DA3 Exercise1

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Introduction

This is a report about building models to predict the hourly wage of the driving jobs with multiple predictor variables in the cps data set. In the end we horse race the models to see which is the best one. It checks the BIC and the RMSE on the whole data set and the RMSE with 4 fold cross validation.

Data cleaning, Feature engineering

- Target Variable (Y): Hourly wage
- Predictor variables (X): Education (High school graduate as base), Race (White as base), Age, Sex (Male as base), Marital Status (Married as base), Union Status (Not in union as base)
- For more information see in Appendix

Models

- Model 1: age, age squared
- Model 2: age, age squared, sex
- Model 3: age, age squared, sex, union, marital status
- Model 4: age, age squared, sex, union, marital status, race, education
- Model 5: age, age squared, sex, union, marital status, race, education, interaction age and female, interaction with age and union

Results

From the model summary table we can see that on the complete data set is the best is Model 3 in BIC and Model 5 is the best in RMSE. With 4 fold cross validation Model 3 has the best average RMSE seen on the Prediction performance and model complexity plot and on the summary table. I would choose Model 3 for prediction, but the increase in variable count from Model 2 to Model 3 is maybe too much.

Appendix

Data selection and cleaning

I selected the driving occupations.

I filtered with the same filter values as in class:

- More than 20 hours worked a week
- More than 0 dollars earned a week
- Older than 24 years
- Younger than 64 years

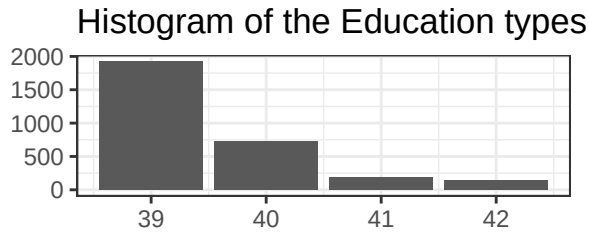
I also filtered for better or equal education than BSc turns out, drivers do not usually have BSc Education.
* Education between high school and Bsc (BSc not included).

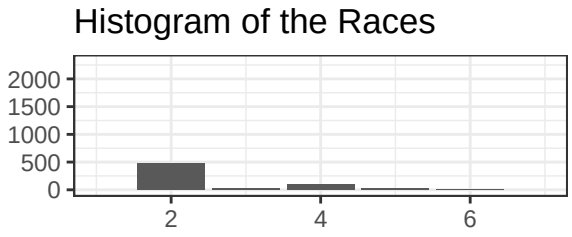
I choose the predictors:

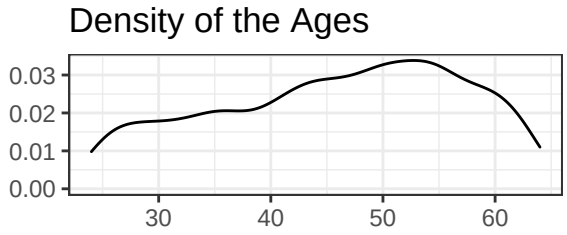
- grade92 (Education) as I think education is always an important quality with jobs
- race to see if there is bias towards white people
- age as I think age is always an important quality with jobs
- sex to see if there is a bias towards males
- marital to see if there is a marital status that earns more than others
- unionmme (Union status) I think this is a hot topic in the US.

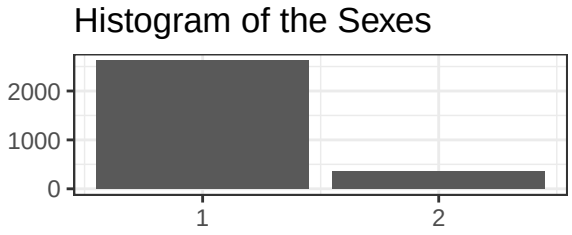
Distribution of the hourly wages

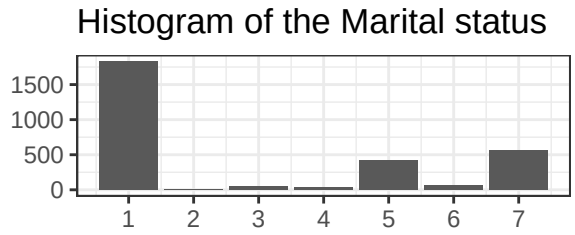
The hourly wage distribution is close to normal with right long tail

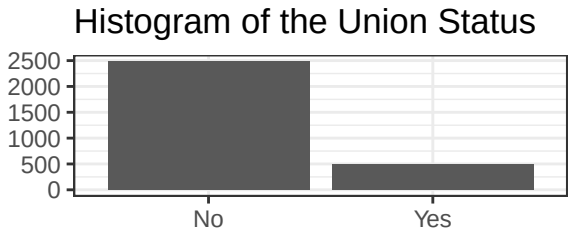




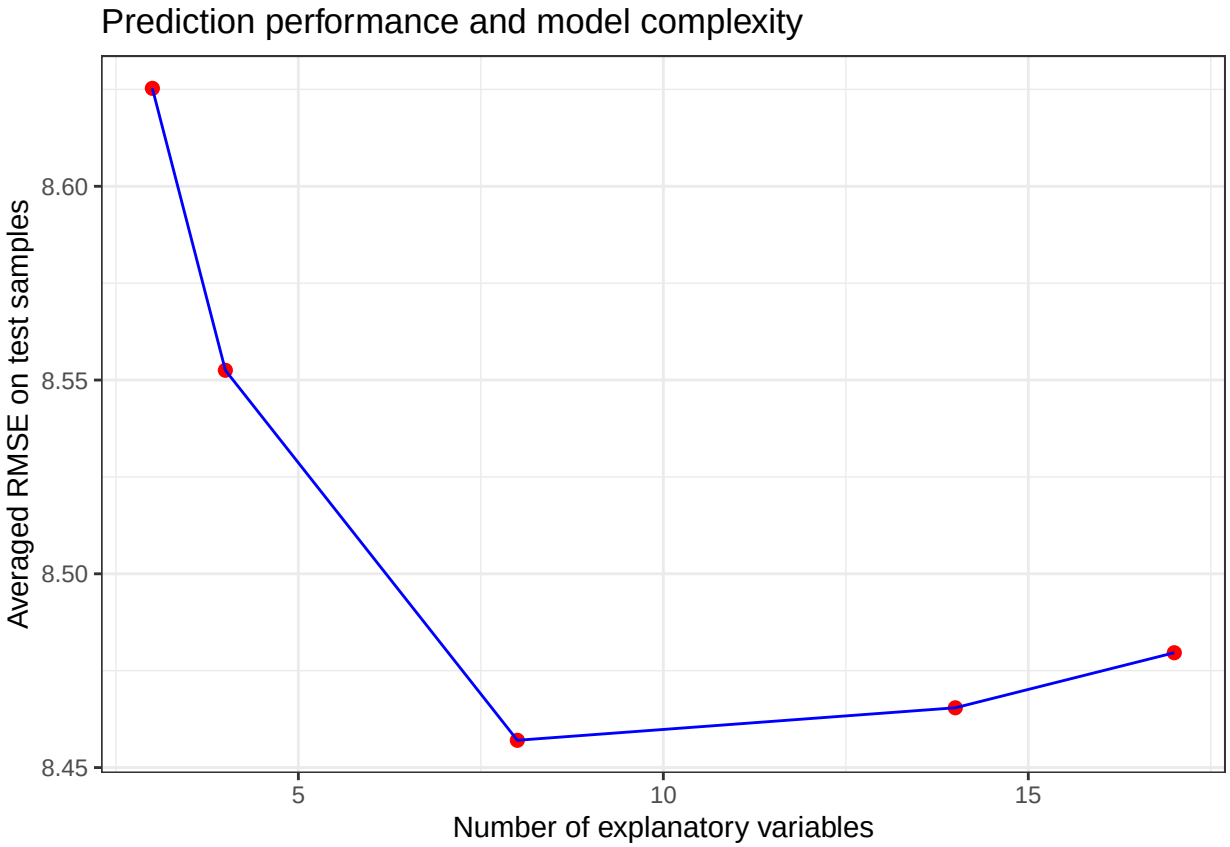








occ2012	n
9120	403
9130	2380
9140	197



Resample	RMSE	RMSE.1	RMSE.2	RMSE.3	RMSE.4
Fold1	8.590490	8.474870	8.338192	8.293919	8.297041
Fold2	8.926210	8.814151	8.682432	8.744360	8.745257
Fold3	8.309046	8.223868	8.162299	8.162094	8.186240
Fold4	8.664158	8.685491	8.634376	8.647591	8.676497
Average	8.625277	8.552521	8.457033	8.465423	8.479631

With 4-fold cross validation Model 3 has the best RMSE

Evaluation of the models using all the sample

	reg1	reg2	reg3	reg4	reg5
Dependent Var.:	earnho	earnho	earnho	earnho	earnho
Intercept	1.915	1.676	3.992	3.407	-2.449
	(2.392)	(2.371)	(2.504)	(2.563)	(9.631)
age	0.6876***	0.7182***	0.6146***	0.6460***	1.095
	(0.1157)	(0.1149)	(0.1172)	(0.1187)	(0.7073)
age squared	-0.0069***	-0.0072***	-0.0063***	-0.0067***	-0.0173
	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0167)
female		-3.639***	-4.000***	-4.073***	-4.134*
		(0.4378)	(0.4510)	(0.4575)	(1.917)
unionized			3.532***	3.543***	0.4839
			(0.4268)	(0.4212)	(1.890)
divorced			0.4361	0.3766	0.3872
			(0.4939)	(0.4937)	(0.4928)
never married			-0.9001*	-0.7635	-0.7563
			(0.4349)	(0.4357)	(0.4352)
other marital status			-0.1950	-0.1103	-0.1091
			(0.5845)	(0.5855)	(0.5852)
black				-0.8400*	-0.8445*
				(0.3966)	(0.3972)
asian				-1.219	-1.175
				(1.022)	(1.023)
other race				-1.991*	-2.073*
				(0.8207)	(0.8215)
college drop-out				0.5206	0.5151
				(0.3849)	(0.3854)
occupational degree				-1.838***	-1.849***
				(0.5385)	(0.5381)
academic degree				2.000*	2.019*
				(0.8355)	(0.8368)
age cubed					7.87e-5
.					(0.0001)
age x female					0.0012
.					(0.0428)
age x unionized					0.0645
.					(0.0396)
S.E. type	Hete.-rob.	Hete.-rob.	Hete.-rob.	Hete.-rob.	Het.-rob.
AIC	21,297.8	21,243.4	21,173.7	21,157.6	21,160.7
BIC	21,315.8	21,267.4	21,221.7	21,241.6	21,262.7
RMSE	8.6150	8.5339	8.4234	8.3837	8.3797
R2	0.01795	0.03636	0.06115	0.06997	0.07085
Observations	2,980	2,980	2,980	2,980	2,980
No. Variables	2	3	7	13	16

According to BIC, Model 3 is the best. According to RMSE Model 5 is the best on the full data set