

# State-ANFIS: A Generalized Regime-Switching Model for Financial Modeling

Gregor Lenhard

Dietmar Maringer\*

## Abstract

This paper presents an extension to the adaptive neuro-fuzzy inference system (ANFIS) called State-ANFIS (S-ANFIS) that is able to model nonlinear functions by a weighted model combination. In this context one often observes several variables that determine the regime of a system. S-ANFIS distinguishes cases based on external state variables and produces a weighted output of linear models. An application of S-ANFIS to artificially generated time series data is shown and compared to its base model and other neural networks. In addition, an application to a well-known dataset, the three factor model of Fama and French to describe stock returns, is presented to underline the usefulness of the model. The work contributes to the existing regime-switching literature like smooth transition models in that it is able to utilize arbitrary many state variables.

**Keywords:** ANFIS, fuzzy inference system, neural networks, model combination, regime-switching, state variables, factor models, financial modeling.

---

\*University of Basel, Computational Economics and Finance Group, Peter Merian-Weg 6, CH-4002 Basel, Switzerland.