HYBRID APPROACH FOR FINANCIAL FORECASTING
WITH SUPPORT VECTOR MACHINES

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the degree Master of Science

Department of Mechanical Engineering

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Sri Lanka

June 2014
**Declaration**

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Master’s thesis under our supervision.

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Dedicated
To my parents
Acknowledgements

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Abstract

Financial markets are the biggest business platforms in the world. Therefore, financial forecasting is getting a lot of attention in today’s economic context. Accurate forecast is beneficial to broker firms, governments, individuals etc.

Vast range of forecasting methods, models have introduced by the research community. However, the risk involved with trading on those markets are very high. Such complexity makes a difficulty of making consistent profit. Building an accurate forecasting model is still an active and interesting research area for the academic community.

Recently, nonlinear statistical models such as neural network, support vector machine have shown greater capability to forecast financial markets over conventional methods. This dissertation proposed a hybrid support vector machine model which consists of wavelet transform and k-means clustering for foreign exchange market forecasting. The proposed model analyzes the trends and makes a forecast by entirely depending on the past exchange data. Wavelet transform is used to remove the noise of the time series. K-means clustering cluster the input space according to the similarities of the input vectors and finally support vector models make a forecast for the relevant cluster.

The proposed hybrid forecasting system was tested on real market environment to check the forecasting capability. Auto trading algorithm developed on ‘metatrader4’ platform used the forecast of the model to trade on the real conditions. Results confirmed that the proposed model can forecast price movements with greater accuracy that leads to profitable trades on foreign exchange market.
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List of abbreviations

ABC - Artificial Bee Colony Algorithm
APE - Absolute Percentage Error
ARIMA - Auto Regression Integrated Moving Average
BP - Back Propagation
CD - Correct Down Trend
DS - Directional Symmetry
DWT - Discrete Wavelet Transform
EA - Expert Advisor
EKF - Extended Kalman Filter
EMA - Exponential Moving Average
EUR - Euro
FFT - Fast Fourier Transform
FLNN - Functional Link Neural Network
FOREX – Foreign Exchange
GA - Genetic Algorithm
GARCH - Generalized Autoregressive Conditional Heteroskedasticity
GLAR - Generalized Auto Regression
IBCO - Improved Bacterial Chemotaxis Optimization
ICA - Independent Component Analysis
ICA - Independent Component Analysis
JPY – Japan Yen
MAD – Mean Absolute Deviation
MAE - Mean Absolute Error
MLP - Multilayer Perceptron
MSE - Mean Squared Error
NMSE - Normalized Mean Squared Error
PCA - Principal Component Analysis
PCA - Principal Component Analysis
PSNN - Pi-Sigma Neural Network
PSO - Particle-Swarm Optimization
RBF - Radial Basis Functions
RMSE - Root Mean Square Error
RNN - Recurrent Neural Network
RPNN - Ridge Polynomial Neural Network
RW - Random Walk
SOM - Self-Organizing Maps
SVM - Support Vector Machine
SVR - Support Vector Regression
SWT - Stationary Wavelet Transforms
TAIEX - Taiwan Capitalization Weighted Stock Index
TEMA - Triple Exponential Moving Average
USD - US Dollar
VC - Vapnik-Chervonenkis
WT - Wavelet Transform