Development of Business Model in the Stock Market using Artificial Intelligence

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ARTICLE INFO	ABSTRACT
	In today's rapidly evolving landscape, to overcome the criticalness of the synergy between business and information technology, this article is presented with deriving a business model for one of the biggest businesses in the world involving Artificial Intelligence (AI) to help traders or investors. The business model is developed based on mathematical formulas and logic with reward to risk management and emotion management. As the Fibonacci sequence has emerged in nature and science and is used as Fibonacci retracement in the analysis of the stock market (SM), the mathematical models were derived using the Fibonacci numbers. The Python programming: AI tool is used to implement the developed mathematical model for real-time stock data to support popular Algorithmic trading. The validation of the developed model was held with available real-time stock data. Buy/Sell signals, and exit signals with loss or profit with proper risk management, emotion management are beautifully derived as an outcome with around 80% accuracy in the present work. The Python programming implementation for developed mathematical models can be used in Algorithmic trading. **Keywords:** Business Model, Development of Mathematical Model, Artificial Intelligence-Python Programming, Validation, Risk Management, Emotional Management.

INTRODUCTION

Looking at various surveys, it has been observed that SM has attracted the youth of India and become popular among youngsters nowadays [1,2]. According to popular estimates, as much as 90% of people lose money by trading in the SM [3]. There have been several cases of depression/suicide caused by SM losses of late, especially among youngsters [4]. Few people have the mentalities like "to become quick reach", "to earn from day 1", "to identify some shortcut" and "to take revenge", which are the major reasons for the big losses and addiction to SM. Therefore, these SM big losses and addictions are becoming great concerns for novice traders' lives these days.

"SM is a gambling", these words are heard amongst the people very commonly. SEBI Study Reveals that 93% of Individual Traders Incurred Losses in Equity F&O between FY22 and FY24; Aggregate Losses Exceed ₹1.8 Lakh Crores Over Three Years [5]. On the other side, to earn money, trading provides the biggest business opportunities by buying and selling stocks in F&O, deliveries, day trading, swing trading, investments, etc. Therefore, the fact was derived in the present work by referring to the books and watching the interviews of the top professional traders of India [6-10]. The fact about SM was derived that "SM is a pure Business", when people operate it with rules and discipline using risk management, money management & emotion management otherwise it is a gambling. I also understood that novice traders do not follow these rules and discipline for taking the trades. They just took the trades randomly or on others' tips and achieved big losses. They are not even booking the pre-decided stop losses and waiting for the pre-decided targets due to emotions.

Based on this fact of the SM, it was decided to develop the mathematical models to run the business in SM based on mathematical formulas and logic by following all risk management, money management and emotion management

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rules. The validation of the developed model is also carried out with real-time data from SM in the present study. Python programming is used to execute developed mathematical models to support algorithmic trading.

BUSINESS MODEL

Based on the literature, it was observed that many traders were using the relative strength index, moving average convergence and divergence, Bollinger Bands, ichimoku cloud, average directional index, etc. lagging/leading indicators to do the trading, which are also based on some mathematical equations [11]. Fibonacci sequence are applied in several applications directly and indirectly such as wonders of nature: ocean, flower, tree, man & animals, natural science, nuclear theory, medicine, radio, television, etc. [12-14]. Robert Fischer (1993) derived strategies for traders by applying the Fibonacci series [15]. Hence, in this work mathematical model is developed with advanced technique by using the consecutive Fibonacci numbers 8 and 21 and logic as depicted below. Here, the logic is derived that it is difficult to move for the price to touch 8% (in down if the market is trending up, in up if the market is trending down) by analyzing the market survey, stock movement weekly in %, volatility, Indiavix, etc., which is set to be stop loss of the respective trade. Here, the reward should be set to 16% and the risk should be set to 8% based on Fibonacci numbers to fulfill the reward to risk management (2:1) and to earn money in a longer span with a minimum accuracy of 50%. At, 50% accuracy with RR-2:1, the trader/investor should be held at breakeven. The mathematical models were derived using a weekly time frame and with the limitation that it applies to only trading market.

Mathematical Model for Buy Signal (MMBS) is derived based on a mathematical formula and using Fibonacci numbers for the buy signal as shown in Equation (1).

$$\text{Buy at Current Price} = \text{Price of EMAY}(W)$$

$$\text{Where, EMAX}(W) > \text{EMAY}(W) \text{ and } X = 8 \text{ \& } Y = 21 \text{ are the fibonacci series numbers.}$$

$$\text{Sell}(\text{Profit}/\text{Loss}) \text{ at Current Price} = \text{Buy Price} + (2 \times 8\% \times \text{Buy Price}) \text{ or Buy Price} - (8\% \times \text{Buy Price}) \tag{1}$$

The value of EMA should be found using below Eqauation (2).

$$\text{EMA}_{\text{Today}} = \left(\left(\text{PriceValue}_{\text{Today}} \times \frac{\text{Smoothing}}{(1+\text{Days})} \right) + \left(\text{EMA}_{\text{Yesterday}} \times \left(1 - \frac{\text{Smoothing}}{(1+\text{Days})} \right) \right) \right) \tag{2}$$

Here, the trend of the stock must be upside-trending in nature at the time of execution of the buy signal. Therefore, the trend of stock should be checked as per Dow's Theory by considering major pivots [16].

Mathematical Model for Sell Signal (MMSS) is derived based on a mathematical formula and using Fibonacci numbers for Sell signal as shown in Equation (3).

$$\text{Sell at Current Price} = \text{Price of EMAY}(W)$$

$$\text{Where, EMAX}(W) < \text{EMAY}(W) \text{ and } X=8 \text{ \& } Y=21 \text{ are the fibonacci series numbers.}$$

$$\text{Buy}(\text{Profit}/\text{Loss}) \text{ at Current Price} = \text{Sell Price} - (2 \times 8\% \times \text{Buy Price}) \text{ or Sell Price} + (8\% \times \text{Buy Price}) \tag{3}$$

Here, the trend of the stock must be downside-trending in nature at the time of execution of the sell signal. Therefore, the trend of stock should be checked as per Dow's Theory by considering major pivots [16].

AI TO EXECUTE MATHEMATICAL MODELS

The financial market has revolutionized by enabling data-driven, automated trading strategies to enhance speed, efficiency, and decision-making through advanced computing and AI [17-18]. Algorithmic trading is the use of programs and computers to generate and execute large orders in markets with electronic access to help traders [19-20]. The necessary quantitative toolbox including more advanced machine learning is needed to operate in the field of trading [21]. Looking at the advantages of Python programming such as Comprehensive Libraries and Frameworks, Ease of Learning and Use, Highly Embeddable, etc. so in the present work, to support algorithmic trading, python programming as an AI tool is used to run developed mathematical models [22]. The logic of MMBS & MMSS for Python Programming is depicted in **Figure 1**. The execution of MMBS and MMSS with real-time stock data are depicted in **Figure 2** and **Figure 3** respectively.

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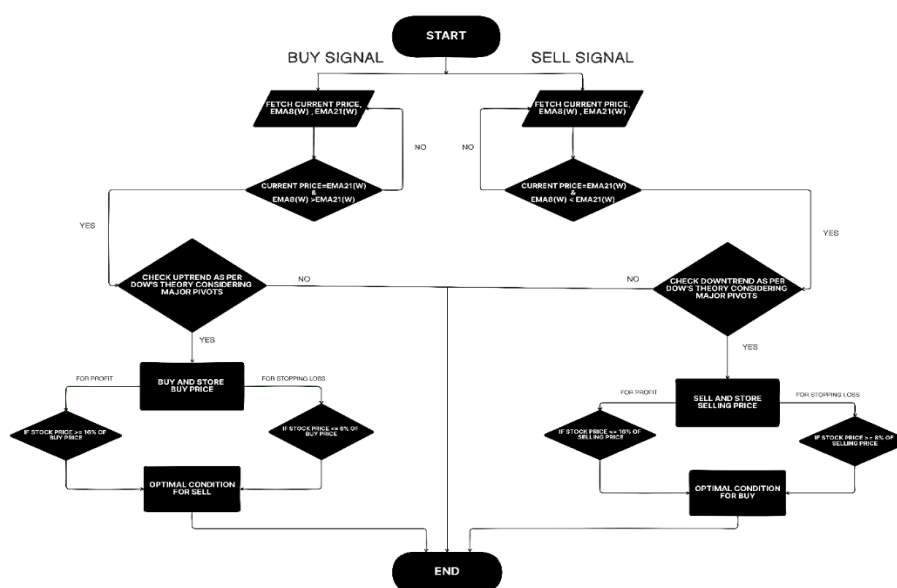
Figure 1. Flowchart presenting logics of MMBS & MMSS for Python Programming
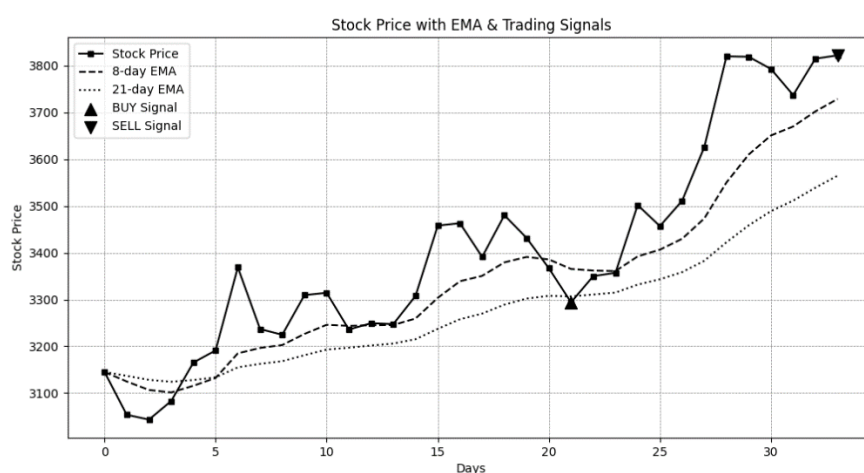
Figure 2. Execution of MMBS with real-time stock data of Tata Consultancy Serv. Ltd. using Python programming
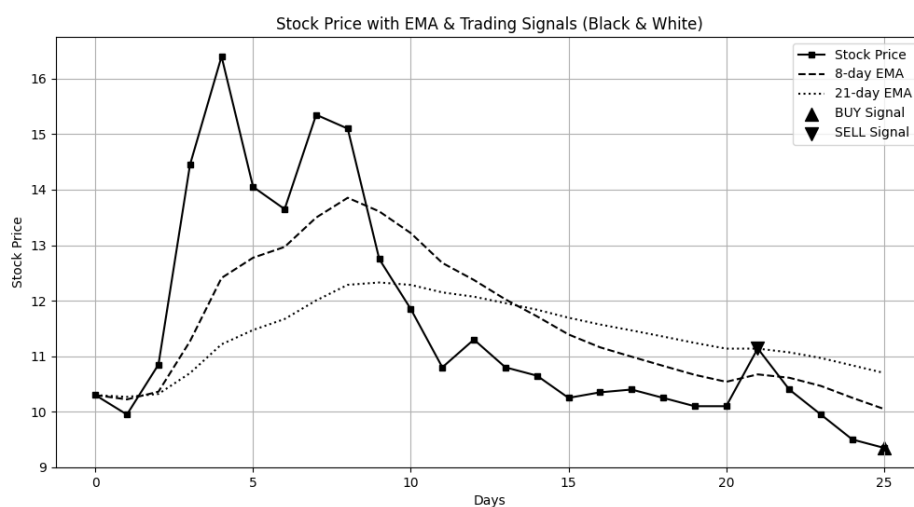
Figure 3. Execution of MMSS with real-time stock data of Vodafone Idea Ltd. using Python programming

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VALIDATION

The developed models are validated with real-time data from the SM as depicted in below **Table 1** & **Table 2**. Here, a minimum 2:1 Reward to Risk should be considered in execution. Here, the stocks are selected randomly to validate the developed models. Using the developed mathematical model, as per RR 2:1 and following emotional management to exit at Target or Stoploss after getting the entry, the following results are achieved as depicted in **Table 1** for MMBS and in **Table 2** for MMSS.

Table 1. Validation of developed MMBS

Sr. No.	Stock Name	Buy Date	Buy Price	Sell Date	Sell Price	Profit/ Loss	Achieved Gain (%)	Validation with Real-time data [23]
1	Tata Consultancy Serv. Ltd.	23/10/2023	3294.84	19/01/2024	3821.90	Profit	+16	https://www.tradingview.com/x/Nw3otZyD/
2	Zomato Ltd.	23/10/2024	245.14	18/11/2024	284.35	Profit	+16	https://www.tradingview.com/x/vDDmId9g/
3	Infosys Ltd.	19/03/2024	1525.95	16/04/2024	1403.95	Loss	-8	https://www.tradingview.com/x/JZEDRiQ3/
4	HDFC Bank Ltd.	26/09/2022	1398.93	14/12/2022	1622.75	Profit	+16	https://www.tradingview.com/x/iy4LKcwr/
5	Oil and Natural Gas Corp.	31/05/2023	139.15	02/08/2023	164.42	Profit	+16	https://www.tradingview.com/x/20w9UM6J/
					Total Gain:		**+56%**	**Accuracy:80%**

From **Table 1** Out of 10 stocks, 8 stocks hit the target and 2 stocks hit stop loss. Hence, the accuracy of developed mathematical models is around 80%. As the weekly time frame involves, for achieving target and stop loss, it consumes a huge time. So, present mathematical models can be more suitable for the short-term investment of SM. To control emotion, it is advised to traders/investors that strictness should be followed in execution using GTT orders (Good trill Triggered) and it should be exited at a decided target or stop loss after achieving entry. Here, after placing the order, the trader/investor does not watch the running stock script until it is exited at target or stop loss price. When trader/investor face numerous stop losses, they have to take a break for few days to relax their mind and emotions. He/she can do regular meditation to achieve calmness of mind as scientifically proven and it will be helpful to control the emotions at the time of execution.

CONCLUSION

The following important outcomes are concluded from the present study. The developed MMBS & MMSS can be used to predict the data in the weekly time frame of the SM. For consistency in gaining profits, a Reward to Risk ratio minimum of 2:1 should be considered which makes you at breakeven on 50% accuracy. The accuracy of the developed mathematical models is around 80%. Developed mathematical models implementing Python programming may be used in Algorithmic trading. To control emotions, strictness should be followed with advanced trading tools in execution to achieve a target or stop loss. The developed mathematical models can be more suitable for short-term investment in SM. For day trading and long-term investment, these developed models may be applied considering additional conditions for timeframes on daily timeframe and monthly time frames respectively as a scope of future study.

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