



# **Evaluation and Extension of the Gann Swing Trading Rules**

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## Abstract

Gann trading rules are widely applied in the technical analysis of the financial market. As the WD GANN predicted, the rules lead to a successful way to make profits in the past. Nowadays, traders prefer to use algorithm trading to make money in an efficient and fast way. Do Gann trading rules still work in algorithm trading? The article introduces the Gann Swing trading rules in mathematic ways and applies it with computerized algorithms to verify the efficiency and accuracy. Except for the traditional Gann Swing trading rules, the combinations of the traditional Gann Swing trading rules creates the extension rules. The task is to evaluate the extension of Gann Swing trading rules and compare them with the traditional rules.

Key words: technical analysis, Gann Swing trading rules, efficiency of rules, extension of Gann Swing trading rules

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## **1. Introduction**

Nowadays, in the financial market, different traders have different trading rules, conservative or aggressive. Traders have their own objects in mind, forming their own trading style. As the computer science developed, the traditional trading and analysis transformed to computerized trading. The computerized trading is called automated trading. Programmers transfer the trading rules into codes, according to different requests from different traders. Automated trading helps traders to make fast and rational decisions to make money. It will determine the timing of entrance and exit of the positions automatically. It will judge and weigh the appropriate amount of capitals to invest a certain stock. It is all based on the trading rules which the trader follows and creates. The computer program makes decisions autonomously which can be applied in stock analysis.

The stock analysis is divided into two primary analysis methods, the fundamental analysis and the technical analysis. In the technical analysis section, Gann theory was treated as the pioneer analysis method. *"Gann was a trader who was noted both for his success in trading stocks and commodities as well as for his record in forecasting significant events, mostly reversals, in the stock market."* (Chen, 2010) It is known that the Gann theory is still in use due to its high accuracy and profitability. Traders continue to explore its inner secret, hoping to handle the abstruse method and win tremendous profits. Since the automated trading is widely used in technical trading, can it still be applied for the amazing Gann trading? Does Gann trading rules have a good performance in automated trading? If so, the computerized Gann trading rules will be enhanced to produce higher profitability. Taking into account these factors, we aim to implement the Gann trading rules in computerized algorithms. During the experiment process

with empirical data, we hope to evaluate the efficiency and profitability of with each of the Gann trading rules.

In this paper, we select one of the famous Gann theories, the Gann Swing trading rules. In the Gann Swing trading rules, there are three entry rules, suitable for long or short positions. The objective is to evaluate the efficiency and return of each three entry rules with the empirical data from different sectors. Besides, we combine the three trading rules with each other, extending the Gann Swing trading. It is the newly created Gann Swing trading rules which combine the superiority of each rule. Still, the evaluation process for the extension of rules is the same. The experiment of the extension of the Gann Swing trading rules will be compared with the traditional Gann Swing trading rules, and it will hope to find a better trading strategy based on the Gann Swing trading rules.

In Section 2, we will introduce the specific definition of the Gann Swing trading rules. The Gann Swing trading rules set a couple of indicators, and keeps on watching the current price movement. There are three entry rules in Gann Swing trading, suitable for long or short positions. Besides, the corresponding profit protection rules will be outlined. In Section 3, we will discuss the evaluation process of traditional Gann Swing trading and analyze the experiment results. In Section 4, we will introduce the extension of the Gann Swing trading rules. Using the same evaluation process, we will check the experiment of the extension rules and analyze the experiment results. Section 5 and 6 is the discussion and conclusions. And in the last part, Section 7 discusses possible future research.

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#### 2. Literature Survey

#### **2.1Technical analysis**

Technical analysis is one of the most important methods which traders use, aiming to predict the trend of the financial market. Technical analysis, which involves making investment decisions using past prices or other past statistics. "Much of technical analysis involves pattern recognition using specific frequency (intraday, daily, weekly) charts that display opening, high, low, and closing prices, as well as trading volume in some form." (Kavajecz, 2004)

Technical analysis is very popular with the investment and financial markets, all major brokerage firms publish technical commentary on the market and many of the advisory services are based on technical analysis. Nowadays, the many excellent traders and fund managers make profits according to technical analysis. "In its simplest form, technical analysis uses information about historical price movements, summarized in the form of price charts, to forecast future price trends. This approach to forecasting originated with the work of Charles Dow in the late 1800s, and is now widely used by investment professionals as input for trading decisions." (Neely, Weller, & Dittmar, 1997).

In fact, technical analysis has been doubted by the traders, because the technical analysis aims to grasp the trading opportunities when the price patterns appear again. However, it is too late to take an action when observing the similar price patterns. "Besides, the basic elements of technical analysis widely used in everyday work do not behave the same way as they were described in textbooks and publications. Difficulties arise when technical analysis is used in daily short-term trading because of minor market fluctuations that, in essence, are just the market noise. This noise can be compared with radio interference hindering clear reception. Unfortunately, the amplitude of this interference is too high to be ignored in short-term trading, and it disturbs the market harmony." (Toshchakov, 2006)

#### 2.2 Gann and Gann Swing trading

WD. Gann was the most famous investor in the securities and futures industry. *"The name of WD. Gann has become legendary among traders and market technicians today. Tales of his phenomenal success in trading and his arcane, yet highly accurate, technical theories are widely known."* (Droke, 2001). Due to the high accuracy and profitability, the subsequent traders are eager to reveal the secrets underneath the Gann trading rules. *"To this day, William D. Gann is an enigma. Much has been written about his success, or the lack of it. Questions remain about how great his techniques were, or how poor. Did he make fortunes or lose them? Most important, can any of his concepts stand up in today's fast-moving computer-driven markets?" (Krausz, The New Gann Swing Chartist , 1998).That is why people are still interested in discovering and applying with the Gann trading rules in technical analysis.* 

In the nature, people are familiar with waves, such as the sea waves, and voice waves. Actually in actual swing trading, the ideas of waves are applied in the trading system to expose the inner secret underneath the stock price. "A wave alternates from positive to negative, then to positive and negative, and so on. Waves are found in nature – you see waves when you throw a rock into a lake. Sound is transmitted in waves. And when stock prices change, they follow a wave-like pattern. The wave is rarely as orderly a sine wave, but they are waves nevertheless, and we use these waves in Swing Trading." (Swing, 2011)

Gann Swing trading is the application of pattern, price and time to discover the price movement in real time. "Gann Theory looks at pattern, price, and time as the key important

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elements in forecasting the future movement of the market. While each element has its own characteristics, each also has a unique, overlapping quality." (Hyerczyk, 2009)

## 2.3 Basic Gann Swing trading definition

## **2.3.1 Price Structure**



Figure 1: Price structure at time t-1 and time t in Gann Swing trading rules

The Gann Swing trading rules requires four price elements, the open price, the close price, the intraday high price and the intraday low price. The Figure 1 shows the price bar at a certain time. The left price shows the open price which is noted as  $OP_t$  at time t. The right price presents the close price which is noted as  $CP_t$  at time t. The above of the price bar is the intraday high price, which is noted as  $HP_t$  at time t. And the price below the bar is the intraday low price, which is noted as  $LP_t$  at time t. The price bar with four important prices is vital factor to determine the trading indicators and rules.

## 2.3.2 Swing indicator

"Beyond charting are various market indicators-calculations using the primary information of open, high, low, or close. Indicators can also be charted or graphed. Buy and sell signals and complete systems can be generated from a battery of indicators." (Archer, 2010) The swing indicator is divided into two parts, the upswing and the downswing. As the name suggests, swing seems like the wave up and down, changing the directions. In finance, the price pattern has a similar performance as the swing, rising or declining as a certain rule.

Upswing is defined as the price trend from down to up. The swing direction changes to upswing when the following two consecutive prices are higher than the low price. Figure 2(a) shows the change of the tendency to from downswing to upswing. At the price 1 and price 2, these two consecutive prices are higher than the price L. Bar 1 is the first consecutive higher, and Bar 2 is the second consecutive higher. Under the condition, the process is defined as the upswing.

Condition of Upswing:

If (1) 
$$CP_t < CP_{t+1}$$
 (2)  $CP_{t+1} < CP_{t+2} \rightarrow$  Then Upswing

Downswing is similar to the definition of upswing. When the prices tend to go down with two consecutive lower prices, the swing direction enters the downswing process. In the figure 2(b), the prices tend to change from the upswing to downswing. At the price 1 and price 2, these two consecutive prices are lower than the price H. Bar 1 is the first consecutive lower, and Bar 2 is the second consecutive lower. Under the condition, the process is defined as the downswing.

Condition of Downswing:

If (1)  $CP_t > CP_{t+1}$  (2)  $CP_{t+1} > CP_{t+2} \rightarrow$  Then Downswing



(a) Price pattern of Upswing (b) Price pattern of Downswing

Figure 2: Price pattern of the swing changes

Besides, the mini-swing can form to the broad swing. The Figure 3 shows the comparison. The broad swing can be better presented as the general movement of the price. "In the figure, the trading process appears multiple swing direction changes. In the broad field of vision, the swing directions can be divided to the broad swing, which improving the understanding and manipulating the whole market trend. The broad swings are defined as down from point A to point B. From point B to point C, the broad swings are defined as up. Each of the swings offers the overview of the changes of short-term trend of the market. In this way, swing traders make profits according to different swings. (Rivalland, 2002, p. 9)



Figure 3: Broad swing VS. Mini swing

## 2.3.3 Support and Resistance Lines

## 2.3.3.1 Valley & Support

In finance, valley is defined as the lowest point of a specific trading process. Figure 4(a) shows the valley and support line. The valley is always updated according to the change of the trading. It will change according to the new upswing. Valley is constantly updated to the minimum of the current price of each swing.

"Support is the Valley of the Previous Clearly defined Swing." (Krausz, W.d. Gann Treasure Discovered, 2005) In other words, the support line aims to make sure the price is up and not beyond the lowest current price. "As long as prices do not penetrate below the 'valley' point then support is holding. This 'valley' point is actually the low of the previous swing." (Krausz, W.d. Gann Treasure Discovered, 2005)



(a) Valley and Support line (b) Peak and Resistance line

Figure 4: Price pattern of Peak and Valley

#### 2.3.3.2 Peak and Resistance

Peak is the opposite to the valley. In finance, peak represents the highest current price during the process of trading. It is shown in Figure 4(b). "This peak point is the high of the previous completed upswing, and followed by a downswing." (Krausz, W.d. Gann Treasure Discovered, 2005) It keeps on updating to the highest point, is this meant to be new downswing.

The role of resistance is similar to the support line. The resistance line aims to make sure the price is down and not beyond the highest current price. "Resistance is the 'peak' of the previous clearly defined swing. As long as prices do not rise above the 'peak'point then resistance is holding. This 'peak' point is actually the high of the previous swing." (Krausz, W.d. Gann Treasure Discovered, 2005)

## 2.3.4 Trend Indicator

"Most traders are trend followers. They accept the widespread belief that the trend is a trader's friend." (Keller, 2010) Generally speaking, trading strategies are usually classified into three important strategies. One important strategy is called trend following strategy. Another is contra-trend strategy. "Gann price and time analysis often seems very complicated but for the most part, it boils down to a simple concept: Most highs and lows are made in proportion to one or more previous sections of the trend or countertrend." (Miner, 2009) According to the trend indicators, investors can apply the stop loss techniques to make the profits and control the market's movement. Actually, in swing trading, the trend indicator which is well defined strength is the power of the investor's analysis. When the pattern of the prices is recognized, the investors are able to adjust to the trading strategies to lock the profits. In Gann Swing trading, there are two trend indicators, the uptrend indicator and downtrend indicator. Uptrend

indicator presents the rising market in certain period of time. And downtrend indicator gives the signal about the decline of the general market movement.

"The trend indicator is based simply on the relationship between daily highs and lows." (MacLean, 2005) Uptrend represents the trend from down to up. When the current price beyond the nearest peak price, meanwhile the previous trend was downtrend, the trend is transferring to the uptrend. Uptrend process gives the good signal that the general price movement will go up, which encourages the investors to apply with the trend-following strategy.



Figure 5(a) shows the specific charts of prices which satisfies the uptrend's conditions. (Uptrend



Figure 5: Price pattern of trend changes

Downtrend is similar to the uptrend. Downtrend represents the trend from up to down. When the current price takes out the nearest valley price, meanwhile the previous trend was uptrend; the trend is transferring to the downtrend. Downtrend process gives a bad signal that the general price movement will go down, which suggests the investors are applying with the contra-trend strategy. Figure 5(b) shows the specific charts of prices which satisfies the downtrend's conditions. (Downtrend is shown as a dash line)

## 2.3.5 Gann HiLo Activator

In swing trading, there is a special threshold which aims to consummate the swing trading theory. It is called as Gann HiLo activator. The Gann HiLo activator was first introduced by Robert Krausz in the Feb. 1998 issue of Stocks and Commodities Magazine. Further information about this indicator was gathered from Robert Krausz Fibonacci Trader Journal (Volume 1, Issue 2). The Gann HiLo Activator combines the Gann Swing and Gann Trend indicators, creating a new trading strategy which is called "New Gann Swing Chartist Plan". The signals from Gann HiLo activator determines the entry trigger and stop loss point in the real-time trading.

"The HiLo Activator is a simple moving average of the highs or lows plotted in an unusual manner. The sell stop is calculated by adding the lows of the last three periods together, and then dividing the sum by three. The result is then plotted in step formation, that is, once the calculation is found it is plotted as a horizontal line below the market. If the market closes below the HiLo Activator sell stop then the horizontal plot will switch to a buy stop, based on the three period averages of the highs, and follows the market down. With practice you will see that the HiLo Activator will indicate that the market is in a trend, following the market higher or lower in the step formation." (Krausz, New Gann Swing Chartist-Dynamic Fibonacci Channels)

The Gann HiLo activator is the previous three periods' simple moving average. It can be applied with daily data, monthly data, yearly data, even in the high frequency trading. The Gann HiLo activator consists of two activators. One is called the HiLo-High activator, which is the simple moving average of past three periods' high prices. The other one is called the HiLo-Low activator, which is the simple moving average of the past three periods' low prices. The specific definition is shown as followed. (LP<sub>t</sub>: Low Price at time t.HP<sub>t</sub>: High Price at time t)

$$HiLo_Low_t = (LP_{t-1} + LP_{t-2} + LP_{t-3}) / 3$$
(1)

$$Hilo_High_t = (HP_{t-1} + HP_{t-2} + HP_{t-3})/3$$
(2)

Figure 6 shows that the two activators are plotted as crossed stairs. When the current close price is above the HiLo-Low activators, the market has the potential to continue increasing. When the current close price is below the HiLo-High activators, the market is more likely to continue decreasing. At the important point which the current close price is below the HiLo-Low activator, it means the current price is below the past average low prices. In other words, the price curve will fall soon. This point is the action point for the investors to enter or exit the positions. Meanwhile, the HiLo activator will transfer from HiLo-Low activator to HiLo-High activator, keeping watch on the price movement. The same principle is applied when the current close price is above the HiLo-High activator. At this point, the current close price is beyond the past average high prices. The price curve will bounce back. It is the precious time for

investors to take actions. At the same time, the HiLo activator will transfer from HiLo-High activator to HiLo-Low activator, keeping watch on the price movement. Due to the HiLo activator, investors are equipped by a more efficient tool to observe the changes and grasp the trading opportunities to hold or sell. (Krausz, Wd Gann Treasure discovered, 2005)

## If CPt<HiLo\_Lowt && HiLot-1=HiLo\_Lowt-1

#### HiLo<sub>t</sub>=Hilo\_High<sub>t</sub>

#### If CP<sub>t</sub>>Hilo\_High<sub>t</sub> && HiLo<sub>t-1</sub>=HiLo\_High<sub>t-1</sub>

### HiLo<sub>t</sub>=Hilo\_Low<sub>t</sub>



Figure 6: The switch of HiLo-Low Activator and HiLo-High Activator

#### 2.4 Basic Gann trading rules

After constructing the indicators above, such as like the swing indicators, the trend indicators, the peak and valley indicators, and the HiLo activators, it is easier for traders to commence their initial trading. With the combination of different indicators, the price pattern is formed as the trading pattern. When the price pattern satisfies the predefined conditions, the Gann trading system will suggest to the traders to take the action of buying or selling. The Gann trading rules give the signals of when to enter or exit the market, with the different indicators.

The basic Gann trading rules are firstly published by Robert Krausz in his book *W. D. Gann Treasure Discovered (2005).* In his book, the author demonstrated the trading rules with detailed charts:

There is an example of each of the long or short entry rules, and the specific rule is presented below the example. This plan trades only with the trend. That is, for long positions the Gann Swing Chartist must show an uptrend (solid line) and for short positions the Gann Swing Chartist must show a downtrend (dashed line). There are three sets of entry rules for longs or shorts, and two sets of exit rules. In this plan you use whichever rule is activated first. Occasionally, more than one rule applies. (Krausz, W.d. Gann Treasure Discovered, 2005)

In the Gann trading rules, there are three entry rules for traders to determine the entrance of trading. We called it Entry Rule #1, Entry Rule #2, and Entry Rule #3. All the three rules are suitable for the different positions, long or short positions, deciding the entrance point. For the exit of trading, there are two rules for traders to take profits. One is called the Profit Protection Rule #1. The other is the Profit Protection Rule #2. Similarly, the profit protection rules are suitable for different positions, the long or short positions.

## 2.4.1 Entry Rules

Entry Rules give the signals to initial a trading, no matter long a position or short a position. Three of Gann Entry Rules will be illustrated as follows below.

### 2.4.1.1 Entry Rule #1

The Figure 7 shows the specific entry rule of a long position. It is called the Buy Rule #1. The Buy Rule #1 set a prerequisite which the trend indicator must show uptrend. In the Figure 7, it is clearly that the trend is uptrend (shown as a solid line). Besides, in this rule, the HiLo Activator is the tool to offer the information about the action point. When the current close price is above the HiLo Activator, as the chart shows at the point A, the buy signal occurs. In other words, the Buy Rule #1 tells traders that the price is more likely to increase after the point A. It is a good opportunity to enter a long position and buy the stocks.

The condition of Buy Rule #1:

(1) Trend: Uptrend

(2) CP<sub>t</sub>>Hilo\_High<sub>t</sub> at Point A,

HiLo<sub>t</sub>=Hilo\_High<sub>t</sub>→Hilo\_Low<sub>t</sub>

Then Long the position.



Figure 7: Entry Rule #1 for long positions

The Figure 8 shows the specific entry rule of a short position. It is called the Sell Rule #1. The Sell Rule #1 set a prerequisite which the trend indicator must show downtrend. Figure 8 shows that the trend is downtrend (shown as a dash line). Besides, in this rule, the HiLo Activator determines the action points to short a position. When the current close price is below the HiLo Activator, as the chart shows at the point A, the sell signal occurs. In other words, the Sell Rule #1 tells traders that the price has the trend to go down after the point A. It is the good opportunity to enter a short position and sell the stocks.

The condition of Sell Rule #1:



Figure 8: Entry Rule #1 for short positions

## 2.2.4.2 Entry Rule #2

For the long position, the Buy Rule #2 is shown as the chart below. The Figure 9 shows the specific entry rule of a long position. The Buy Rule #2 set a prerequisite which the previous trend should be downtrend (shown as the dash line). At point A, the current close price beyond the previous peak, which means the trend changes from downtrend to uptrend.(shown as the solid line) Meanwhile, the Buy Rule #2 set another condition that the HiLo Activator must below the Bar A, as the chart shows. It is the point A which the Buy Rule #2 gives the buying signal to the traders. In other words, the Buy Rule #1 tells traders that the price is more likely to increase after the point A. It is a good opportunity to enter a long position and buy the stocks.

The condition of Buy Rule #2:

(1) Trend: CPt> Peak
Downtrend → Uptrend at Point A
(2) CPt>Hilo\_Lowt
HiLot=Hilo\_Lowt
Then Long the position



Figure 9: Entry Rule #2 for long positions

For the short position, the Sell Rule #2 is similar. The Figure 10 shows the specific entry rule of a short position. The Sell Rule #2 set a prerequisite which the previous trend should be uptrend (shown as the solid line). At point A, the current close price is below the previous valley, which means the trend changes from uptrend to downtrend.(shown as the dash line) Meanwhile, the Sell Rule #2 set another condition that the HiLo Activator must above the Bar A, as the chart shows. It is the point A which the Sell Rule #2 gives the selling signal to the traders. In other words, the Sell Rule #2 tells traders that the price is more likely to decrease after the point A. It is a good opportunity to enter a short position and sell the stocks.

The condition of Sell Rule #2:

 (1) Trend: CPt < Valley</li>
 Uptrend→Downtrend at Point A
 (2) CPt <Hilo\_Hight HiLot=Hilo\_Hight

Then Short the position



Figure 10: Entry Rule #2 for short positions

## 2.2.4.3 Entry Rule #3

For the long position, the writer of W. D. Gann Treasure Discovered, Robert Krausz demonstrated the rule as shown in Figure 11. "The Trend is up (swing line is solid). You can buy when prices surpass the previous peak providing the HiLo Activator sell stop is below the bars. Action is taken intraday. The buy signal occurs on Bar B. Use two ticks pass the previous peak for the Treasury Bonds." (Krausz, W.d. Gann Treasure Discovered, 2005) . The Buy Rule #3 requires that the trading swing should be uptrend (shown as the solid line). At point B, the current close price beyond the previous peak. Besides, the Buy Rule #3 sets another condition

that the HiLo Activator must below the Bar B, as the chart shows. For traders, it is wise to enter the market and long a stock at the point B.



Figure 11: Entry Rule #3 for long positions

For the short position, the rule is similar. Figure 12 shows the specific price pattern of Sell Rule #3. The Sell Rule #3 requires that the trading swing should be downtrend (shown as the dash line). At point B, the current close price is below the previous valley. Besides, the Sell Rule #3 sets another condition that the HiLo Activator must above the Bar B, as the chart shows. For traders, it is wise to enter the market and short a stock at the point B.

The condition of Sell Rule #3:



Figure 12: Entry Rule #3 for short positions

## 2.4.2 Profit Protection Rules

Profit Protection Rules aim to take profits at the relatively exact time when the traders are in the long or short positions. Due to the Profit Protection Rules, traders are more likely to optimize the profits in a certain periods of time. For different position holdings, the Mr. Gann established the different Profit Protection Rules. In the first profit protection rule, the HiLo Activator is applied for exiting the positions and for the second set of profit protection rule, we add a percentage retracement factor. The two sets of profit protection rules are demonstrated as follows.

## 2.4.2.1 Profit Protection Rules #1

Profit Protection If Long Rule #1:

When the traders are in the long positions, trend indicator will show uptrend. For the exit point, the HiLo activator is crucial indicator to remind traders closing the position. When the current close price is below the HiLo Activator, the HiLo Activator will transfer from the HiLo-Low activator to the HiLo-High activator. It means the price is in the trend of decreasing. At the moment when the changes of HiLo activator happen, the profit protection moment occurs. It is the time to sell the stock and close out all long positions to lock the profits. The condition of Profit Protection Rule #1(Long Position):



Figure 13: Profit Protection Rule #1 if long the positions

Profit Protection If Short Rule #1:

When the traders are in the short positions, the trend indicator will show downtrend. For the exit point, the HiLo activator is a crucial indicator to remind traders closing the position. When the current close price is above the HiLo Activator, the HiLo Activator will transfer from the HiLo-High activator to the HiLo-Low activator. It means the price is in the trend of increasing. At the moment when the changes of the HiLo activator occurs the profit protection moment occurs. It is the time to buy the stock back and close out all short positions to lock the profits.

The condition of Profit Protection Rule #1(Short Position):



Figure 14: Profit Protection Rule #1 if short the positions

## 2.4.2.2 Profit Protection Rules #2

Profit Protection If Long Rule #2:

"If prices retrace 38% of the upswing A to B then close out all existing positions at point C. The price must be below the HiLo Activator Sell Stop by two ticks. Do not wait for the close of the day." (Krausz, W.d. Gann Treasure Discovered, 2005). Figure 15 shows that the trend keeps the uptrend (shown as solid line). The current close price of point C is below the HiLo Activator. When the retracement of B and C is equal to 38% of the upswing A to B, it is the action point that traders are advised to close out the positions and take profits.

The condition of Profit Protection Rule #2(Long Position):

(1) Position= Long Position
(2) Trend= Uptrend
(3) Peak-CPt≥38 %\*( Peak-Valley)
Then Take Profits.



Figure 15: Profit Protection Rule #2 if long the positions

Profit Protection If Short Rule #2:

The similar rule is suitable for taking profits at the short positions. "If prices retrace 38% of the downswing A to B then close out all existing positions at point C. The price must be above the HiLo Activator Buy Stop by two ticks. Do not wait for the close of the day." (Krausz, W.d. Gann Treasure Discovered, 2005) In the Figure 16, it is clear that the trend keeps the uptrend (shown as solid line). The current close price of point C is above the HiLo Activator. When the retracement of B and C is equal to 38% of the downswing A to B, it is the action point that traders are advised to close out the positions and take profits.

The condition of Profit Protection Rule #2(Short Position):



Figure 16: Profit Protection Rule #2 if short the positions

## 3. Evaluation of Gann Swing trading rules

The focus of this paper is to verify the efficiency of the Gann Swing trading rules and compare the profitability of each rule. Moreover, the newly created trading rules based on Gann Swing trading rules will be experimented, judging and comparing the accuracy and profitability with the traditional Gann Swing trading rules. This section will include the experimental setup, the evaluation process and experimental results analysis. This section emphasizes the experiment and evaluation process of traditional Gann Swing trading rules.

### **3.1 Data**

The experimental data is extracted from the DataStream system. We choose the most famous and representative companies from three different sectors, the banking sector, the oil sector, the FTSE 100. In this way, it will more directly to represent the trend and movement of different sectors. Moreover, it can verify that whether the Gann Swing trading rules can be applied in different sectors. The data of the banking sector covers the Barclays Bank. The data of the oil sector contains the BP oil and gas company. The last sector is the FTSE 100, giving the general presentation of the whole market. The Gann Swing trading rules require the price movement of equity. Therefore, the information of data which we collect should contains the Open Price, the Close Price, the Intraday High Price and the Intraday Low Price and its corresponding date.

The experiment aims to test the price series over the past ten years. The time period of the experimental data is from 2001 to 2010. We set the time threshold as one year. In other words, the experiment will run the each year's historical data to check and compare the profit of each year.

#### **3.2 Experimental setup**

The purpose of the experiment is to simulate the Gann Swing trading in the virtual market. According to the empirical data, the experiments show the performance of Gann Swing trading rules. Considering the fact that the Gann Swing trading contains three entry rules, the experimental section is divided into three parts, representing the different entry rules performance. In each part of the section, we will run all the three sectors data to check the feasibility for the equities from different sectors. Besides, the performance of each trading rules will be presented in different years, from 2001 to 2010. In a relatively long period of time, the experimental results will be more convincing.

In Gann Swing trading, the default of each trading is 1000 shares no matter whether it is in the long position or short position. In other ways, the trading start with 1000 shares and initial capital can be set in advance according to the share price.

After finishing the parameter setup, we will execute the program with the data. First, the 10 years data in three sectors will be executed in the Entry Rule #1 (contains the Buy Rule #1 and Sell Rule #1). The Entry Rule #1 will report the signal to enter the market. And the two of the

Profit Protection Rules will report the signal to exit the market and take profits. The gross return and accumulative capital and the details of each trading will be present as a chart. The same experimental process is for the Entry Rule #2 (Buy Rule #2 and Sell Rule #2) and Entry Rule #3 (Buy Rule #3 and Sell Rule #3). Finally, the simulated trading from three sectors will be shown in different years of each three rules.

## **3.3 Evaluation**

The evaluation on the Gann Swing trading is based on the trading profits. Each transaction's profit or loss can be computed with the entry price and exit price. To evaluate the trading rules, the most important parameter is the rate of return. The rate of return is the ratio of profit or lost on an investment relative to the amount of money invested. It is all known that the rate of return is widely used in the financial analysis. It is one of the simple but most direct ways to measure the profits. The formula to compute the rate of return is shown as follows.

$$Rate of Return = \frac{Profit/Loss}{Initial Capital}$$
(3)

In the experiment, we can get the profits or loss of each transaction. Therefore, the net profits or loss can be computed by the sum of each transaction profits or loss. The initial capital is determined at beginning according to the price and shares. To obtain the rate of return, it is direct to compare the efficiency of different trading rules.

#### **3.4 Experimental results**

## 3.4.1 Specific performance of Gann Swing trading in Year 2010

The trading details of the three different equities in 2010 are clearly shown in Appendix 1, 2, and 3. The Tables show the performance of the application of the three entry rules. The first

column of the Table shows the trading date of each transaction. The second column represents the trading statue of each trading. If traders enter a long position and they will close the position and take profits at the statue of short position. The third column of the table presents the current trading price of each transaction. The fourth column is the indicator of profits. It will be shown according to the trading price of each transaction. The fifth column is the number of shares in the position. The Gann Swing trading set the default number of share as 1000. The sixth column is the accumulating profits of each transaction. The Column Capital is the capital in the trading account which updates according to the profits. The last column shows the rate of return, and this aims to check the performance of the rule in a certain year.

#### 3.4.1.1 Entry Rule #1:

Appendix 1, it clearly shows the trading details of the three different equities with Entry Rule #1. For example, Table 3 gives the specific overview of the performance and trading details of the Barclays Bank using the Entry Rule #1 in 2001. On Feb 4<sup>th</sup>, 2010, the traders entry the market and short a position at the price of 272.2. On Feb 10<sup>th</sup>, 2010, the traders close the position and take the profits at the price of 277.85. However, this trading leads to loss of -5650. In the trading account, the capital remains 494350. Through the 15 trades, the overall profit is 27400. The rate of return is 5.48% based on the Entry Rule #1 in 2010.

Table 4 and Table 5 show the performance of the BP Oil Company and FTSE 100 in Entry Rule #1 in 2010 respectively. The traders complete 8 trades in BP Oil Company and 10 trades in FTSE 100 in 2010. The trading of the BP Oil Company leads to the loss of -26150 in total during 2010. The rate of return in Entry Rule #1 is -5.23%. The trading of FTSE100 takes profit of 103420, and the rate of return is 10.342%.

#### 3.4.1.2 Entry Rule #2:

Appendix 2 presents these three equities' trading situation, as applied with the Entry Rule #2 in 2010. These three Tables provide the specific trading date, price, and volume of each transaction. The way of presenting the result is the same as the Entry Rule #1. Table 6 shows that the profit is 86450 and the rate of return is 17.29% for the Barclays Bank. In Table 7, the profit of BP Oil Company is 81000, the rate of return is 16.2%. And the FTSE 100 make profits of 736390, the rate of return is 7.36%.

### 3.4.1.3 Entry Rule #3:

In Appendix 3, the three Tables give the specific overview of the different equities' trading details with the Entry Rule #3. As the same as Appendix 1 and 2, the three Tables display the trading date, price and volume. Besides, the profits, accumulating profits and capital are shown respectively. Table 9 displays the 9 transactions details of Barclays Bank with the Entry Rule #3. This trading leads to the loss of 7200 and the rate of return is -1.44%. Table 10 shows the performance of BP Oil Company with Entry Rule #3. The profit is 118600, and the rate of return is 23.72%. In Table 11, the profit of FTSE100 is 353570, and the return is 3.54%.

## **3.4.2** Performance of Gann Swing trading rules over past 10 years

#### Entry Rule #1:

For the performance of the Barclays Bank (See Table 12(a), Appendix 5) over the past 10 years, Table 12(a) displays the yearly profit or loss and rate of return. For the average return of past 10 years is -7.247%. Five years' return is negative and five years' return is positive. In 2009, the Barclays Bank made the best profits. The return of 2009 is 24.43%. In 2001, the worst return is - 34.688%. The performance of BP Oil Company (See Table 12(b), Appendix 5) shows the average return is -9.537%. Eight of the returns are negative. The performance of FTSE100 (See Table 12(c), Appendix 5) presents the average return as -5.332%.

## Entry Rule #2:

The performance of the Barclays Bank (See Table 13(a), Appendix 6) over the past 10 years with the Entry Rule #2. The average return is 8.017%. Seven years' return is positive. The performance of the BP oil company (See Table 13(b), Appendix 6) shows the average return as 10.001%. Eight years' return is positive. The performance of FTSE100 (See Table 13(c), Appendix 6) gives the average return as 16.65%. Seven years' return is positive.

### Entry Rule #3:

The performance of the Barclays Bank, the BP oil company and the FTSE100 are shown in the Table 14(a), Table 14(b), Table 14(c), and Appendix 7 respectively. The average return of the Barclays Bank is -2.75%. The average return of the BP Oil Company is 21.89% and the FTSE 100 is 7.398%.

#### **3.5 Verdicts**

From Table 1, it is clear that the Entry Rule #2 plays a better performance in the three equities from different sectors. All the equities with Entry Rule #2 get both positive and a considerable return. It suggests that the Entry Rule #2 is more suitable for application to the real stock market. In theory, the Entry Rule #2 will produce higher and stable profits and traders can invest more capital on this rule. However, not all the Gann Swing trading rules make sense. The Entry Rule #1 shows a poor performance in the different sectors. All the return is negative, showing the instability and unreliability. For traders, they must be cautious when investing the money with this rule. For the Entry Rule #3, two equities get a positive return. Only in the bank sector, this rule has a poor performance. In that case, the Entry Rule #3 has a limitation for traders to apply. In some sectors, this rule can lead to incredible profits. However in some sectors, it may cause to serious problems.

On the whole, the performance of traditional Gann Swing trading rules is mainly satisfactory. In the right sectors, the Gann Swing trading rules are more likely to have a better impact on the rate of return.

Equity	Rule #1	Rule #2	Rule #3
Barclays	-7.25%	17.29%	-2.75%
ВР	-9.54%	10%	2.19%
FTSE100	-5.32%	16.65%	7.40%

Table 1: The rate of Return of different equities using different Gann Swing trading rules

## 4. Extension of Gann Swing trading rules

### 4.1 Extension Gann Swing trading rules descriptive

The extension of the Gann Swing trading rules have some slight changes based on the traditional trading rules. The extension of the Gann Swing trading rules chooses two of the three entry rules and combines them into a new rule respectively. We call the new extension rules as The Entry Rule #1&#2, The Entry Rule #2&#3, and The Entry Rule #1&#3. Due to the combination of entry rules, hopefully the opportunities to gain profits will increase. In that case, the profits of the new combination rules will exceed the original corresponding rules in theory. The experiment section aims to verify the new extension rules' efficiency. Applying the same

price series (Barclays, BP and FTSE 100), the experiment will compute the return of each extension rules and compare them with the original rules.

# 4.1.1 Entry Rule #1&#2

Condition of the Entry Rule #1&#2 (Long Position):





# 4.1.2 Entry Rule #2&#3

Condition of the Entry Rule #2&#3(Long Position):



Condition of the Entry Rule #2&#3(Short Position):



## 4.1.3 Entry Rule #1&#3

Condition of the Entry Rule #1&#3(Long Position):



#### **4.2 Evaluation**

The evaluation method for the extension of Gann Swing trading rules is the same as the traditional Gann Swing trading rules. To compute the rate of return of trading in different rules is the key to present the performance of extension rules. In this experiment section, the data still uses the three sectors. In that case, the evaluation of the extension of the Gann Swing trading rules will compare with the traditional rules based on these three sectors during the past ten years.

#### **4.3 Experimental results**

## 4.3.1 Performance of Entry Rule #1&#2

The performance of Entry Rule #1&#2 can be presented through the result of three sectors over the past 10 years. The performance of the Barclays Bank (See Table 15(a), Appendix) shows that the average return with the new rule is 5.076%. Maximum return rate is 33.88% in 2007. The performance of the BP (See Table 15(b)) displays the average return as 5.721%. Seven years' return is positive. The performance of the FTSE100 (See Table 15(c), Appendix) shows the return as 6.448%. Maximum return is 10.07% in 2008.

## 4.3.2 Performance of Entry Rule #2&#3

Table 16(a), Table 16(b), Table 16(c), Appendix 7 displays the performance of the three sectors with Entry Rule #2&#3 from 2001 to 2010. The return of Barclays Bank is 6.72%. Maximum return is 32.04% in 2007. The return of BP is 9.41%. Maximum return is 44.15% in 2008. The return of FTSE100 is 14.35%. The maximum return is 96.7% in 2010.

## 4.3.3 Performance of Entry Rule #1&#3

Table 18(a), Table 18(b), Table 18(c), Appendix 8 displays the performance of the three sectors with Entry Rule #1&#3 from 2001 to 2010. The return of Barclays Bank is 3.49%. The return of BP is 7.03%. Maximum return is 19.43% in 2010. The return of FTSE100 is 8.95%. The maximum return is 70.85% in 2010.

## 4.3.4 Comparison

Table 2 compares the performance of extension with the traditional rules, using the average rate of return. From the Table, the return of extension rules is quite satisfying. All the return of extension rules in different sectors is positive. Besides, the return of the extension rules is higher than the risk free rate. The return of Rule#1&#2 is 5.08%, 5.72% and 6.45% in the three sectors. The return of Rule#1&#3 is 3.49%, 7.34% and 8.95% respectively. And the return of Rule#2&#3 is 6.72%, 9.41% and 14.35%. However, considering the traditional rules, several return rates are negative. Only with the Rule #2, traders can get the higher return rate. The maximum average return is 17.29%. It is the best performance of Barclays Bank with Rule #2.

	Rule #1	Rule #2	Rule #3	Rule#1	Rule#1	Rule#2
Barclays	-7.25%	17.29%	-2.75%	5.08%	3.49%	6.72%
ВР	-9.54%	10%	2.19%	5.72%	7.34%	9.41%
FTSE100	-5.32%	16.65%	7.40%	6.45%	8.95%	14.35%

**Table 2:** The rate of return of three equities using traditional and extensional Gann rules

#### **4.4 Verdicts**

From the results of the experiment, the performance of the extension of the Gann Swing trading rules is better than the traditional Gann Swing trading rules. The return of the extension rules is all positive and higher than the risk free rate in theory. Comparing with the traditional Gann Swing trading, the extension rules are more stable and profitable. No matter which sector of equity, the extension rules always perform noticeably well. Due to the combinations of the traditional Gann Swing trading rules, the extension rules abstract the good features of each traditional rule and discard the disadvantages of traditional rules. In that case, traders are more likely to make profits with the extension of Gann Swing trading rules.

One of the remarkable things is the performance of Rule #2. When looking at the performance of Rule #2, it is obvious that the return of Entry Rule #2 is highest among the all trading rules. And the extension rules, Rule #1&#2, Rule #2&#3 also got the excellent return rates. In the light of this finding, we conclude that the Rule #2 is crucial in the Gann Swing trading rules. It is the Rule #2 or extension Rule #2 which traders can rely on.

## **5. Discussion**

### 5.1 Feasibility of the Gann Swing trading rules

From the experimental data, it is clear that Gann Swing trading rules are able to produce profits in practice. Sometimes, when the traders grasp the golden opportunities, they can obtain an extremely high return. In this case, we can conclude that the Gann Swing trading rules make sense and can be applied by the traders to take profits. Although the Gann Swing trading rules sometimes can get high return, it still has the high volatility. Due to the data, a part of return is negative, showing the potential dangers in the practical trading. It is advisable that traders should be careful when using the Gann Swing trading rules. Since it is possible to result in a significant lost. In addition, the data shows that Gann Swing trading rules are not suitable for all the sectors of equities. According to the data, the bank sector's performance is obviously inferior to the oil sector and FTSE 100. In other words, traders should seek for the correct and suitable sectors to apply the Gann Swing trading rules, hoping to maximize their profits.

## 5.2 Diversity of different Gann Swing trading rules

According to the data, applying a different set of rules leads to a different performance. The Entry Rule #2 produces the highest return in comparison to the other two rules. In three sectors' performance, the return of the Entry Rule #2 is all above 10% without any negative return rate. It is obvious that the Entry Rule #2 has higher return but lower volatility. However, all the experimental data in the three sectors shows that the return of this rule is negative. Therefore, the Entry Rule #1 is not advisable to use due to the low return rate. Also, to some extent, the Entry Rule #3 shows the uncertainty.

### 5.3 Efficiency of Extension of Gann Swing trading rules

The extension of Gann Swing trading rules is the combination of each rule. In other words, it owns the advantages of each rule. It is more possible to grasp the precious opportunities when traders operate the trading. Because the extension rules extend the effective entry conditions, more possible trading opportunities will be included. Therefore, the return rate of the extension rules is higher than the traditional Gann Swing trading rules. Moreover, the extension rules extract the characteristics of each rule. The trading process with extension rules will be low risky and stable.

Among the extension rules, the Rule#2&#3 presents the best trading performance. It is known that the Entry Rule #2 and the Entry Rule #3 are regarded as better rules. The combination of

these two rules certainly gives the most satisfying answer. The Rule#1&#2 and the Rule#1&#3 are slightly inferior to the Rule#2&#3. But still, they can be applied by the traders and make profits.

In all, the Gann Swing trading rules are regarded as a useful tool through the experiment. What is more, the new extensions of the Gann Swing trading rules are proved to be better rules in comparison to the traditional rules. In the future, traders can widely use the extension rules to make profits.

### **6.** Conclusion

In the dissertation, I have already implemented the Gann Swing trading rules through the computerised trading. The simulation experiments verified the efficiency of each Gann Swing trading rules. Through the comparison of the experiment, I have found the best performance rule which can be applied by traders in the trading. Besides, I created new trading rules which are called the extension of Gann Swing trading rules. It is the combination of each rule. The experimental data shows that the extension rules have a better performance than the traditional rules. At this point, it suggests that traders can apply with the extension rules to get higher return at lower risk.

## 7. Future works

It is known that Gann Swing trading rules is the representative of technical analysis. However, applying with technical analysis in stock market still has limitations and weaknesses. Therefore, if we put some fundamental factors into the trading strategies, it will combine the advantages of both technical analysis and fundamental analysis. In this way, the fundamental analysis gives the information of trading in a macroscopic view. It can determine the amount of invest capital. If the fundamental part suggests a good trend of market, traders may increase the capital and take more profits. If in a bad trend of the market, traders may decrease the capital and protect the profits. Technical analysis also gives specific information of action point in the trading. As the Gann Swing trading rules, it determines when to enter the position or exit the position. With the combination, the trading strategies will focus on the macro movement of the whole market and specific movement of individual stock. Thus, it will produce a higher return than of the Gann Swing trading rules.

# Appendix 1:

Date	P	Price	Profit	NO	Accumulate	Capital	Return
			N	()		500000	1
2010/2/4	S	272.2		1000			
2010/2/10	L	277.85	-5.65	1000	-5650	494350	
2010/2/16	L	293.75		1000			
2010/3/31	S	360.3	66.55	1000	66550	560900	
2010/4/12	L	364.65		1000			
2010/4/16	S	373.35	8.7	1000	8700	569600	
2010/4/26	L	370.9		1000			
2010/4/28	S	352	-18.9	1000	-18900	550700	
2010/5/14	S	308.9		1000			
2010/5/28	L	305.1	3.8	1000	3800	554500	
2010/6/4	S	288.6		1000			
2010/6/14	L	301.35	-12.75	1000	-12750	541750	
2010/6/23	S	300.8		1000			
2010/7/7	L	291.6	9.2	1000	9200	550950	
2010/7/15	S	300.35		1000			
2010/9/2	L	312	-11.65	1000	-11650	539300	
2010/9/7	S	314		1000			
2010/9/10	L	319.1	-5.1	1000	-5100	534200	
2010/9/15	S	316.75		1000			
2010/9/16	L	314, 75	2	1000	2000	536200	
2010/9/30	S	299.6		1000			
2010/10/6	L	306.8	-7.2	1000	-7200	529000	
2010/10/8	S	297.25		1000			
2010/10/20	L	291.1	6.15	1000	6150	535150	
2010/11/11	S	284.9		1000			
2010/11/18	L	277.95	6, 95	1000	6950	542100	
2010/12/6	S	263		1000			
2010/12/10	L	272.2	-9.2	1000	-9200	532900	
2010/12/15	S	262		1000			
2010/12/26	L	267.5	-5.5	1000	-5500	527400	
					27400	1027400	0.0548

**Table 3**: Performance of Barclays Bank using Entry Rule #1 in 2010

Date	P	Price	Profit	NO	Accumulate	Capital	Return
					0	500000	
2010/1/11	L	635.5		1000	0		
2010/3/15	S	619.3	-16.2	1000	-16200	483800	
2010/4/6	L	646.3		1000			
2010/4/8	S	637.1	-9.2	1000	-9200	474600	
2010/6/1	S	430		1000			
2010/6/4	L	433.35	-3.35	1000	-3350	471250	
2010/7/19	S	387.85		1000			
2010/7/21	L	399.9	-12.05	1000	-12050	459200	
2010/9/29	L	421		1000			
2010/10/18	S	432.15	11.15	1000	11150	470350	
2010/10/19	L	435.7		1000			
2010/10/22	S	428.7	-7	1000	-7000	463350	
2010/11/2	L	431.65		1000			
2010/11/23	S	428.75	-2.9	1000	-2900	460450	
2010/12/2	L	441.6		1000			
2010/12/10	S	455	13.4	1000	13400	473850	
					-26150	973850	-0.0523

**Table 4**: Performance of BP Oil Company using Entry Rule #1 in 2010

Date	Р	Price	Profit	NO	Accumulate	Capital	Return
						1000000	
2010/1/13	S	5473.48		1000			
2010/1/19	L	5513.14	-39.66	1000	-39660	960340	
2010/2/4	S	5139.31		1000			
2010/2/11	L	5161.48	-22.17	1000	-22170	938170	
2010/3/1	L	5405.94		1000			
2010/4/19	S	5727.91	321.97	1000	321970	1260140	
2010/5/14	S	5262.85		1000			
2010/6/11	L	5163.68	99.17	1000	99170	1359310	
2010/7/16	S	5158.85		1000			
2010/7/19	L	5148.28	10.57	1000	10570	1369880	
2010/8/2	L	5397.11		1000			
2010/8/12	S	5266.06	-131.05	1000	-131050	1238830	
2010/8/17	L	5350.55		1000			
2010/8/18	S	5302.87	-47.68	1000	-47680	1191150	
2010/9/20	L	5602.54		1000			
2010/11/23	S	5581.28	-21.26	1000	-21260	1169890	
2010/11/25	L	5698.93		1000			
2010/11/30	S	5528.27	-170.66	1000	-170660	999230	
2010/12/2	L	5767.56		1000			
2010/12/17	S	5871.75	104.19	1000	104190	1103420	
					103420	1103420	0.10342

**Table 5:** Performance of FTSE 100 using Entry Rule #1 in 2010

# Appendix 2:

Date	P	Price	Profit	NO	Accumulate	Capital	Return
						500000	
2010/1/20	S	619.5		1000			
2010/2/16	L	588.2	31.3	1000	31300	531300	
2010/3/1	L	596		1000			
2010/3/15	S	619.3	23.3	1000	23300	554600	
2010/4/29	S	584.2		1000			
2010/5/6	L	567	17.2	1000	17200	571800	ļ
2010/8/2	L	413.1		1000			
2010/8/11	S	411	-2.1	1000	-2100	569700	
2010/9/2	L	392.6		1000			
2010/9/27	S	403.9	11.3	1000	11300	581000	3
					81000	108100	0.162

**Table 6:** Performance of Barclays Bank using Entry Rule #2 in 2010

Date	Р	Price	Profit	NO	Accumulate	Capital	Return
			1			500000	
2010/1/26	S	276		1000			
2010/2/3	L	295.35	-19.35	1000	-19350	480650	
2010/2/16	L	293.75		1000		0	
2010/3/31	S	360.3	66.55	1000	66550	547200	
2010/4/30	S	338.25		1000		0	
2010/5/28	L	305.1	33.15	1000	33150	580350	
2010/7/26	L	315.65		1000		0	
2010/8/6	S	324.6	8.95	1000	8950	589300	
2010/8/24	S	309.15		1000		0	
2010/9/2	L	312	-2.85	1000	-2850	586450	
				1	86450	1086450	0.1729

 Table 7: Performance of BP Oil Company using Entry Rule #2 in 2010

Date	P	Price	Profit	NO	Accumulate	Capital	Return
						10000000	
2010/2/18	L	5325.09		1000			
2010/4/19	S	5727.91	402.82	1000	402820	10402820	
2010/4/29	S	5617.84		1000			
2010/6/11	L	5163.68	454.16	1000	454160	10856980	
2010/6/14	L	5202.13		1000			
2010/6/24	S	5100.23	-101.9	1000	-101900	10755080	
2010/6/30	S	4916.87		1000			
2010/7/8	L	5105.45	-188.58	1000	-188580	10566500	
2010/7/23	L	5312.62		1000			
2010/7/30	S	5258.02	-54.6	1000	-54600	10511900	
2010/8/23	S	5234.84		1000			
2010/8/31	L	5225.22	9.62	1000	9620	10521520	
2010/9/1	L	5366.41		1000			
2010/11/23	S	5581.28	214.87	1000	214870	10736390	
					736390	10736390	0.073639

**Table 8:** Performance of FTSE 100 using Entry Rule #2 in 2010

# Appendix 3:

Date	Ρ	Price	Profit	NO	Accumulate	Capital	Return
						500000	
2010/1/6	L	307		1000			
2010/1/20	S	300.85	-6.15	1000	-6150	493850	
2010/2/17	L	302.3		1000			
2010/3/31	S	360.3	58	1000	58000	551850	
2010/5/4	S	323		1000			
2010/5/28	L	305.1	17.9	1000	17900	569750	
2010/6/29	S	267.35		1000			
2010/7/7	L	291.6	-24.25	1000	-24250	545500	
2010/7/16	S	284.65		1000			
2010/9/2	L	312	-27.35	1000	-27350	518150	
2010/10/8	S	297.25		1000			
2010/10/20	L	291.1	6.15	1000	6150	524300	
2010/10/28	S	278.5		1000			
2010/11/4	L	287.1	-8.6	1000	-8600	515700	
2010/11/26	S	259.8		1000			
2010/12/2	L	274.95	-15.15	1000	-15150	500550	
2010/12/17	S	259.75		1000			
2010/12/22	L	267.5	-7.75	1000	-7750	492800	
					-7200	992800	-0.0144

**Table 9:** Performance of Barclays Bank using Entry Rule #3 in 2010

Date	Р	Price	Profit	NO	Accumulate	Capital	Return
				( ) (		500000	
2010/1/11	L	635.5		1000			
2010/3/15	S	619.3	-16.2	1000	-16200	483800	
2010/3/17	L	630.7		1000			
2010/3/30	S	624	-6.7	1000	-6700	477100	
2010/5/7	S	553.9		1000			
2010/6/4	L	433.35	120.55	1000	120550	597650	
2010/6/8	S	408.9		1000			
2010/7/21	L	399.9	9	1000	9000	606650	
2010/8/3	L	415.65		1000			
2010/8/11	S	411	-4.65	1000	-4650	602000	
2010/9/3	L	401.7		1000			
2010/9/27	S	403.9	2.2	1000	2200	604200	
2010/9/29	L	421		1000			
2010/10/18	S	432.15	11.15	1000	11150	615350	
2010/11/3	L	439.3		1000			
2010/11/23	S	428.75	-10.55	1000	-10550	604800	
2010/12/6	L	450		1000			
2010/12/10	S	455	5	1000	5000	609800	
2010/12/13	L	458.35		1000			
2010/12/17	S	467.15	8.8	1000	8800	618600	
				. h	118600	1118600	0.2372

**Table 10:** Performance of BP Oil Company using Entry Rule #3 in 2010

Date	Р	Price	Profit	NO	Accumulate	Capital	Return
and a start of the		Set Wrenk destrie	NAMERICAL AND AND A	No-sta		10000000	The selection of the second
2010/1/6	L	5530.04		1000			
2010/4/19	S	5727.91	197.87	1000	197870	10197870	
2010/4/30	S	5553.29		1000			
2010/6/11	L	5163.68	389.61	1000	389610	10587480	
2010/6/15	L	5217.82		1000			
2010/6/24	S	5100.23	-117.59	1000	-117590	10469890	
2010/7/1	S	4805.75		1000			
2010/7/8	L	5105.45	-299.7	1000	-299700	10170190	
2010/8/2	L	5397.11		1000			
2010/8/12	S	5266.06	-131.05	1000	-131050	10039140	
2010/9/2	L	5371.04		1000			
2010/11/23	S	5581.28	210.24	1000	210240	10249380	
2010/12/2	L	5767.56		1000	2		
2010/12/17	S	5871.75	104.19	1000	104190	10353570	
					353570	1353570	0.035357

**Table 11:** Performance of FTSE 100 using Entry Rule #3 in 2010

## **Appendix 4:**

Year	Profit	Profits (Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	-173.34	-99.32	8	-74.02	10	-0.34668
2002	-17.8	8.27	7	-26.07	10	-0.0356
2003	-84.23	-39.19	8	-45.04	4	-0.16846
2004	-46.27	-42.37	6	-3.9	4	-0.09254
2005	-21.9	0	4	-21.9	4	-0.0438
2006	35.06	50.15	7	50.15	7	0.07012
2007	-38.47	-120.27	6	81.8	4	-0.07694
2008	-164.95	-196.41	4	31.46	8	-0.3299
2009	122.15	151.95	5	-29.8	3	0.2443
2010	27.4	56.35	3	-28.95	12	0.0548
				AVG Return:		-0.07247

## Table 12: Summarized Performance of Entry Rule #1 from 2001 to 2010 year

(a) Performance of Barclays Bank

Year	Profit	Profits (Long)	NO (Long)	Profits (Short)	NO(Short)	Return
2001	-28	-22.5	6	-5.5	7	-0.056
2002	-141.5	-89.5	5	-52	5	-0.283
2003	-0.5	-15.25	6	14.75	7	-0.001
2004	-47.25	-35.75	6	-11.5	3	-0.0945
2005	-9.5	25	6	-34.5	7	-0.019
2006	26.5	-13.5	4	40	8	0.053
2007	-139	-32.5	7	-106.5	7	-0.278
2008	-116.5	-10.25	4	-106.25	5	-0.233
2009	5.05	-18.45	6	23.5	2	0.0101
2010	-26.15	-10.75	6	-15.4	2	-0.0523
				AVG Return		-0.09537

(b) Performance of BP Oil Company

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	319.35	-275.49	5	594.84	10	0.06387
2002	-841.06	-563.47	6	-277.59	11	-0.168212
2003	-486.57	-147.48	6	-339.09	4	-0.097314
2004	-537.17	-433.3	9	-103.87	3	-0.107434
2005	-573.61	-59.82	2	-513.79	4	-0.114722
2006	-492.64	-498	12	5.36	1	-0.098528
2007	-975.25	-413.71	8	-561.54	8	-0.19505
2008	944.18	-295.72	4	1239.9	8	0.188836
2009	-1052.35	-433.44	7	-618.91	5	-0.21047
2010	103.42	55. 51	6	47.91	4	0.20684
					AVG:	-0.0532184

(c) Performance of FTSE 100

Note: Profits (Long) are the profits which the entry rules take in a long position. Profits (short) are the profits which the entry rules take in a short position. No (Long) and No (Short) are the number of transactions in the long and short positions respectively.

# **Appendix 5:**

Year	Profit	Profits (Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	-36.75	-30.92	3	-5.83	3	-0.0735
2002	146.33	11.2	3	135.13	3	0.29266
2003	22.65	-11.93	2	34.58	2	0.0453
2004	29.47	51.14	2	-21.67	2	0.05894
2005	-0.48	-6.33	3	5.85	2	-0.00096
2006	1.95	-1.95	3	3.9	3	0.0039
2007	-79.86	-144.13	3	64.27	4	-0.15972
2008	141.36	-69.09	2	210.45	2	0.28272
2009	89.75	53.9	2	35.85	2	0.1795
2010	86.45	75.5	2	10.95	3	0.1729
					AVG:	0.80174

## **Table 13:** Summarized Performance of Entry Rule #2 from 2001 to 2010 year

# (a) Performance of Barclays Bank

Year	Profits	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	114	22.5	4	91.5	4	0.228
2002	-12.5	-12.5	3	0	3	-0.025
2003	10.75	20.75	3	-10	3	0.0215
2004	42	36.25	3	5.75	3	0.084
2005	-31.5	-14.5	2	-17	3	-0.063
2006	62.5	11	1	51.5	3	0.125
2007	72	2	3	70	2	0.144
2008	161.25	23.75	3	137.5	2	0.3225
2009	0.55	14.25	2	-13.7	2	0.0011
2010	81	32.5	3	48.5	2	0.162
					AVG:	0.10001

(b) Performance of BP Oil Company

Year	Profits	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	284.27	-105.2	4	389.47	4	0.056854
2002	-242.8	-309.22	2	66.42	2	-0.04856
2003	248.02	408.96	2	-160.94	1	0.049604
2004	-117.04	-136.68	3	19.64	3	-0.023408
2005	121.63	124.05	2	-2.42	2	0.024326
2006	-61.28	-83.86	1	22.58	2	-0.012256
2007	144.68	142.55	3	2.13	2	0.028936
2008	1540.35	39.51	4	1500.84	3	0.30807
2009	-956.11	-175.78	2	-780.33	1	-0.191222
2010	736.39	461.19	4	275.2	3	1.47278
					AVG:	0.1665124

# Appendix 6:

Year	Profits	Profits (Long)	NO(Long)	Profits (Short)	NO(Short)	Return
2001	-16.08	-84.24	5	68.16	3	-0.03216
2002	53.58	-18.75	5	72.33	7	0.10716
2003	-70.1	-46.49	7	-23.61	2	-0.1402
2004	26.3	2.93	6	23.37	3	0.0526
2005	-39.91	-28.23	5	-11.68	2	-0.07982
2006	66.71	70.11	2	-3.4	1	0.13342
2007	-61.36	-124.66	3	63.3	4	-0.12272
2008	-203.67	-228.11	3	24.44	6	-0.40734
2009	114.2	114.2	5	0	0	0.2284
2010	-7.2	51.85	2	-59.05	7	-0.0144
					AVG:	-0.027506

# **Table 14:** Summarized Performance of Entry Rule #3 from 2001 to 2010 year

(a) Performance of Barclays Bank

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	3.5	-31.5	5	35	4	0.007
2002	-163	-107.5	4	-55.5	5	-0.326
2003	10.25	1.75	3	8.5	5	0.0205
2004	45.25	32.25	5	13	4	0.0905
2005	-10.5	27.5	7	-38	4	-0.021
2006	75.5	7.5	3	68	6	0.151
2007	-7	-20	7	13	5	-0.014
2008	2.25	-31.75	4	34	3	0.0045
2009	34.6	23.25	4	11.35	4	0.0692
2010	118.6	-10.95	8	129.55	2	0.2372
					AVG:	0.02189

(b) Performance of BP Oil Company

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	682.18	-53.92	3	736.1	4	0.136436
2002	52.88	-41.93	1	94.81	6	0.010576
2003	-605.57	-166.02	2	-439.55	5	-0.121114
2004	-324.28	-165.45	7	-158.83	5	-0.064856
2005	148.01	178.18	7	-30.17	2	0.029602
2006	-32.48	-40.99	4	8.51	1	-0.006496
2007	160.81	38.18	3	122.63	3	0.032162
2008	604.12	-611.2	6	1215.32	6	0.120824
2009	-522.32	-72.19	3	-450.13	3	-0.104464
2010	353.57	263.66	5	89.91	2	0.70714
					AVG:	0.073981

# Appendix 7:

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	-82.51	-99. 32	9	16.81	11	-0.16502
2002	22.88	-58.17	5	81.05	11	0.04576
2003	65.98	42.35	8	23.63	5	0.13196
2004	-37.24	-25.55	10	-11.69	6	-0.07448
2005	-8.27	-23. 37	4	15.1	6	-0.01654
2006	-13.12	-4.85	3	-8.27	3	-0.02624
2007	169.44	6.33	1	163.11	11	0.33888
2008	-61.78	-102.91	5	41.13	10	-0.12356
2009	57.05	46.35	12	10.7	5	0.1141
2010	141.3	84.15	5	57.15	5	0.2826
					AVG:	0.050746

## **Table 15:** Summarized Performance of Entry Rule #1&#3 from 2001 to 2010 year

(a) Performance of Barclays Bank

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	-24.5	-40	9	15.5	5	-0.049
2002	-102	-34.5	3	-67.5	8	-0.204
2003	-58.25	-19.75	6	-38.5	11	-0.1165
2004	3.5	3.5	9	-23.25	6	0.007
2005	67.5	57	10	10.5	2	0.135
2006	86	27.5	2	58.5	4	0.172
2007	35	40.5	6	-5.5	4	0.07
2008	135.25	11	5	124.25	8	0.2705
2009	51.75	52.85	6	-1.1	5	0.1035
2010	91.8	-2.45	7	94.25	5	0.1836
					AVG:	0.05721

(b) Performance of BP Oil Company

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	-0.11	-276.51	5	276.4	9	-2.2E-05
2002	-815.97	-766.76	9	-49.21	10	-0.163194
2003	66.93	-203.67	15	270.6	3	0.013386
2004	-17.57	89.83	3	-107.4	9	-0.003514
2005	-312.98	51.82	8	-364.8	5	-0.062596
2006	76.46	140.57	9	-64.11	6	0.015292
2007	-594.85	-616.52	10	21.67	2	-0.11897
2008	503.87	-67.26	3	571.13	13	0.100774
2009	193.26	145.2	9	48.06	5	0.038652
2010	412.51	255.92	4	156.59	5	0.82502
					AVG:	0.0644828

# Appendix 8:

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	-63.05	-99.32	9	36.27	4	-0.1261
2002	53.59	2.46	6	51.13	6	0.10718
2003	36.51	42.35	8	-5.84	4	0.07302
2004	-39.91	-25.55	10	-14.36	4	-0.07982
2005	16.07	0.49	5	15.58	2	0.03214
2006	-0.95	-18	10	17.05	3	-0.0019
2007	-2.44	-42.85	4	40.41	7	-0.00488
2008	-11.09	-146.73	6	135.64	5	-0.02218
2009	83.55	44.95	12	38.6	1	0.1671
2010	102.15	69.5	6	32.65	2	0.2043
					AVG:	0.034886

## **Table 16:** Summarized Performance of Entry Rule #2&#3 from 2001 to 2010 year

(a) Performance of Barclays Bank

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	-26	-40	9	14	1	-0.052
2002	-117.5	-34.5	3	-83	4	-0.235
2003	20.75	-25.5	7	46.25	3	0.0415
2004	27.75	34.75	9	-7	3	0.0555
2005	15	35	11	-20	1	0.03
2006	12.5	27.5	2	-15	3	0.025
2007	85	74	7	11	3	0.17
2008	160	11	5	149	4	0.32
2009	77.05	55.35	7	21.7	3	0.1541
2010	97.15	-18.8	8	115.95	5	0.1943
					AVG:	0.07034

(b) Performance of BP Oil Company

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	439	-276.51	5	715.51	5	0.0878
2002	-361.55	-766.76	9	405.21	4	-0.07231
2003	-346.11	-337.67	16	-8.44	5	-0.069222
2004	160.91	171.75	4	-10.84	5	0.032182
2005	-230.08	130.25	6	-360.33	4	-0.046016
2006	164	114.48	10	49.52	3	0.0328
2007	-867.38	-616.52	10	-250.86	3	-0.173476
2008	1066.52	-438.92	4	1505.44	4	0.213304
2009	909.31	334.56	10	574.75	2	0.181862
2010	354.24	175.97	5	178.27	3	0.70848
					AVG:	0.0895404

# **Appendix 9:**

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	-37.49	-94.71	4	57.22	13	-0.07498
2002	45.03	-62.8	2	107.83	13	0.09006
2003	17.06	13.88	5	3.18	7	0.03412
2004	-60.85	-16.55	4	-44.3	9	-0.1217
2005	-22.39	-37	4	14.61	7	-0.04478
2006	-35.04	-0.97	4	-34.07	5	-0.07008
2007	160.19	6.33	1	153.86	11	0.32038
2008	103.81	-35	1	138.81	12	0.20762
2009	39.45	-5.6	6	45.05	2	0.0789
2010	126.4	56.4	2	70	9	0.2528
					AVG:	0.067234

# **Table 17:** Summarized Performance of Entry Rule #1&#3 from 2001 to 2010 year

(a) Performance of Barclays Bank

Year	Profit	Profits (Long)	NO(Long)	Profits (Short)	NO(Short)	Return
2001	54	17.5	3	36.5	9	0.108
2002	-36.5	0	0	-36.5	8	-0.073
2003	-8.25	-30.5	4	22. 25	12	-0.0165
2004	12.5	33.25	5	-20.75	7	0.025
2005	35.5	35	6	0.5	8	0.071
2006	62	3.5	2	58.5	4	0.124
2007	13.5	16	3	-2.5	5	0.027
2008	220.75	22.5	3	198.25	8	0.4415
2009	38.25	36.35	4	1.9	6	0.0765
2010	78.65	-34.25	6	112.9	8	0.1573
					AVG:	0.09408

(b) Performance of BP Oil Company

Year	Profit	Profits(Long)	NO(Long)	Profits(Short)	NO(Short)	Return
2001	621.75	-37.46	2	659.21	16	0.12435
2002	702.03	-130.62	2	832.65	15	0.140406
2003	14.56	-197.2	7	211.76	6	0.002912
2004	150.43	181.4	4	-30.97	11	0.030086
2005	-305.96	48.37	5	-354.33	7	-0.061192
2006	261.62	102.86	6	158.76	7	0.052324
2007	-778.79	-135.97	4	-642.82	7	-0.155758
2008	846.62	-472.57	2	1319.19	14	0.169324
2009	824.63	363.75	4	460.88	5	0.164926
2010	483.88	240.69	4	243.19	7	0.96776
					AVG:	0.1435138,

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