RVO Health

Case Study
Jensen Brock

Prompt
Bankrate Data

Key Deliverables

1. Describe the customer

2. Demonstrate an understanding of the lenders

3. Develop a Predictive model for Loan Approval

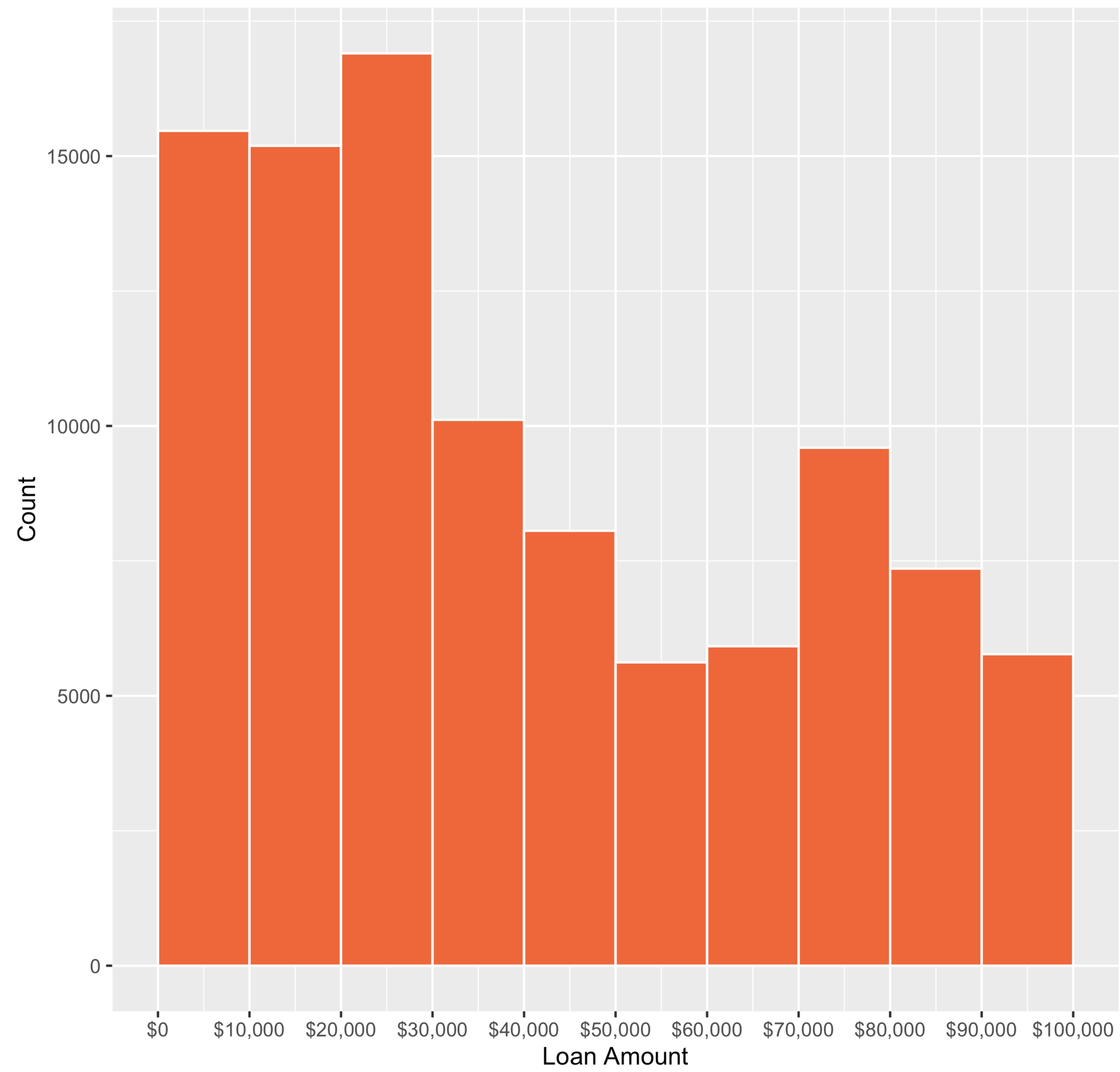4. Next Steps: Lender-Customer Matching

High Level Data Overview

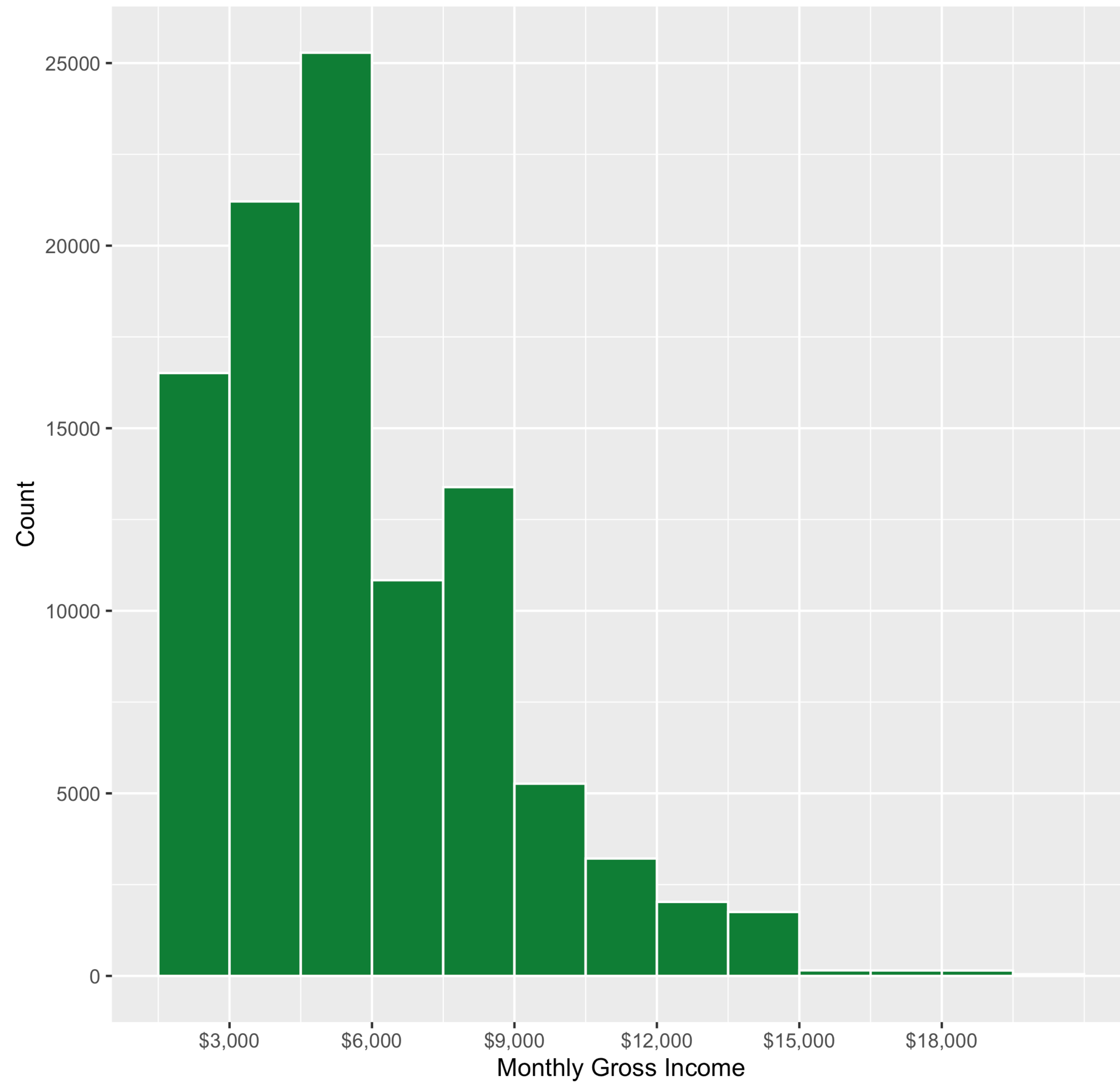| Approval Rate	Avg. FICO Score	Avg. Loan Amount	Avg. Monthly Income	Avg. Monthly House Payment	House to Income Ratio
11%	629.35	$45,234.35	$5,871.90	$1,649.69	28%

FICO Score Distribution
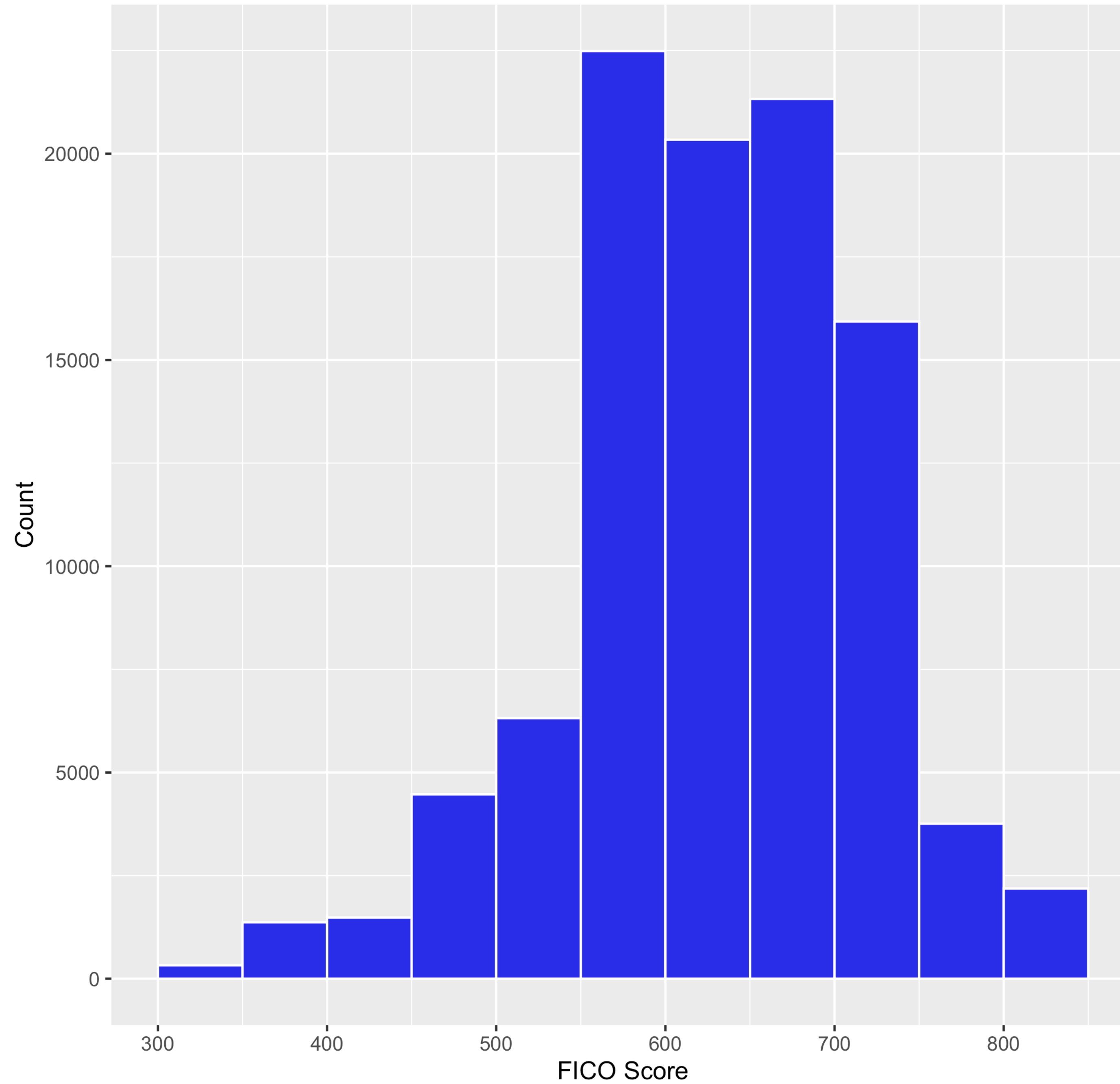
Loan Amount Distribution

Income Distribution

Understanding the Customer

Key Customer Takeaways

Employment Status	Employment Sector	Approval Rate	Avg. FICO Score	Avg. Loan Amount	Avg. Monthly Income	Avg. Monthly House Payment
full_time	communication_services	10%	619.05	$45,938.16	$6,212.02	$1,732.30
full_time	consumer_discretionary	9%	610.86	$46,082.63	$5,595.62	$1,697.19
full_time	consumer_staples	10%	622.32	$45,871.76	$6,301.35	$1,720.59
full_time	energy	11%	626.77	$44,805.62	$6,581.65	$1,724.91
full_time	financials	14%	639.45	$45,449.28	$7,211.63	$1,715.10
full_time	health_care	13%	632.35	$45,034.57	$6,817.58	$1,714.52
full_time	industrials	12%	628.44	$44,692.93	$6,608.09	$1,715.71
full_time	information_technology	13%	634.20	$45,121.09	$6,934.65	$1,719.65
full_time	materials	12%	626.34	$45,005.59	$6,495.91	$1,721.16
full_time	real_estate	12%	630.62	$44,983.04	$6,757.84	$1,709.50
full_time	utilities	11%	626.64	$44,791.43	$6,525.77	$1,732.26
full_time	NA	0%	585.00	$20,000	$5,610	$741
part_time	communication_services	8%	626.52	$44,996.55	$3,185.69	$1,415.54
part_time	consumer_discretionary	6%	629.43	$47,601.81	$2,944.53	$1,390.82
part_time	consumer_staples	8%	628.79	$46,198.67	$3,157.87	$1,391.33
part_time	energy	8%	627.32	$45,638.83	$3,183.38	$1,407.81
part_time	financials	8%	629.99	$44,837.00	$3,365.27	$1,421.68
part_time	health_care	9%	628.36	$45,510.54	$3,261.72	$1,402.32
part_time	industrials	9%	630.01	$45,612.54	$3,208.57	$1,399.51
part_time	information_technology	8%	631.14	$45,606.65	$3,297.07	$1,421.24
part_time	materials	8%	631.60	$45,422.69	$3,148.90	$1,395.05
part_time	real_estate	7%	629.98	$45,385.56	$3,224.75	$1,389.30
part_time	utilities	9%	632.29	$47,388.30	$3,178.77	$1,388.36
unemployed	NA	5%	626.22	$44,258.51	$3,206.98	$1,483.53

Lender Activity

Lender Summary

Lender Overview

Lender	Number of Applications	Approval Rate	Avg. FICO Score	Avg. Loan Amount
A	55,000	11%	630	$45,258
B	27,500	7%	630	$45,223
C	17,500	17%	626	$45,178

Lender FICO Score Break Down

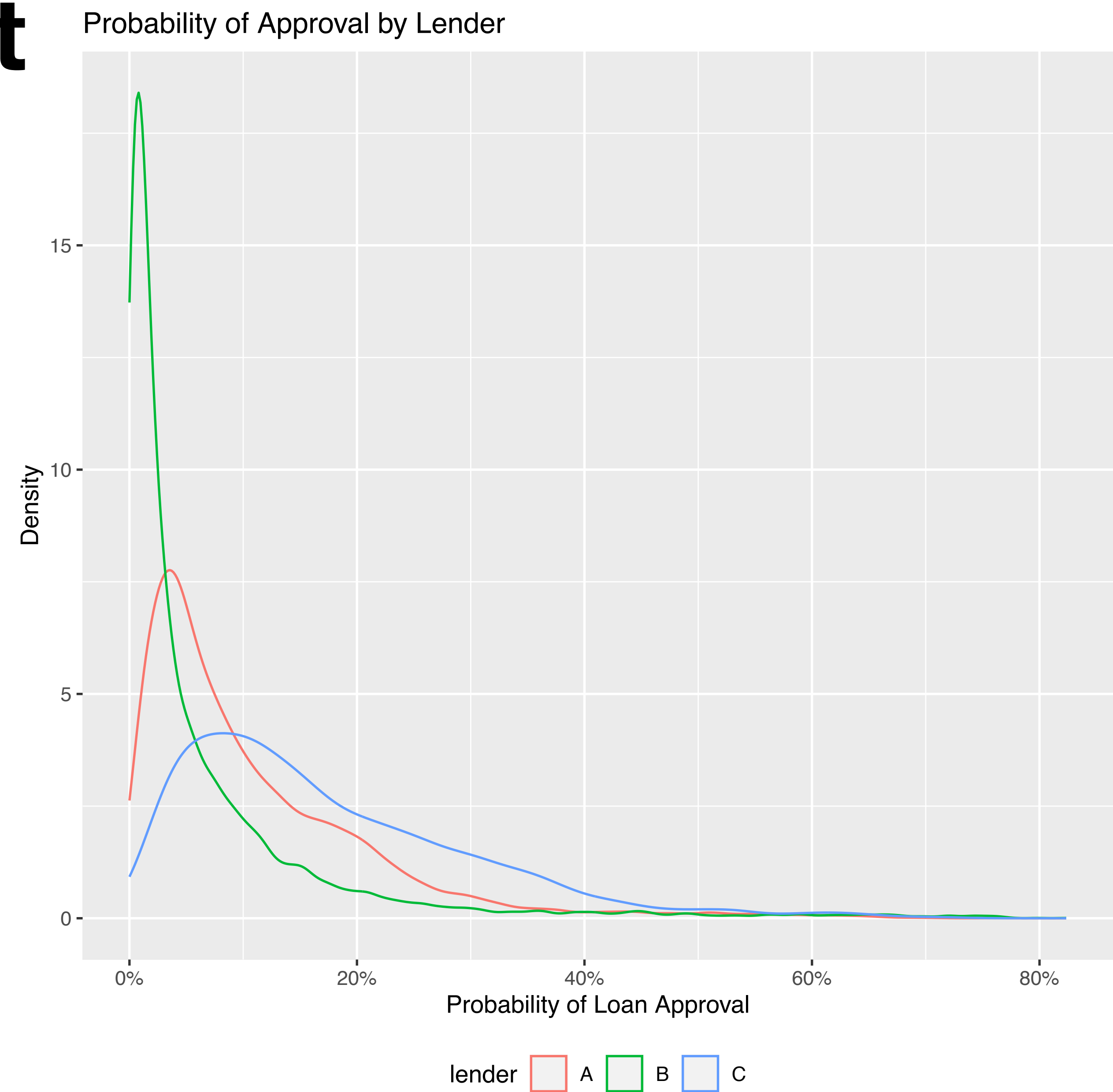| Lender	FICO Score Group	Number of Applications	Approval Rate	Avg. FICO Score	Avg. Loan Amount
A	excellent	1,190	44%	825	$44,903
B	excellent	630	43%	824	$46,786
C	excellent	368	55%	824	$42,188
A	very_good	2,597	36%	770	$45,606
B	very_good	1,773	30%	763	$45,175
C	very_good	732	49%	768	$45,096
A	good	16,008	18%	704	$45,203
B	good	7,400	14%	701	$44,895
C	good	4,352	26%	703	$45,550
A	fair	19,562	7%	626	$45,448
B	fair	9,923	2%	626	$45,277
C	fair	6,990	13%	626	$44,768
A	poor	15,643	3%	523	$45,046
B	poor	7,774	0%	523	$45,351
C	poor	5,058	8%	523	$45,653

Predictive Model

Predictive Model: Loan Approval
Logistic Regression

- Split data into Training and Test Data (70%, 30%)

- Tune Logistic Regression Model

- Model Selection

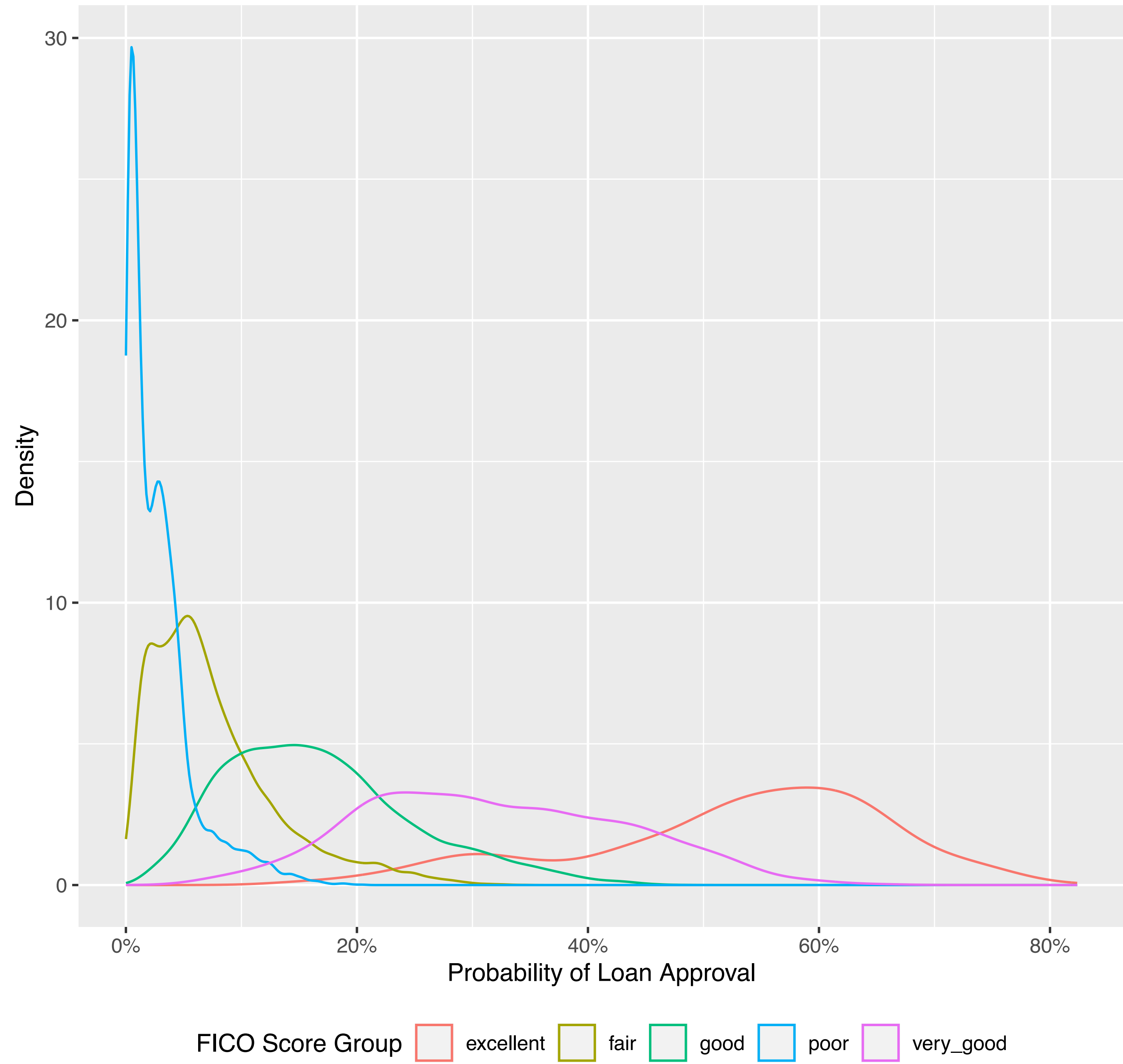- Apply model to test data

Model Output

Probability of Approval by Lender

Covariate	Coefficient
(Intercept)	−9.090***
	(0.252)
lenderB	−5.901***
	(0.397)
lenderC	2.472***
	(0.283)
fico_score	0.011***
	(0.000)
monthly_gross_inc	0.000***
	(0.000)
house_pmt_mo	0.000***
	(0.000)
loan_amount	0.000***
	(0.000)
employment_statuspart_time	−0.393***
	(0.045)
employment_statusunemployed	−1.116***
	(0.077)
lenderB × fico_score	0.008***
	(0.001)
lenderC × fico_score	−0.002***
	(0.000)
lenderB × monthly_gross_inc	0.000
	(0.000)
lenderC × monthly_gross_inc	0.000***
	(0.000)
fico_score × loan_amount	0.000*
	(0.000)
Num.Obs.	70000
AIC	40235.0
BIC	40363.1
Log.Lik.	−20103.476
RMSE	0.29

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Loan Approved	Number of Applications	Predicted Correctly
Approved	512	50%
Not Approved	29,488	90%

Probability of Approval by FICO Score Group

Probability of Approval by FICO Score Group
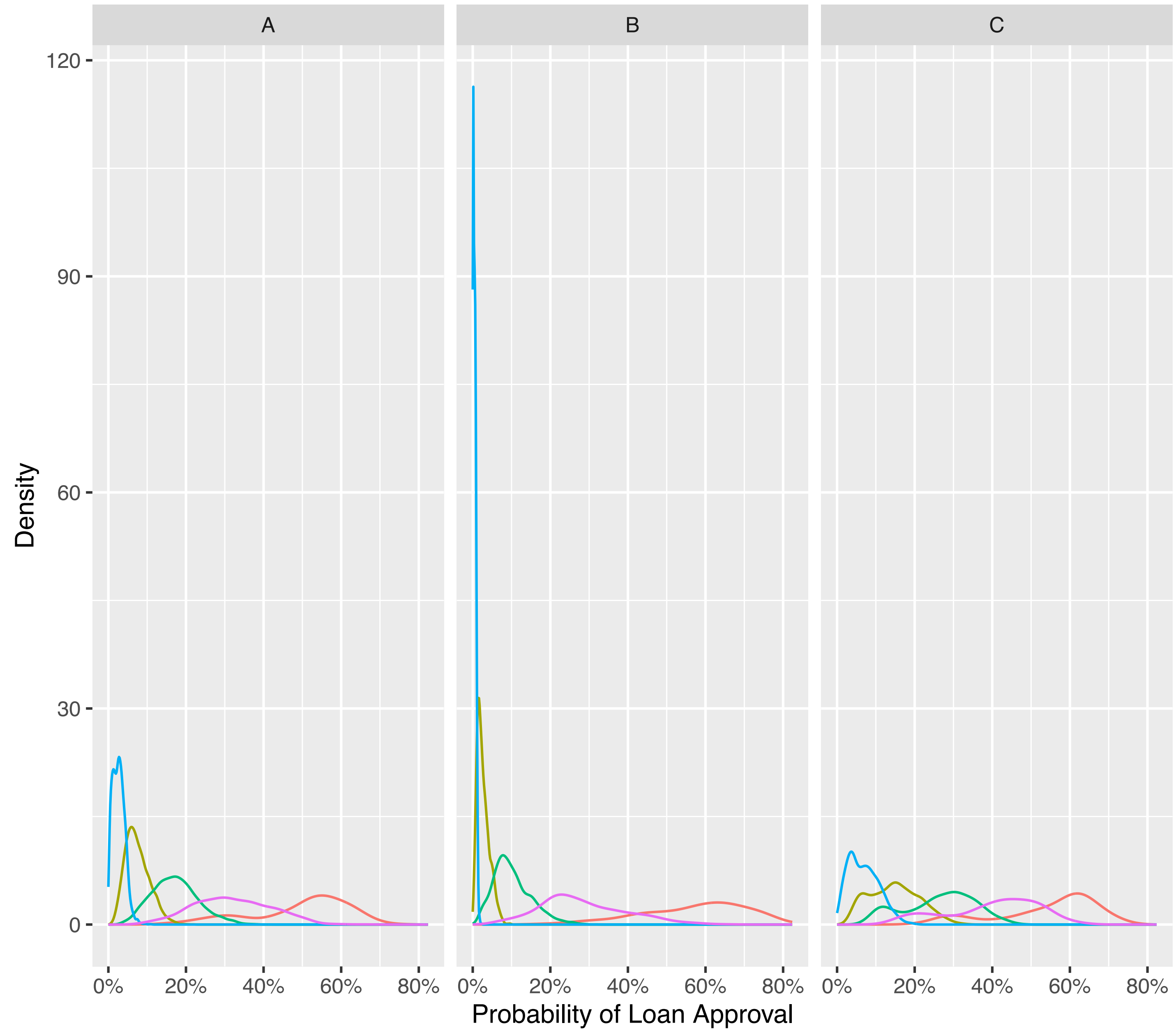
Approval Probability by Loan Amount