AI for finance: Project 2

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Scenario

You are a portfolio manager. Hence, you want to rebalance your portfolio from high beta stocks to low beta stocks before recessions. As a result, you may want to find a model that has some predictability of recessions.

Since GDP data is quarterly, and hence "recession" is quarterly data. We need to do the analysis quarterly. Convert monthly data to quarterly by taking an average.

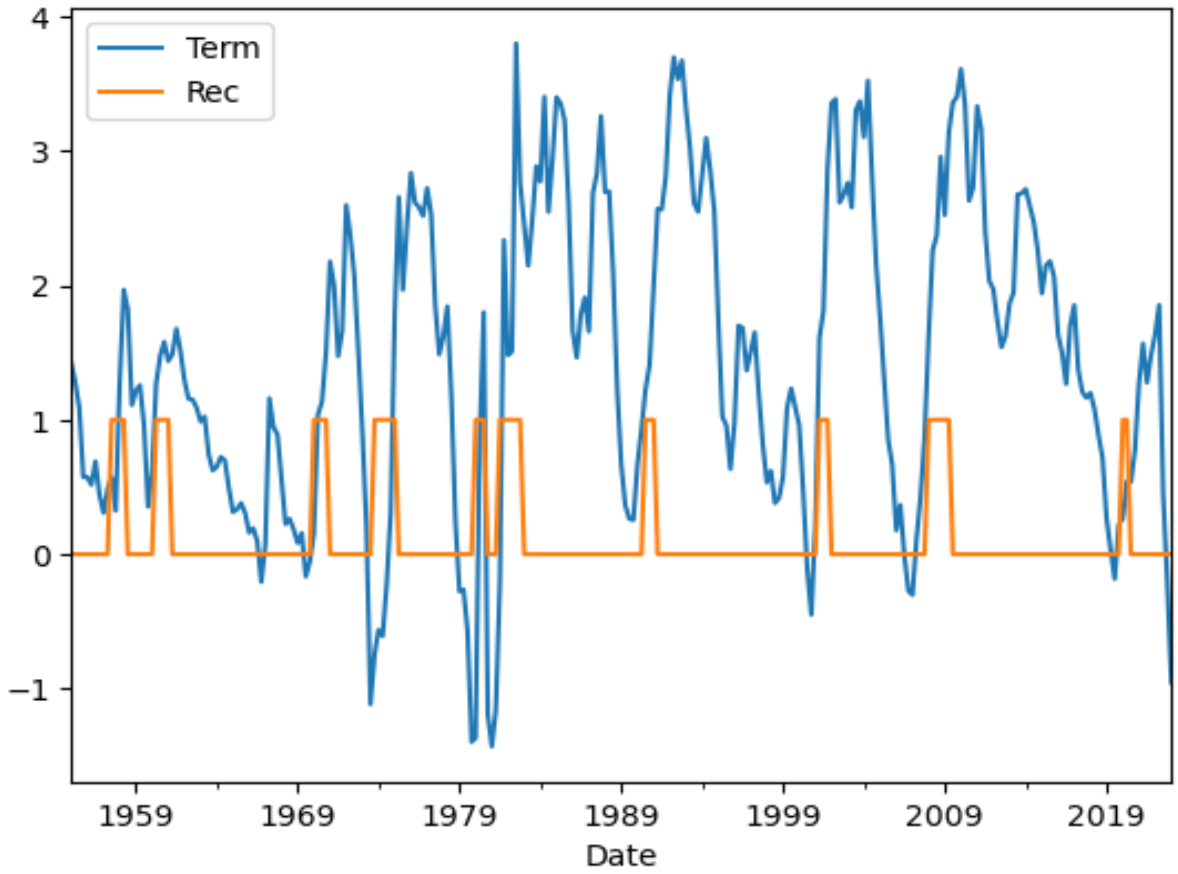
• You need to run a Probit model as explained in class.

• Compare the results of the probit model with two AI models 1) PNN (1960s): probabilistic neural network; 2) MLP (1940s): multilayer perceptron.

Exercise 1

The dependent variable is the NBER recessions binary variable. Since we want to forecast recessions, use lags (up to 12 quarters) of the explanatory variables.

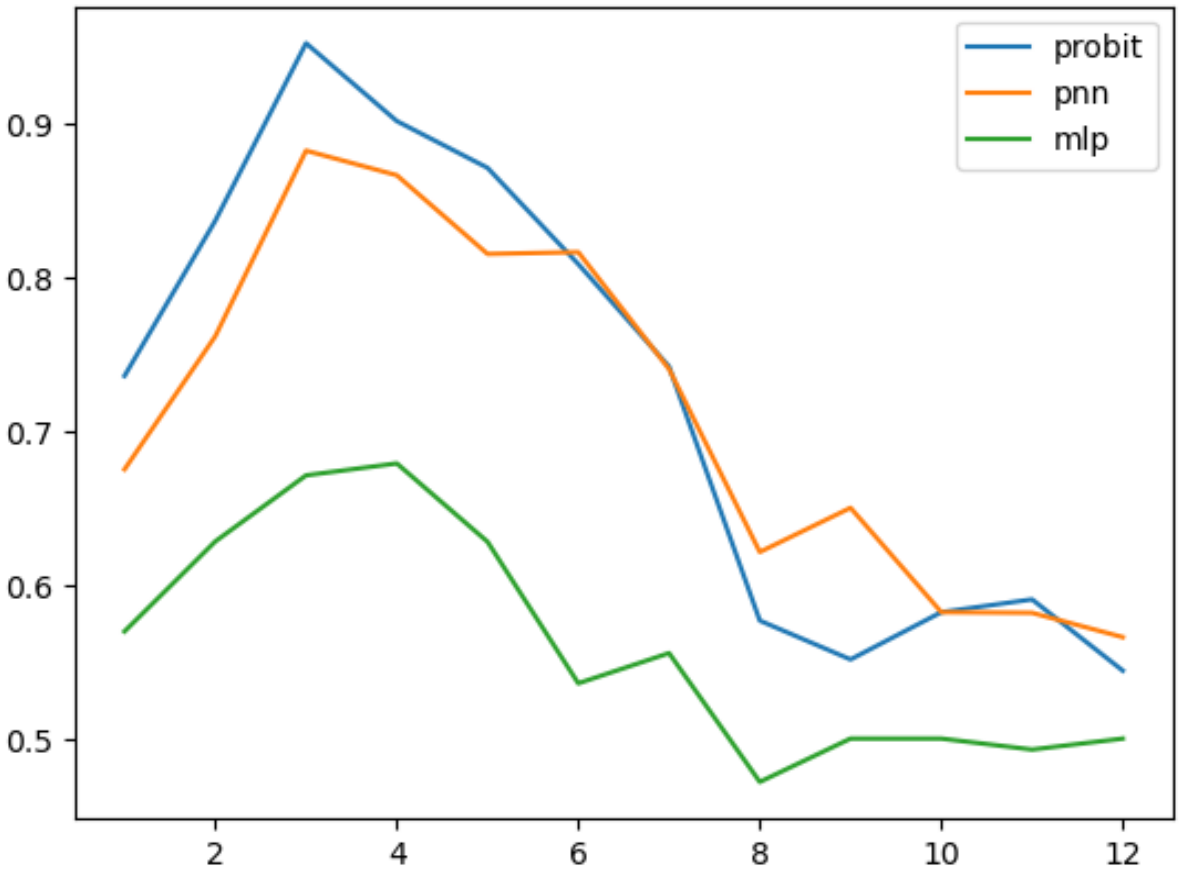
The Term variable is a good estimator for forecasting the Recession as we can see from the graph below. The decreasing in the value of term quite always follows with a recession period.



from the R-squared and AUROC values listed below we can see how the model that better predict the recession is the Probit model , this is expecially true if we observe the R-squared for 4-5 lags periods (around 1.5 years) which is greater than 0.2 , this means that the term data that better predicts the recession are the values that comes from 4-5 period lags. While for the AI based models that is not true since the R-squared values are mainly negative so the models find difficulties to explain the data. This is expecially true in the very short-term and very long-term

Period LAG	1	2	3	4	5	6	7	8	9	10	11	12
(R-squared)												
Probit	0.051	0.147	0.188	0.233	0.219	0.184	0.109	0.100	0.061	0.052	0.032	0.023
PNN	-0.736	-0.464	-0.036	-1.167	-0.813	-1.281	-2.755	-4.007	-3.914	-3.327	-4.642	-3.814
MLP	-0.096	-0.033	0.136	-0.026	-0.036	-0.254	-0.001	-0.627	-0.142	-0.196	-0.253	-0.179
(AUROC)												
Probit	0.735	0.836	0.952	0.901	0.871	0.808	0.741	0.576	0.551	0.582	0.590	0.544
PNN	0.675	0.761	0.882	0.866	0.815	0.816	0.740	0.621	0.650	0.582	0.581	0.565
MLP	0.569	0.628	0.671	0.678	0.627	0.535	0.555	0.471	0.5	0.5	0.5	0.5

Models used: Probit, Probabilistic Neural Network (PNN) and Multilayer Perceptron (MLP)



Exercise 2

Assume that if we are in a "Recession" today, the "Recession" today is a good predictor of recession tomorrow. That is, in each quarter, add a lag of "Recession" as a predictor. As a result, in each quarter, you have 2 explanatory variables – make sure both have the same lag, otherwise prediction is faulty.

From the results listed before we can see how adding the "recession" today as part of the explanatory variable we can obtain major improvements with short periods of lags but still it tends to fail in predicting recession if the lag is too large

Models used: Probit, Probabilistic Neural Network (PNN) and Multilayer Perceptron (MLP)

Period LAG	1	2	3	4	5	6	7	8	9	10	11	12
(R-squared)												
Probit	0.513	0.345	0.240	0.246	0.220	0.196	0.116	0.104	0.061	0.052	0.033	0.025
PNN	0.268	-0.205	-0.036	-1.167	-0.813	-1.281	-2.881	-3.882	-3.914	-3.419	-4.517	-3.912
MLP	0.451	0.052	-0.036	-0.026	-0.036	-0.254	-0.001	-0.251	-0.142	-0.289	-0.253	-0.179
(AUROC)												
Probit	0.964	0.930	0.922	0.869	0.876	0.822	0.769	0.587	0.555	0.577	0.603	0.567
PNN	0.879	0.811	0.882	0.866	0.815	0.859	0.733	0.628	0.650	0.574	0.588	0.558
MLP	0.862	0.663	0.599	0.678	0.599	0.535	0.555	0.492	0.5	0.5	0.5	0.5