Exchange Rate Forecasts with Candlestick Patterns and Expert Systems

Masterarbeit

zur Erlangung des akademischen Grades „Master of Science (M.Sc.)" im Studiengang Wirtschaftsingenieur der Fakultät für Elektrotechnik und Informatik, Fakultät für Maschinenbau und der Wirtschaftswissenschaftlichen Fakultät der Leibniz Universität Hannover

vorgelegt von

Name: Amelsberg   Vorname: Nanno

███████████████   ████████

Prüfer: Prof. Dr. M. H. Breitner

Hannover, den 20.08.2014

List of contents

1 Introduction

1.1 Problem definitions

The fascination of trading strategies is unbroken. There is a countless number of strategies which pursue completely different approaches including macroeconomic factors, technical analysis or other approaches. Factors such as the time frame or risk strategy can also have an impact on the underlying strategy. Hence, market participants attempt to find the Holy Grail in order to outperform the market and therefore to gain an excess return. One of those trading strategies is based on candlestick patterns and is widely used. This may be due to the very long history within the Asian market, particularly in the Japanese market where candlestick charts and patterns have their origins. Candlestick patterns have been used for hundreds of years to predict price movements within the rice market. Steve Nison made this trading philosophy popular in the Western world resulting in a boom. Since then, market participants have been considering this useful technique by implementing them into their strategies. Among market participants there is no common consensus if strategies based on candlestick patterns may lead to remarkable trading results. On the one hand, proponents are convinced that such a trading strategy obtains superior results. Therefore, some proponents share the opinion that only some certain candlestick patterns show reliable results. They classify the amount of patterns into useful signals and nonworking signals. Other participants reject this thesis and do not believe that adequate results can be achieved by integrating candlestick patterns into their trading strategy. Thus, it is quite challenging to find out which group of market participants is right. This central question builds the foundation of this underlying thesis.

1.2 Objectives

As described above trading strategies which include the power of candlestick patterns are quite popular. Nevertheless, there is no uniform consensus if trading strategies based solely on candlestick patterns could provide evidence of profitability. In the common published literature researches investigate this interesting subject in their respective papers and come to different conclusions. It should be mentioned that no one of these authors take the foreign exchange market into consideration. Therefore, a research gap may arise which examines the profitability of candlestick patterns within this market.

The foreign exchange market is selected due to its huge trading volume as well as the large amount of market participants. These facts ensure that this market cannot be influenced by one or less market participants. Further on, due to the high number of trading participants it is more likely that a trading strategy which follows the rule of candlestick patterns may work because more participants are regarding this strategy. Additionally, the foreign exchange market is one of the most popular markets and therefore market data is accessible easily.

The objective of this underlying thesis is to investigate the profitability of certain candlestick patterns within the foreign exchange market. Due to limited computer capacity a small number of ten candlestick patterns will be taken into consideration. An expert system is created to include these patterns characteristics, trading rules and if required risk strategies, too. Further, the expert system is capable of determining the returns of its generated trading signals. Remarkable results should reveal statistical significance which is reviewed by a conducted t-test. Finally, the central question of section 1.1 is taken into account again and the underlying thesis should prove the evidence for profitability of the investigated candlestick patterns.

1.3 Methodology

In order to check the profitability of candlestick patterns, chapter 2 starts with the basics of candlestick patterns and classifies candlesticks as a part of technical analysis. Therefore, a brief summary about the history and structure of candlesticks are given. The next step deals with ten appointed candlestick patterns which are used in the following approach. Those are described in detail including the presentation of the market psychology for each candlestick. The last points of chapter 2 cover a briefly introduction of expert systems and provide current literature referring to the application of candlestick patterns analysis within different markets.

The majority of this thesis deals with the central analysis of the profitability of the candlestick patterns and is described in chapter 3. At first, the data set is being explained which provides the basic of this approaches followed by candlestick patterns characteristics for the programming code as well as the functioning of different strategies. A detailed explanation is being given showing trading strategies used and how results are accepted as statistically significant. For robustness reasons candlestick patterns characteristics are extended and reduced by 10 % and results are reviewed.

Chapter 4 provides a more detailed discussion about the achieved results. Chapter 5 represents limitations and further research. Therefore, neural networks are mentioned as an additional

possibility to conduct this analysis based on candlestick patterns. Finally, chapter 7 briefly concludes.

6   Conclusion

The underlying thesis investigates the profitability of ten reversal candlestick patterns by seven different currency pairs in the foreign exchange market. Therefore, a data from 2005 to 2013 is taken into consideration.

Within the analysis two strategies are developed in order to review the profitability of the selected candlestick patterns. The first strategy S1 serves the purpose to appoint a benchmark for the second strategy S2. Strategy S1 find evidence for profitability for two out of ten patterns by applying a five-day exponential moving average for stipulating the prior trend although no risk strategy is taken into account. This includes the candlestick patterns Bearish Engulfing as well as Closing White Marubozu. Thereby, it should be mentioned that in case of the Closing White Marubozu solely one out of ten holding days shows statistically significant results. A stop loss strategy is implemented to limit losses within strategy S2. Furthermore, the indicator Bollinger Bands is employed to define the prior trend. The findings of this analysis present statistically significant results for four out of ten candlestick patterns – Hammer, Bullish Engulfing, Bearish Engulfing and Closing Black Marubozu. Implementing a risk strategy is therefore highly recommended and utilizing the Bollinger Bands leads to enhanced result. In order to avoid that results are achieved randomly, definitions parameter for the candlestick patterns' characteristics are extended as well as reduced by 10%. Nevertheless, the findings of strategy S2 can be confirmed. In an extension this thesis also investigates the profitability of candlesticks within the long term view. Therefore, strategy S2 is taken into account and additionally a take profit strategy of 300 pips is conducted. The results show statistical significance for two candlestick patterns – Hammer and Closing Black Marubozu. This leads to the inference that candlestick patterns work better in the short term horizon compared to the long term view.

The central question within the introduction of this thesis is to figure out which group of market participants is right. This underlying thesis follows the applicant that only some candlestick patterns show statistical evidence for profitability heavily depending on the trading strategy. Therefore, many parameters can have an impact on the results like the time frame, risk strategy, profit strategy, definitions of the patterns, currency pair or the trading indicator. Finally, this thesis finds statistical evidence for five out of ten candlestick patterns by considering strategy S1 as well as strategy S2 – Hammer, Bullish Engulfing, Bearish Engulfing, Closing White Marubozu and Closing Black Marubozu.