Risk Scorecard for 'Current Personas'

Model Monitoring & Validation Report

March 2020

Model Overview

Model Objective	Risk Scorecard for portfolio of individuals (personas) Eligibility criteria - 0 days past due on all credit cards, loans & mortgage accounts in the month of scoring

Data Overview		Development Cohort	Validation Cohort
	Performance window	Apr'13 to Sep'13	Jul'19 to Dec'19
	# Total Customers	470,329	696,963
	# Bad(1)	4,648	33,098
	# Good(0)	465,681	663,865
	Event Rate / Bad Rate	1.0%	4.7%
	Mean Score(Good)	736	740
	Mean Score(Bad)	646	675

Model Performance Summary

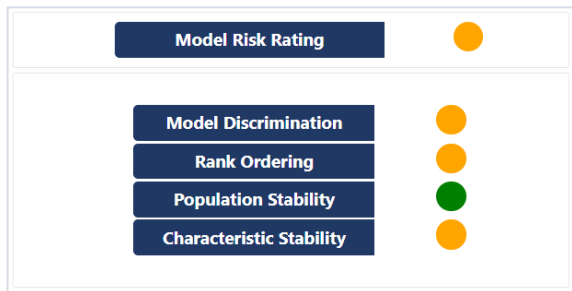1. **Model's discriminatory power has decreased**

   This is evident from decrease in KS, AUC and Gini values by 24%, 10% and 26% respectively
   This means model has lesser ability than before to differentiate between goods and bads

2. **Default rate for the personas has increased significantly**

   Default rate has increased from 1% to 4.7%, potentially due to change in origination risk rules or due to changing macroeconomic environment over the 6 year period. Though the overall PSI index is within the benchmark, there is a higher then expected proportion of population in top 2 risk deciles

3. **Rank ordering is maintained, with high variation in default rate for same risk score buckets**

   While there are no rank order breaks observed, there is high variation in default rate% for same risk score buckets for actual(validation) vs expected (development) data

Model Risk Rating	🟠
Model Discrimination	🟠
Rank Ordering	🟠
Population Stability	🟢
Characteristic Stability	🟠

Recommendation based on model monitoring

Give the high annual default rate of ~9.4% & decreasing discriminatory power of the model, opportunity to re-develop the scorecard to improve the discrimination performance. Materiality impact to be reviewed to identify potential incremental impact of scorecard re-development

Model Discrimination Results

Model's discriminatory power has decreased
*This is evident from decrease in KS, AUC and Gini values by 24%, 10% and 26% respectively*
This means model has lesser ability than before to differentiate between goods and bads

Metric	Development	Validation	% Change	Risk
+ KS Statistic	50%	38%	-24%	🔴
+ AUC	82%	74%	-10%	🟢
+ Gini Score	65%	48%	-26%	🔴
- Divergence	1.72	0.96	-44%	🔴

Rank Ordering – Actual vs Expected

Rank ordering is maintained, with high variation in default rate for same risk score values

While there are no rank order breaks observed, there is high variation in default rate% for same risk score buckets for actual(validation) vs expected (development) data
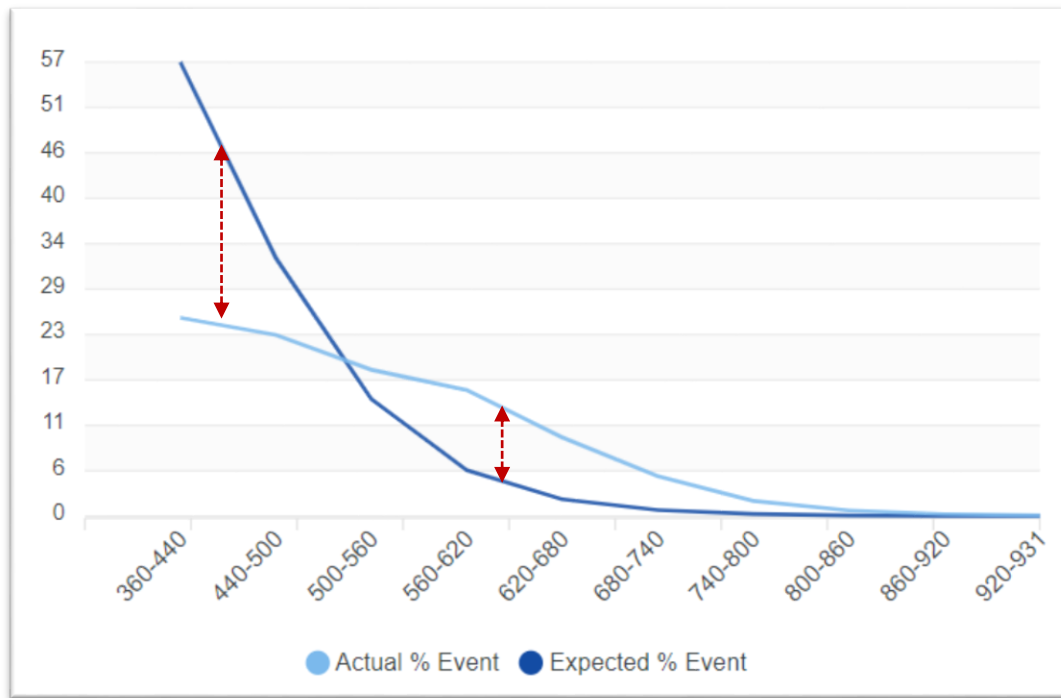
Score Decile	Actual % Bad	Expected % Bad
360-440	25	57
440-500	22	32
500-560	18	14
560-620	15	5
620-680	9	2
680-740	5	0
740-800	1	0
800-860	0	0
860-920	0	0
920-931	0	0

* Expected – Development Window ; Actual – Validation Window

Population Stability

Higher then expected proportion of population in top 2 risk deciles

While the overall population stability index of 0.034 indicates no significant shift, there is higher proportion of population in top 2 risk decile for the recent customers cohort (23% actual vs 18% expected)

Score_Decile	Expected %	Actual %	Actual-Expected	ln(Actual/Expected)	Contribution To PSI
[-,647)	9	10	0.82	0.08	0.001
[647,682)	9	13	3.6	0.31	0.011
[682,704)	9	8	-1.27	-0.14	0.002
[704,720)	9	8	-0.65	-0.07	0
[720,734)	10	7	-2.52	-0.28	0.007
[734,748)	11	8	-2.16	-0.22	0.005
[748,766)	9	8	-0.79	-0.08	0.001
[766,789)	9	9	-0.31	-0.03	0
[789,825)	10	10	0.51	0.05	0
[825,+]	10	12	2.78	0.24	0.007

🟢 **PSI = 0.034**

* Expected – Development Window ; Actual – Validation Window

Characteristics Stability

Drift in distribution of three model variables
CSI Index is high (>0.1) for three model variables, overall low impact of this expected due to PSI within benchmark range
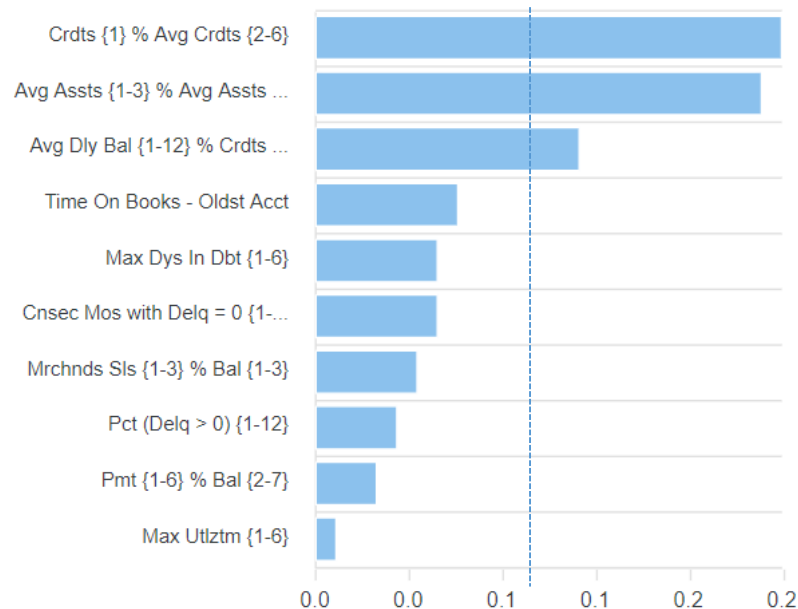
Variable	CSI Score	Status
Crdts {1} % Avg Crdts {2-6}	0.23	🟠
Avg Assts {1-3} % Avg Assts {4-12}	0.22	🟠
Avg Dly Bal {1-12} % Crdts {1-12}	0.13	🟠
Time On Books - Oldst Acct	0.07	🟢
Max Dys In Dbt {1-6}	0.06	🟢
Cnsec Mos with Delq = 0 {1-12} - Lagged	0.06	🟢
Mrchnds Sls {1-3} % Bal {1-3}	0.05	🟢
Pct (Delq > 0) {1-12}	0.04	🟢
Pmt {1-6} % Bal {2-7}	0.03	🟢
Max Utlztm {1-6}	0.01	🟢

Model Classification Summary

Confusion Matrix

		Predicted	
		0	1
Actual	0	596,705 (85%)	67,160 (9%)
	1	22,074 (3%)	11,024 (1%)

Event Classification Summary

Precision	Recall
14%	33%

F1 Score	False Positive Rate
0.2	10%

Metric	Development	Validation	% Change	Risk
Accuracy	-	87%	-	🟢
Precision	-	93%	-	🟢
Recall	-	87%	-	🟢
F1 Score	-	0.9	-	🟢

* Customer level data not available for Development Cohort to calculate values for Accuracy, Precision, Recall & F1 Score
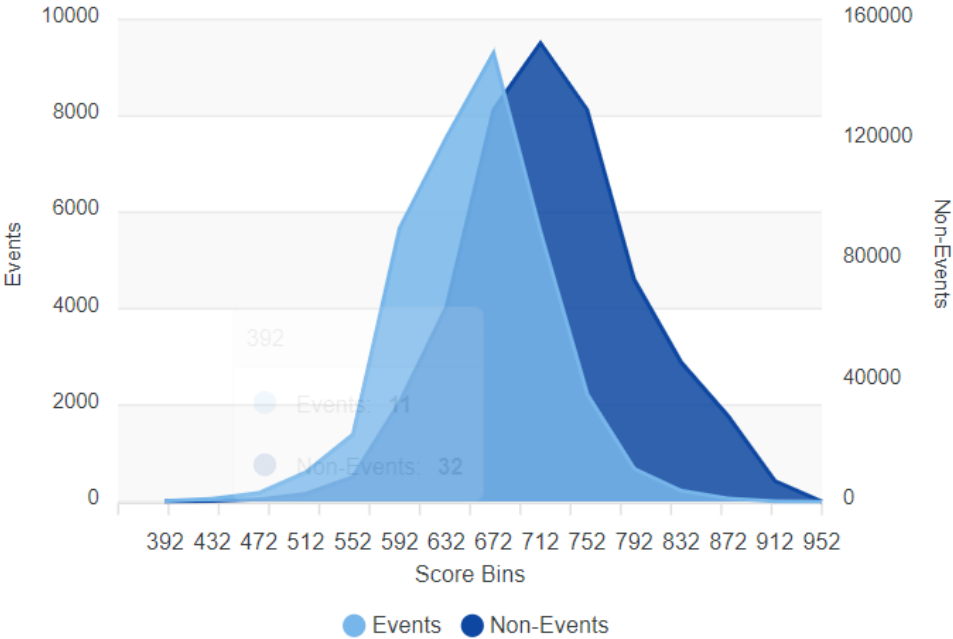
Appendix I – KS Graph for Validation

KS Chart
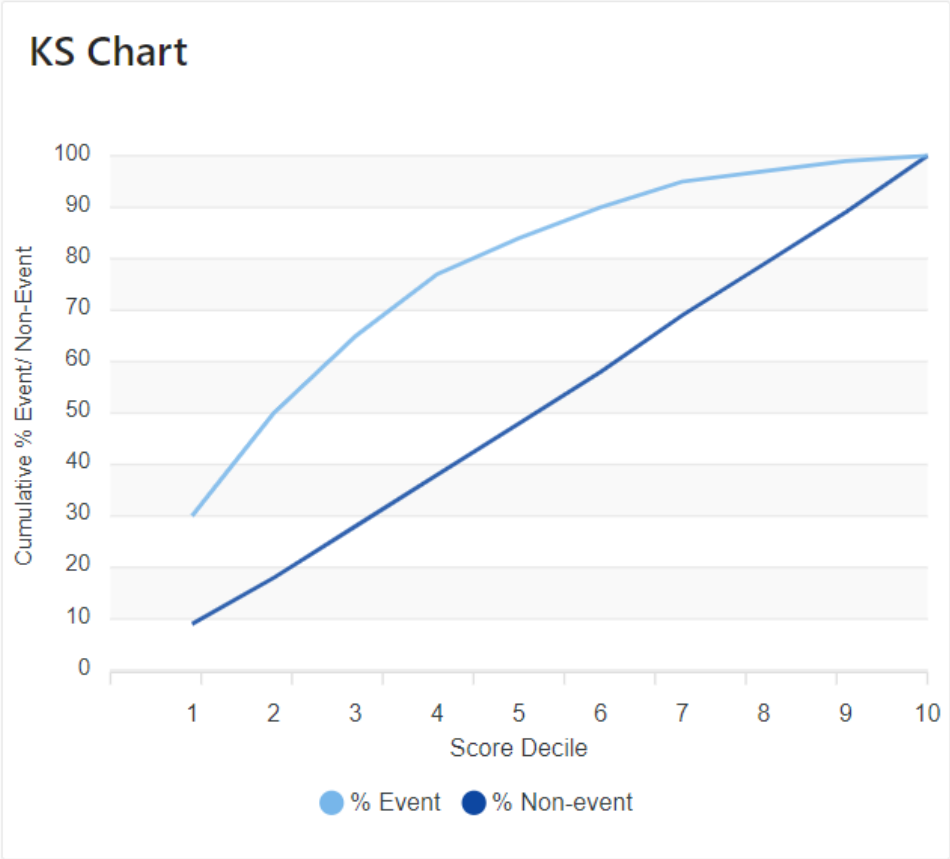
Score Decile	Cumulative Event %	Cumulative Non Event %	KS
392	30	9	21
645	50	18	31
675	65	28	36
698	77	38	38
719	84	48	36
735	90	58	32
754	95	69	25
775	97	79	18
799	99	89	9
840	100	100	0

Appendix II – ROC Curve for Validation

ROC Curve

Score Decile	FalsePositiveRate	TruePositiveRate
(391 644.0]	0.09	0.31
(644.0, 674.0]	0.18	0.5
(674.0, 697.0]	0.28	0.65
(697.0, 718.0]	0.38	0.77
(718.0, 734.0]	0.47	0.84
(734.0, 753.0]	0.58	0.91
(753.0,		

Appendix III – Divergence for Validation

Divergence Chart

Divergence Summary

Event Distribution Mean
675

Non-Event Distribution Mean
740

Event Distribution Variance
3666

Non-Event Distribution Variance
5434