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FAITH Software Life Cycle Model for Forex Expert Advisors

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ABSTRACT

The emotional stress and uncertainties associated with foreign exchange (forex) trading due to the high risk of losing the investment capital has left most forex traders in a state of indecision on the best methodology to apply for achieving long term profit. The provision of lot sizes, leverages, take profits and stop losses in forex trading implies that very high profit can be made within a very short time with the same capital, but at the same time, very high losses can be incurred. On one hand, this provision often prompts a set of traders to become greedy by increasing their take profit levels, lot sizes and leverages, which in turn increases their probability of losing out. On the other hand, the provision creates doubts and induces the fear of losses in some other set of traders. Consequently, these set of conservative traders employ the use of relatively small lot sizes, low leverages and low values of take profit and high stop loss levels. This in turn often results in a devastating effect on the investment capital due to lost opportunities and resulting losses. The problem of losses in forex trading effort is compounded by the fact that many programmers and developers of forex expert advisors do not adopt a software life cycle, having learned only how to write codes to program the trading platform. Furthermore, software engineering professionals who understand the import of software development life cycles soon discover that conventional software life cycles are not capable of effectively handling the complexity of the forex market. This paper models the human characteristics of greed, fear and doubt as manifested by traders in forex trading using selected expert advisors' properties. It proposes Facts, Analysis, Implementation, Testing and Hope (FAITH) software life cycle model for Forex trading profitability to tackle the problem of indecision in the development of forex expert advisors. The proposed model was implemented on a live trading platform for a period of three months and compared with doubt, fear and greed approach to trading. The results showed that while a level of greed can be profitable, FAITH software life cycle produced more profitable results and can be adopted for forex trading.

Keywords: Software Development Life Cycle, Expert advisors, Forex Model, Losses, Profit

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1. INTRODUCTION

Traders in stocks, commodities and forex have the opportunities of automating their trading decisions with the use of expert advisors, which are programs written in MetaQuote programming language. However, many developers of expert advisors usually adopt different trading strategies, approaches and methods which are implemented with the expert advisors for trading in the stock and forex market without following any specific software development life cycle [1]. In spite of all the methodologies and models so far proposed by the academic communities and researchers, about 90% of individual traders lose their investments in Forex within the initial six months. This level of losses put emotional strains on both traders and investors, resulting in their adoption of different approaches and experimentations to minimize losses. However, the high daily volume of Forex still classifies it as having great potentials for profitability. For example, one of the forex brokers, amongst others, which automatically updates traders' investment volume online has reported a daily trading turnover of 1.29 trillion USD, asserting that traders can earn from 100 USD to 1 million USD per month depending on their performance and popularity [3]. Although such a gain is still a difficult and almost an impossible task for many traders, the overall daily turnover of Forex is very high and should attract the efforts of software professionals for the application of the best methods for traders' profitability in the Forex industry.

The provision of leverages by the forex brokers makes it possible for an investor to start forex trading with a little amount of money, as little as 200 USD. However, the leverage is like a loan obtained from the forex broker for trading and for which the trader pays some commissions. A trader has the choice of trading with very high leverage but this implies paying more commission and putting the capital to a higher risk of losses. The provision of lot sizes gives the opportunities for traders and investors to set different multiplication values for their profit or loss for each trade based on the availability of capital. Therefore, a trader can become greedy, for example, by trading with a large lot size, which will culminate in a very large profit or loss. Traders exhibit the characteristics of greed, fear and doubt in diverse ways in forex or stock trading. Greed and fear have been described as natural human emotions that affect forex market prices and drive or tilt the supply and demand of currencies [1]. For automated forex trading, the complexity of the forex market in particular demands careful study and the introduction of a software development life cycle suited for it. The peculiarity of Forex operations and the investment risk associated with Forex cannot be effectively handled by the conventional and existing software life cycles. This paper proposes Facts, Analysis, Implementation, Testing and Hope (FAITH) software life cycle model for Forex trading to address the problem of indecision in the development of forex expert advisors for profitability in forex trading.

This paper is structured as follows: having considered section 1, the background of the study is described in section 2 while section 3 describes the related works. section 4 covers the materials and methods while section 5 explains greed, fear and doubt approaches to expert advisors' development. The FAITH software life cycle model is presented in section 6. In section 7, the tests and results are presented while section 8 gives the conclusion.

1.1 Background of Study

The purpose of software development life cycle is to enable consistency, coherency and efficiency in the design and development of software [8]. Software engineering requires the adherence to standard, proven, knowledgeable and repeatable development methodologies for the building of useful software. The basic methodology adopted by software engineers for software development is referred to as software development life cycle. Software engineers adopt the models of software development life cycle during the software development process. A holistic view of software development life cycle reveals that it includes requirement analysis, design, construction, testing, deployment and maintenance [2]. Each of these phases can be decomposed into sub-processes.



For example, design includes architectural, interface, component, data structure and algorithm design, while testing encompasses unit, module, sub-system, system and acceptance testing. Some examples of software development life cycle include plan-driven models such as the waterfall model, V-model and spiral model, agile-driven models such as rapid application development, extreme programming and Scrum [9].

Expert advisors, otherwise known as forex robots, are automated systems which relieve traders from the rigour of manual trading. Manual trading is characterized by low execution speed, stress of monitoring diverse charts patterns, news or technical indicators, and inappropriate emotional interventions.

2. RELATED WORKS

In the last two decades, a number of models of software development life cycles have been proposed. These proposals and other research efforts that relate to software development life cycle are discussed in this section. Olszewska [4] proposed a software life cycle for intelligent vision systems and posited that this category of systems required an adapted software development life cycle to address their multi-domain needs. Mohankumar and Kumar [5] proposed a software life cycle for the elimination of environmental impacts attributable to hardware and software products caused by the emission of CO2. Their proposed model, designed for sustainability, is referred to as green based software development life cycle model. Maindalkar et al. [6] applied games development life cycle to develop the puzzle genre, but proposed no software development life cycle. Aleem et al. [7] carried out a systematic review of game development software life cycle. Olszewska and Allison [8] proposed an approach for the configuration and development of software through the task of intelligent agents and the use of an ontology developed for software development life cycle. Madji et al. [10] studied the relevance of human computer interaction components in software development life cycle but proposed no software life cycle model.

Cohen et al. [11] focused on improving communication and collaboration between software developers, vendors, customers, consultants and integrators in their proposed unified, collaborative and multi-tier system development life cycle. Lee et al. [12] introduced a survival kit which is an adaptive codesign life cycle model for the cost reduction of consumer electronics by adopting hardware/software codesign technology, a method of replacing an expensive hardware component with an equivalent software component. Benediktsson et al. [13] evaluated the impact of software development life cycle on software projects comparing the V-model, incremental, evolutionary and Extreme Programming software life cycle approaches. Kabassi and Virvou [14] presented a software life cycle framework for intelligent user interfaces in consideration of the multi-criteria decisions of knowledge-based systems. Capretz [15] presented Y-model, a software life cycle for component-based software engineering to address reusability. Zhang et al. [16] demonstrated a methodology for implementation of human-centered software development life cycle and stressed the need for the integration of human computer interaction into the software development life cycle. Rajlich and Bennett [17] described and proposed a new view of software life cycle in which the maintenance phase is a series of stages and emphasized that both the management and software developer would benefit from understanding the staged phase and process of software life cycle.

Previous forex, stock and commodities research in literature focused on the application of machine learning [18, 19], reinforcement learning [20], support vector machine, genetic algorithm [21], fuzzy logic models [22], rule-based reasoning [23], statistical models [24], neural networks, particle swam optimization [25], text mining [26], artificial neural networks [27] and technical indicators [28]. No previous research has been done on software life cycle model for forex expert advisors, according to our knowledge. This is one of the major contributions and uniqueness of this paper.

3. MATERIALS AND METHOD

The methods applied for this study consist of the analysis of the existing software development life cycle, through literature survey, to discover their drawbacks, and the design of the proposed model to address the drawbacks of the existing software development life cycles for the development of expert advisors. The experiment was carried out by deploying the expert advisors on a Commercial Network Services, US, virtual private server, through a paid subscription for live trading for a period of three months. Microsoft Windows server 2016 and Microsoft Window 11 operating systems machines were employed for the experiments.

3.1 Greed, Fear and Doubt Approaches to Expert Advisors' Development

In the development of expert advisors and in forex trading, the characteristics of greed, doubt and fears are manifested by traders and developers in diverse ways.

3.2 Greed

The natural instinct of greed is manifested when a trader or an expert advisor developer desires to acquire much profit with little risk or inadequate capital. This can be done by setting high values of lot sizes with low funds or opting for high take profit values with low or no stop loss. Greed also comes into play due to overconfidence concerning the stability of a country's currency exchange rate, prompting a decision to go long or go short repeatedly over a period of time without due consideration for the possibility of a sudden reversal in the currency prices. In this study, greed is implemented by making the swing take profit (TP) values to be greater than the swing stop loss (SL) values. In addition, for the implementation of characteristics of greed, the trend TP is made to be slightly less than the trend SL.

3.3 Fear

For a currency pair, the currencies which constitute the pair are dependent on one another in terms of supply and demand. During trends, price reversal or price breakout, when a set of traders' decision is bearish, the decision of other traders is automatically bullish for a currency pair. This turns forex trading to a game of making profit or incurring losses, creating fear in the minds of traders. This fear can prompt a trader to exit a profitable position prematurely or retrieve relatively small TP with high SL. The lost opportunities, which is the product of fear, often result in cumulative losses at the end of a trading session. The characteristics of fear are implemented in this study by setting the values of the TPs for trend and swing to be half of the values of the SLs respectively.

3.4 Doubt

Obtaining an optimal value for the TP and SL is not a simple task. Many traders and expert advisors' developers are at loss concerning the values to set for the TP and SL for profitability. Consequently, the same values are set for both the TP and SL. In this study, fear is implemented by setting the value of TP to be approximately equal to the value of SL. The conceptual diagram for greed, fear and doubt models is shown in Figure 1.



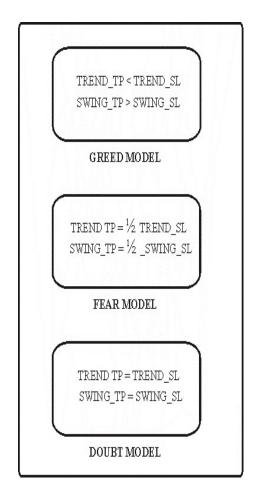


Figure 1: The Conceptual Diagram of Greed, Fear and Doubt Models

4. FAITH SOFTWARE LIFE CYCLE MODEL

The proposed FAITH software life cycle model addresses the peculiarity and complexity of the forex market in the development of expert advisors to fill the vacuum created by the generic software life cycle. FAITH software life cycle consists of five phases and processes. Starting from the first phase, the model comprises of Facts gathering, Analysis and design, implementation, testing, hope and monitoring. At the center of these processes is a scheme for take profit and stop loss settings for swing and trend operations. The diagrammatic representation of FAITH software life cycle is shown in Figure 2.



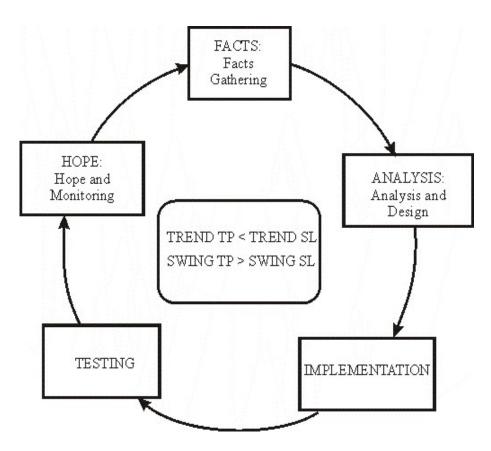


Figure 2: The Conceptual Diagram of FAITH Software Life Cycle

4.1 Facts Gathering

The development of an expert advisor starts from facts gathering. Facts gathering should cover the acquisition of knowledge, information and facts in the following areas and concepts of the forex market: financial management, forex risk disclosure, currency pairs peculiarity, chart patterns, technical analysis, fundamental analysis, the effects of spikes, breakouts and volatility on the market prices, the diverse effects of high, medium and low impact news on opened orders and opened positions. Knowledge of various programmable trading methods such as hedging, swing, scalping, trending and martingale must be acquired. Brokers' constraints must be studied. Furthermore, programmable properties and components of the MetaTrader platform must be known: these include pips, lot sizes, bid, ask, spread, take profit, stop loss, currency type, time frame, order placement, order closing, order modification, pending order and market order. Requirement analysis is classified under facts gathering.

4.2 Analysis and Design

Analysis includes the determination of the model and methods to be used for the expert advisor among many options and alternatives. This includes architectural decisions such as the choice of the trading platform and specific programming language. The design includes conventional design processes such as architectural, interface, component, data structure and algorithm design.



4.3 Implementation

In the implementation phase the design is converted into program codes in the appropriate programming language and debugging is done as necessary. Implementation in expert advisors' development is done in two stages: the demo implementation and the live implementation. The demo implementation is the deployment of the expert advisor on the forex broker's demo server and not on the live server. All forex brokers provide the demo server with virtual funds for trading for the purpose of strategy evaluation, since the certainty of profitability cannot often be guaranteed in forex trading. The evaluation of the strategy should continue until the expert advisor can generate profit. Such evaluation may continue for a period of more than six months before an expert advisor with reasonable stop loss can be trusted for profitability.

4.4 Testing

Apart from the conventional testing stages such as unit, module, sub-system, system and acceptance testing, in expert advisors development, testing should include profitability testing on the broker's live account server with real funds. Trading on the live server can produce results that are completely different from the demo account's results due to slippages which is peculiar to live account. Another testing process unique to the forex trading is the broker's platform test. It can be shown that the same expert advisor deployed on different brokers MetaTrader platform often produce significantly different results, due to a number of different constraints integrated by different forex brokers into their platform. The MetaTrader platform Strategy Tester, which is a trading simulation component, can also be used before testing with a demo account.

4.5 Hope and Monitoring

If after the deployment on both the demo and live account, an expert advisor consistently produces profit for a period of up to six months, it can be hoped that the expert advisor can produce a long term profit, although this cannot be guaranteed. Hope ensures that any emotional manual intervention of an active expert advisor's operation is completely avoided to allow its performance to evolve after subjecting it to various forex eventualities such as volatility, high impact news, natural disaster, which all have the potentials of crashing a live account. The monitoring of the expert advisor is crucial for a decision to start the cycle all over, that is, in case it is found unprofitable. If an expert advisor fails in performance, the cycle is repeated. In this case, process starts with the gathering of more facts. Software evolution or maintenance is classified under Hope and Monitoring phase.

5. TESTS AND RESULTS

The greed, fear, doubt and FATIH models were tested using swing method combined with a trending algorithm at the same period for three months. Instances of take profit and stop loss values used for the four different models are shown in Figure 3 which displays a week's results. For greed and fear models, apart from the standard take profit values, the algorithm was allowed to retrieve smaller profits only at the end of a daily trading session. The total profit generated by each model for a week can be calculated from Figure 3 but this is not necessary since one week is not sufficient to draw a conclusion on the performance of an expert advisor. Table 1 shows the summary of the stop loss and take profit values for the models as used for implementation.

Journal, Advances in Mathematical & Computational Sciences Vol. 9 No. 1, 2021

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Figure 3: One Week Profit and Loss Instances of Greed, Fear, Doubt and FAITH Models

Table 1: Summary of Take Profit and Stop Loss Values for Models

Table 1. Julilliary of Take Front and Stop Loss values for wodels					
	TREND TP	TREND SL	SWING TP	SWING SL	
MODEL					
Greed	36.5	43.5	85.7	50	
Fear	25	50	25	50	
Doubt	30	30	30	30	
FAITH	34	45	76	45	

The result of the three months comparative test for FAITH and Doubt models is shown in Figure 4. It can be seen from Figure 4 that FAITH is more profitable than Doubt.



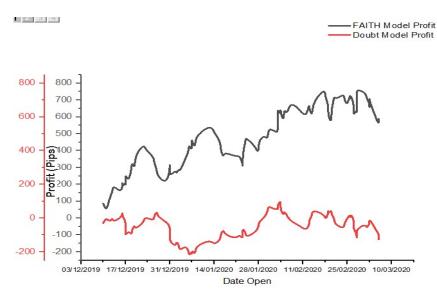


Figure 4: FAITH and Doubt Models Three Months Comparative Charts

Figure 5 shows the result of three months comparative test for FAITH and Fear models. It can also be seen from Figure 5 that FAITH is more profitable than Fear.

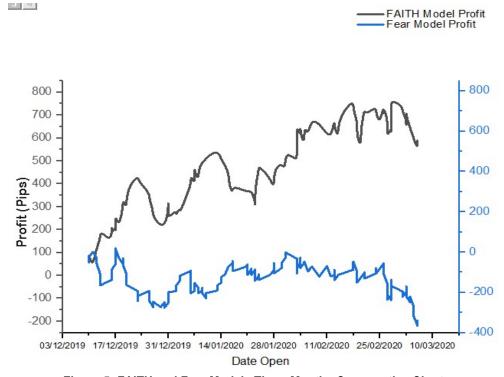


Figure 5: FAITH and Fear Models Three Months Comparative Charts



Journal, Advances in Mathematical & Computational Sciences Vol. 9 No. 1, 2021

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Figure 6 shows the result of three months comparative test for FAITH and Greed models. It can be seen from Figure 6 that FAITH is more profitable than Greed. However, the gap between FAITH and Greed is not as wide as the gaps between FAITH and Fear or between FAITH and doubt.

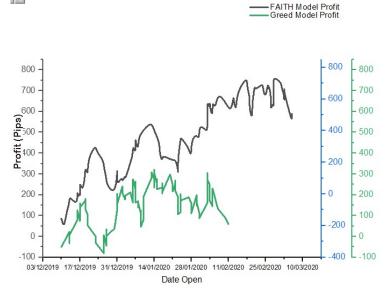


Figure 6: FAITH and Greed Models Three Months Comparative Charts

Figure 7 shows the result of three months comparative tests for all the four models. It can be seen from Figure 7 that Greed is more profitable than Fear and Doubt. However, Figure 7 also shows that Doubt is more profitable than Fear.

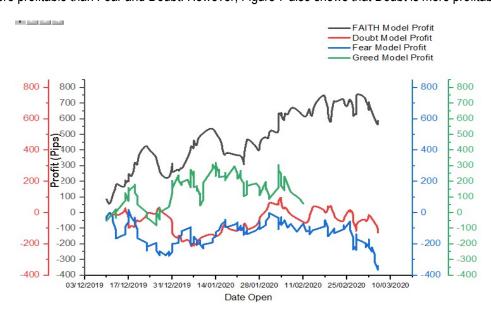


Figure 7: Three Months Comparative Charts for FAITH, Greed, Fear and Doubt Models



6. CONCLUSION

In this paper, we have proposed FAITH software life cycle model for profitability in expert advisors development to address the drawbacks of existing generic software development life cycle. The study models the human natural emotions of greed, fear and doubt often manifested by foreign exchange traders. The results showed that FAITH is more profitable than fear, doubt and greed. The research results further shows that Greed is more profitable than Fear and Doubt. However, Doubt is more profitable than Fear. The overall result reveals that the proposed FAITH software life cycle model is the most profitable of the four models and can be adopted for expert advisors' development. However, a level of greed is profitable. Future works shall focus on knowledge discovery through each phase of the FAITH software life cycle.

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