Lending Club Case Study

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Executive Summary

Business Objective:

- Understand factors impacting the likelihood of loan defaults

Context:

- Over the full time period covered by available data, avg Loan Default Rate (Charge-Off Rate) was ~**14%**[1]

- This figure, however, was composed of pockets of borrowers who defaulted far more than 14% of the time, and others who defaulted far less

- This analysis identifies factors impacting the likelihood of loan defaults and provides recommendations which will help reduce defaults

Selected Key Findings:

Sl #	Factor Impacting Default	Action to be taken	Charge-Off Rate Reduction[2]
1	% Revolve Credit Utilised	Add/change max tolerable utilisation	3.5 ppts
2	Borrower's Annual Income	Add/change requirement for minimum income	3 ppts
3	Number of Derogatory Public Records	Applications with 1+ Derog Pub Record rejected	1.5 pts
4	Borrower's Purpose	Decline loans drawn for Small Business purpose	1.5 pts
Total Opportunity			3.5 ppts[2]

[1] Charge-Off Rate defined as proportion of total loans issued which were charged-off; loans whose repayments were in progress (i.e. loans with 'current' status) are included as 'good' loans (i.e. those that were *not* charged-off)

[2] Impact figures based on univariate/bivariate analysis; calculations assume that all other factors remain the same, and only the said factors change; this is also the reason why total impact of recommended actions will not be the sum of predicted reductions from each actions

Selected Key Findings

How to read findings shown in subsequent slides

- Metric to be minimised – **Overall Charge-Off Rate**

Charge-Off Rates	Loan Proportion	Contribution to Overall Charge-Off Rate (CoR)
• On the LHS of the chart shown are two sub-plots showing **Charge-Off Rate** by segment • This helps identify segments with high, low and average Charge-Off rates • The measurement unit for this metric is **%**	• In the center of the chart shown are two sub-plots showing **Loan Proportion** by segment • This shows the percentage of total loans in a given segment • This helps visualise the size of impact any given segment has on overall charge-off rates • The measurement unit for this metric is **%**	• On the RHS of the chart shown are two sub-plots showing **Contribution to Charge-Off Rate (CoR)** by segment • Further to the loan proportion metric helping visualise impact of segment, contribution **quantifies** the impact • The measurement unit for this metric is **% pts** • Formula: % of Charged-Off Loans in Segment in the Total Portfolio of loans

# Impact of Applicant's Revolve Utilisation on Charge Off Rate
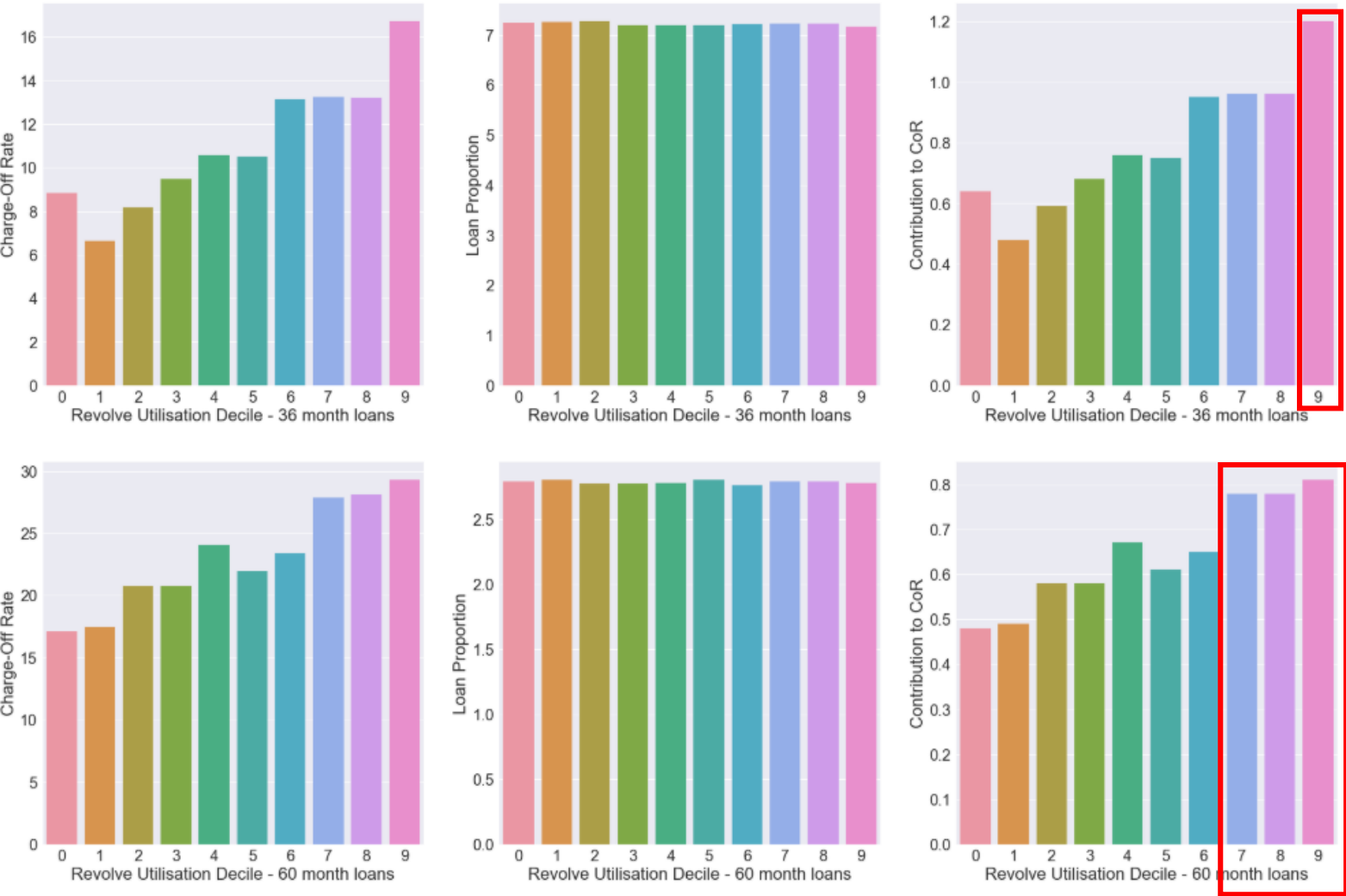
Insights:

1. Revolve Utilisation deciles rank-order charge off rates in both 36 month and 60 month loans
2. Deciles 9 in 36 mo loans and Deciles 7, 8 and 9 form a small proportion of total loans but have a disproportionately large impact on Overall Charge-Off Rates

Recommendation:

1. Change approval policy by setting maximum Revolve Utilisation requirements - 76.3% for 36 mo loans and 62.1% for 60 mo loans

- Enforce a maximum tolerable limit for applicant's Revolve Utilisation% per below recommendation; this is expected to reduce Overall Charge-off Rate by ~3.5 ppts, from ~14% to 10.5%

- The said maximum utilisation limits are upper limit of the lower limit of the top utilisation decile within 36 month loans, and 3rd top decile within 60 month loan

- These limits work out to 76.3% for 36 month loans and 62.1% for 60 month loans

- **Note**: Enforcing the recommendation will result in the reduction of total loans disbursed by ~ 16%; but in the absence of further data, this is good for the business objective

Impact of Applicant Income on Charge Off Rate
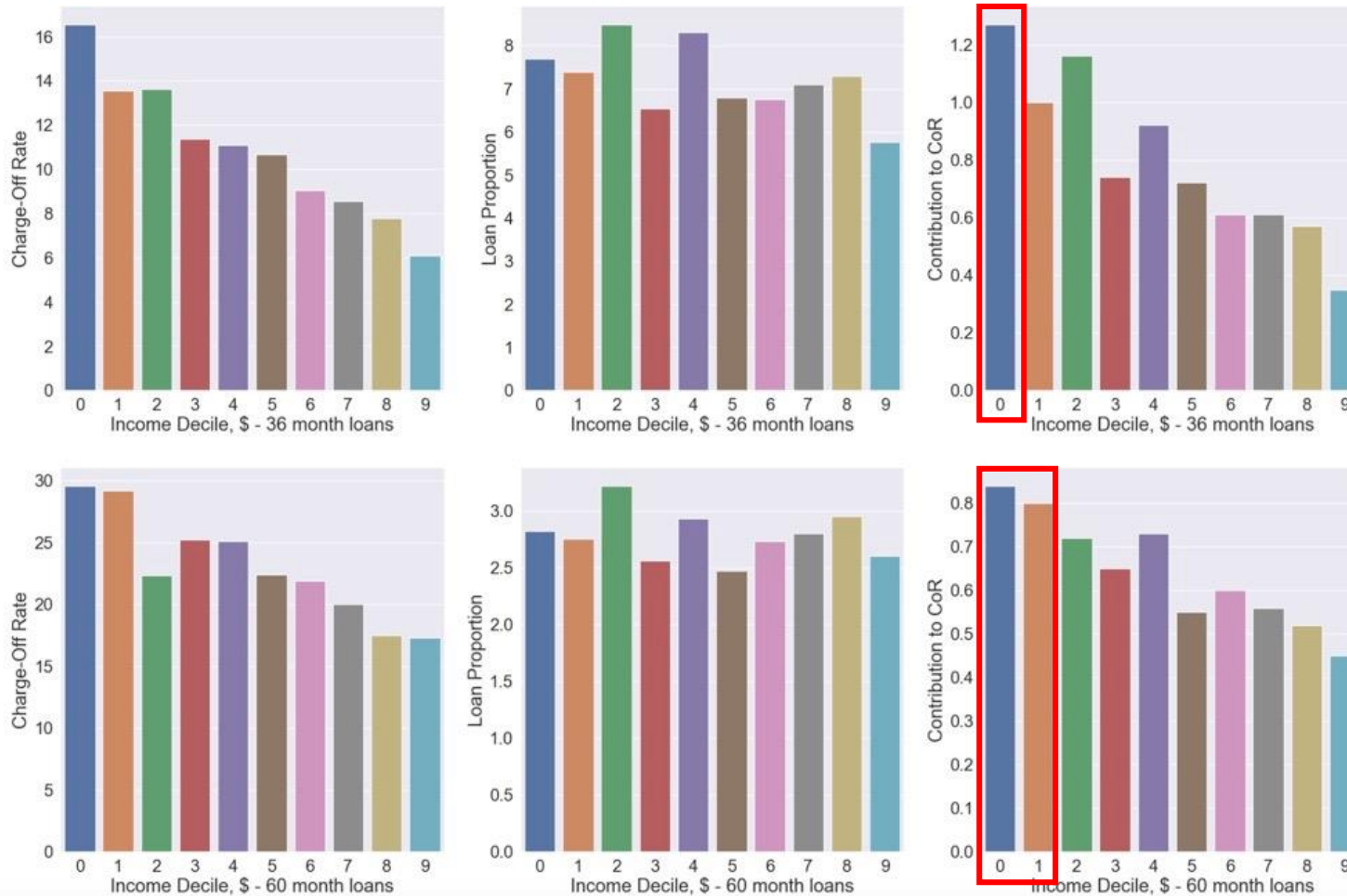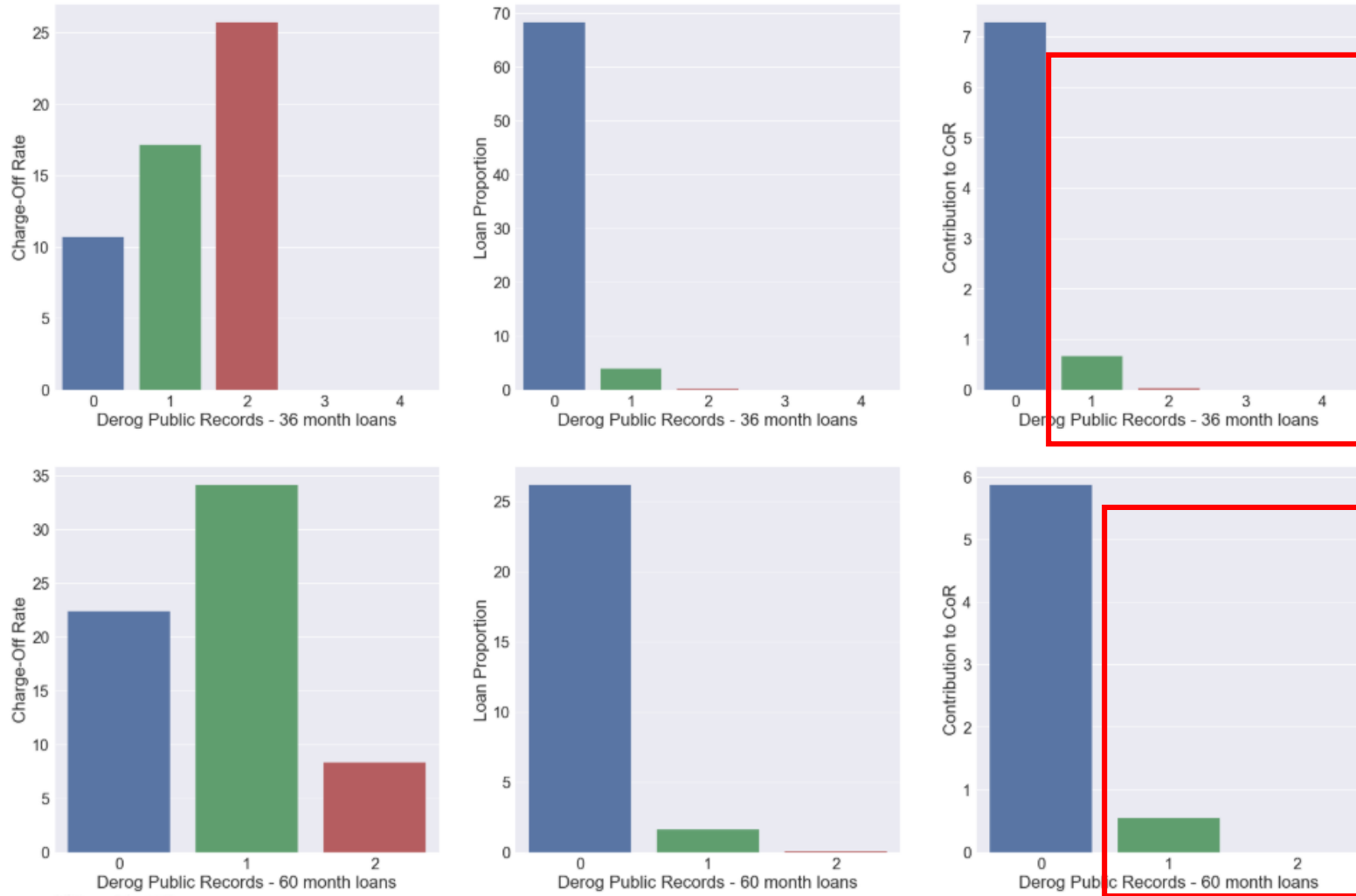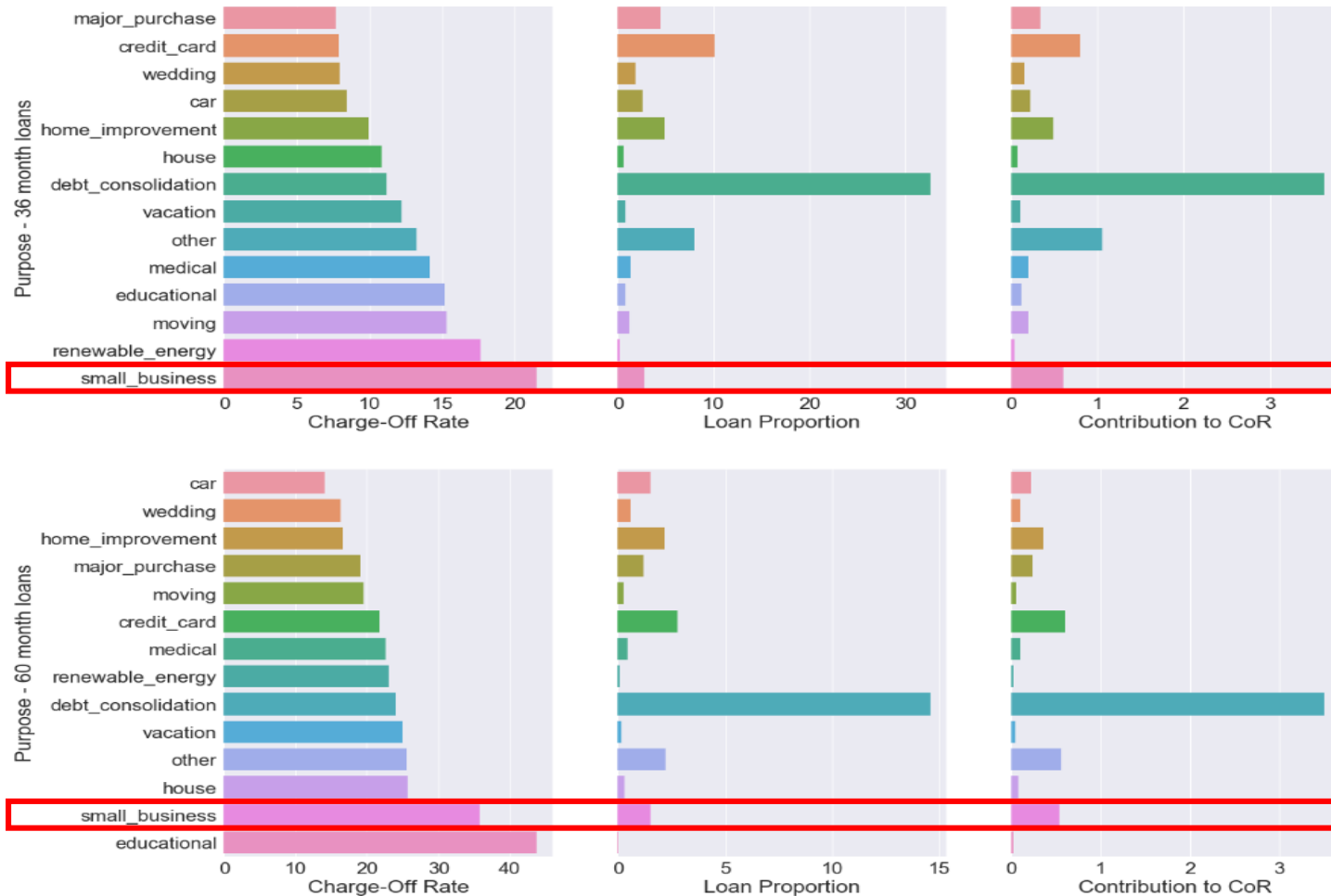

Insights:

1. Income deciles rank-order charge off rates in both 36 month and 60 month loans

Recommendation:

1. Change approval policy by setting minimum annual income requirements - USD 27,600 for 36 mo loans and USD 40,300 for 60 mo loans

- By enforcing the below mentioned minimum annual income requirement, Overall Charge-off Rate is expected to reduce by ~3 ppts, from ~14% to 11%

- The said minimum income limits are upper limit of the lowest 1st income decile within 36 month loans, and the lowest 2nd decile within 60 month loan

- These limits work out to USD 27,000 for 36 month loans and USD 40,300 for 60 month loans

- **Note**: Enforcing the recommendation will result in the reduction of total loans disbursed by ~ 12%; but in the absence of further data, this is good for the business objective

Impact of # Derogatory Public Records on Charge Off Rate

- By enforcing a rule to decline all applications where borrowers have 1+ derogatory public record, Overall Charge-off Rate is expected to reduce by ~1.5 ppts, from ~14% to 12.5%

- Only a small proportion of loans will be impacted by this rule

Insights:

1. Income deciles rank-order charge off rates in both 36 month and 60 month loans

Recommendation:

1. Change approval policy by setting minimum annual income requirements - USD 27,600 for 36 mo loans and USD 40,300 for 60 mo loans

Impact of Borrower's Purpose on Charge Off Rate

- By enforcing a rule to decline all applications made for Small Business purposes, Overall Charge-off Rate is expected to reduce by ~1.5 ppts, from ~14% to 12.5%

- Only a small proportion of loans will be impacted by this rule

Insights:

1. 'Small Business' is the one purpose which both has high charge-off rate and demand (as measured by proportion of loans); the result is high contribution to overall charge-off rate
2. Loans where applicants's purpose is 'Other' also has relatively high charge-off rates and demand
3. There are other purposes seeing high charge-off rate, but have relatively low demand, so not very important

Recommendation:

1. Reject loans for Small Business purposes
2. Implement stringent approval rules where applicant's purpose of application is 'Other'

Appendix

Key Steps in Analysis Flow

Data Cleansing

- Removal of unsuitable variables
- Treatment of String-type data to remove white spaces
- Missing Value Treatment
- Grouping of granular variable values

Univariate / Bivariate Analyses

- Understand variable distributions
- Detect and treat outliers
- Understand relationship between variable and target variable and/or other variables
- Create derivative variables if they may be useful for analysis

Business Impact Analysis and Presentation

- Working out actionable recommendations and related benefits
- Prioritising key findings and recommendations
- Laying out the presentation with relevant data, charts, definitions and assumptions

Bi-variate Analysis: Income Distribution by Loan Term
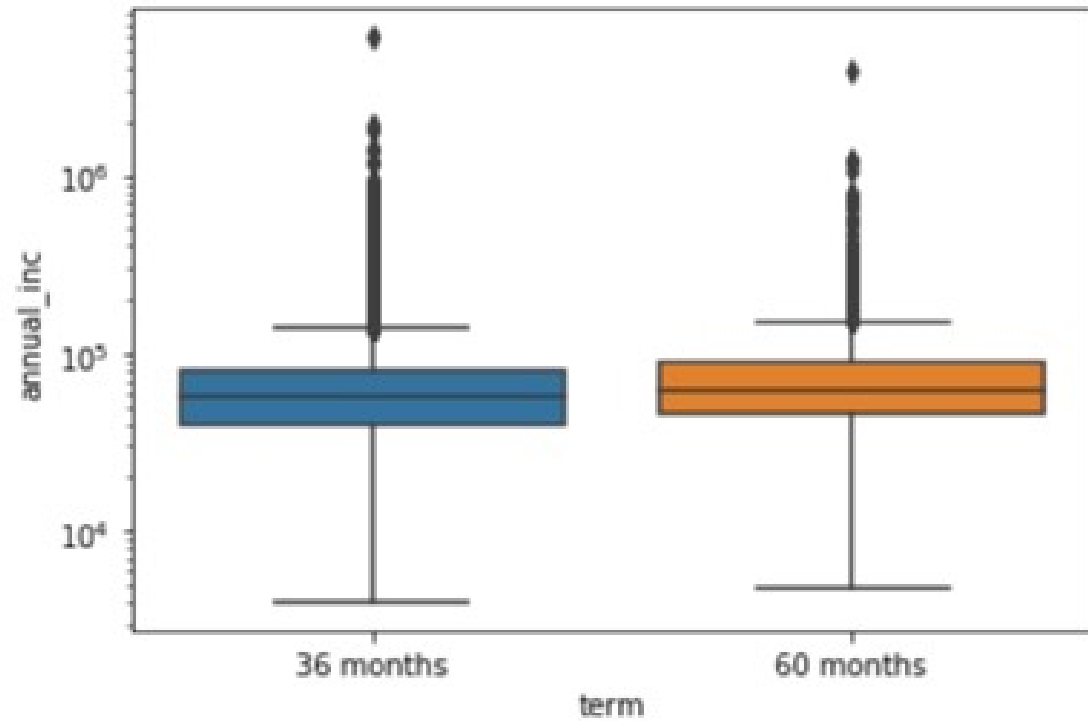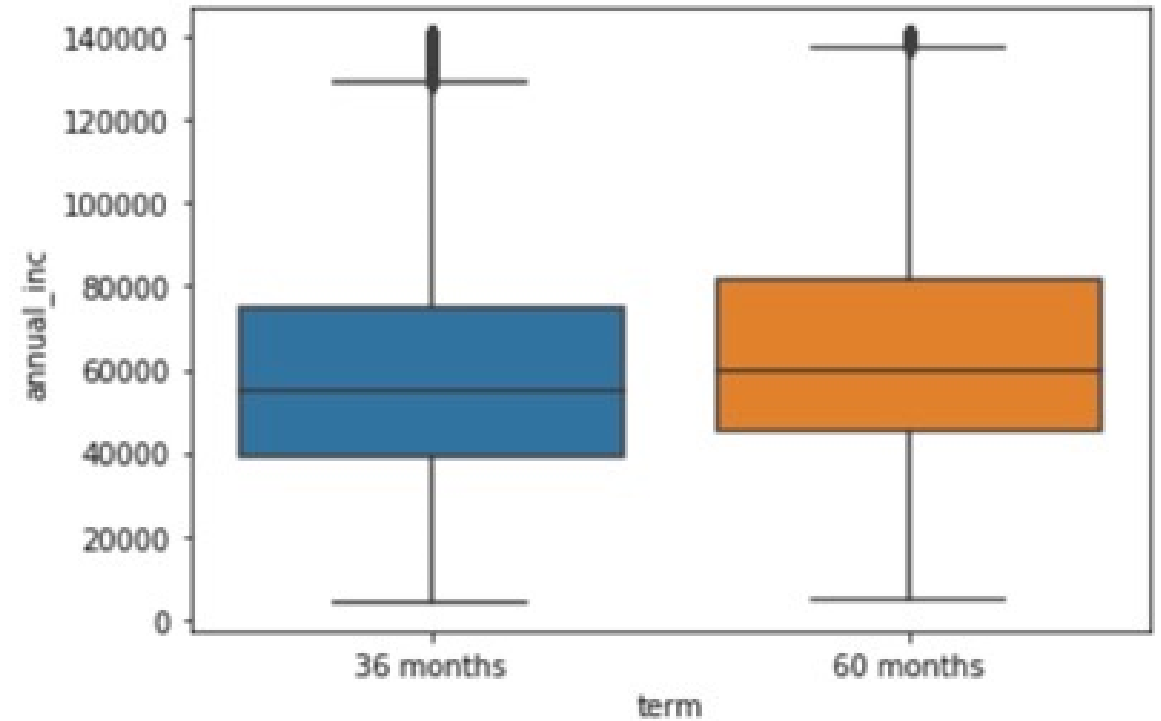
Bi-variate Analysis: Loan Amount Distribution by Term
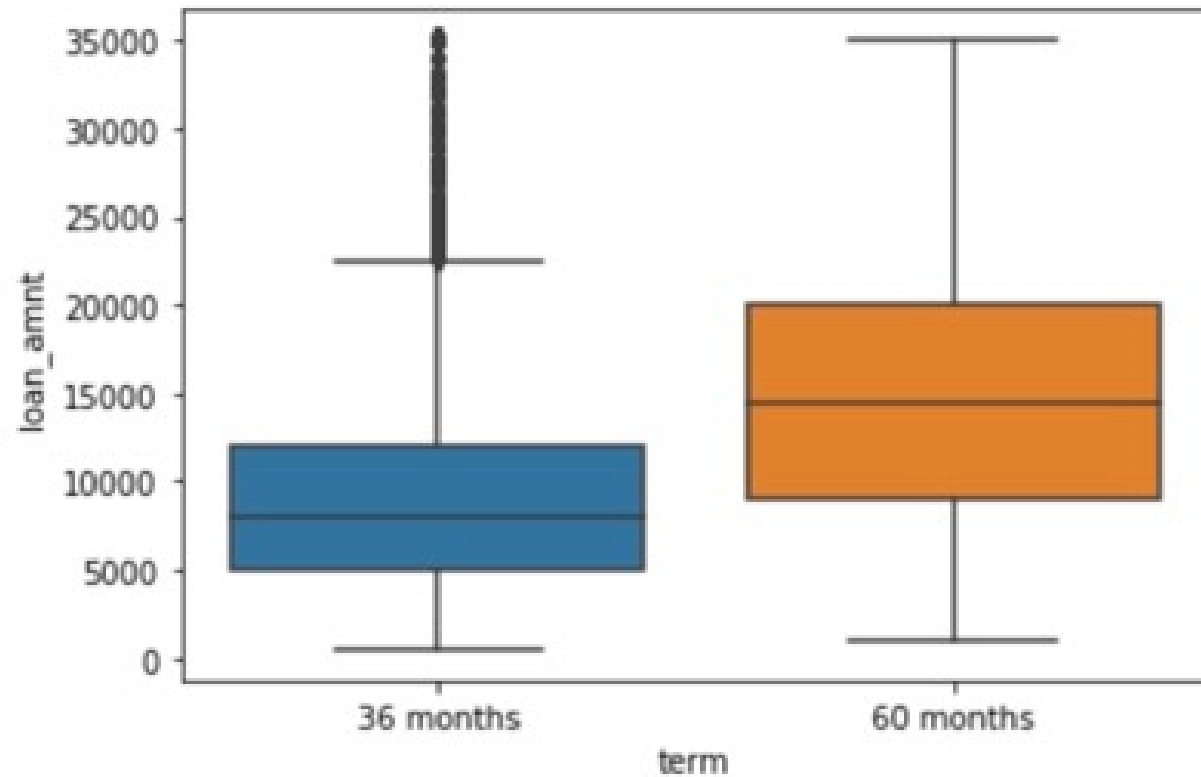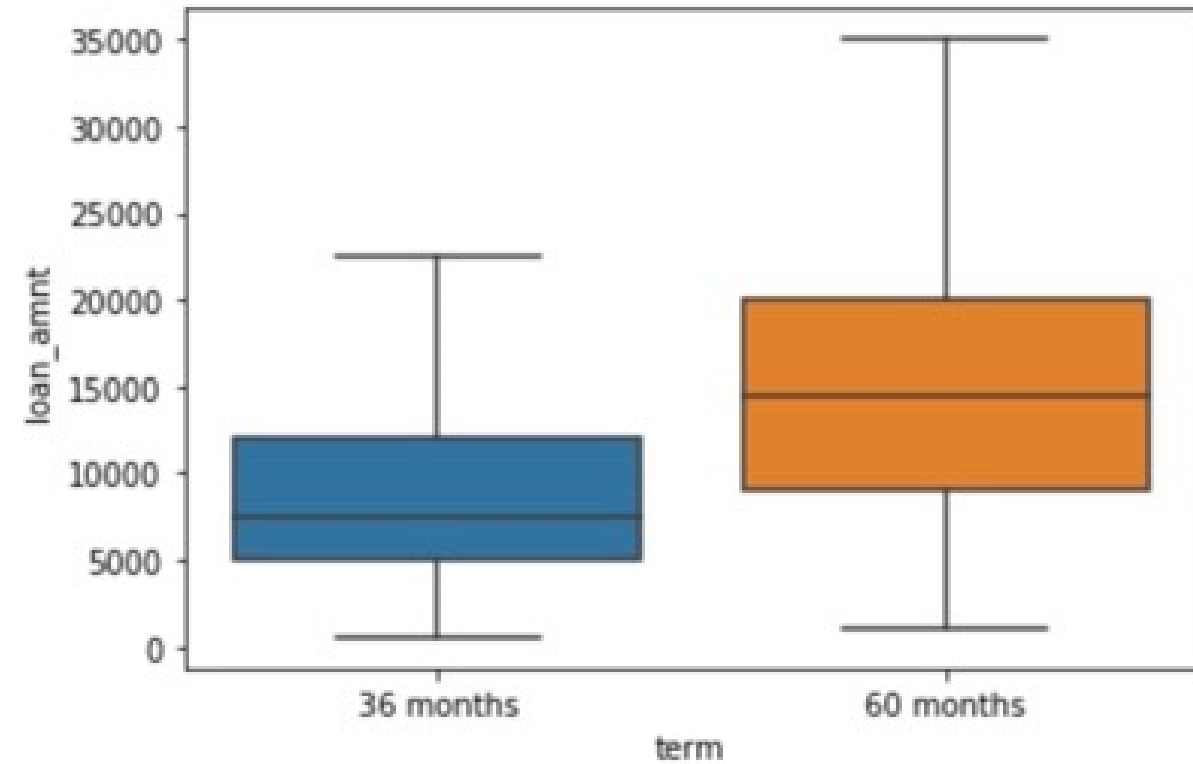
Charge-off Rate by Loan Term

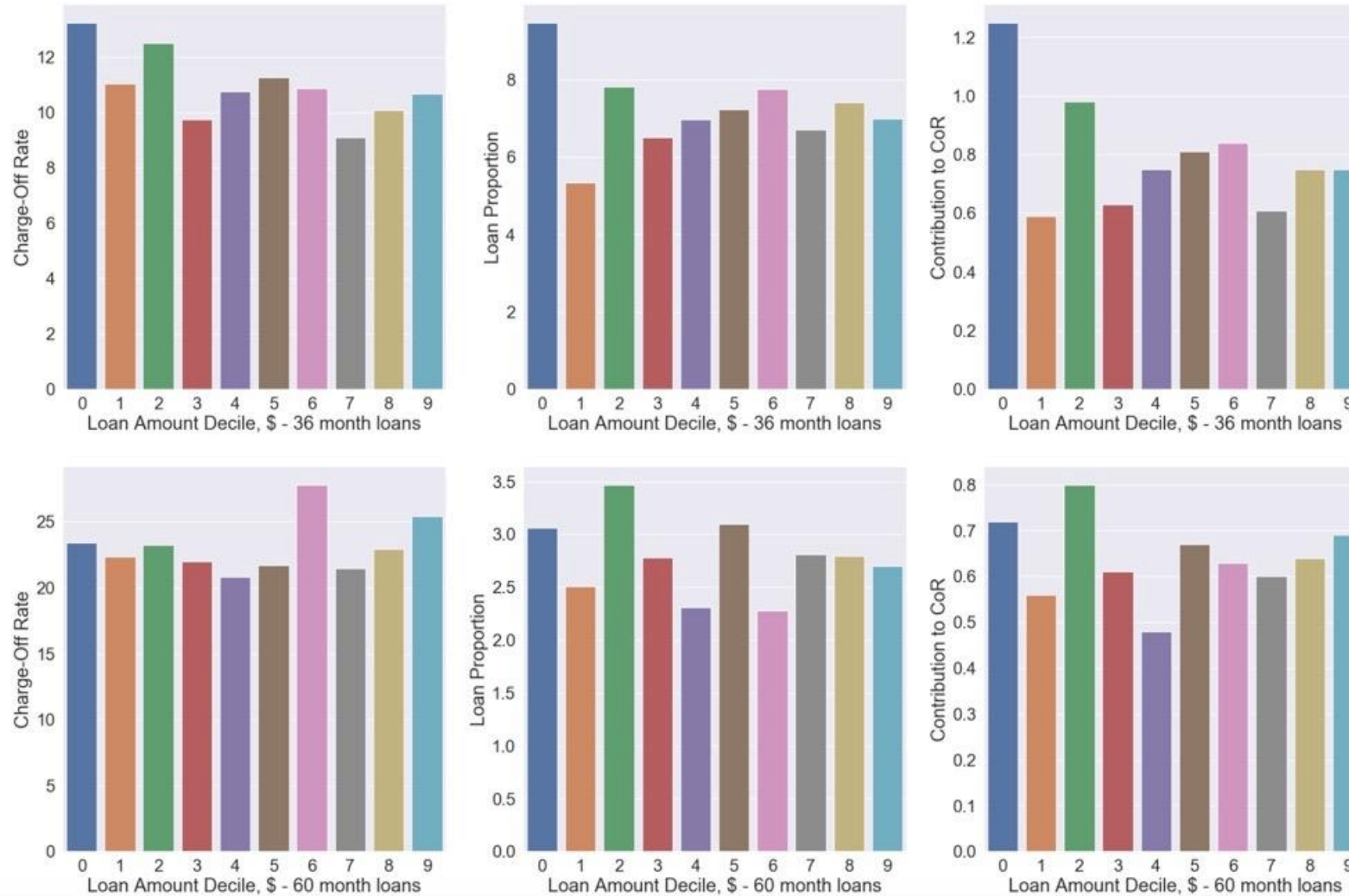|	Charge-Off Rate	Loan Proportion	Contribution to CoR
term			
36 months	11.04	72.17	7.97
60 months	23.06	27.83	6.42
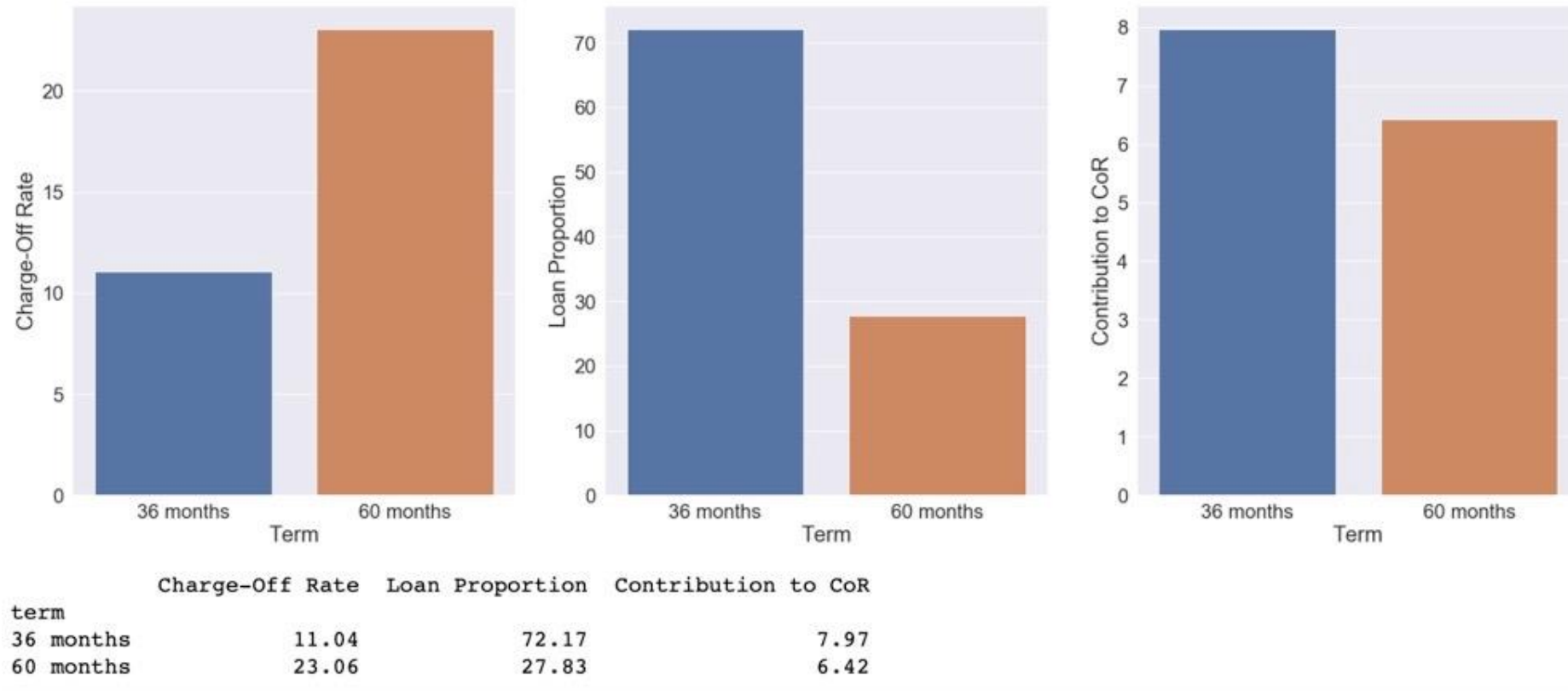
Insights:

1. 60 month loans riskier than 36 month loans

Recommendation:

1. Be more stringent with 60 month loan approvals, as 1 ppt decrease in proportion of 60 mo loans would reduce total charge-off rate by 14 bps

# Impact of Loan Amount on Charge Off Rates

Insights:

1. Loan Amount deciles not exactly rank-ordering charge off rates in either 36 month or 60 month loans

Recommendation:

1. It *may* be useful to slightly increase the minimum amount to loan for 36 months (all other approve/decline rules must be the same, otherwise increasing loan amount would increase risk). Suggested amount is USD 2,000; current minimum is USD 500

# Impact of Applicant DTI on Charge Off Rate
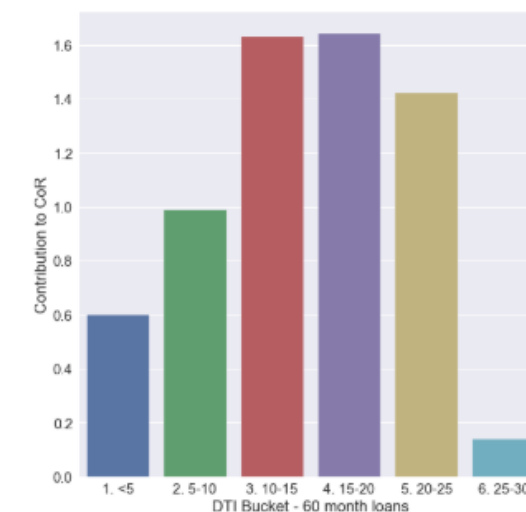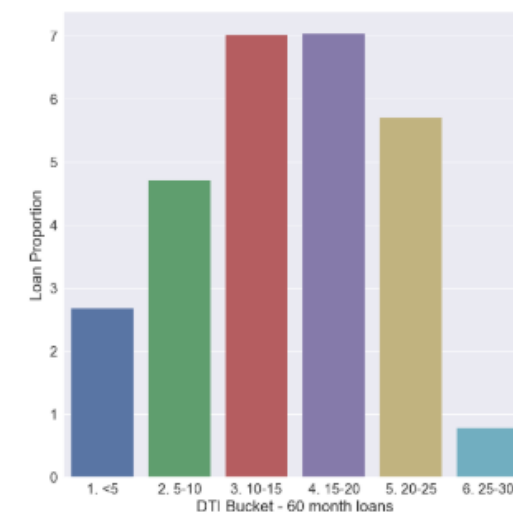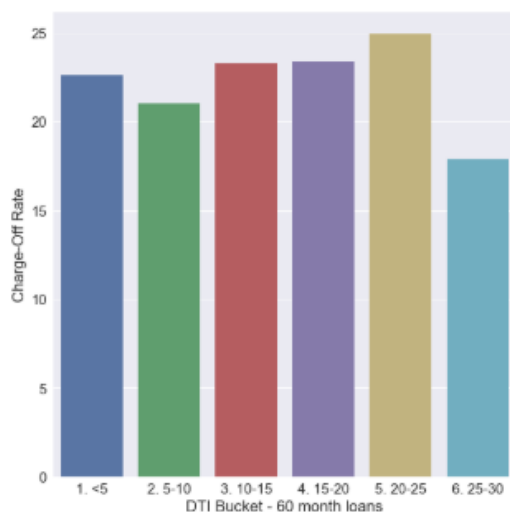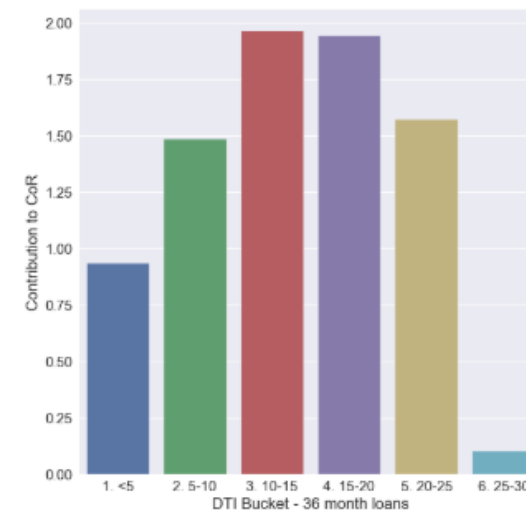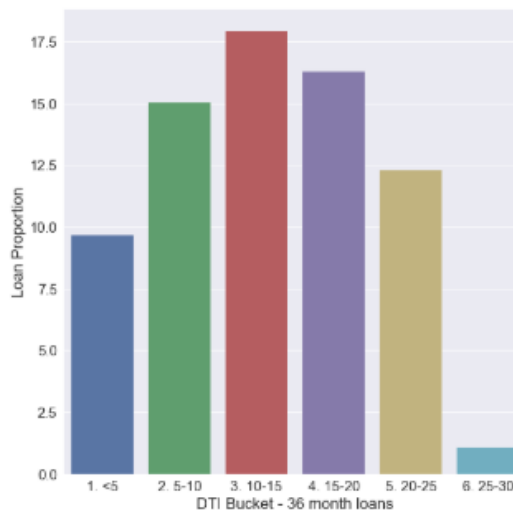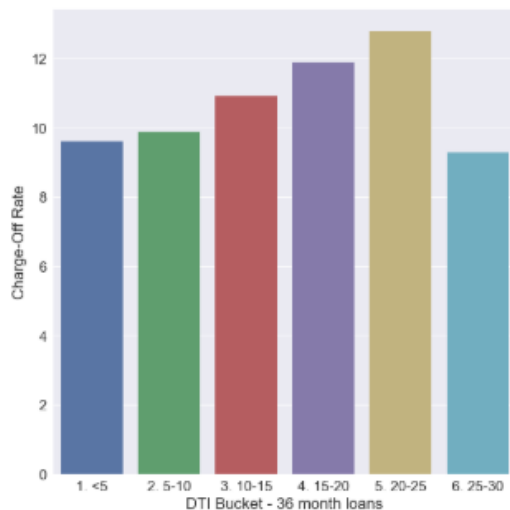
Insights:

1. DTI buckets (upto DTI = 25) rank-ordering charge off rates particularly in 36 month loans
2. Approvals for applicants with DTI between 25-30 already appear to be stringent; this is helping minimise Charge Off Rates

Recommendation:

1. Approval rules for 36 month loans where applicant DTIs are in buckets other than 25-30 should also be stringent

Impact of Employment Length on Charge of Rate
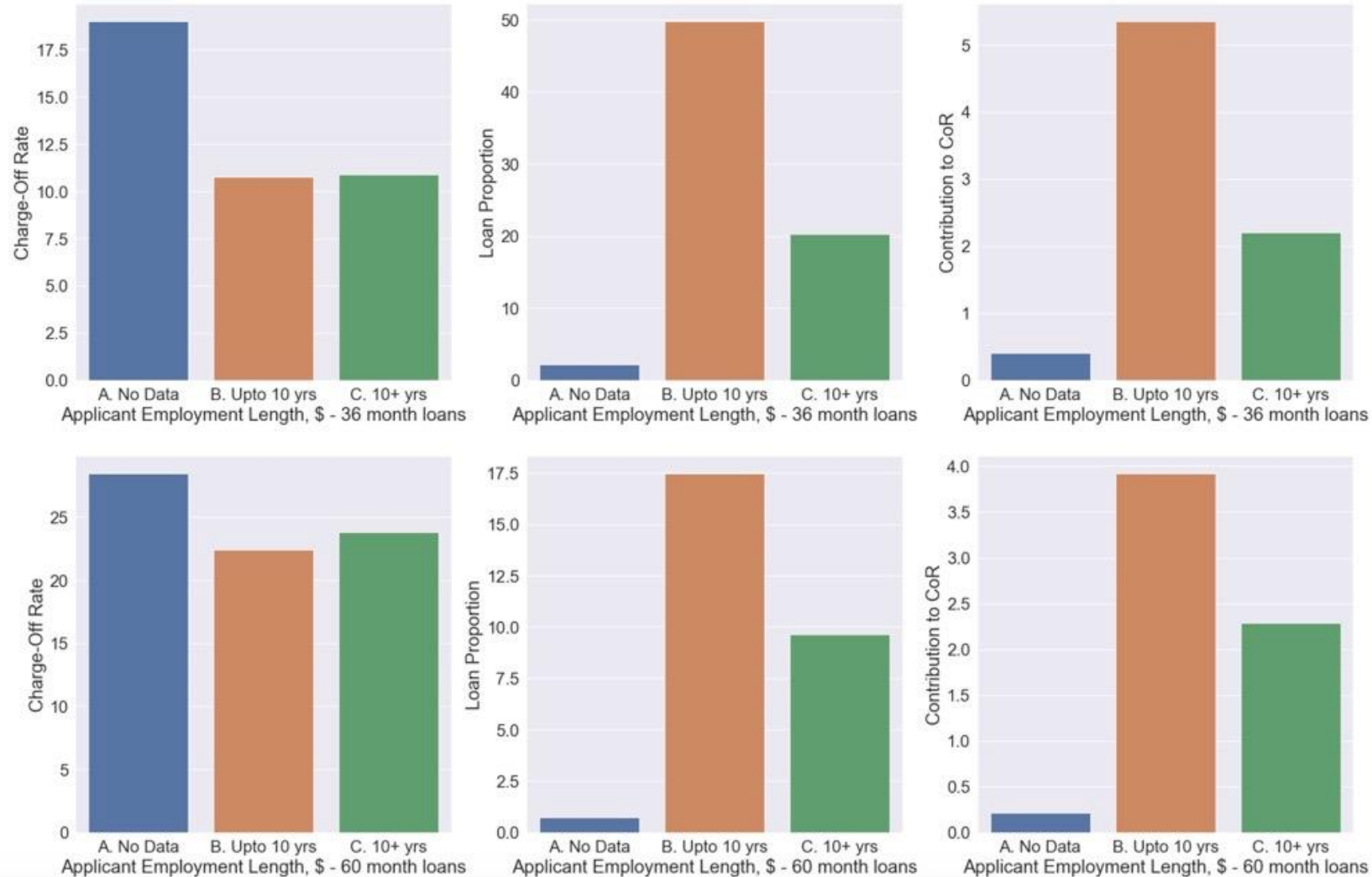
Insights:

1. Loans for which applicants had not provided Employment Length have much larger likelihood of charge-offs

Recommendation:

1. Make it impossible to apply for loan without providing Employment Length
2. If necessary, enable applicants to mark that they are self-employed, and validate this prior to loan disbursal
3. If, further, the applicant has been unemployed until the date of application, do not approve

# Impact of Home Ownership Status on Charge Off Rate
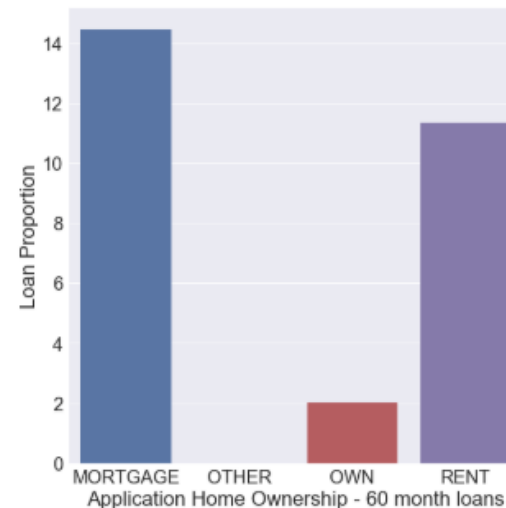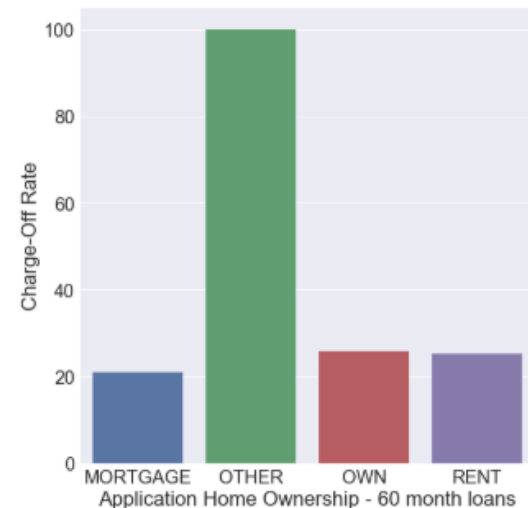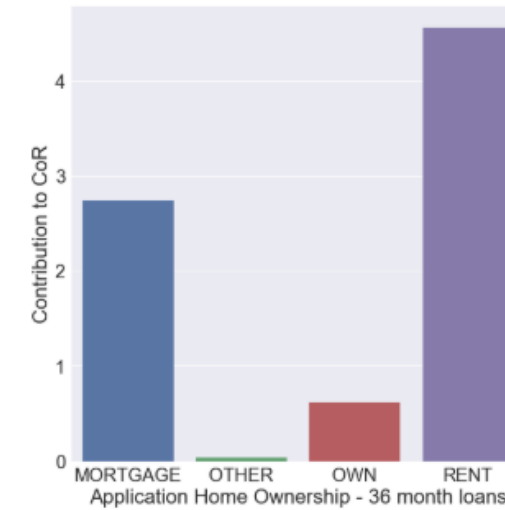
Insights:

1. Loans for which applicants' Home Ownership status is 'Other' have much larger likelihood of charge-offs
2. As of right now, there are only few such loans, which is helping minimise charge-off rate

Recommendation:

1. However, if possible, loans must not be disbursed to applicants whose Home Ownership status is 'Other'

Impact of Loan Grade on Charge Off Rate
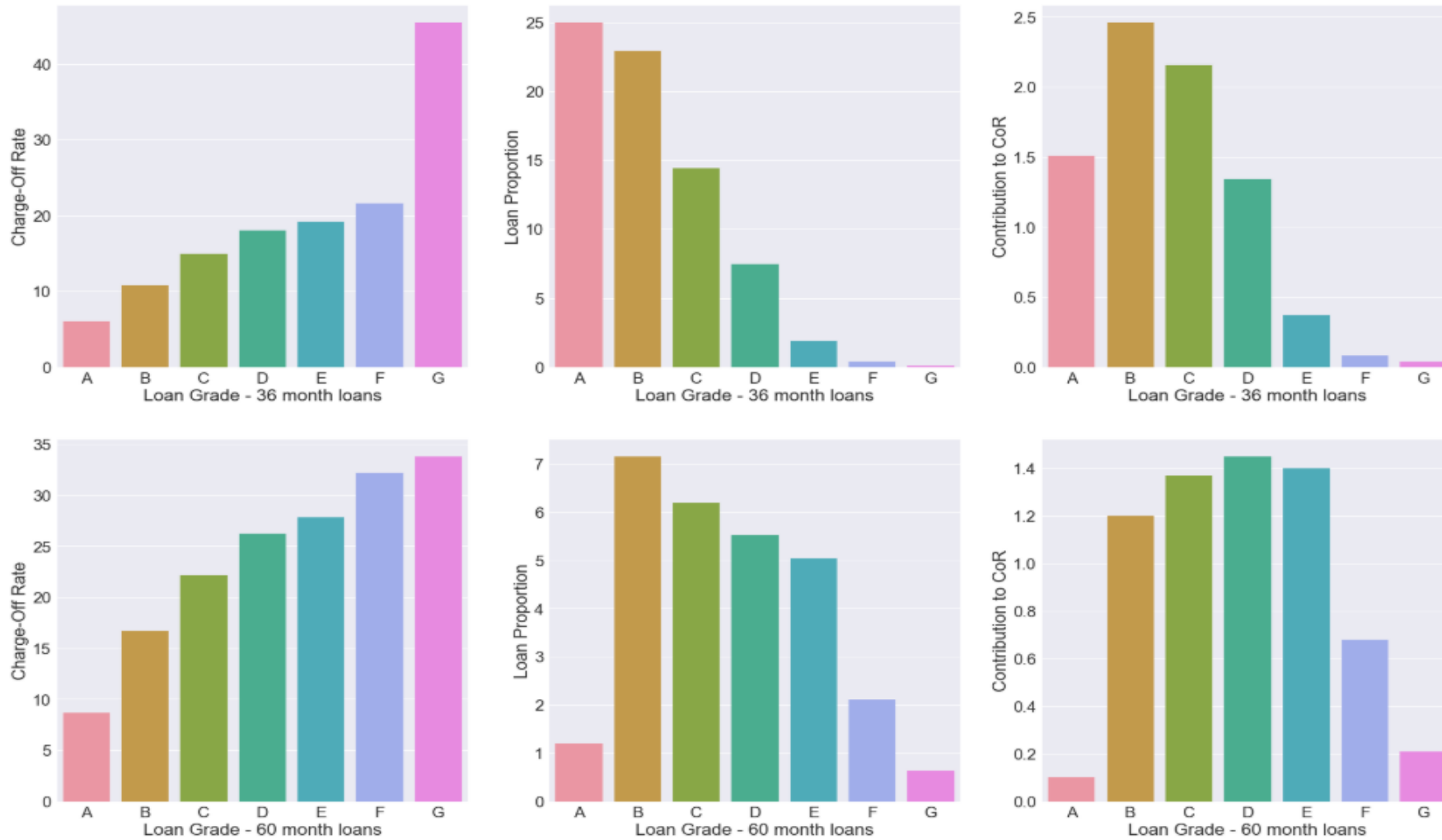
Insights:

1. As expected, Loan Grades are rank-ordering charge off rates in both 36 and 60 month loans
2. However, some of the low grade loans have a large contribution to Total Charge Off rate visavis size

Recommendation:

1. Considering that grade G has fewer proportion of loans anyway, consider not making G grade loans at all (OR) definitely increase interest rates significantly for these loans
2. Consider similar actions for 60 month grade F loans as well