Predicting Economic Recessions

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FSU

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Introduction

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  - A recession begins when the business cycle goes from peak to trough.
  - They are influenced by:
    - GDP
    - real income
    - employment level
    - industrial production
    - wholesale-retail sales
- Used interest rate data from the Federal Reserve Bank of St. Louis and the Board of Governors of the Federal Reserve System to to make predictions of future economic recessions in the U.S. and determine which variables are important.

Literature Review

- Some models used by other economic researchers:
  - simple rules of thumb
  - GDP forecasting model
  - Stock and Watson model
  - Logistic models
  - Boosting Regression Trees (BRT)
  - the Probit model

Literature Review

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  - the Probit model

- Many researchers find that the leading indicator for economic recession is the term spread.

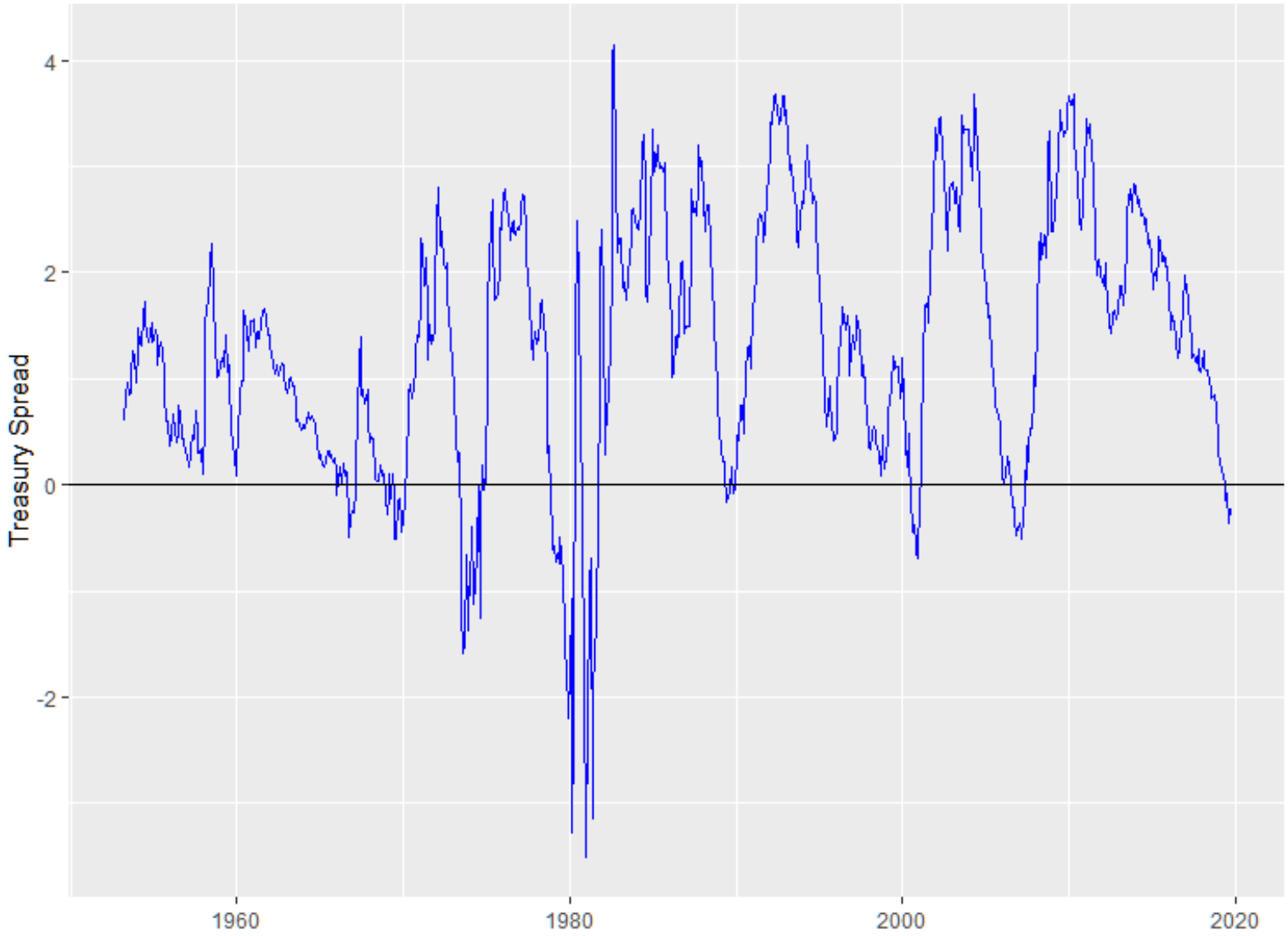
Data: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
NBER Recession Indicator	0.129	0.335	0	1
Three Month Treasury Yield (%)	4.502	3.226	0.01	17.237
Ten Year Treasury Yield (%)	5.839	2.852	1.5	15.32
Spread (%)	1.337	1.236	-3.505	4.146
Federal Funds Rate (%)	4.785	3.595	0.07	19.1
Consumer Price Index	119.33	75.864	26.71	256.36
Industrial Production Index	63.73	28.505	18.61	110.55
Election Year	0.246	0.431	0	1

n=783

- Note: data from April 1953 to September 2019 was used to make predictions.

Data: A plot of the Term Spread



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$$P(USREC_{t+h}) = F(\alpha + \beta_1\ SPREAD_t + \beta_2\ FFR_t + \beta_3\ CPI_t + \beta_4 INDPRO_t + \beta_5 E_t)$$

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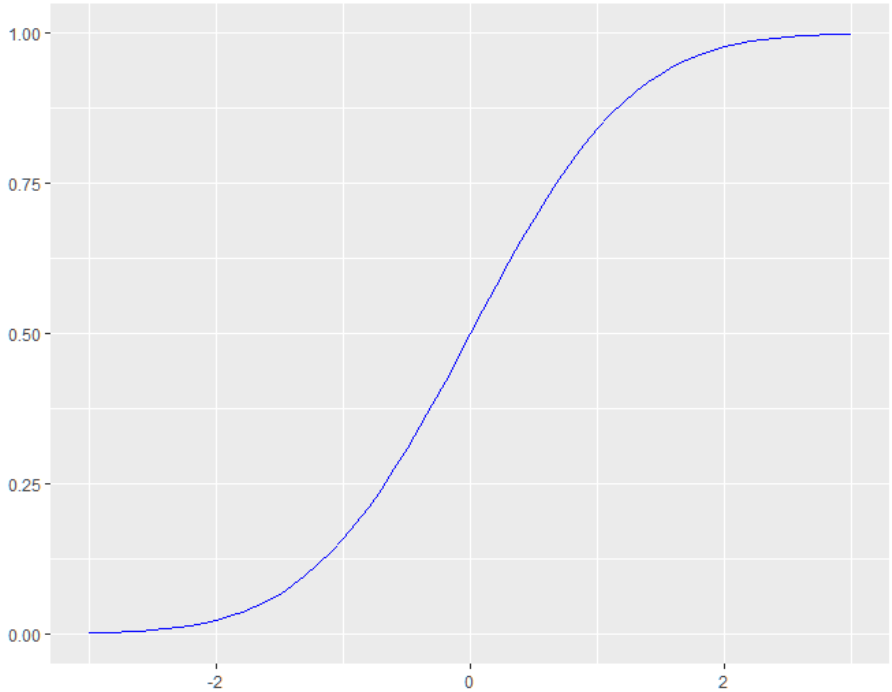
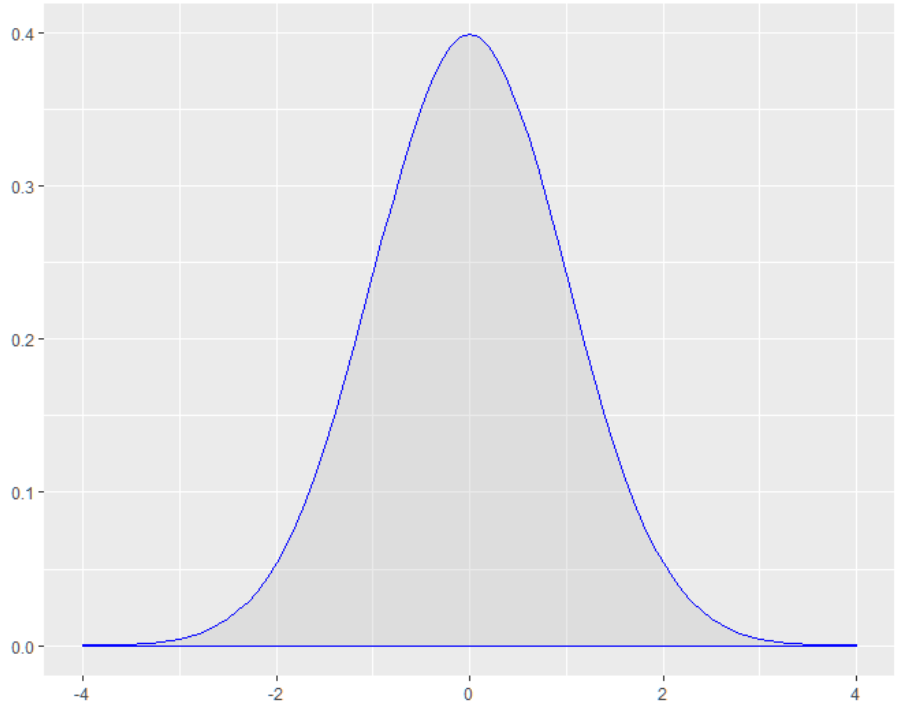
where F is the standard normal cumulative density function which can represented as:

$$F(z) = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx.$$

Methods: Plots of the Standard Normal CDF and PDF





Methods: Model Selection and Performance

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- Performance was measured by finding the area under the Receiver Operating Characteristic Curve known as the AUC.

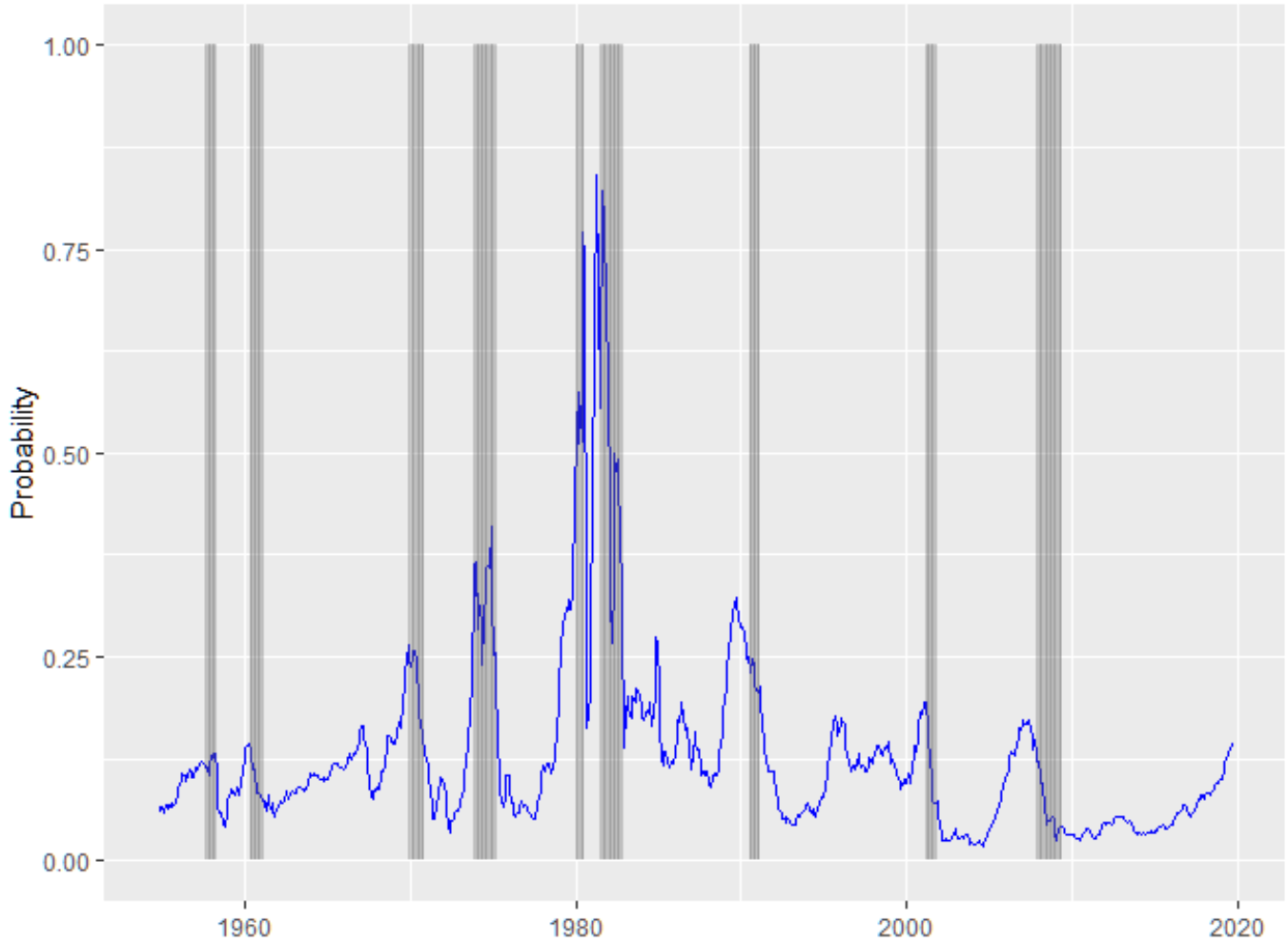
Results: Stepwise Probit Coefficients

Forecast Horizon	**Three Months (AIC = 536.35)**	**Six Months (AIC = 492.91)**	**One Year (AIC = 442.47)**	**Two Years (AIC = 535.41)**
Intercept	-1.259*** (0.292)	-1.269*** (0.163)	-0.856*** (0.184)	-1.646*** (0.258)
Ten-Year less Three Month Spread	-0.174** (0.059)	-0.326*** (0.062)	-0.632*** (0.081)	-0.195*** (0.055)
Federal Funds Rate	0.102*** (0.019)	0.082*** (0.020)	0.036 (0.023)	
Consumer Price Index	0.006 (0.004)			-0.021*** (0.004)
Industrial Production Index	-0.016 (0.011)			0.050*** (0.011)
Election Year			0.239 (0.157)	

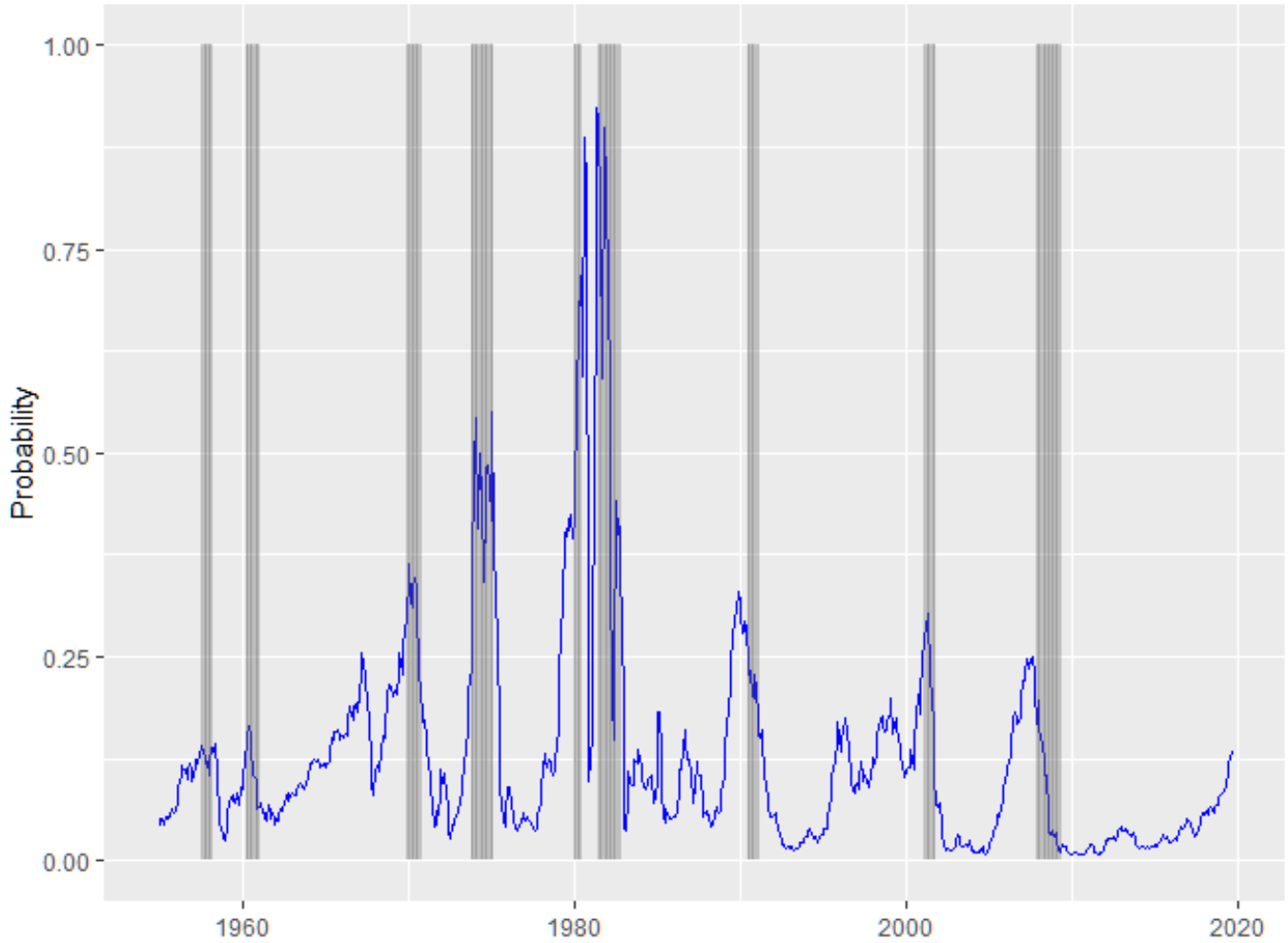
'***' $p \approx 0$, '**' $p \leq 0.001$, '*' $p \leq 0.01$. '.' $p \leq 0.05$

Standard errors are in parentheses.

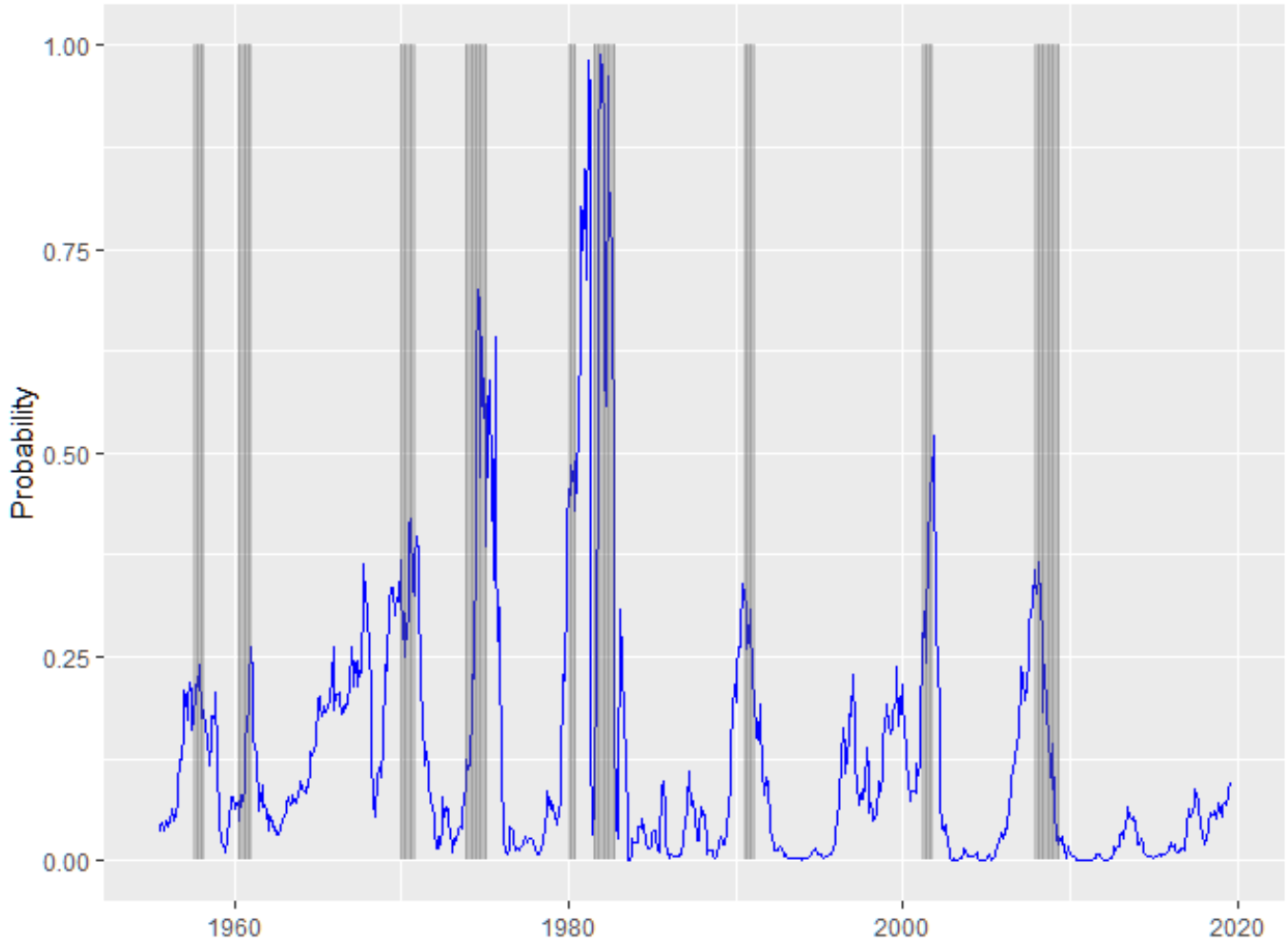
Results: The Probability of Recession Three Months Ahead



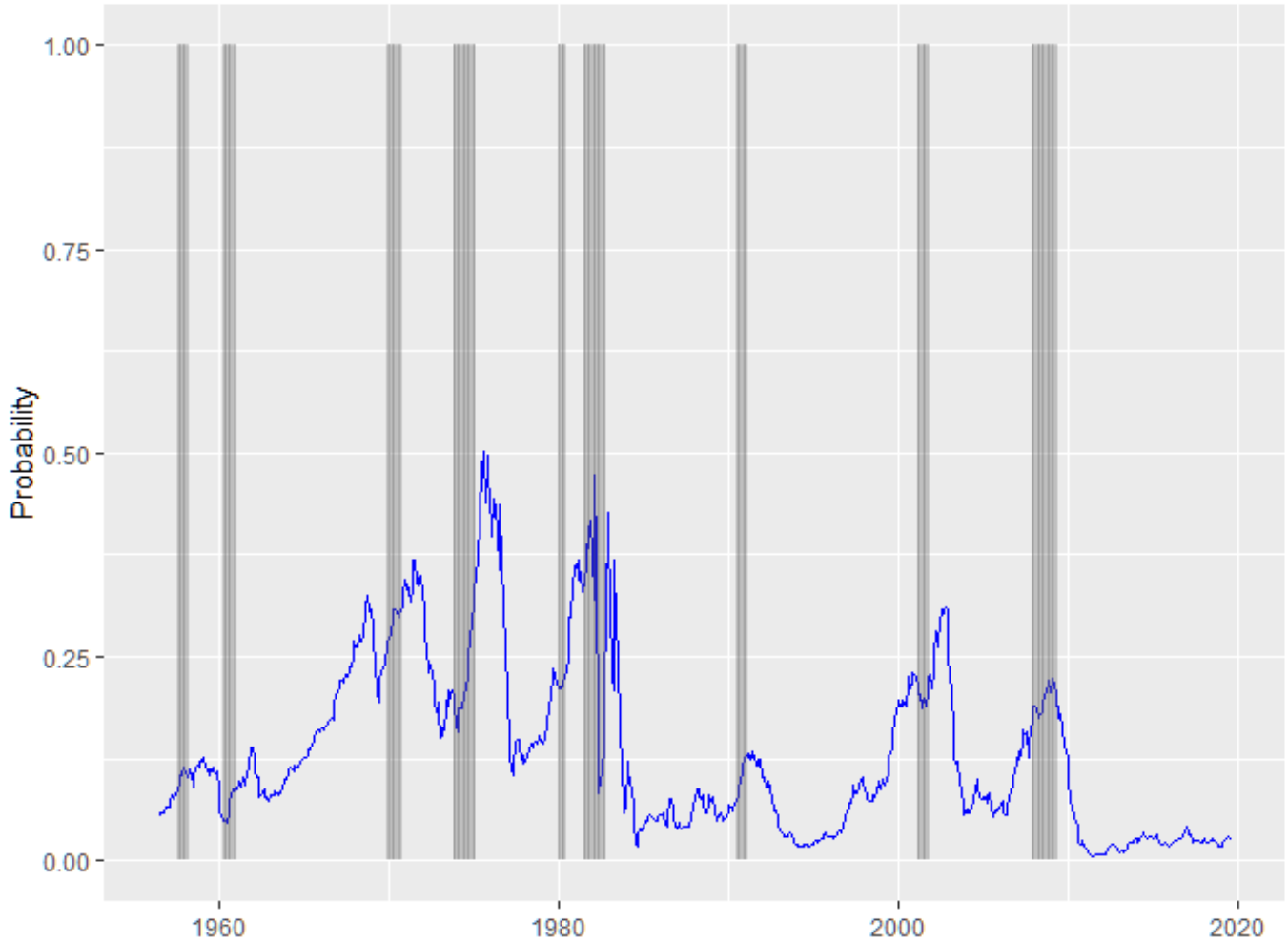
Results: The Probability of Recession Six Months Ahead



Results: The Probability of Recession One Year Ahead

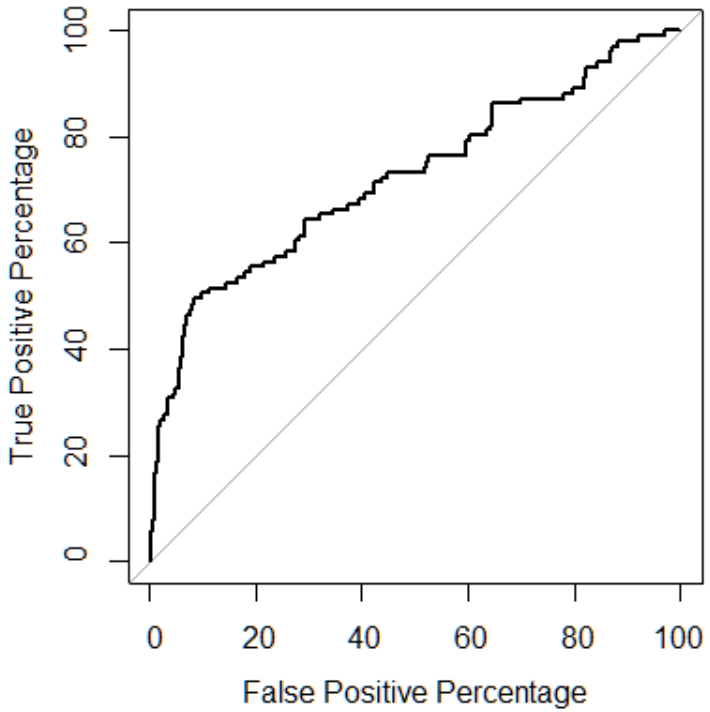


Results: The Probability of Recession Two Years Ahead



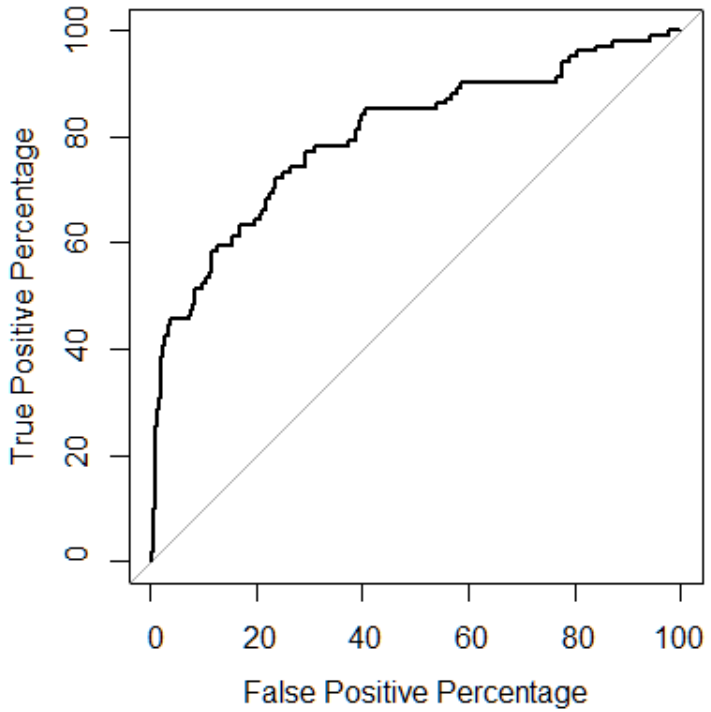
Results: ROC Curves for Stepwise Models

Three months:



AUC = 72.15%

Six months:



AUC = 79.88%

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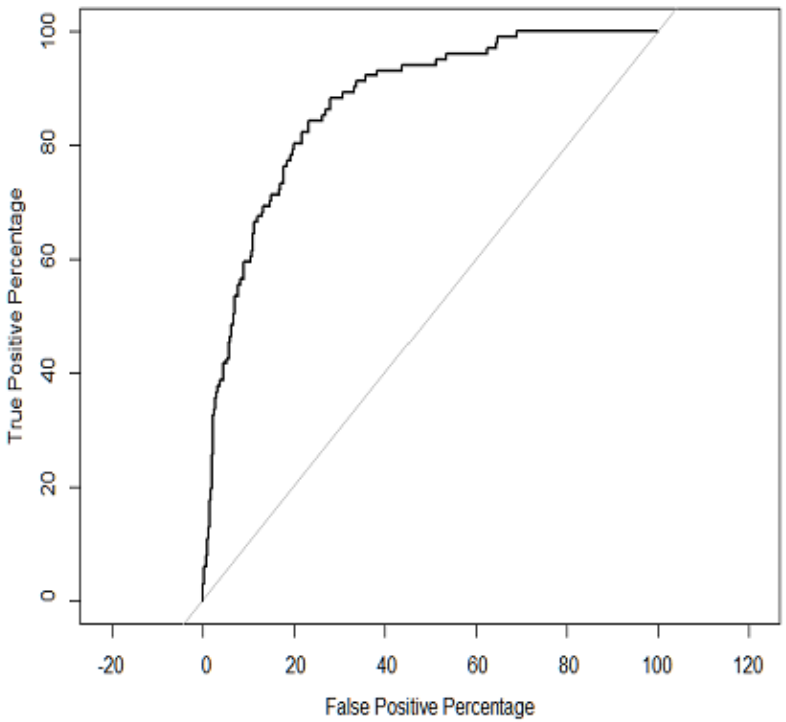
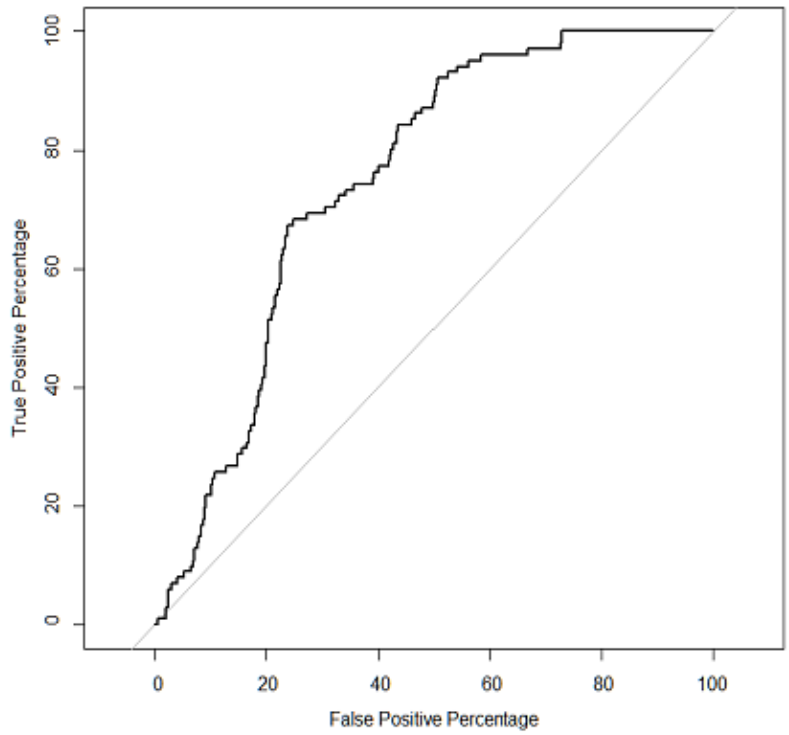
One year:



AUC = 87.12%

Two years:



AUC = 74.88%

Conclusion

- The term spread was an important predictor for all forecast horizons.
- The federal funds rate was important for the three and six month forecast horizons.
- The CPI and Industrial Production Index were significant for the two-year horizon.
- The election year dummy was not significant.
- The model that performed best was the one-year forecast horizon model since it had the lowest AIC and highest AUC.

Thank you!