutions to calculate the RSI index using artificial intelligence techniques. This improvement is based on the use of feed forward neural networks to calculate RSI index. This new tool has been applied in two scenarios. First predicts the Spanish stock market IBEX 35 index. In the second group, for prediction of the individual companies' values, this included the IBEX 35 index, during the period from 16 December, 2005 to 27 October, 2009. The results were very encouraging and reveal the power of technical analysis in developed markets using CAST technology in index of the market as a whole along with the individual securities on the IBEX 35 index.

Fayek, Boghdadi, and Omran (2013) suggested new genetic algorithm technique, which is based on the optimal utilization of the parameters of a set of technical indicators through the objective of two functions: sharpe ratio and annual profit. Genetic algorithm technique deals through four indicators: double exponential moving average crossovers (DEMAC), RSI, MACD, and moving average RSI (MARSI). This technique has been tested on 30 years of historical data for the DJIA index. The results showed that the optimal parameters obtained by the proposed technique (genetic algorithm) improved forecasting accuracy profits for buy and hold strategy. As a result of the last previous studies, the author thought that it can overcome the weakness of technical analysis models to predict stock value in developed markets as a result of the financial markets efficiency, by using the advanced models and applied with the same technical analysis, such as genetic algorithm, genetic programming, neural network analysis, or combining more than one model to extract a proposed model which leads to the increase in prediction accuracy.

Methodology

This study depends on the critical approach for literature review, in order to discuss the multiple perspectives, to reach to a new research gap to be idea for new trend in technical analysis approach.

Findings and Discussion

Through the analysis of previous studies, the study finds the following:

First: In the emerging markets, the technical analysis rules are effective and have high ability to predict the stock value. This is because of the lack of financial efficiency in these markets, making the application of the simple technical trading rules feasible and profitable.

Second: In the developed markets, the technical trading rules achieved returns as before 1980s, but after technological developments and the transparency of information, as well as the large size of the market, the technical trading rules have become characterized as useless. On the bright side, there are studies that support the strength of technical analysis in developed markets, by using the advanced models and application with the same technical analysis, such as genetic algorithm, genetic programming, and neural network analysis, or combining more than one model to extract a proposed model which leads to the increase in prediction accuracy as explained by Pai and Lin (2005).

Finally: The financial markets efficiency or inefficiency is no longer as an essential impediment to the technical analysis models for forecasting the future stock value. So the author thought that instead of going on studying, researching, testing theories of efficiency, random walk (RW) theory, noise theory and also the chaos theory as expounded by Glen (2005), and setting up hypotheses that determine market studies, it is better to move conversely, at the beginning of the application in multiple markets to conclude any models commensurate

with the market conditions and then come up with the many different theories, until people get to a theory which can be generalized. Therefore, through the studies that have been presented previously, it is clear that the technical analysis model has not only limited usefulness and importance in emerging markets, but it is also extended to reach the ability to predict in developed markets, however, the only difference is how to apply using advanced models as previously explained.

Conclusions

This paper concludes that the research in the technical analysis methods is still ongoing, although it was approved only on historical data. But recent studies using complex models (such as genetic programming, genetic algorithm, and neural network analysis) made the technical analysis more effective in both emerging and developed markets. So it is no longer efficient markets that represent impediment for the effectiveness of technical analysis.

So it suggests one of the advanced methods and their application in both emerging and developed markets to compare the extent of their effectiveness and to find whether a specific model can be generalized or not.

This study provides a conception that a new direction did not repeal the importance of efficiency theory, which was conducted by Fama (1970; 1991; 1995), but it draws the attention of researchers for additional study which is more advanced than those of other traditional technical analysis models. It has to be a combination of operations research models and studies in finance to achieve more accurate results, whereas all sciences are closely linked to each other and should not be separated. So this study is a new beginning for further studies in this field, to search for the advanced models, and for doing several comparisons between the developed markets and each other's, also between emerging markets and each other's, and finally between developed and emerging markets, to attempt to reach the best and most accurate models, which can be generalized to predict the value of the stock in the future.

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