

Project Title: Neural Network Modeling of Noisy Financial Time Series (2005)

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Research Output:

File Name: nn00.pdf

Title: Neural Network Models of the Spot Canadian/U.S. Exchange Rate

Abstract: This paper proposes several predictive nonlinear transfer function models between short-term interest-rate spread and daily spot Canadian/US foreign exchange rate, using multi-layer feedforward neural networks with backpropagation learning algorithm. A comparative pre-test of the neural network model is constructed to evaluate the network performance and to select the best model. All of the testing models yield about 55% - 60% accuracy of the directional forecast on the out-of-sample test set. Comparing with the linear predictive models, a 2% to 5% gain is obtained by using neural network models. In particular, one of the models proposed in this paper, namely the separate neural networks model, is able to explore the nonlinear relationship between the spot Canadian/US foreign exchange rate and short-term interest-rate spread during a period of negative interest rate spread. Furthermore it is able to capture a corrective mean reversion when the Canadian dollar is under or over-valued in the market. The comparative pre-test also demonstrates the impact changes in the interest rate spread have on changes in the spot rate. As an aside the pre-test provides numerical evidence on the stable relationship between the short term interest rate spread and the spot Canadian/US foreign exchange rate.

File Name: ls00.pdf

Title: Local Stability Analysis of Neural Network Models with Application to Exchange-Rate Data

Abstract: In this paper we discuss the stability property of a predictive neural network model from a deterministic point of view. In particular, the stability property of linear and nonlinear causal transmission link models of daily spot Canadian/US foreign exchange rate is analyzed using a local stability analysis based on a nonlinear dynamical systems framework. This analytical result enables a numerical analysis of the stability to be fully

testable on the data set. Also the stability of the interval prediction of a general neural network model is studied in this paper.

File Name: jack00.pdf

Title: Jackknife Learning Algorithms for the Neural Network Model of Exchange Rate

Abstract: In this paper, we propose two grouped jackknife algorithms and apply them to a separate multi-layer feed-forward neural-network model of the spot Canadian/US foreign exchange rate. The integrated method delivers a reasonably reliable forecast of the spot rate along with a large amount of statistical information associated with the historical data.

File Name: boot00.pdf

Title: Bootstrapping Neural-Network Models of Exchange Rate

Abstract: In this paper, we provide a framework to quantify a forecast of noisy financial time series through an interval prediction by integrating two computationally oriented methods, namely neural network and bootstrap. In particular, we develop parametric and non-parametric bootstrap cross-validation learning algorithms and apply them to a multi-layer feed-forward neural-network model of the spot Canadian/US foreign exchange rate, exploiting the existence of a stable transmission link between the spot rate and the short-term interest-rate. Using the integrated method, we are able to uncover a hidden nonlinear structure between the spot rate and the short-term interest-rate spread during the period of negative interest-rate spread. Also, using this method, we are able to capture a corrective mean reversion when the Canadian dollar is under or over-valued in the market. Lastly, this method allows us to obtain a reliable forecast of the spot rate along with a large amount of statistical information associated with the historical data.