

# MLP Report

The following is examinations on data of 2020Q1.

Here state(class) 3 means delinquency state of higher than 2 months.

## MLP with only Previous Loan Delinquency Status

### Results on train set:

**average probability = 0.49361862426499764**

Probability of truly predicting class 0 is 0.9934451091435801

Probability of truly predicting class 1 is 0.08125582909927707

Probability of truly predicting class 2 is 0.16037910580976664

Probability of truly predicting class 3 is 0.7393944530073668

**brier score = 0.014891547048121827**

Brier score for state 0 is 0.006567268370069974

Brier score for state 1 is 0.005746053930023123

Brier score for state 2 is 0.0014493765330497329

Brier score for state 3 is 0.0011288482149789958

### Results on test set:

**average probability = 0.4955193236275815**

Probability of truly predicting class 0 is 0.9930507611570091

Probability of truly predicting class 1 is 0.10158275795180167

Probability of truly predicting class 2 is 0.15705111785060197

Probability of truly predicting class 3 is 0.7303926575509132

**brier score = 0.018360628106507296**

Brier score for state 0 is 0.007768639160916899

Brier score for state 1 is 0.006996330386601547

Brier score for state 2 is 0.001963766526432156

Brier score for state 3 is 0.001631892032556692

## MLP with also Credit Score

### Results on train set:

**average probability = 0.49897476170817634**

Probability of truly predicting class 0 is 0.9933947804218469

Probability of truly predicting class 1 is 0.08205197913003032

Probability of truly predicting class 2 is 0.18534577788141554

Probability of truly predicting class 3 is 0.7351065093994124

**brier score = 0.0149677445408871**

Brier score for state 0 is 0.0065842036416194445

Brier score for state 1 is 0.00574243031317572

Brier score for state 2 is 0.0014435011078176383

Brier score for state 3 is 0.0011976094782742966

**Results on test set:****average probability = 0.506295248261863**

Probability of truly predicting class 0 is 0.9931707566305218

Probability of truly predicting class 1 is 0.10946207335356292

Probability of truly predicting class 2 is 0.19512208871662678

Probability of truly predicting class 3 is 0.7274260743467407

**brier score = 0.018458786555378436**

Brier score for state 0 is 0.0077803780164585066

Brier score for state 1 is 0.006929036239252714

Brier score for state 2 is 0.001959156322055135

Brier score for state 3 is 0.0017902159776120778

MLP with other five main features

```
["Credit Score", "Original UPB", "Original Debt-to-Income (DTI) Ratio", "Original  
Loan-to-Value (LTV)", "Original Interest Rate"]
```

**Results on train set:****average probability = 0.5009808806292595**

Probability of truly predicting class 0 is 0.9934632066872101

Probability of truly predicting class 1 is 0.07094718378219947

Probability of truly predicting class 2 is 0.16993923861741422

Probability of truly predicting class 3 is 0.7695738934302141

**brier score = 0.014856850050616174**

Brier score for state 0 is 0.006507416417497639

Brier score for state 1 is 0.005742269986937353

Brier score for state 2 is 0.001480872574023168

Brier score for state 3 is 0.0011262910721580141

**Results on test set:****average probability = 0.49966579458923066**

Probability of truly predicting class 0 is 0.9932778488551468

Probability of truly predicting class 1 is 0.08476200630691624

Probability of truly predicting class 2 is 0.17056453461949794

Probability of truly predicting class 3 is 0.7500587885753616

**brier score = 0.01873666606986128**

Brier score for state 0 is 0.007594427121554932

Brier score for state 1 is 0.007087360103429906

Brier score for state 2 is 0.0019945901881885065

Brier score for state 3 is 0.002060288656687935

***Authored by Peini SHE on Mar.31, 2025***