

## Accepted Manuscript

Title: Combining Support Vector Machine with Genetic Algorithms to Optimize Investments in Forex Markets with High Leverage

Authors: Bernardo Jubert de Almeida, Rui Ferreira Neves, Nuno Horta



PII: S1568-4946(18)30003-6  
DOI: <https://doi.org/10.1016/j.asoc.2017.12.047>  
Reference: ASOC 4644

To appear in: *Applied Soft Computing*

Received date: 28-9-2016  
Revised date: 18-12-2017  
Accepted date: 30-12-2017

Please cite this article as: Bernardo Jubert de Almeida, Rui Ferreira Neves, Nuno Horta, Combining Support Vector Machine with Genetic Algorithms to Optimize Investments in Forex Markets with High Leverage, Applied Soft Computing Journal <https://doi.org/10.1016/j.asoc.2017.12.047>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Combining Support Vector Machine with Genetic Algorithms to Optimize Investments in Forex Markets with High Leverage

Bernardo Jubert de Almeida<sup>a</sup>

Rui Ferreira Neves<sup>a</sup>

Nuno Horta<sup>a</sup>

(bernardo.jubert@gmail.com)

(rui.neves@tecnico.ulisboa.pt)

(nuno.horta@lx.it.pt)

<sup>a</sup>Instituto de Telecomunicações

Instituto Superior Técnico – Universidade de Lisboa

Lisboa, Portugal

## Highlights

- Develops a hybrid system with SVM and Evolutionary Computation
- The SVM categorizes the market into three different types.
- The GA optimizes an investment strategy with dynamic approaches.
- The algorithm invests in the Forex market with high leverage.

**Abstract**— This work proposes a new approach, based on Genetic Algorithms and Support Vector Machine to trade in the forex market. In this work, a new algorithm capable of generating technical rules to make investments with a given amount of leverage depending on the certainty of the prediction is presented. To forecast those predictions, a combination of a Support Vector Machine (SVM) algorithm – to identify and classify the market in three different stages –, and a Dynamic Genetic Algorithm – to optimize trading rules in each type of market, is used. The optimization of the trading rules is based on several technical indicators. Forex data for the EUR/USD currency pair, in a timeframe between the years of 2003 and 2016, is used as training and test data. The proposed architecture for the machine learning system, as well as the implementation and study of the proposed system is described in detail. The use of an hybrid system, combining a SVM and a GA with dynamic approaches such as hyper-mutation and adaptability approaches by training three different GA's for each type of market, provide a new approach for FOREX trading, where it is possible to classify trends using price sequences and therefore using the same classification for optimizing investment strategies with the most appropriate GA. Finally, the work shows promising results during the test period between the 2<sup>nd</sup> of January of 2015 until the 2<sup>nd</sup> of March of 2016, where the *Return on Investment* obtained is 83%.

**Keywords**— *Genetic Algorithms; Support Vector Machine; Leverage; Forex;*

## 1. INTRODUCTION

The Foreign Exchange (FX) Market is a global market for currency trading, it is considered the most liquid financial market in the world. According to the Bank for International Settlements, trading in Forex markets averaged \$5.3 trillion per day in April 2013 [1]. Another advantage of this kind of markets, is that, transactions are available 24 hours a day, every day from Monday to Friday.

This financial problematic is a widely studied subject, and constitutes a rather motivating problem to researchers on the *Machine Learning* field of studies. In this work, more precisely, it is intended to develop an investment strategy, using different *Leverage ratios*, applied to Foreign Exchange Markets, or more specifically on FOREX markets. The work is motivated by the study of techniques within the area of Evolutionary Computation, that are capable of learning past events in order to predict future ones, and generate investment rules accordingly, thus, potentiating the quality

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات