FOREX Trend Classification using Machine Learning Techniques

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Abstract :- Foreign Currency Exchange market (Forex) is a highly volatile complex time series for which predicting the daily trend is a challenging problem. In this paper, we investigate the prediction of the High exchange rate daily trend as a binary classification problem, with uptrend and downtrend outcomes. A large number of basic features driven from the time series data, including technical analysis features are generated using multiple history time windows. Various feature selection and feature extraction techniques are used to find best subsets for the classification problem. Machine learning systems are tested for each feature subset and results are analyzed. Four important Forex currency pairs are investigated and the results show consistent success in the daily prediction and in the expected profit.

Keywords: - Technical analysis, Feature selection, Feature extraction, Machine-learning techniques, Bagging Trees, SVM, Forex prediction.

1 Introduction

This paper is about predicting the Foreign Exchange (Forex) market trend using classification and machine learning techniques for the sake of gaining long-term profits. Our trading strategy is to take one action per day, where this action is either buy or sell based on the prediction we have. We view the prediction problem as a binary classification task, thus we are not trying to predict the actual exchange rate value between two currencies, but rather, if that exchange rate is going to rise or fall. Each day there are four observed rates, namely, the "Open", "Close", "Low" and "High". In this work, we focus on predicting the direction of the "High".

Forex daily exchange rate values can be seen as a time series data and all time series data forecasting and data mining techniques can be used to do the required classification task.

In time series analysis, it is always a challenge to determine the required history window used by the classification or forecasting system to do its prediction. In this paper, we have taken an approach of providing features from multiple time windows ranging from one day up to 30 days. This of course results in a number of features larger than using a single time window. Processing of the raw time domain daily values is done to produce the basic features used in the feature selection and extraction steps. This processing involves calculation of technical analysis and other time and frequency domain features over multiple time windows with a total of 81 basic features. Our approach is to let feature selection and feature extraction techniques find the best set of features for the classification task. Feature selection techniques choose a subset of the basic features while feature extraction techniques find features in new projected spaces. In this paper, two feature selection and six feature extraction techniques are used which all aim at finding feature subsets to enhance the classification performance.

For each feature subset, three supervised machine learning classifiers are used, namely, radial basis function neural network (RBF), multilayer perceptron neural network (MLP) and support vector machine (SVM). This gives a large array of different feature subsets and different classifiers. Comparison between these different systems is done based on two factors. The first is the percentage classification performance on the test data. The second is a novel function we call the percentage normalized profit (*PNP*), which represents the ratio between the accumulated profits using the predicted trends versus the accumulated profit using perfect predictions along the duration of the test period. We have selected four Forex pairs which are namely the USD/YEN, USD/EGP, EURO/EGP and EURO/SAR (where EGP is the Egyptian pound and SAR is the Saudi Riyal). The remaining of this paper is organized as follows. Section 2 discusses the nature of the Forex data, and the most prominent approaches used in the literature

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