academicJournals

Vol. 7(24), pp. 2337-2341, 28 June, 2013
DOI: 10.5897/AJBM11.2849
ISSN 1993-8233 © 2013 Academic Journals
http://www.academicjournals.org/AJBM

African Journal of Business Management

Full Length Research Paper

Can we apply Fibonacci retracement in the African market?

Toshitsugu Otake* and Fall Fallou

Graduate School of Management, Ritsumeikan Asia Pacific University, 1-1 Jumonjibaru Beppu, Oita 874-8577 Japan.

Accepted 20 June, 2013

Forecasting was one of the most important issues facing companies. Technical analysis was the use of trends and charts to understand and analyze investors' behavior and their effect on subsequent price action of financial instruments when the trend is so clear or support and resistance levels obtained through Fibonacci ratios. The applicability of Fibonacci trading in the stock market for the western countries or Japan had been the center of intense debates for many years to predict future price. In this paper, we tried to check if there was any logic in the turning points patterns in the African market similar to in the western or Japanese market.

Key words: Fibonacci retracement, forecasting, technical analysis.

INTRODUCTION

Technical analysis is the use of trends and charts to understand and analyze investors' behavior and their effect on subsequent price action of financial instruments. It is believed that technical analysis holds the key to monitoring investors. For technical analysts, investor sentiment is the single most important factor in determining an instrument's price and they are only interested in the price movements in the market. Allen and Taylor (1992) conducted a survey among chief foreign exchange dealers based in London in November 1988. They found that traders relied more on technical analysis than on fundamental analysis at shorter time horizons, and that this would be reversed in the long run. Lui and Mole (1998) came almost to the same conclusion when they conducted a survey in 1995 on the use by foreign exchange dealers in Hong Kong of technical analysis. Neely et al. (1996) used technical trading rules and genetic programming, and found strong evidence of economically significant out-of-sample excess returns to those rules for each of six exchange rates over the period 1981 to 1995. Neely (1997) explained briefly the fundamentals of technical analysis and an efficient market hypothesis as applied to the foreign exchange market, and evaluated the profitability of simple trading rules, and reviewed recent ideas that might justify extrapolative technical analysis. Many previous studies, Batchelor and Ramyar (2006), investigated filter rules that require a trader to buy if price goes up more than k% above the most recent low price.

Technical analysis relies on the use of trends and chart patterns, or moving average when the trend is so clear or support and resistance levels obtained through Fibonacci ratios. Batchelor and Kwan (2000) found that support and resistance trend lines are used much more often than moving average rules and other indicators in both stock markets and currency markets. Kavajecz and Odders-White (2004) stated that support and resistance levels coincide with peaks in depth and moving average forecasts revealed information about the relative position of depth on the book. The Fibonacci sequence begins with 0 and 1, and then adds the previous two numbers to get the current number. Then, the sequence continues onwards to infinity. Mathematically, the Fibonacci sequence is as follows:

$$F_0 = 0,\ F_1 = 1,\ F_2 = 1,\ F_3 = 2,\ F_4 = 3,\ F_5 = 5,\ F_6 = 8,\ F_7 = 13,...$$

*Corresponding author. E-mail: totake@apu.ac.jp. Tel: +081-977-78-1311. Fax: +081-977-78-1123.

More generally, the Fibonacci sequence is defined by the following recurrence:

$$F_{n+1} = F_n + F_{n-1}$$

with the initial conditions $F_0 = 0$ and $F_1 = 1$, for $n \geq 1$. These numbers are believed to have a very important role in sciences and are seen as the key to nature. Moreover, the Fibonacci sequence of numbers is also referred to by Ralph Elliot as the mathematical basis for the "Elliot Wave" principle (1938, 1940). The "Elliot Wave" principle is a powerful tool for forecasting stock market behavior. This idea has been challenged by Batchelor and Ramya (2006).

The Fibonacci ratio is found in the geometry of logarithmic spiral which is widespread in nature. Fibonacci proportions are also found in the double helix of DNA molecules in the reproduction cycles of rabbits, and the branching pattern in plant life and they are also used in art and architecture. Furthermore, Fibonacci ratios are also found in many different fields in sciences and in nature. In Finance, Fibonacci ratios are a popular trading tool and they are used in trading strategies by many professionals.

The most common Fibonacci ratio is obtained by dividing any Fibonacci number by the Fibonacci number one place higher in the sequence, that is,

$$r_n = \frac{F_{n+1}}{F_n}$$

When n goes to infinity in the above equation, we obtain

$$\varphi = \lim_{n\to\infty} r_n = \lim_{n\to\infty} \frac{F_{n+1}}{F_n} = \frac{1+\sqrt{5}}{2} \cong 1.618$$

Hence, the common Fibonacci ratio is derived as

$$X_1 = \frac{1}{\varphi} = 0.618$$

The same process can lead to another common Fibonacci ratio obtained by dividing any Fibonacci number by the Fibonacci number two places higher in the sequence and its ratio is equal to $X_2 = 0.382$. Likewise, we can consider the ratio obtained by dividing any number by the one 3 places above in the sequence and its value is $X_3 = 0.236$. All the numbers above are called as the Fibonacci ratios. In this paper we demonstrate that the Fibonacci ratios can be found in the African stock market, the BRVM (Bourse regionale des valeurs mobilieres) which is a Regional Stock Exchange for 8 West African Countries.

LITERATURE REVIEW

Anyone who is familiar with the financial press and the web-based financial services is aware of the popularity of technical analysis and the abundant literature about it. It is revealed that at least ninety per cent of interviewees gave some weights to technical analysis when performing views at one or more time horizons. Technical analysis is like a generic word that comprises a set of techniques and methods based on visual recognition of chart patterns and trends shown from past price and volume data.

Lebaron (1996) and Szakmary (1997) showed that extrapolative technical trading rules trade against U.S foreign exchange intervention and produced excess returns during intervention periods. Leahy (1995) demonstrated that technical trades make excess returns when they take positions contrary to U.S. Batchelor and Ramyar (2006) showed that recent studies investigate moving average that tell the trader to buy or sell if the market price exceeds or falls below a long term moving average. Gencay (1999) found that simple technical rules provide significant improvements for the current returns over the random walk model.

Some traders look at a trend line breaking rules that require to buy or sell if the price breaks above some resistance level or falls through some support level. This is based on the belief that as long as the share remains between these levels of support and resistance, the trend is likely to continue. A support level is the level at which brokers are willing to buy. On the other hand, a resistance level is the one at which they are willing to sell. If the price rises above resistance level, it will often become support. Traders look also at the pattern trades that require to go short if some sequence of prices characteristic of an upward trend appeared. An upward trend is a succession of higher peaks and troughs. Likewise, a downward trend is a succession of lower peaks and troughs.

In a comprehensive and influential study, Brock et al. (1992) analyzed 26 technical trading rules using ninety years of daily stock prices from Dow Jones Average and found that they all outperformed the market. Neftci (1991) also showed that a few of the rules used in technical analysis generated well-defined techniques of forecasting, but even well-defined rules were shown to be useless in prediction if the economic times series is Gaussian. Brown and Jennings (1989) pointed out that technical analysis has value in a model in which prices are not fully revealing and traders have rational conjectures about the relation between prices signals. However, Blume et al. (1994) showed that volume provides information quality that cannot be deduced from the price. They showed also that traders who used information contained in market statistics did better than traders who did not. It was found by Lo et al. (2000), after an examination of the effectiveness of technical analysis on U.S stocks from 1962 to 1996, that several technical

Table 1. Peak of stock price.

Day	Peak
4	165.72
11	170.27
18	170.48
25	172.14
40	183.64
58	181.58
92	167.19
99	168.55
105	167.86

Table 2. Trough of stock price.

Day	Peak
20	169.57
31	169.48
50	178.51
61	166.29
68	166.20
75	159.06
87	162.87
109	162.60

indicators did provide incremental information and may have some practical value. Ferdandez-Rodriguez et al. (2000) applied a kind of neural network to the Madrid Stock Market and found that, in the absence of trading costs, the technical trading rule is always superior to a buy-and-hold strategy for both "bear" and "stable" market but not in a "bull" market. In the technical analysis literature, there is more emphasis on technical indicators than on chart patterns and support and resistance levels identification. Nevertheless, Lucey and Aggarwal (2006) examined whether or not there is psychological barriers in gold prices. He used the standard M-values of the various time series and claimed to find some evidence to back the existence of psychological barriers.

As described earlier, technical analysis relies on the use of trends and chart patterns when the trend is supported and resistance levels are obtained through Fibonacci ratios. In the next section, we summarize materials and methods in this paper to demonstrate Fibonacci retracement.

MATERIALS AND METHODS

The data of our analysis are daily observations on the BRVM10 which is a West African regional stock exchange index for 119 trading days between September 7, 2010 and February 7, 2011. We used the closing prices during this period for the BRVM10 index. Dividends are not taken into account in the index because as in a technical analysis, we are interested in identifying peaks and troughs that might be observed by technical analysts rather than looking at the intrinsic value of the index. The determination of initial turning points in the series is done by picking peaks and troughs when they occur as the highest or the lowest prices in range size of 8 months on both sides of the date (Pagan-Sossounov, 2003). To make it appropriate for our data, we will be considering a smaller range; the highest or lowest values in a four days window on either side of the date will qualify as a turning point either as a peak or a trough. It is considered that the price p is at its peak at time t if the following inequality is verified:

$$[P_{t-4}, ..., P_{t-1} < P_t > P_{t+1}, ..., P_{t+4}]$$

This notation tells us that

$$P_{t-4} < P_t, P_{t-3} < P_t, ..., P_{t-1}, P_t$$

that is, a peak occurring at time t, the corresponding price is the maximum of the following set:

$$P_t = \max(P_{t-4}, ..., P_{t-1}, P_{t+1}, ..., P_{t+4})$$

Similarly, as for a trough,

$$P_t = [P_{t-4}, ..., P_{t-1} > P_t < P_{t+1}, ..., P_{t+4}]$$

that is, a trough will be considered to have occurred at time t, the corresponding price is the minimum of the following set:

$$P_t = \min(P_{t-4}, ..., P_{t-1}, P_{t+1}, ..., P_{t+4})$$

Given this lack of clarity in the way to choose a suitable window size for the analysis, we think that given the size of our data set, a four days window is appropriate. We use Scilab to implement this algorithm. Scilab is a free software for numerical computation that contains many mathematical functions. After obtaining the turning peaks and troughs, we need to calculate the retracement and projection ratios. Once those ratios are obtained, we test if those ratios and the Fibonacci ratios have statistically the same distribution checking by the K.S test. Table 1 shows the peaks from daily observations on the BRVM10. Likewise, we have troughs from daily observations on the BRVM10 as shown in Table 2.

We have to go through the tables and compare the occurrence dates to pick those that fulfill these conditons.

Also, we need to perform the K.S. test to the distributions of the ratios found in the market to the Fibonacci ratios. The ratios found in the market are both retracement and projection ratios. There exist two types of retracements: a bull retracement and a bear retracement. A bull retracement takes place when the price moves from a falling trend to a rising one. On the other hand, a bear retracement appears when the price moves from a rising to a falling trend. We can see that a retracement is the ratio of one phase to the most recent opposite phase. As for a projection ratio, it represents the ratio of one phase to the most similar phase. After obtaining both projection and retracement ratios, we examined the K.S test, D = 0.3571 with p-value = 0.7818. From the KS test results, we cannot reject the null hypothesis that Fibonacci ratios can be found in the African market.

RESULTS FOR FIBONACCI RETRACEMENT

In this section, we test how close the retracement and projection ratios are to the Fibonacci ratios, and what are

the most frequent Fibonacci ratios that have occurred in the period of study. Technically we will see if the ratios that have occurred are within ε of Fibonacci ratios:

$$R \in [f - \varepsilon,\ f + \varepsilon]$$

where R is a ratio, whether a retracement or a projection ratio and f is a Fibonacci number and ε a kind of error term. We do not expect the ratios found in the market to be exactly the same as the Fibonacci ratios,

To define the interval numerically, we choose ε to be equal to 0.025 as follows

$$R \in [f - 0.025,\ f + 0.025]$$

so that we can test if the given ratio is within ε of some Fibonacci ratio. Our objective is to compare those retracement ratios to the closest Fibonacci ratio in order to examine if they are within 0.025 each other. The main Fibonacci ratios sequences many practitioners are using are:

$$0.236,\ 0.382,\ 0.618,\ 1.382,\ 1.618$$

Before we focus on the computation of the retracement and projection ratios, it is useful to have a look at the graph that represents the prices trend during the period of interest. From Day 4 to Day 40, we can see the first upward trend, a 17.92 increment from the starting point. It lasted 36 days from Day 4 to Day 40. From Day 40, it retraced back until Day 75, which was a long decline.

The retracement ratio is obtained by dividing the length of the decline by that of the previous bull phase, which is given by

$$\frac{|183.64 - 159.06|}{|165.72 - 183.64|}$$

Hence. the stock price was a 137.16% retracement from the precedent peak. The Fibonacci ratio which is the closest to the 137.16% retracement ratio is the 1.382. The difference between the two ratios is simply given by

$$1.382 - 1.3716 = 0.0104$$

We can see that the retracement ratio is very close to the corresponding Fibonacci ratio. Next, we will look at the projection ratio. After the long decline from Day 40 to Day 75, the stock price was the opposite movement and started to go up again, i.e., the bull phase from Day 75 to Day 99, which lasted 24 days. The corresponding stock prices are 159.06 and 168.55, respectively. Therefore, the projection ratio is

$$\frac{|159.06 - 168.55|}{183.64 - 159.06} = 0.3861$$

The projection ratio can be compared to 0.382 which represents the closest Fibonacci ratio to that from the previous equation. The difference between the two ratios is simply given by

$$0.3861 - 0.382 = 0.0041$$

We can see that the projection ratio is very close to the corresponding Fibonacci ratio.

At Day 99, there is a local peak that is followed by a bear phase that has lasted until Day 109. The stock price at Day 109 was 162.60. Since the length of the downtrend divided by that of the previous uptrend is the retracement ratio, this is given by

$$\frac{|168.55 - 162.60|}{168.55 - 159.06} = 0.6269$$

This ratio can be compared to its closest Fibonacci ratio, 0.618. The difference between the two ratios is simply given by

$$0.6269 - 0.618 = 0.009$$

Hence, we can see that the retracement ratio is very close to the corresponding Fibonacci ratio.

None of the Fibonacci ratios can be considered as the most frequent from our analysis. However, we recognize Fibonacci retracement exists and that the Fibonacci trading rules can be a very useful tool for traders in the African market.

DISCUSSION AND CONCLUSION

Forecasting is one of the most important issues facing companies. Improving forecasting will always remain a difficult task because the future will always remain uncertain. The applicability of Fibonacci trading in the stock market has been the center of intense debates for many years to predict future price. In this paper, we tried to check if there is any logic in the turning points patterns in the African market. We looked upon a range of four months data from September 7 2010 to February 7 2011 obtained by the African regional stock exchange in Abidjan in Cote d' Ivoire. In addition, we considered the closing stock prices of the BRVM10 for our analysis. We first found the different turning points during the sample period using the Pagan and Sossounov (2003) algorithm modified a bit to account for the shorter timeframe of our research. We used the mathematical software, Scilab, to find the different turning points and then calculated the retracement and projection ratios. The K.S test was then

used to test the extent at which the Fibonacci ratios sequence and the different ratios found in the market. Afterwards, we concluded the analysis for Fibonacci retracement proved the stock prices which were almost always reversed around Fibonacci ratios. Although it was not clear how to identify which Fibonacci ratios were the most frequent, our conclusion from our analysis is that the Fibonacci trading can be a very useful tool for traders in the African stock market.

ACKNOWLEDGEMENTS

The first author is grateful to Ritsumeikan Asia Pacific University for their financial support during this work. The authors are grateful to the referees for their useful comments on the paper.

REFERENCES

Allen H, Taylor M (1992). The Use of Technical Analysis in the Foreign Exchange Market. J. Int. Money Finance, 11(3): 304-314.

Batchelor R, Ramyar R (2006). Magic Numbers in the Dow, Cass Business School, City of London.

Batchelor R, Kwan S (2000). A survey of Technical Analysts. Cass Business School and MMS international.

Blume L, Easley D, O'hara M (1994). Market Statistics and Technical Analysis: the role of volume, J. Financ. 49(1): 153-181.

Brock W, Lakoniskok J, B Lebran (1992). Simple Technical Trading Rules and the Stochastic Properties of Stock Returns. J. Financ. 47(5): 1731-64

Brown D, Jennings R (1989). On Technical Analysis. Rev. Financ. Stud., 2(4): 527-551

Doucouliagos C (2004). Number Preference in Australian Stock Market, Appl. Financ. Econ., 14(1): 43-54.

Elliot RN (1938). *The Wave Principle* reprinted in R. R. Prechter Jr., Ed., 1994, *R. N. Elliott's Masterworks,* New Classics Library, New York, pp. 83-145

Elliot RN (1940). *How the Wave Principle Works, and its Correlation with Mathematical Laws*, reprinted in R. R. Prechter Jr., Ed., 1994, *R. N. Elliott's Masterworks*, New Classics Library, New York, pp.190-195.

Ferdandez-Rodriguez F C, Gonzalez-Martel S, Sosvilla R (2000). On the profitability of technical trading rules based on artificial neural networks: Evidence from the Madrid Stock Exchange, Econ. Letters, 69(1): 89-94.

Gencay R (1999). Linear, non linear and essential foreign exchange rate prediction with simple technical trading rules, J. Int. Econ. 47(1): 91-107.

Kavajecz KA, Odders-White ER (2004). Technical analysis and liquidity provision, Rev. Financ. Stud. 17(4): 1043-1071.

Leahy MP (1995). The profitability of US intervention in the foreign exchange markets, Journal of International Money and Finance, 14(6): 823-44.

Lebaron B (1999). Technical trading rule profitability of foreign exchange intervention, J. Int. Econ., 49(1): 125-43

Lo A Mamaysky H, Wang J (2000). Foundations of Technical Analysis: Computational Algorithms, Statistical Inference, and Empirical Implementation. J. Financ. 55(4): 1765-70.

Lucey BM, Aggarwal R (2006). Psychological Barriers in Gold Prices, Rev. Financ. Econ. 16(2): 217-30.

Lui YH, M Mole (1998). The use of fundamental and technical analyses by foreign exchange dealers: Hong Honk evidence, J. Int. Money Finance 17(3): 535-45.

Neely C, Weller P, Dittmar R (1996). Is Technical Analysis in the Foreign Exchange Market Profitable? A Genetic Programming Approach, Discussion Paper Series, Centre for Economic Research London.

Neely C (1997). Technical Analysis in the Foreign Exchange Market: A Layman's Guide. Federal Reserve Bank of St Louis.

Neftci SN (1991). Naive Trading Rules in Financial Markets and Wiener-Kolmogorov Prediction Theory: A Study of "Technical Analysis". J. Bus., 64(4): 549-571

Pagan AR, Sossounov KA (2003). A Simple Framework for Analyzing Bull and Bear Markets, J. Appl. Econ. 18(1): 23-46

Szakmary AC, Mathur I (1997). Central Bank Intervention and Trading Rule Profits in Foreign Exchange Markets, J. Int. Money Financ. 16(4): 513-35.