The Application of Evolutionary Computation to Financial Time Series Prediction

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August 2008

A *genetic algorithm* (GA) is a search technique that falls within the intersection of optimization algorithms and evolutionary algorithms. GAs became a widely recognized optimization method as a result of the work of John Holland in the early 1970s (Holland 1975).

Genetic programming (GP) is an evolutionary algorithm that optimizes a population of computer programs according to a fitness landscape determined by a program's ability to perform a user-defined task. The first experiments with GP were reported by Smith (1980) and Cramer (1985), and the seminal book is Koza (1992).

GP generalizes GAs, but Woodward (2003) argues that the two are effectively equivalent and it is the representation that is important. On average, GAs/GP are no better or worse than any other search/optimization algorithm (Wolpert and Macready 1997).

Neely, Weller and Dittmar (1997) use genetic programming techniques to find technical trading rules and find strong evidence of economically significant out-of-sample excess returns to those rules for each of six exchange rates, over the period 1981–1995. Allen and Karjalainen (1999) use genetic algorithms to learn technical trading rules for the S&P 500, but fail to beat a buy-and-hold strategy after transaction costs. Kaboudan (2000) used GP to predict the price of six stocks. Oddly, he concluded that predicting price is easier than predicting returns and the out of sample period was a mere fifty trading days. However, 'six stocks yielded relatively high returns on investment'. Potvin, Soriano and Vallée (2004) employ genetic programming as a means to automatically generate such short-term trading rules on the stock markets and conclude that 'results show that the trading rules generated by GP are generally beneficial when the market falls or when it is stable. On the other hand, these rules do not match the buy-and-hold approach when the market is rising.' A meta-analysis by Park and Irwin (2004) found that genetic programming worked well on currency markets, but performed poorly on stock markets and futures markets.

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