Chapter 2.9
Development of Machine Learning Software for High Frequency Trading in Financial Markets

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ABSTRACT

Foreign exchange trading has emerged in recent times as a significant activity in many countries. As with most forms of trading, the activity is influenced by many random parameters, so that the creation of a system that effectively emulates the trading process will be very helpful. This chapter presents a novel trading system using Machine Learning methods of Genetic Algorithms and Reinforcement Learning. The system emulates trader behavior on the Foreign Exchange market and finds the most profitable trading strategy.

INTRODUCTION

In spite of many years of debate between economists and financiers, the question of whether financial markets are predictable remains open. Numerous tests with financial data have been conducted by researchers but these have tended to support both sides of the issue. In our view, the best evidence of predictability of financial markets would be the development of a strategy or an algorithm which is capable of consistently gaining a profit from the financial market. In this chapter we demonstrate that machine learning techniques are capable of performing this task.

The use of machine learning and optimization methods in finance has become a fairly common practice amongst financiers and researchers. With the continuous deregulation and increasing volatility of financial markets, competition in the financial industry is getting stronger and new techniques are being developed to provide efficient trading for financial institutions and the public.

At the present time, millions of people trade in financial markets and even more wish to become involved. The main problems they face are how to trade and how to develop a profitable strategy. Usually it takes several years to become a successful trader and sometimes success remains elusive.

Trading usually takes place through a broker who provides software for the trader to buy and sell assets on a financial market. This software provides information to the trader such as current and past share prices, exchange rate, market indicators, etc. Based on this data, a trader can decide when to sell and when to buy a particular stock or currency. Choosing these actions in order to maximize profit is a difficult task, not just for beginners, but also for experienced traders. The market is constantly changing so that different rules and concepts apply in different situations. It is not uncommon that a trader's strategy that works well at a given time performs poorly two hours later. Hence the trader has to determine the times at which a strategy should be changed and to identify the changes that should be made. Another problem for the trader is that different strategies are successful for different financial markets. Thus, a strategy should be tailored to a particular situation in a particular market.

To deal with these problems, the issue of market information analysis needs to be addressed, not only theoretically but also practically. In this chapter, we describe our investigations into this issue and how they can be used to develop a software system capable of operating in the manner of a human trader.

Some related studies have previously been carried out, but the question of how to combine

Figure 1. EUR/USD prices and volumes for October, 2004
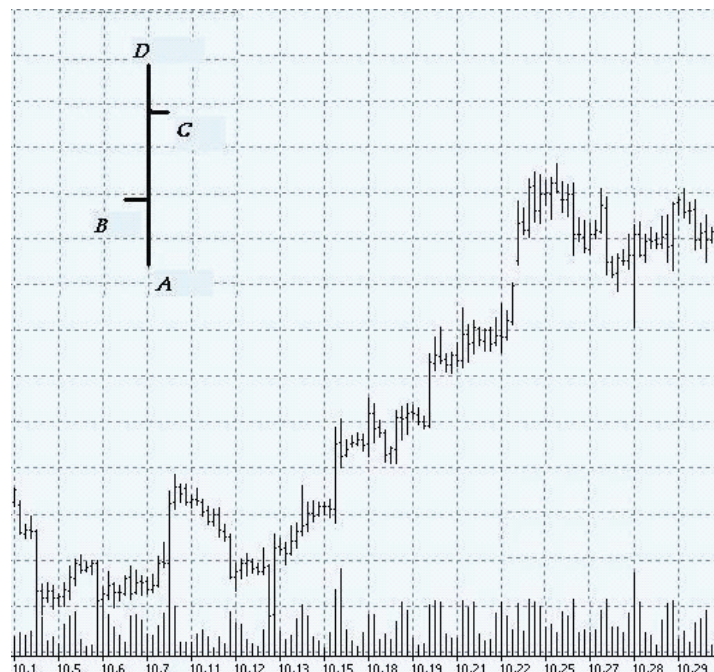
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