BATMAN

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STOCK MARKET: DECISION MAKING

The Stock prices depend on two variables namely:

- **Moving Average**

  A moving average (MA) is a trend-following or lagging indicator because it is based on past prices. The two basic and commonly used MAs are the simple moving average (SMA), which is the simple average of a security over a defined number of time periods, and the exponential moving average (EMA), which gives bigger weight to more recent prices. The most common applications of MAs are to identify the trend direction and to determine support and resistance levels. While MAs are useful enough on their own, they also form the basis for other indicators such as the Moving Average Convergence Divergence (MACD). The Moving Average should be calculated using current values and not values in the too past or too future. The main purpose of using Moving Average in this manner is to reduce the Forecasting Error.

- **Current Price of the Stock**

  This indicates the present value of the stock prices.

Equations governing the Stock Prices

- Price on i-th day:

$$p(i) = 12 + 2.5\sin(2\pi i/19) + 0.8\cos(2\pi i/5) + \zeta(i)$$

- Moving Average:

$$m(i) = 0.5\cos(0.3i) - \sin(0.3i)$$

Fuzzy Rules

The general rules governing the stock market decisions are given in the following table.

TABLE 1: General Rules for Decision Making in Stock Market.

PRICE/MA	NEGATIVE	ZERO	POSITIVE
VERY LOW	BUY MANY	BUY MANY	BUY FEW
LOW	BUY FEW	BUY FEW	BUY MANY
MEDIUM	SELL FEW	DO NOT TRADE	DO NOT TRADE
HIGH	SELL MANY	SELL FEW	DO NOT TRADE
VERY HIGH	SELL MANY	SELL MANY	DO NOT TRADE

Fuzzified Inputs and Output

The following tables give the fuzzified values of input and output.

TABLE 2: Fuzzified values of Price given as Input (Antecedent) over the range 0.0 to 1.0.

PRICE	LOWER LIMIT	UPPER LIMIT
VERY LOW	0.0	0.3
LOW	0.25	0.5
MEDIUM	0.4	0.6
HIGH	0.5	0.75
VERY HIGH	0.7	1.0

TABLE 3: Fuzzified values of Moving Average given as Input (Antecedent) over the range 0.0 to 1.0.

MOVING AVERAGE	LOWER LIMIT	UPPER LIMIT
NEGATIVE	0.0	0.4
ZERO	0.3	0.7
POSITIVE	0.6	1.0

TABLE 4: Fuzzified values of Trade got as Output (Conclusion) over the range 0.0 to 1.0.

TRADE	LOWER LIMIT	UPPER LIMIT
SELL MANY	0.0	0.4
SELL FEW	0.3	0.5
DO NOT TRADE	0.4	0.6
BUY FEW	0.5	0.7
BUY MANY	0.6	1.0

Glossary

Moving Average**:** *In statistics, a Moving Average (Rolling Average or Running Average) is a calculation to analyze data points by creating series of averages of different subsets of the full data set. It is also called a Moving Mean (MM) or Rolling Mean and is a type of finite impulse response filter.*

Fuzzification**:** *The process of converting a crisp input value to a fuzzy value is called fuzzification.*

Defuzzification**:** *It is the process of producing a quantifiable result in fuzzy logic, given fuzzy sets and corresponding membership degrees.*

References

http://www.investopedia.com/articles/active-trading/052014/how-use-moving-average-buy-stocks.asp

Acheme David Ijegwa, Vincent Olufunke Rebecca, Folorunso Olusegun, Olusola Olasunkanmi Isaac. (April 28, 2014). **"A Predictive Stock Market Technical Analysis Using Fuzzy Logic".** Department of Computer Science, Federal University of Agriculture, Department of Physics, University of Lagos, Nigeria.