Analytics Assignment

Ranaji Krishna

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Problem Statement

- Separate *days_delinquent_old* and *days_delinquent_new* into the following groups: $(0, 1-5, 5-10, 10-30, 30-60, 60+)$. Create a transition matrix showing the probability of movement from one group to another. Create another transition matrix showing the probability of movement from one group to another, weighted by outstanding principal balance.

Results

- Transition Probability Matrix:

Transition Probability Matrix						
	A	**B**	**C**	**D**	**E**	**F**
A	-	-	-	-	-	-
B	0.21	0.42	0.12	0.25	0.00	0.00
C	0.06	0.03	0.38	0.53	0.00	0.00
D	0.08	0.00	0.02	0.38	0.53	0.00
E	0.06	0.00	0.00	0.00	0.47	0.48
F	0.17	0.00	0.00	0.00	0.00	0.83

- Weighted Transition Probability Matrix:

Weighted Transition Probability Matrix						
	A	**B**	**C**	**D**	**E**	**F**
A	-	-	-	-	-	-
B	0.14	0.57	0.05	0.25	0.00	0.00
C	0.00	0.00	0.35	0.64	0.00	0.00
D	0.00	0.00	0.00	0.36	0.64	0.00
E	0.00	0.00	0.00	0.00	0.49	0.51
F	0.02	0.00	0.00	0.00	0.00	0.98

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Problem Statement

- Tell me something interesting about a variable, model, or approach that allows you to distinguish loans whose delinquency is likely to worsen from those whose delinquency is likely to improve.

Results

- We use the Logistic Regression model to determine the probability of improvement of a loan delinquency.
- Loans with improved delinquency are identified by 1 and those with worse delinquency are identified by 0.
- Loans with no change in delinquency are removed from the data set.
- The variable *sales_bin* quantifies the variable *sales_channel__c*, where:
  - 1: "FAP: Managed Application Program";
  - 2: "Referral";
  - 3: "Direct";
  - delinquency of loans under "Promonotory" did not change.

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Results

contd.

- Summary of Logistic Regression:

Logit Regression Results

Dep. Variable:	bin_dep	No. Observations:	378
Model:	Logit	Df Residuals:	374
Method:	MLE	Df Model:	3
Date:	Sun, 08 Nov 2015	Pseudo R-squ.:	0.1947
Time:	14:15:56	Log-Likelihood:	-138.44
converged:	True	LL-Null:	-171.91
		LLR p-value:	1.924e-14

	coef	std err	z	P>|z|	[95.0% Conf.	Int.]
new_outstanding_principal_balance	-0.0001	1.9e-05	-6.109	0.000	-0.000	-7.87e-05
initial_loan_amount	9.259e-05	1.59e-05	5.821	0.000	6.14e-05	0.000
term	-0.2495	0.063	-3.953	0.000	-0.373	-0.126
sales_bin	-0.3466	0.197	-1.757	0.079	-0.733	0.040

- Significant coefficients as odds ratio:

new_outstanding_principal_balance	0.999884
initial_loan_amount	1.000093
term	0.779218
sales_bin	0.707111

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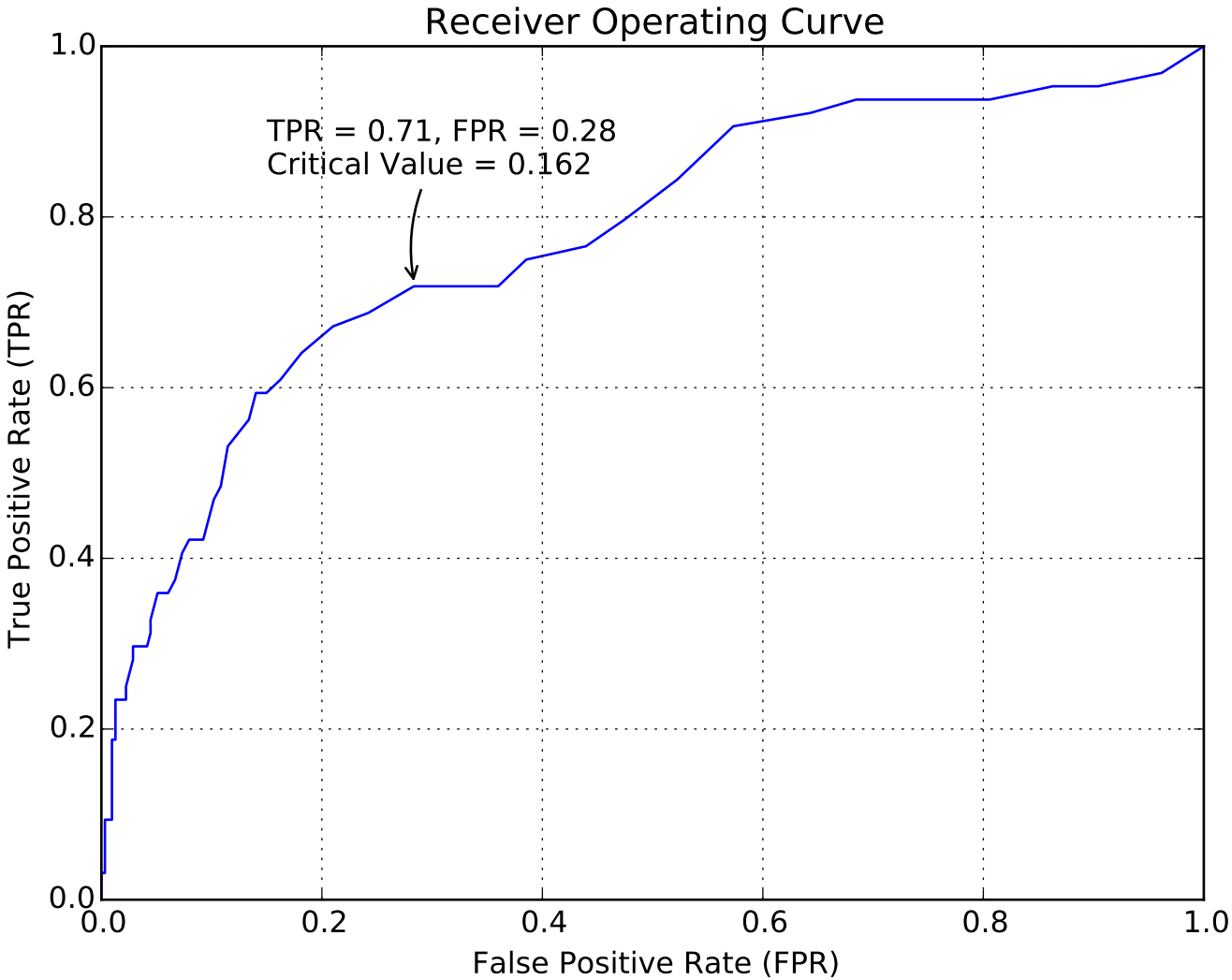
Results

contd.

- Perfromance of the estimator



Insights

- The delinquency of a loan for which the model generates a probability of improvement of greater than 0.16 (the critical-value) has a 71% chance of improvement. However, there is a 28% chance of the delinquency worsening.

- The *Term* and the *Sales_Channel* of a loan have a major influence on the odds of improvement:
  - an increase in *Term* of 1 month reduces the odds of improvement by 22%;
  - the odds of improvement decreases by 29% if the *Sales_Channel* is a "Referral" compared to an "FAP: Managed Application Program". The odds decrease by 29% if the *Sales_Channel* is "Direct" compared to if it is a "Referral".

END

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