

## Predictive Models of Ruin Probability in Retirement Withdrawal Strategies

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**Abstract :** Retirement withdrawal strategies are very important to minimize the probability of ruin in retirement. The ruin probability is modeled as a function of initial withdrawal age, gender, asset allocation, inflation rate, and initial withdrawal rate. The ruin probability is obtained based on the 2019 period life table for the Social Security, IRS Required Minimum Distribution (RMD) Worksheets, US historical bond and equity returns, and inflation rates using simulation. Several popular machine learning algorithms of the generalized additive model, random forest, support vector machine, extreme gradient boosting, and artificial neural network are built. The model validation and selection are based on the test errors using hyperparameter tuning and train-test split. The optimal model is recommended for retirees to monitor the ruin probability. The optimal withdrawal strategy can be obtained based on the optimal predictive model.

**Keywords :** ruin probability, retirement withdrawal strategies, predictive models, optimal model

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