

Multidimensional House Price Prediction with Deep RNNs

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Abstract

There is a recent discussion concerning bubble formations in the Turkish real estate prices as house price growth exceeds the inflation rate, especially between 2010 and 2017. The term “bubble” inferring overvalued and fragile prices may collapse eventually, affecting governments and the financial markets. Despite the high growth in house prices, low affordability levels for middle-income households make this study more appealing for the Turkish experience. Therefore, governments and investors should closely monitor and comprehend housing price dynamics and their features. Our research question concentrates on the best prediction of housing prices in Turkey by employing three recurrent neural network models such as Simple RNN, GRU, and LSTM with an extensive data set of predictors, including twenty-one different financial, housing-sector related, macroeconomic series, and their first lagged values in the period of 2003:M01-2019:M12. We predict the house prices in three, six, nine, and twelve months ahead by determining three different batch sizes and eight learning coefficients, that is, 24 settings. Results mainly indicate that lagged ratio of house price-to-rent, real rents, and USDTRY with its lagged values are the best forecasters of the housing price index according to SHAP values. We find that four-layered LSTM, four-layered Simple RNN, two-layered LSTM, and three-layered Simple RNN are the best predictors of the housing price index in Turkey for three, six, nine, and twelve months ahead forecasts, respectively. However, three-layered Simple RNN for twelve months forecasts has relatively lower prediction power.

Keywords: Housing price prediction, Recurrent Neural Networks, Deep Learning

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