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Geometric progression and relative strength index applied to FX hedging

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Abstract: This research aims at profit maximization and loss minimization in any FX market trading. A geometric progression (geometric sequence), is said to be a non-zero number progression or sequence in which each term following the first is obtained via multiplying the prior by the common ratio, which is a predetermined non-zero value. This method seeks to open an opposite position to an existing initial position in order to hedge that initial position in the event that the market moves against our trade. There are a number of mathematical models to develop new hedging strategies for Forex trading. Due to the apparent high level of unpredictability in price movement, forecasting the future of a stock price is a challenging endeavor. The research would like to study one with geometric progression in particular. In other words, every number can be entered as multiple integer of a different number. Thus, 1, 2, 4, 8,..., 2n is a step forward. Smart traders never take more risks than their capital, however, the otherwise is viewed and considered here.

Keywords: Geometric progression, FX, hedging, index

1. Introduction

The Foreign exchange market (FOREX) without doubt, is the world's largest financial market and is now extremely important for international trade [1-3]. The exchange market enables currency purchases and sales and then sets the relative value of currencies against each other (foreign exchange market, 2013). This financial market has enabled people to profit from price fluctuations between market currencies. People now refer to it as forex trading. The currency hedging transaction is intended to prevent unwanted exchange rate movements from taking an existing or anticipated position [4-6]. Many market players, including investors, traders and enterprises, are using Forex hedging. If someone buys a foreign currency pair or wants to have it in future through business, it can be safeguarded from downside risk by using currency hedging properly. A trader or a shorter-selling investor of a currency pair may alternate with currency hedging in order to prevent upside risk [7-9]. It is important to note that a hedge is not a strategy for money-making. A forex hedge is designed not to benefit but to protect against losses. In addition, most covers are intended to remove part rather than all of the exposure risk, given the cost of coating that may after a certain point outweigh the advantages. Although artificial intelligence includes machine learning, the model may learn from its prior



experiences and build on them without needing to be reprogrammed again; moreover, other predictive methods and approaches suffice [10-18]. Backward propagation, also known as back propagation errors, has been used in certain conventional machine learning approaches for prediction. Researchers now use a variety of approaches for making predictions, including the support vector machine (SVM), though, the stock market movement seems random in the short term, but it takes on a linear pattern over time [19-25].

2. The Geometric progression and Relative strength index modelling

To apply this technique, the first trade will be made with a 0.1 lot size based on the oversold or overbought conditions of the relative strength index based on the market's current condition at that moment, as discussed after the hedge model. Also, if the market goes against us, will apply the hedge model as discussed below.

We need a sequence of the format 0.3, 0.6, 1.2, 2.4, 4.8. Therefore we will be using the geometric progression formula of the format

$$a_n = ar^{n-1}$$

where; a is the first term, r is the common ratio and n is the number of terms.

Furthermore, to get that particular sequence, we will be using 0.3 as the first term of the progression and 2 as the common ratio as shown below;

$$a_n = ar^{n-1} = 0.3 \times 2^{n-1}.$$

NOTE: In this model we set default first trade to be 0.1 at all times, therefore it is after the first trade that the geometric progression will be initialized. (i.e [0.1], 0.3, 0.6, 1.2, 2.4, 4.8... ar^{n-1}). References are made to Figures 1 – 5 as regards hedging and relative index.

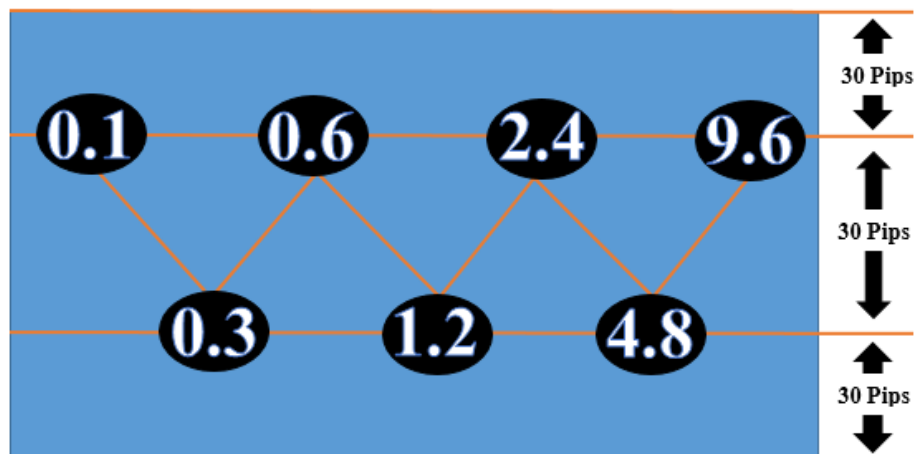


Figure 1. Hedge Model

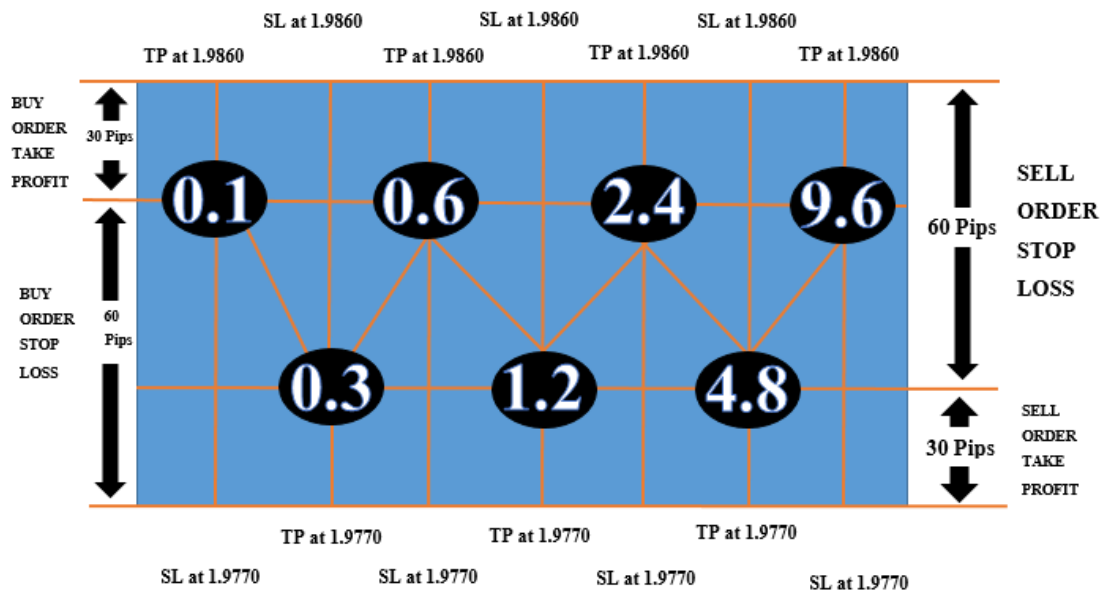


Figure 2. Hedge model description

To use this model, the following steps should be followed respectively;

- i. For the sake of simplicity, assuming there's no difference between the 'ask' and the 'bid' price. The order is opened by the RSI robot in the direction that meets the requirements. Example: Buy a lot of 0.1 at peradventure 1.9830 you place a stop sale order for 0.3 lots at 1.9800 a few seconds after the buy order.
- ii. When the price does not reach 1.9860 TP and the price drops to 1.9770 SL, TP. After that, the Sell Stop was activated earlier with a 0.3 lot move, which resulted in a 30 pip profit.
- iii. If the TP and SL of 1.9770 are not met and the price rises again, a buy stop loss order at 1.9830 should be placed in anticipation of the climb. You should instantly place a purchase stop loss order of 0.6 lots at 1.9830 once the sell stop loss mark is reached and becomes a valid order to sell 0.3 lots.
- iv. If the price rises and hits 1.9860 as a stop loss or take profit, you will benefit by 30 points!
- v. If the price falls further without hitting any TPs, keep an eye out for a 1.2 lot stop sell order, then a 2.4 lot purchase stop order, and so on... Progress in this manner till you make a profit. 0.1, 0.3, 0.6, 1.2, 2.4, 4.8, 9.6, 19.2, and also 38.4 lots.
- vi. I used a 30/60/30 arrangement in this example (TP 30 points, SL 60 points, and coverage distance 30 points). You could also go with 15/30/15 or 60/120/60. You can also experiment with 30/60/15 or 60/120/30 layouts to see if you can maximize profits.

3. Coding and algorithm

The following Forex trading techniques are simply great. First of all we will create a relative strength index robot that will automatically make the first trade for us based on its overbought or oversold levels.

The Relative Strength Index formula is calculated in two parts starting with the following equations:

$$Relative\ Strength\ Index\ (RSI) = 100 - \frac{100}{1 - RS}, \quad 1 \neq RS$$

$$\text{Relative Strength (RS)} = \frac{\text{Average Gain}}{\text{Average Loss}}$$

where average gain = (sum of all 'm gain' period) / m

where average gain equals (sum of all 'm gain period)/n, average gain equals (sum of all 'm loss period)/m, and m represents the periods.

$$RSI_0 = \frac{\text{Average Gain}}{\text{Average Loss}} = \frac{(\text{sum of all 'n gain period'})/14}{(\text{sum of all 'n loss period'})/14}$$

For subsequent calculation, we will use:

$$RSI_1 = \frac{[(\text{Average Gain from Previous Transaction}) \times (m-1) + \text{current gain}]/14}{[(\text{Average Loss from Previous Transaction}) \times (m-1) + \text{current loss}]/14}$$

To make the mathematical description easier to understand, the relative strength index is separated into three primary components: RS (Relative Strength), average gain, and average loss. This relative strength index calculation is based on Wilder's proposed default value of 14 periods in his book. The loss is displayed as a non-negative positive value. The first calculation of the average loss with the average gain is a simple 14-hour average.

- i. Initial Average Gain = Total Gain of Last 14 Periods / 14.
- ii. Initial Average Loss = Total Loss of Last 14 Periods / 14

Further and subsequent evaluations are centered in relation to previous average gain and losses:

- i. Average gain = [(average gain from previous transaction) x 13+ current gain] / 14.
- ii. Average loss = [(average loss from previous transaction) x 13+ current loss] / 14.

This Relative Strength Index is being created to be an indicator in the forex market for analysis and as such, we will create a relative strength index robot that will automatically take trades for us based on 70 and 30 overbought and oversold levels respectively.

The result of the relative strength index comes out a line graph form as shown below; Traditionally, reading above 70 are said to be overbought market condition therefore traders should look for sell opportunities and readings below 30 are said to be oversold market condition therefore traders should look for buy opportunities.

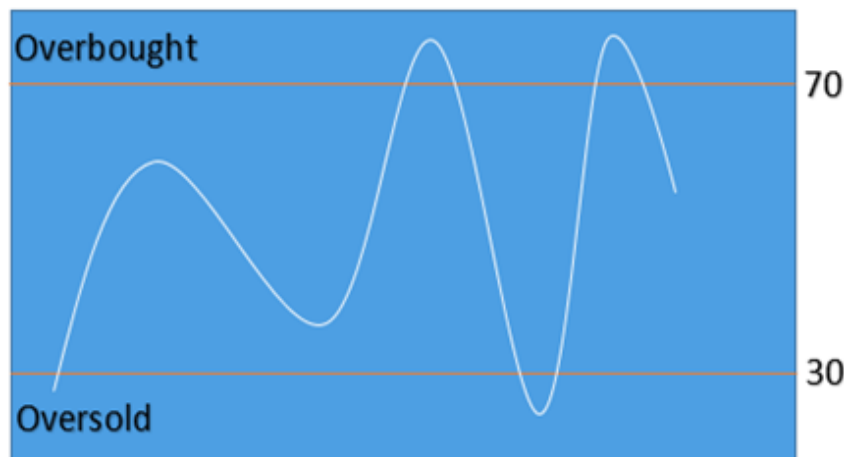


Figure 3. Relative strength index line graph

Furthermore, to build this robot we will make use a website called fxdreema, which is used in creating forex robots. There are numerous website or platforms used in creating robots but we will make use of fxdreema.



Figure 4: Fxdreema homepage

Once the page is opened, we make use of the blocks at the left of the home page to create a “no trade” block, two “condition” blocks, a “buy now” block and a “sell now” block, using the orange linker to link them as shown below.

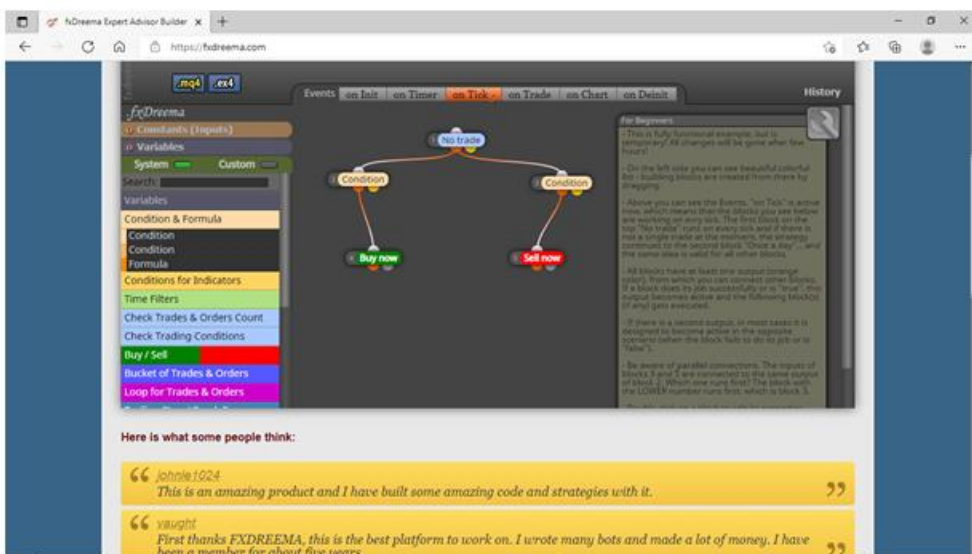


Figure 5: Fxdreema blocks

Secondly we will edit the properties of this blocks to suit our needs by double clicking on the desired block.

The “no trade block” will be left as it is,

The first condition block at the left when double clicked, on the left operand would be set to “relative strength index” as the indicator,

The rsi period remains at 14

The applied price will be “low price”

Inequality sign will be “<”.

On the right operand, indicator will be changed to “value” and will be left on “numeric”

Change the value under “numeric” to “30”.

Click update to save when done.

For the first condition block at the left when double clicked, on the left operand would be set to “relative strength index” as the indicator,

- i. The rsi period remains at 14
- ii. The applied price will be “high price”
- iii. Inequality sign will be “>”.
- iv. On the right operand, indicator will be changed to “value” and will be left on “numeric”
- v. Change the value under “numeric” to “70”.
- vi. Click update to save when done.

For the buy now block,

- i. The money management will be left at “fixed volume”
- ii. Fixed volume will be set “0.01” as the first lot size to be taken by the robot.
- iii. The stop loss be at “fixed pips” with a value of “10”
- iv. The take profit will be at “fixed pips” with a value of “5”
- v. And then we click “update”

For the “sell now” block,

- i. The money management will be left at “fixed volume”
- ii. Fixed volume will be set “0.01” as the first lot size to be taken by the robot.
- iii. The stop loss be at “fixed pips” with a value of “10”
- iv. The take profit will be at “fixed pips” with a value of “5”
- v. An then we click “update”

Finally we export the algorithm by clicking on the “.mql4” or “.ex4” on the top left of the building interface. Mql4 shows you the code generated by fxdreema for any further customization, ex4 save the robot directly.

4. Concluding remarks

Forex strategies have advantages and disadvantages. As technology advances, the trading process has been improved accordingly. It is one of the inventions that has altered the way hedging techniques are viewed. While it is true that hedges can be disastrous for an account if not used appropriately, this should not be a deterrent to this research. Finally, we can see that geometric progression plays a significant part in the profitability of our strategy, ensuring that we will win whatever trade we make regardless of market volatility.

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