Intro

Mortgage-backed securities (MBS) are financial instruments that give investors the rights to receive cash flows from mortgage loans. However, these investments come with a specific risk called prepayment risk. Prepayment risk refers to the possibility that borrowers may repay their mortgages earlier than expected, resulting in investors receiving unscheduled principal payments.

When borrowers prepay, investors face certain disadvantages. They may lose the premium they paid for the MBS above its face value, and when reinvesting the received principal, they have to do so at current market interest rates, which are usually lower than what they initially earned.

To help investors assess the level of prepayment risk associated with their MBS investments and make informed decisions, we have developed a model that predicts the rate of prepayment for a pool of MBS. This model focuses on external configurations and utilizes innovative machine learning algorithms, including dense neural networks, recurrent neural networks (such as LSTM), and random forest. By predicting metrics such as single month mortality (SMM), cash inflows, weighted average life (WAL), and weighted average maturity (WAM) based on input features, the model assists investors in understanding and preparing for potential declines in payments.

Motivation

The task of forecasting prepayment rates in Mortgage-Backed Securities (MBS) is a complex and intellectually demanding challenge that requires expertise in finance, economics, and data analysis. This interdisciplinary approach is essential for developing accurate models and methodologies to predict how MBS prepayments behave, considering the intricate dynamics of the mortgage market. The significance of this endeavor cannot be overstated, as it directly affects various stakeholders such as lenders, investors, regulators, and policymakers. By contributing to the understanding and mitigation of risks associated with mortgage financing in MBS, working on this problem plays a crucial role in shaping the stability and functioning of mortgage markets. Furthermore, engaging in such demanding research facilitates professional growth by fostering collaboration with finance experts, providing networking opportunities with industry professionals, and ultimately earning recognition for valuable contributions in this specialized field.