



# Gramener Case Study

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# Abstract

## Business Problem

Analyse the data to find deriving factors to indentify whether loan applicant is likely to pay loan or not.

## Analysis Objective

Objective of Analysis is to correctly identify loan applicant whether it will become defaulter or will pay loan. Analysis is to make sure bank will not loose potential customer who can pay the loan and also bank will not lent loan to customer, who is not likely to pay off the loan.

Define the Problem

- Define Business Problems and decide goals.

Data Understanding

- Data understanding at initial level.

Cleaning Data

- Cleaning data
- Derive and Formatting as per requirement.

Implement EDA

- EDA to understand behavior of variables.
- Plot graphs, Uni variate, Bi variate analysis.

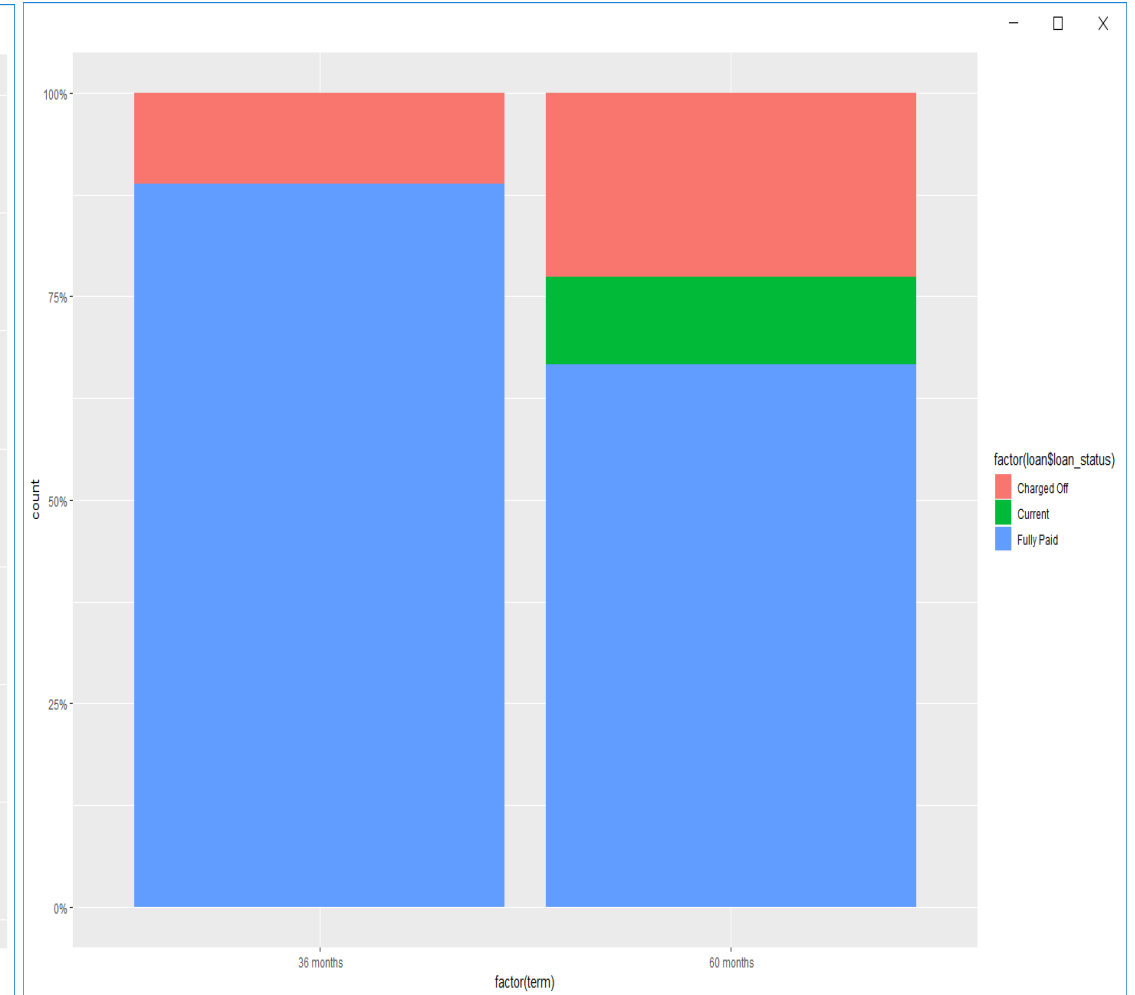
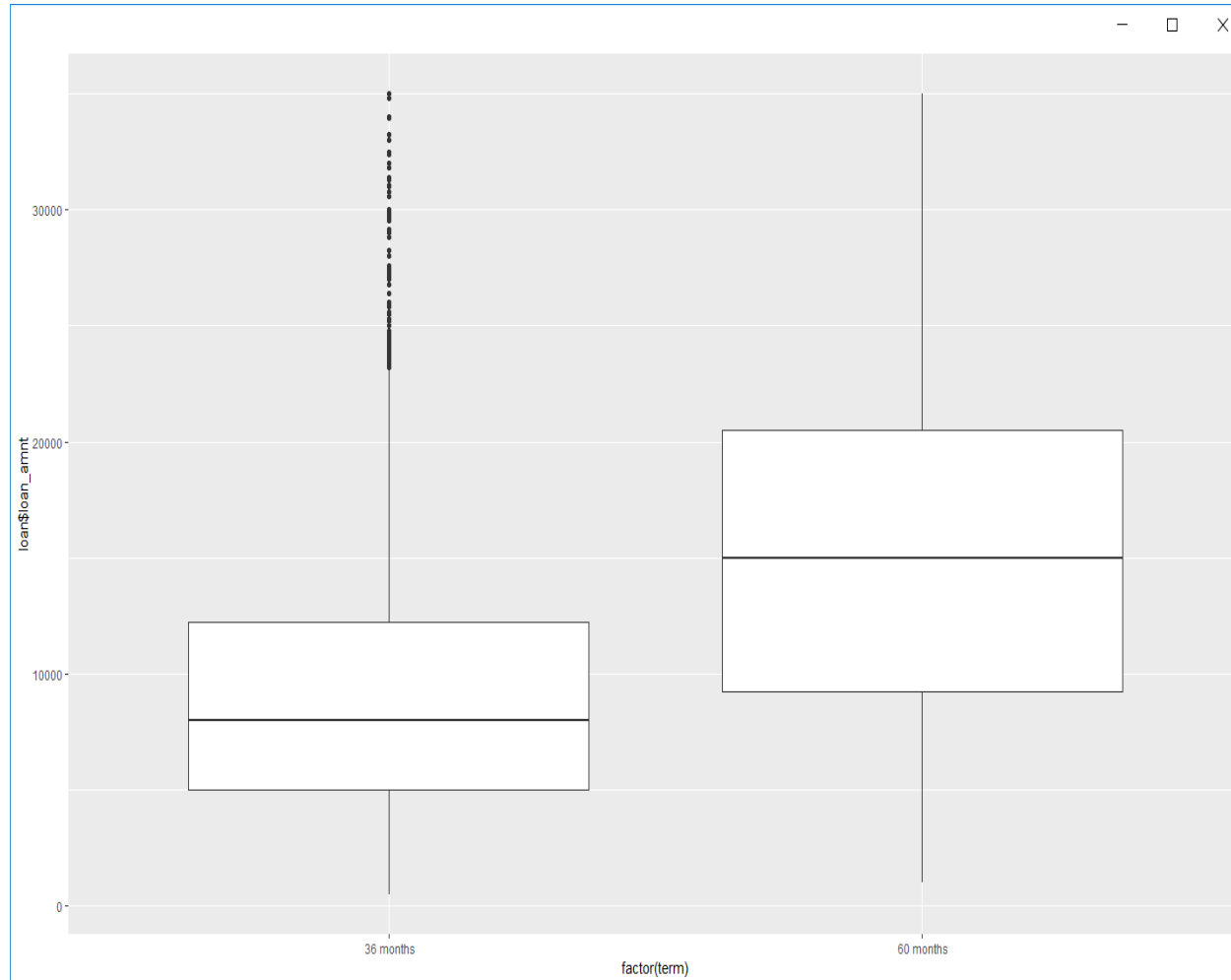
Conclusion

- Final conclusion and Solution

## Data Understanding

- Total 39717 loan details are available.
- There are three status for loan
  - Charged Off : 5627 Rows
  - Current : 1140 Rows
  - Fully Paid : 32950 Rows
- 14% of all loans, are with "Charged off" status.
- Only two options are available for loan term. "36 Months" and "60 Months". Lender are mostly interested in short term loans. Almost 73% loans are given for 36 month term.
- Average amount offered in 36 month loan is around \$7.7k approx and this amount is increased in 60 months duration. And average amount offered is \$14k approx
- Based on comparison of loan status in two terms. Percentage of loan charged off is high, if loan is lent for long term

## Data Understanding Graphs



# **Univariate Analysis (Most Significant Variable)**

## term

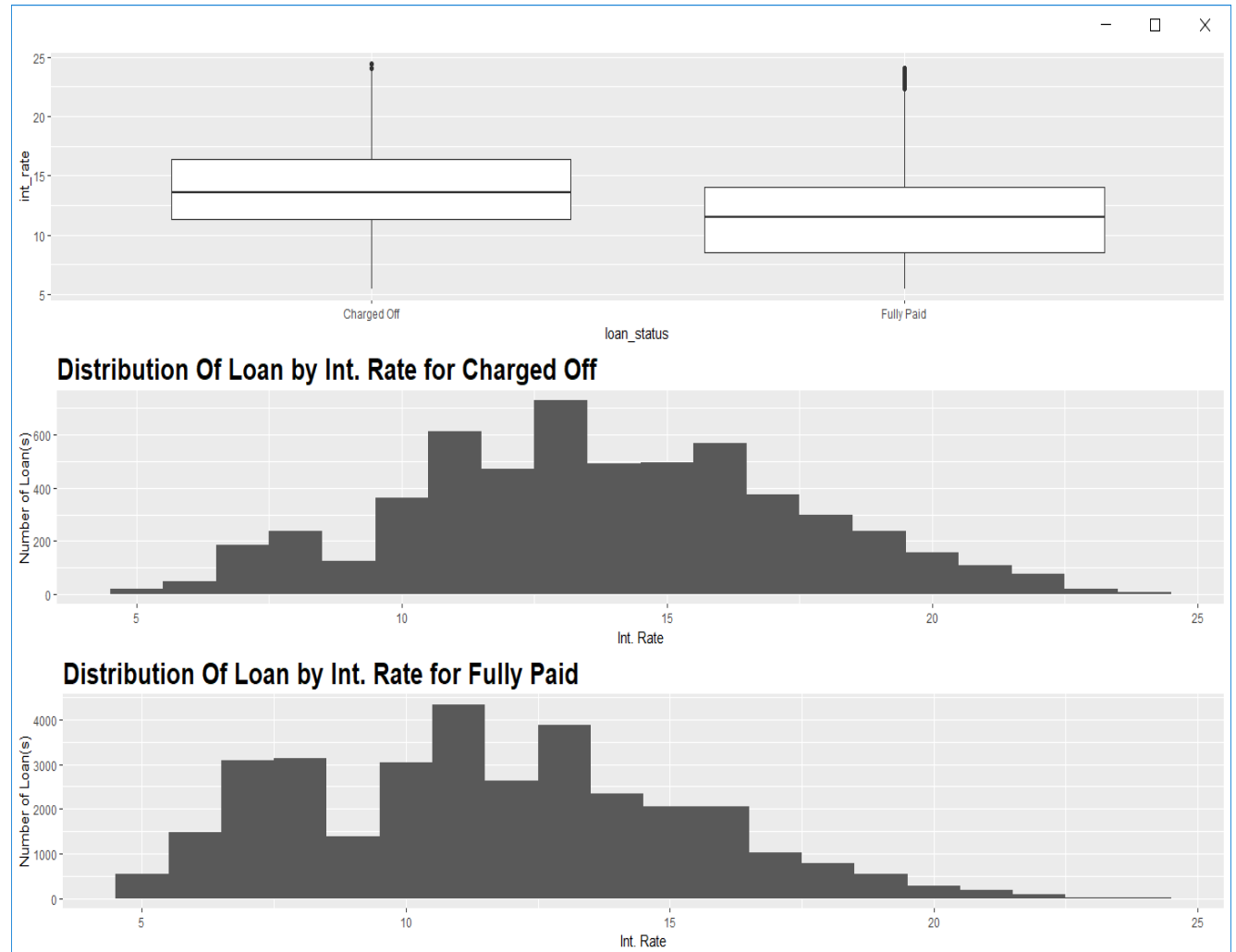
- Based on Portion of Loan status for different term.
- In Graph p2, we can see for 60 months of term % of charged off is higher than 36 month term
- But as per Graph p3, when we further dig into Charged Off loan status.
- Almost 60% of loan are charged off when lent for 36 months term



## int\_rate

- Based on Histogram . It seems there is some significance of interest rate on the status of loan.
- Based on the Bar graph and by.int.segment data frame.
- 80% of loans are charged off when lent between 11 to 20% of interest rate.

loan_status	int_segment	loans	percent
Charged Off	Between 11 to 15	2707	48.11
Charged Off	Between 16 to 20	1794	31.88
Charged Off	Between 21 to 25	296	5.26
Charged Off	Between 5 to 10	830	14.75
Fully Paid	Between 11 to 15	15558	47.22
Fully Paid	Between 16 to 20	5432	16.49
Fully Paid	Between 21 to 25	474	1.44

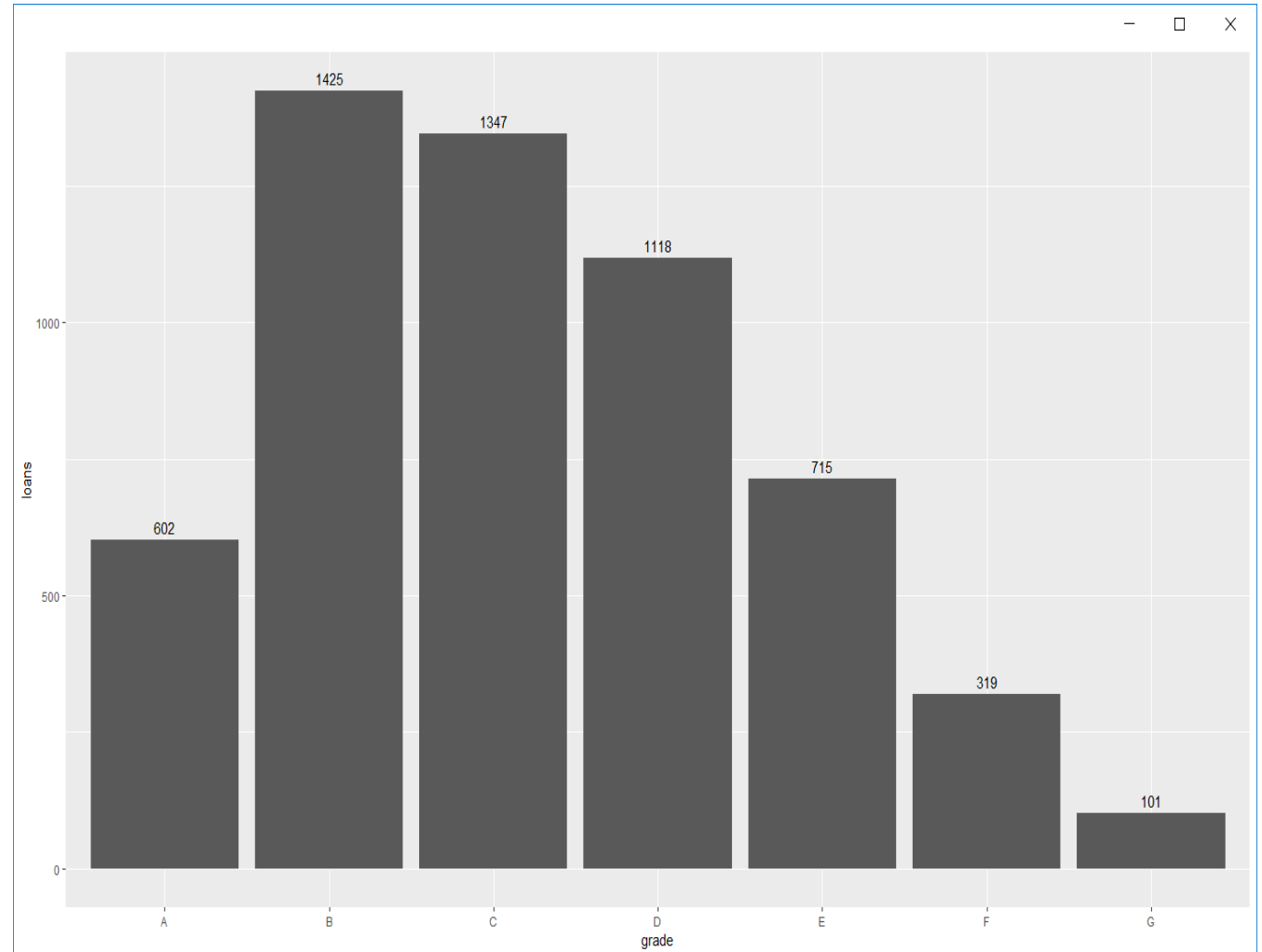




## Grade

- Based on Graph p1
- Number of Charged off loans are high B,C and D.
- Based on Percentage as per by.grade data frame
- Almost 70% loans are charged off when lent to applicant with LC assigned grade as B,C and D

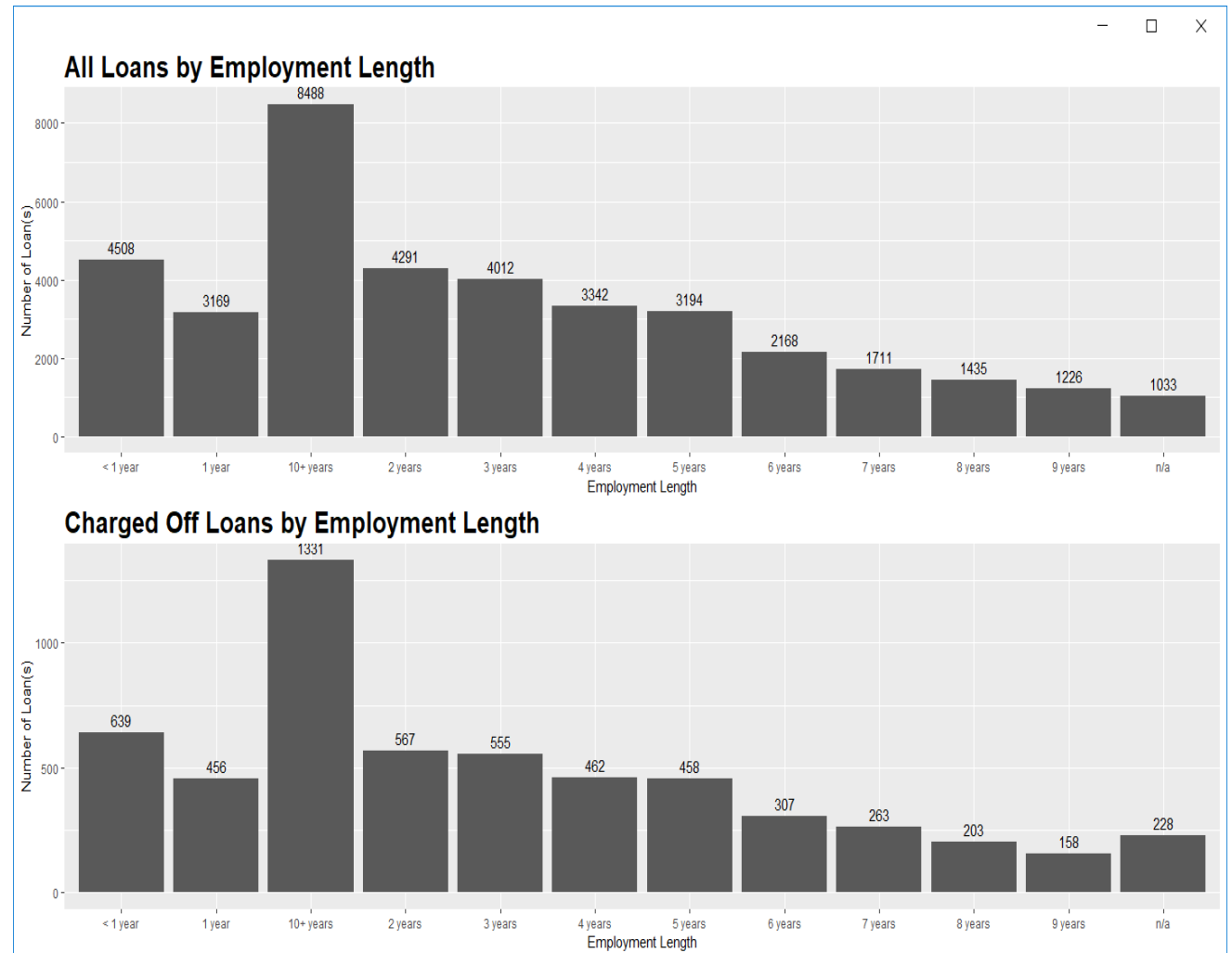
loan_status	grade	loans	percentage
Charged Off	B	1425	25.32
Charged Off	C	1347	23.94
Charged Off	D	1118	19.87
Charged Off	E	715	12.71
Charged Off	A	602	10.70
Charged Off	F	319	5.67
Charged Off	G	101	1.79



## emp\_length

- Based on below graphs, we can conclude.
- For 10+ years of experience and hence almost 22% of loans are charged off.
- For employment length of 2 to 5 year, it's high risk since 38.4 % of loans are charged off.

emp_length	loans	percentage
< 1 year	4508	11.68571947
1 year	3169	8.214739352
10+ years	8488	22.00274775
2 years	4291	11.12320813
3 years	4012	10.39997926
4 years	3342	8.663193094
5 years	3194	8.279544806
6 years	2168	5.619928973
7 years	1711	4.435285274
8 years	1435	3.719833061
9 years	1226	3.178059465



## annual\_inc

- Applicant earning between 30k to 90k are applying for loans
- For annual income between 30k to 90k, 70% of loans are charged off

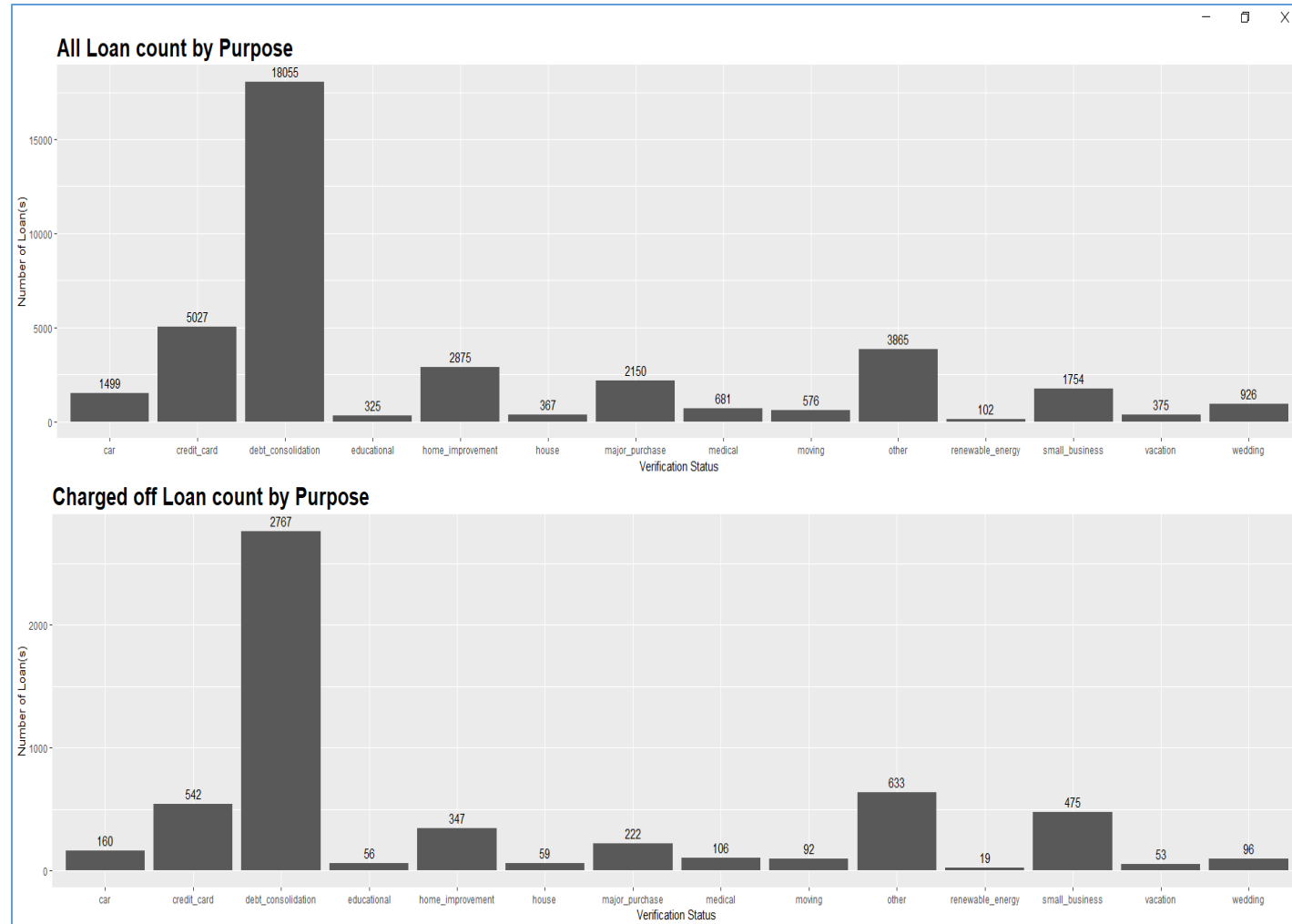
inc_segment	loans	percent
Between 30k to 60k	2641	48.63
Between 60k to 90k	1329	24.47
less Than 30k	839	15.45
Between 90k to 120k	470	8.65
Greater Than 120k	152	2.80



## purpose

- Based on Graph p2 most of the loan borrowed for debt\_consolication and small\_business are most likely to get Charged off.
- Based on by.loan.purpose data frame we can say from over all charged off loans.
- 52% loan are lent for debt\_consolication and small\_business.

purpose	loans	percent
debt_consolidation	2767	49.17
other	633	11.25
credit_card	542	9.63
small_business	475	8.44
home_improvement	347	6.17
major_purchase	222	3.95
car	160	2.84
medical	106	1.88
wedding	96	1.71
moving	92	1.63
house	59	1.05

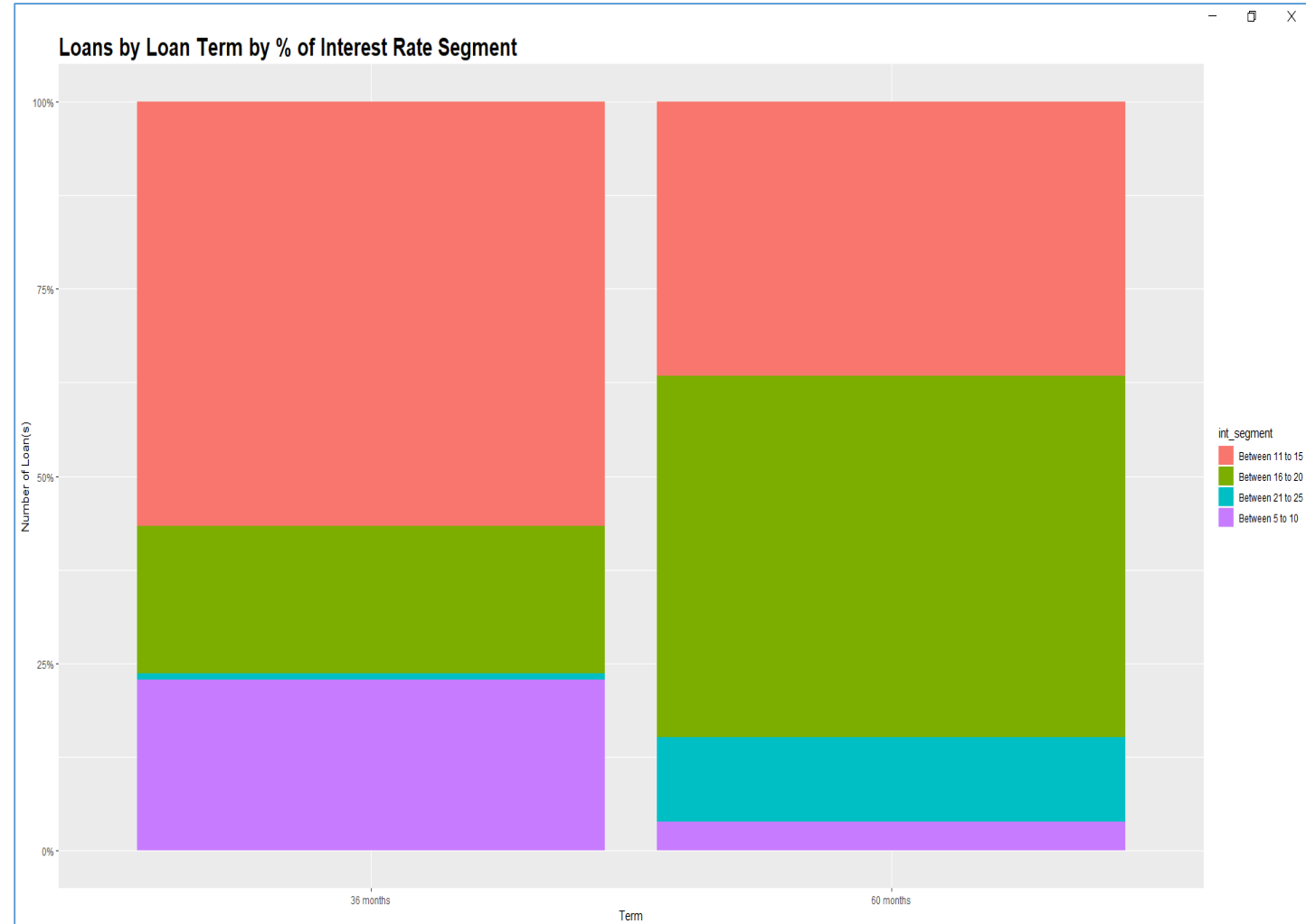


# **Bivariate Analysis (Most Significant Variable)**

**Note: Bivariate Analysis is done for only charged off loans**

## term and int\_rate

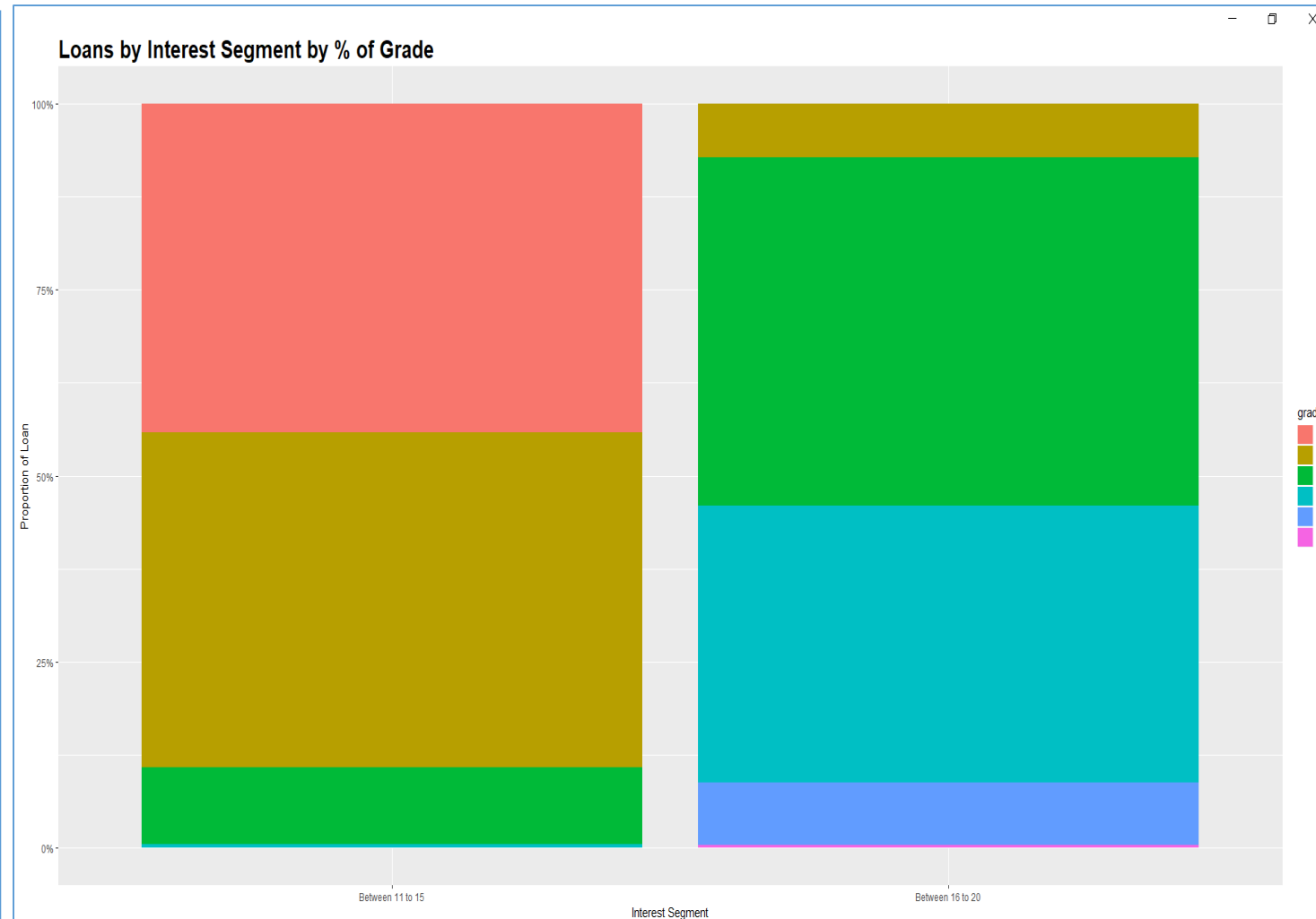
- Based on the proportion of Different interest rate segment as per graph, we can conclude that
- Approx. 88%% of loans, lent for 60 months term, are Charged Off if they are lent at interest rate between 11 to 20



## int\_rate and grade

- Approx. On Average 45% of loans, lent between 11 to 15% rate of interest , are Charged Off if they are lent to applicant of Grade B OR C
- Approx. On Average 42% of loans, lent between 16 to 20% rate of interest , are Charged Off if they are lent to applicant of Grade D OR E

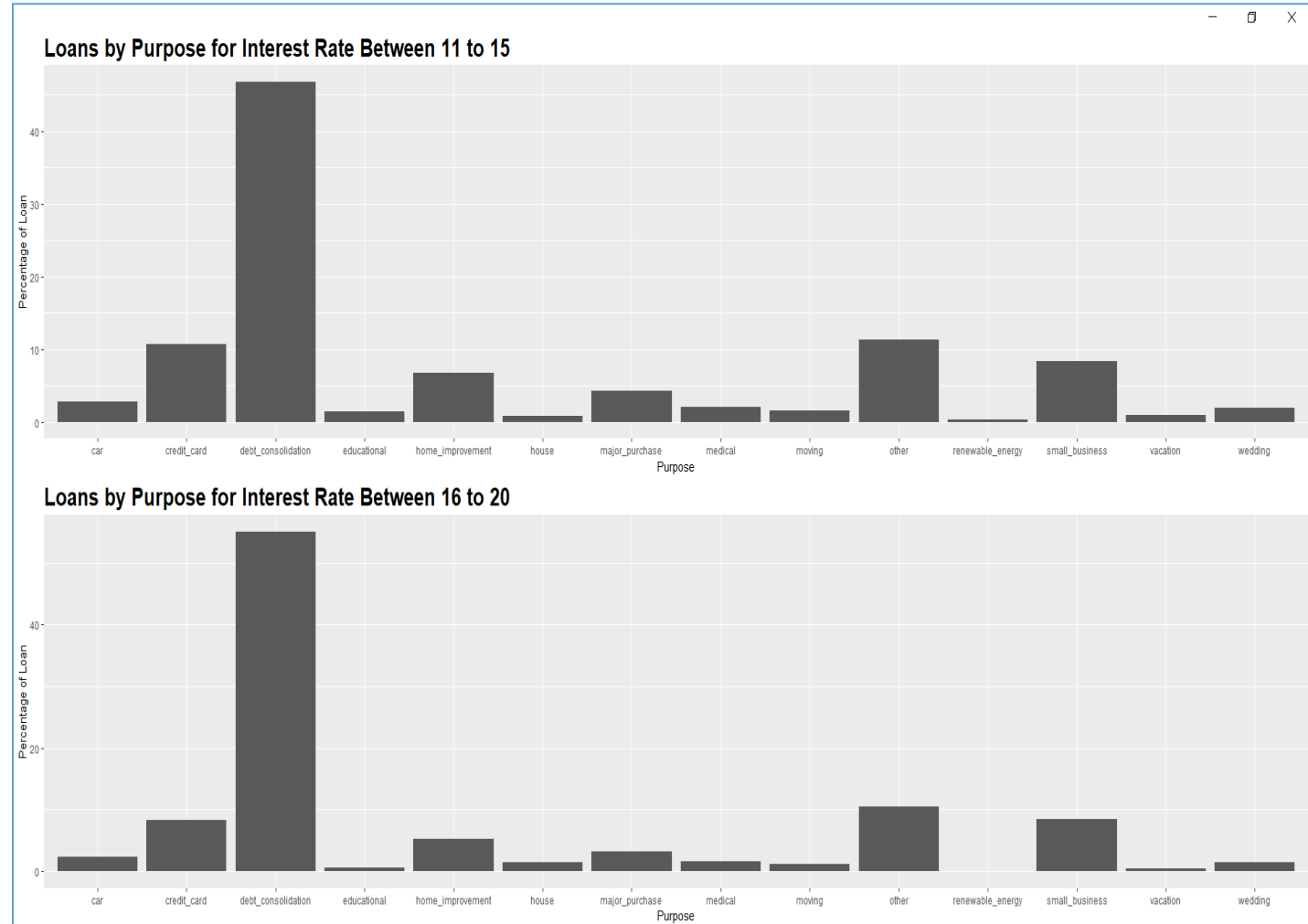
int_segment	grade	loans	percent
Between 11 to 15	B	1197	44.22
Between 11 to 15	C	1217	44.96
Between 11 to 15	D	280	10.34
Between 11 to 15	E	13	0.48
Between 16 to 20	C	130	7.25
Between 16 to 20	D	838	46.71
Between 16 to 20	E	668	37.24
Between 16 to 20	F	150	8.36
Between 16 to 20	G	8	0.45



## int\_rate and purpose

- Approx. 47% of loans, lent between 11 to 15% rate of interest , are Charged Off if purpose is debt\_consolidation.
- Approx. 56% of loans, lent between 16 to 20% rate of interest , are Charged Off if purpose is debt\_consolidation.

int_segment	purpose	loans	percent
Between 11 to 15	debt_consolidation	1266	46.77
Between 11 to 15	other	307	11.34
Between 11 to 15	credit_card	289	10.68
Between 11 to 15	small_business	225	8.31
Between 16 to 20	debt_consolidation	989	55.13
Between 16 to 20	other	188	10.48
Between 16 to 20	small_business	151	8.42
Between 16 to 20	credit_card	149	8.31

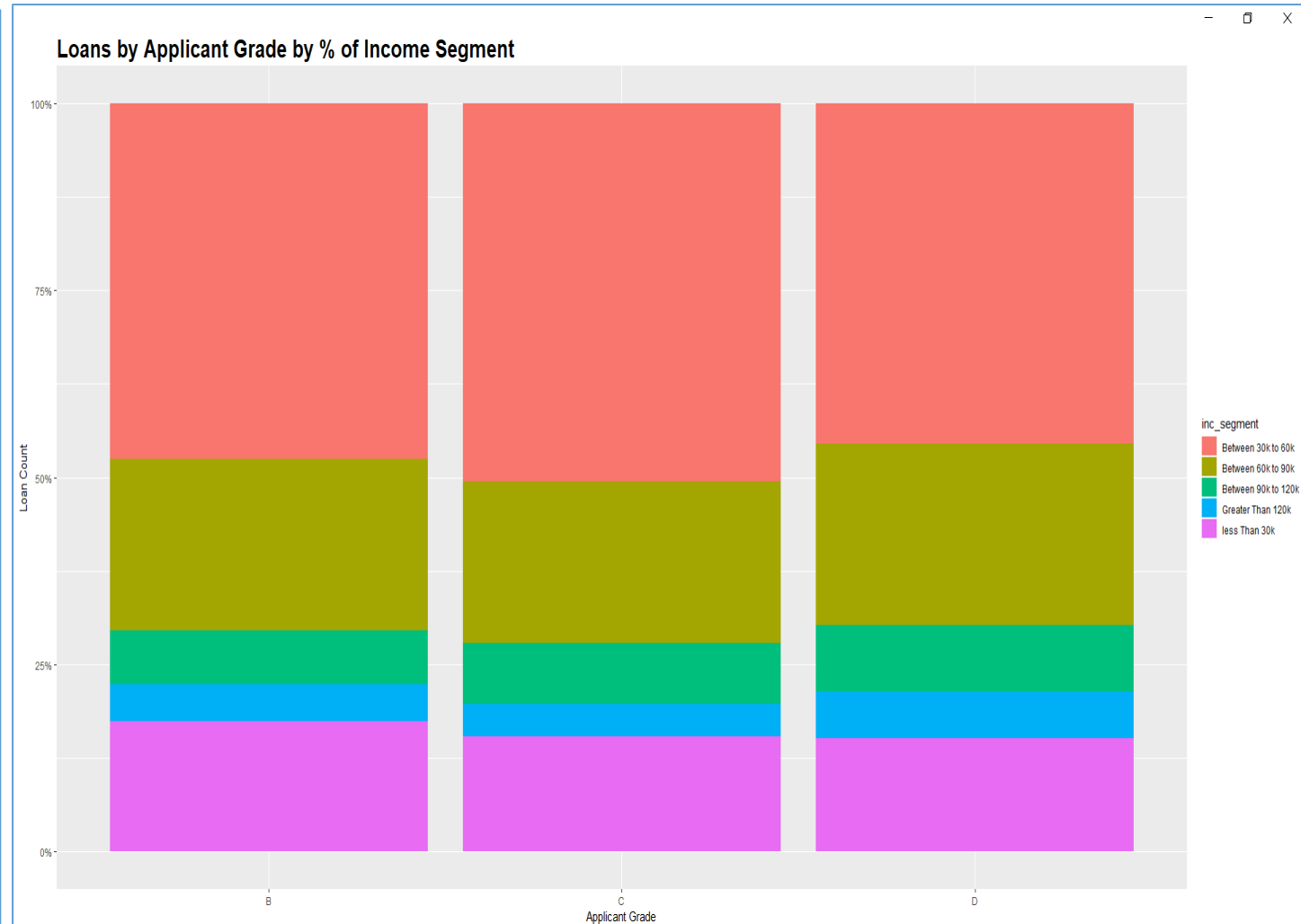




## grade and annual\_inc

- Approx. On an Average 48% of loans, lent to applicant in grade (B,C,D), are Charged Off if there annual income is 'Between 30k to 60k'.
- Approx. On an Average 23% of loans, lent to applicant in grade (B,C,D), are Charged Off if there annual income is 'Between 60k to 90k'.

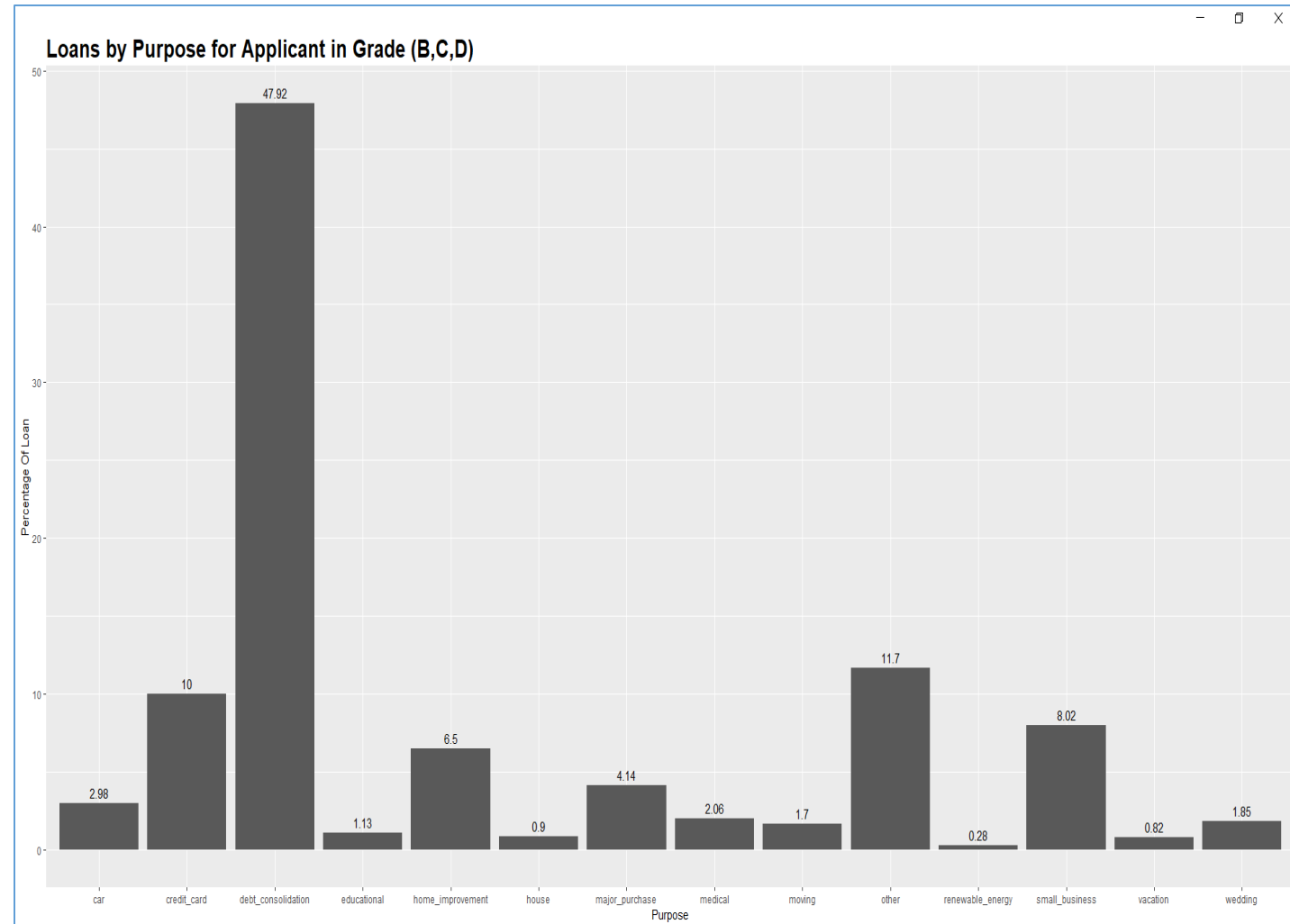
inc_segment	grade	loans	percent
Between 30k to 60k	C	680	50.48
Between 30k to 60k	B	678	47.58
Between 30k to 60k	D	508	45.44
Between 60k to 90k	D	272	24.33
Between 60k to 90k	B	326	22.88
Between 60k to 90k	C	291	21.60



## grade and purpose

- Approx. 48% of loans, lent to applicant in grade (B,C,D), are Charged Off if there purpose of loan is 'debt\_consolidation'

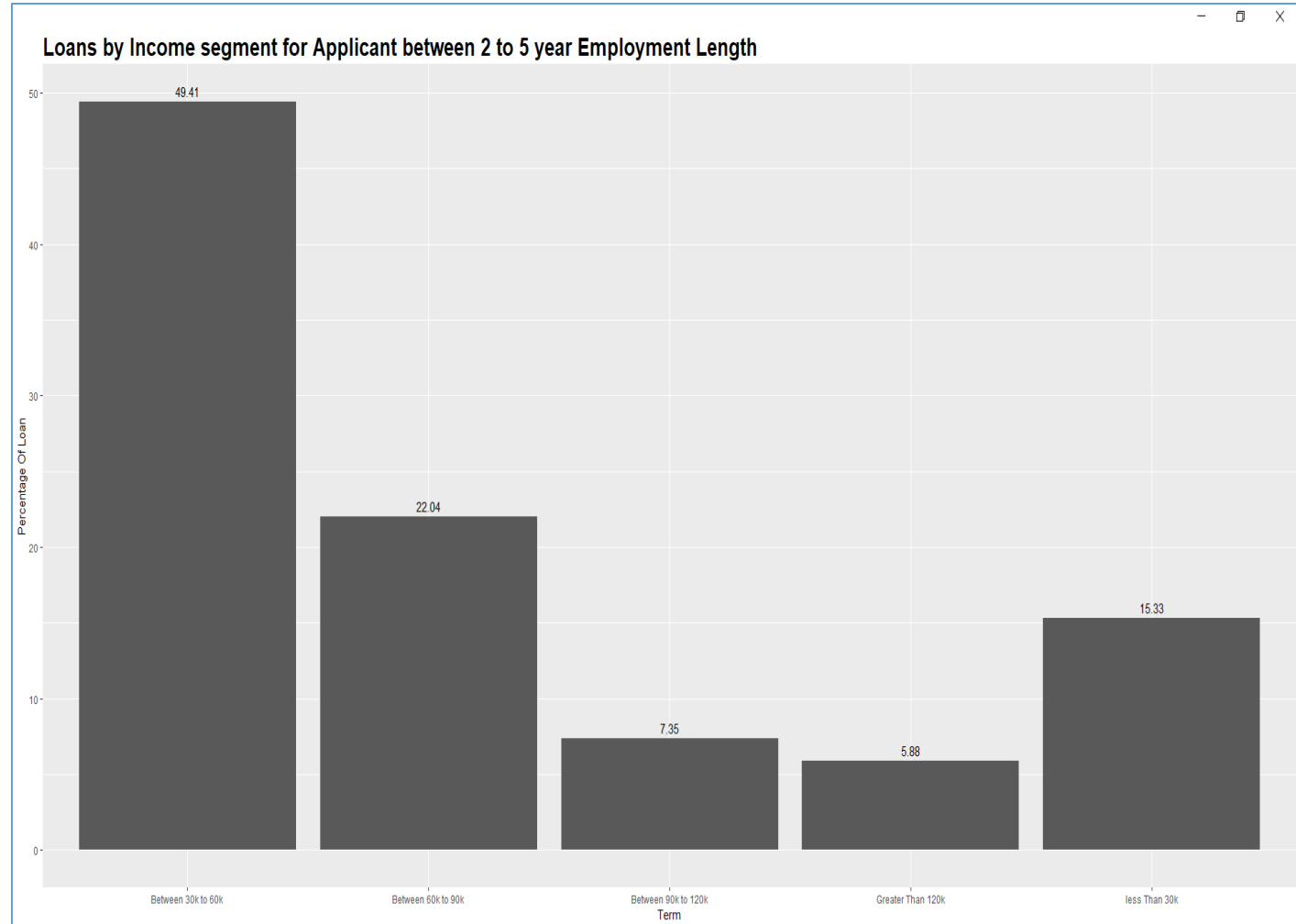
purpose	loans	percent
debt_consolidation	1864	47.92
other	455	11.70
credit_card	389	10.00
small_business	312	8.02
home_improvement	253	6.50
major_purchase	161	4.14
car	116	2.98
medical	80	2.06
wedding	72	1.85
moving	66	1.70
educational	44	1.13



## emp\_length and annual\_inc

- Approx. 50% of loans, lent to applicant having employment length between 2 to 5 years, are Charged Off if there Annual income is Between 30k to 60k.
- Approx. 22% of loans, lent to applicant having employment length between 2 to 5 years, are Charged Off if there Annual income is between 60k to 90k.

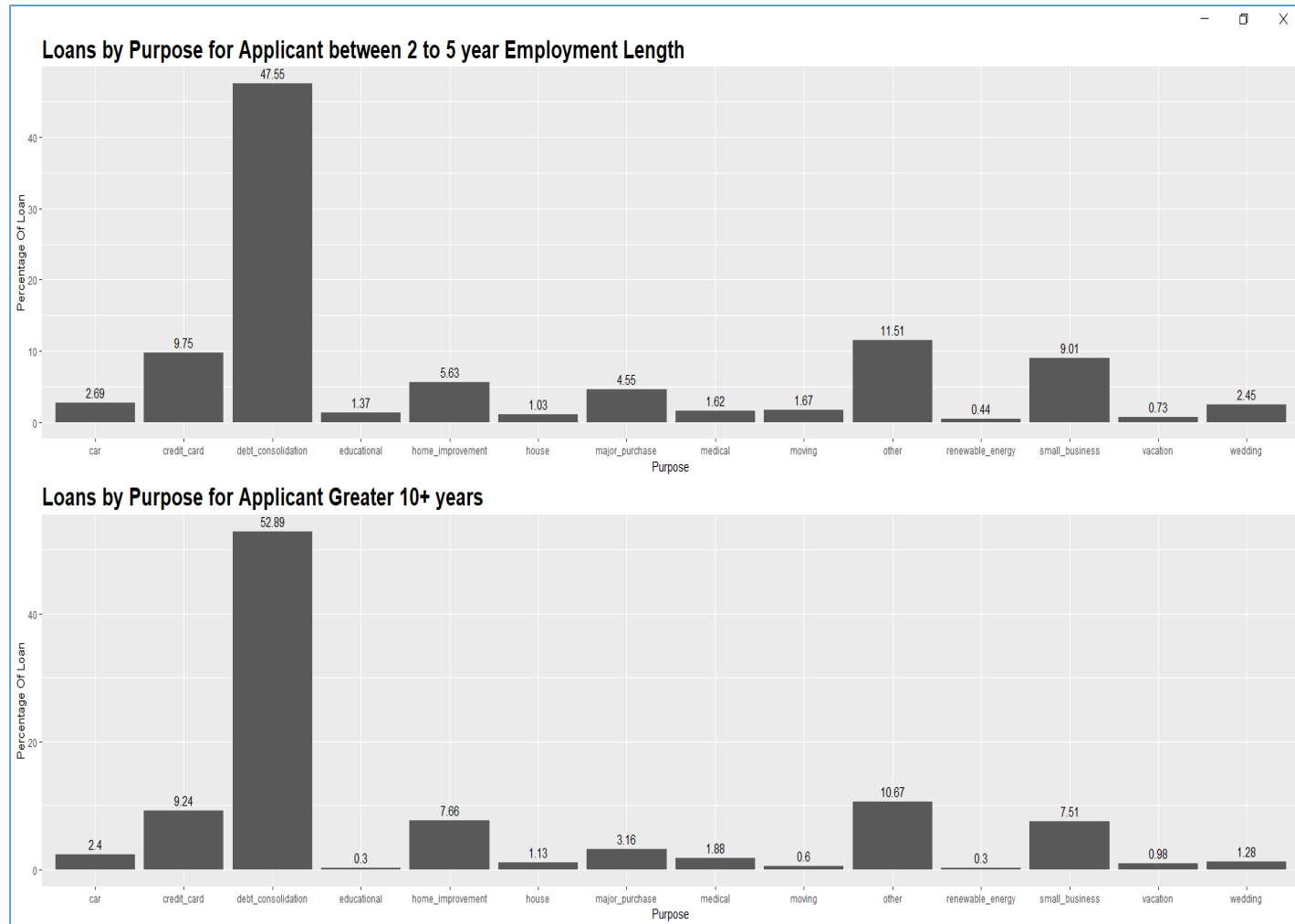
inc_segment	loans	percent
Between 30k to 60k	1009	49.41
Between 60k to 90k	450	22.04
Between 90k to 120k	150	7.35
Greater Than 120k	120	5.88
less Than 30k	313	15.33



## emp\_length and purpose

- Approx. 48% of loans, lent to applicant having employment length between 2 to 5 years, are Charged Off if purpose is debt\_consolidation.
- Approx. 53% of loans, lent to applicant having employment length more than 10+ years, are Charged Off if purpose is debt\_consolidation.

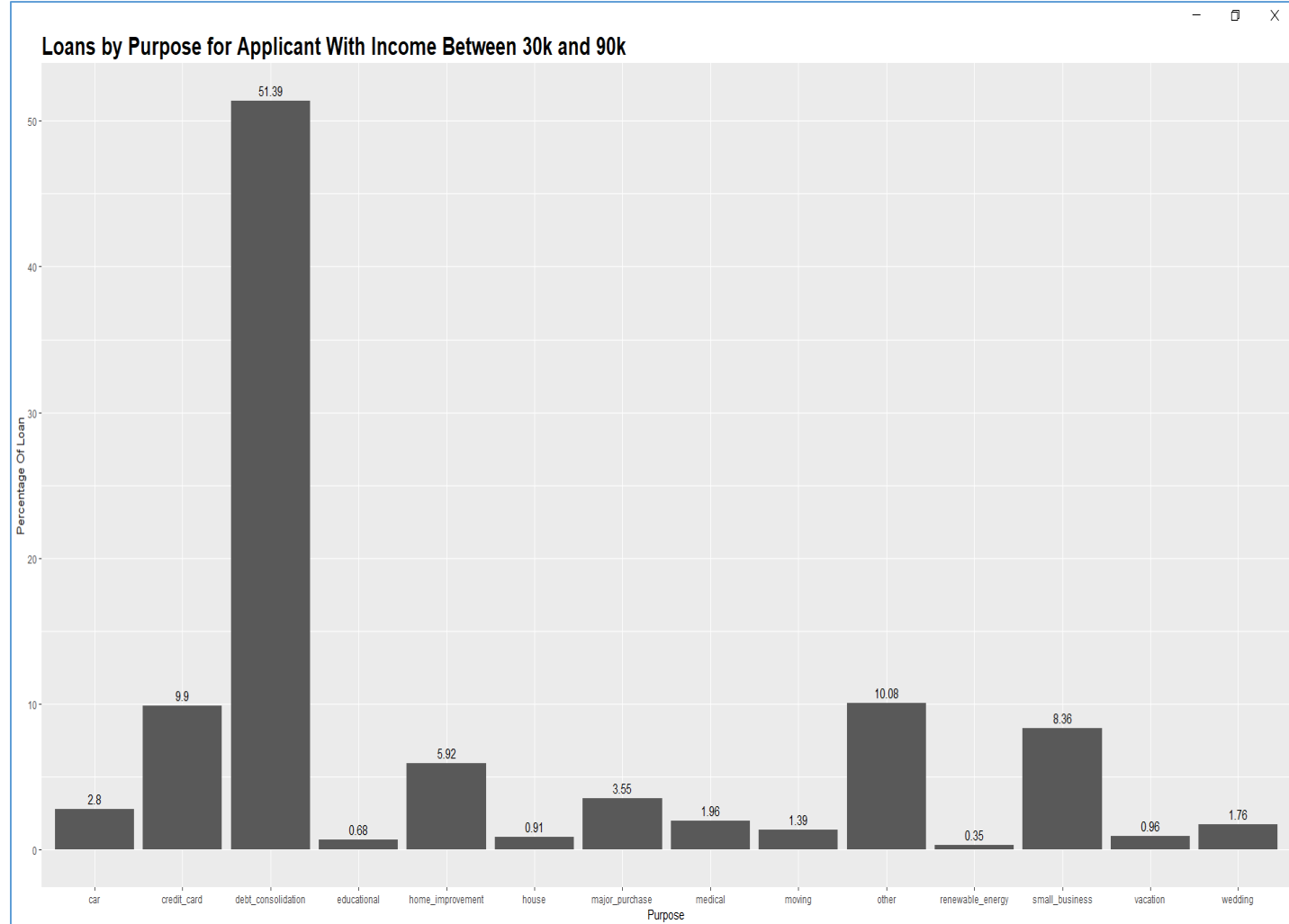
Employment Length	purpose	loans	percent
Greater Than 10	debt_consolidation	704	52.89
Greater Than 10	other	142	10.67
Greater Than 10	credit_card	123	9.24
Greater Than 10	home_improvement	102	7.66
Between 2 to 5	debt_consolidation	971	47.55
Between 2 to 5	other	235	11.51
Between 2 to 5	credit_card	199	9.75
Between 2 to 5	small_business	184	9.01



## annual\_inc and purpose

- Approx. 52% of loans, lent to applicant having annual income between 30 to 90k, are Charged Off if purpose is debt\_consolidation.

purpose	loans	percent
debt_consolidation	2040	51.39
other	400	10.08
credit_card	393	9.90
small_business	332	8.36
home_improvement	235	5.92
major_purchase	141	3.55
car	111	2.80
medical	78	1.96
wedding	70	1.76
moving	55	1.39
vacation	38	0.96
house	36	0.91
educational	27	0.68
renewable_energy	14	0.35



### **Final Conclusion (Using Bivariate and Univariate Analysis)**

- Long term loan with high interest rate are most likely to get charged off.
- 44% loan on an average, get Charged off if lent between 11 to 20 Interest rate, to applicant having Grade B,C,D or E.
- Applicant, with annual income between 30k to 60k and Grade in B,c or D, are likely to be defaulter
- 50% of time Applicant, having annual income of 30k to 60k and with employment length of 2 to 5 years, are likely to get defaulter.
- Most common finding is related to purpose of loan, if Applicant is taking loan for "debt\_consolidation" 50% chances that it will get defaulter.