

Credit Risk Management - loan status in 2018



\$14,34bn

Sum of loan_amnt

906K

number_of_contracts

12,72%

Average of interest_rate_pct

\$454,7

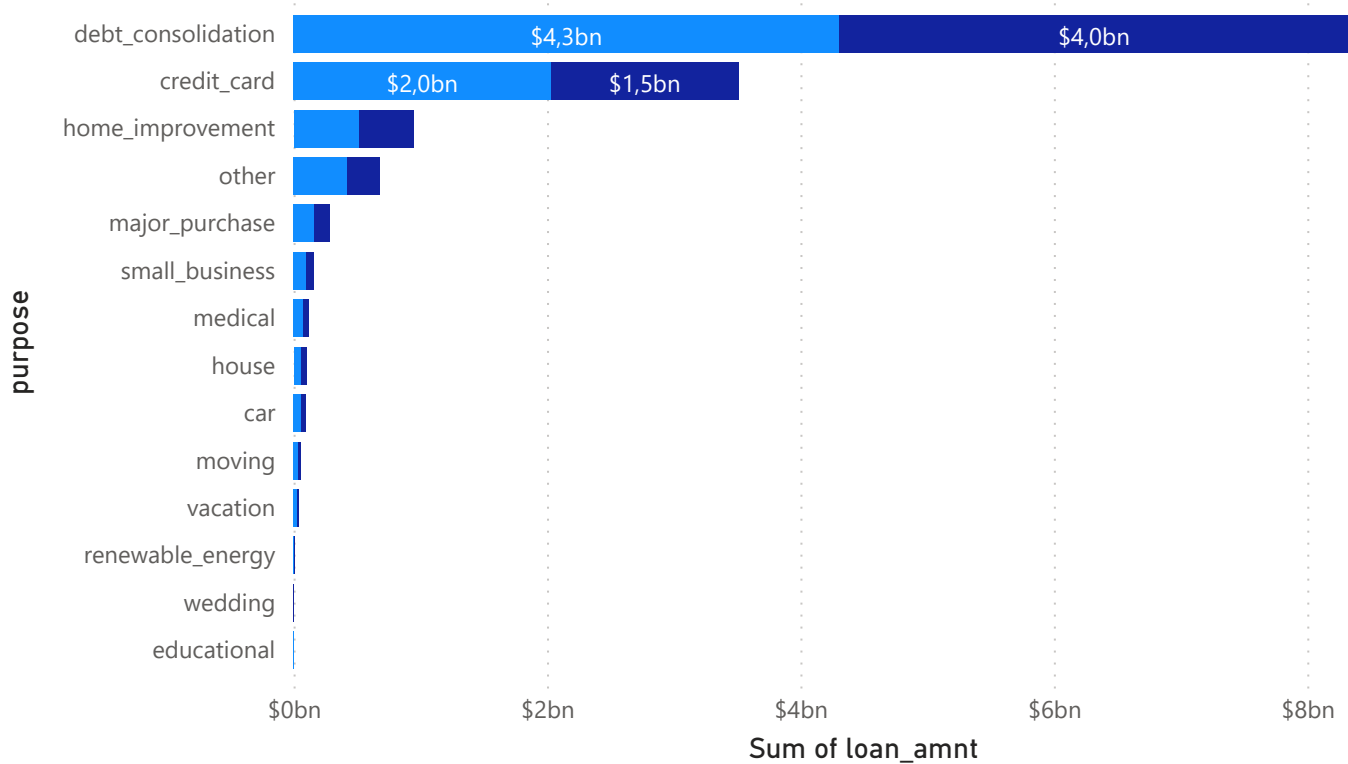
Average of installment

\$6,75bn

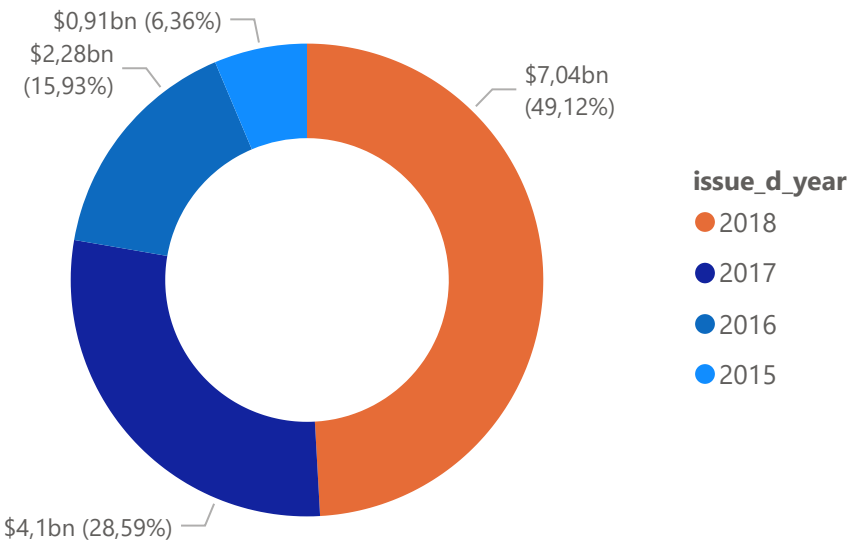
Sum of total_pymnt

Loan in 2018 (Total by duration)

term 36 months 60 months



Sum of loan_amnt by issue_d_year



Dashboard

Credit_Risk_EL

Influencers_EL

Interest_rate

EL_by_State

EL_by_State_TX

Loan_contract_ID

EL_calculation

Credit risk by EL (Expected Loss) - Performance Tracking

loan_prediction_str

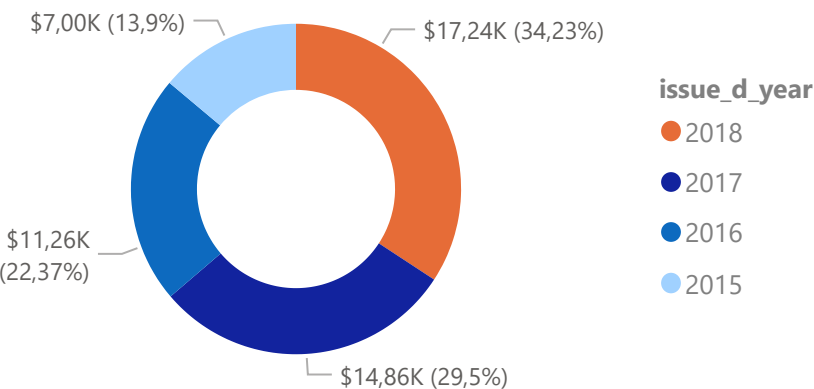
Default



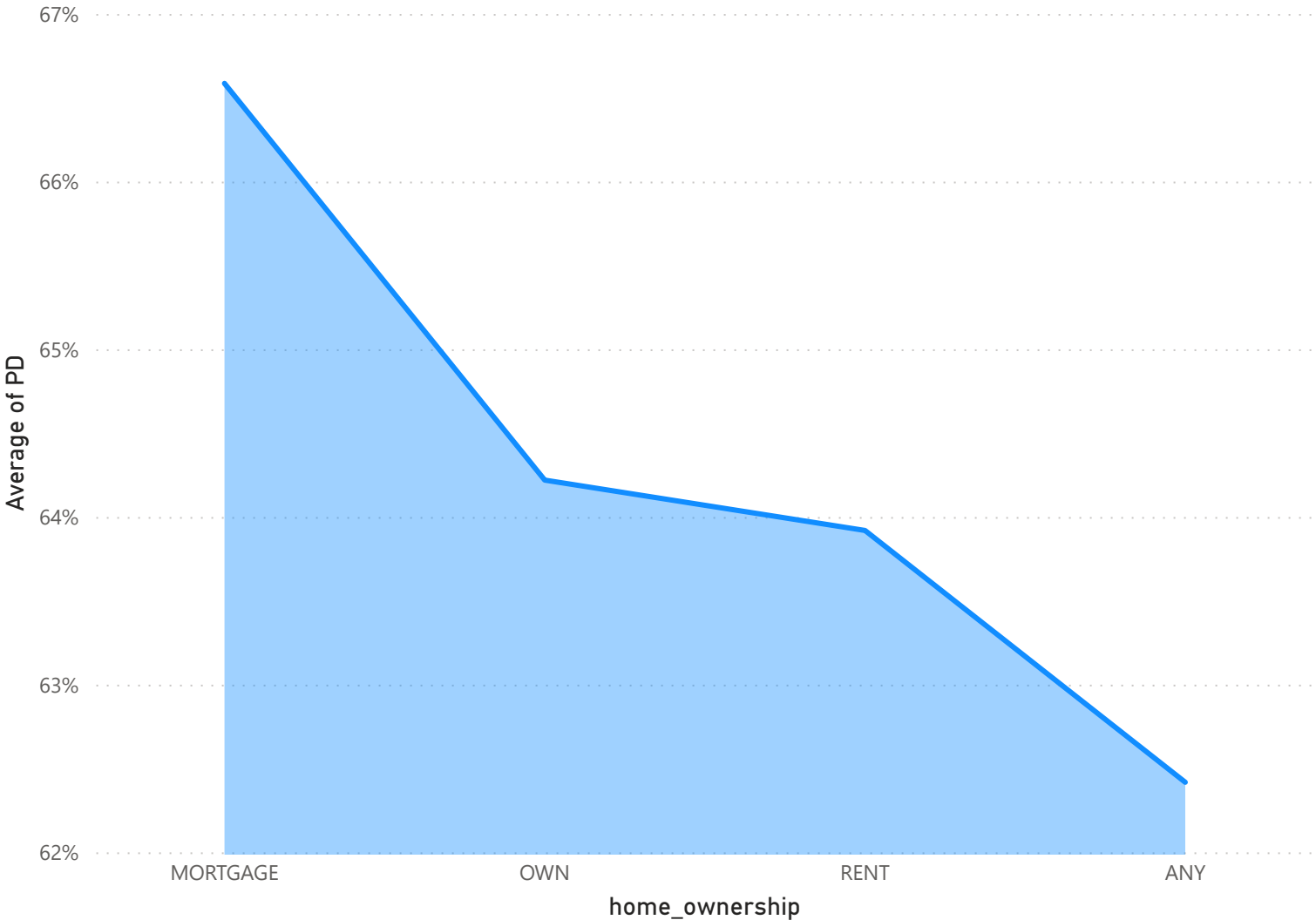
Top 10 EL (Expected Loss) by contract_id and int rate

contract_id	Sum of EL	Average of interest_rate_pct
42949693601	\$34.654,0	11,31%
42949752634	\$34.591,9	13,56%
42949678418	\$34.531,4	8,19%
42949706643	\$34.447,4	13,56%
42949692009	\$34.430,9	7,02%
42949768230	\$34.080,2	15,02%
42949737101	\$33.395,6	10,47%
42949794197	\$33.220,1	10,47%
42949688074	\$33.158,4	18,94%
42949892325	\$32.393,7	13,56%
Total	\$338.903,5	12,21%

Average of EAD by issue_d_year



Average of PD by home_ownership



Dashboard

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EL_by_State

EL_by_State_TX

Loan_contract_ID

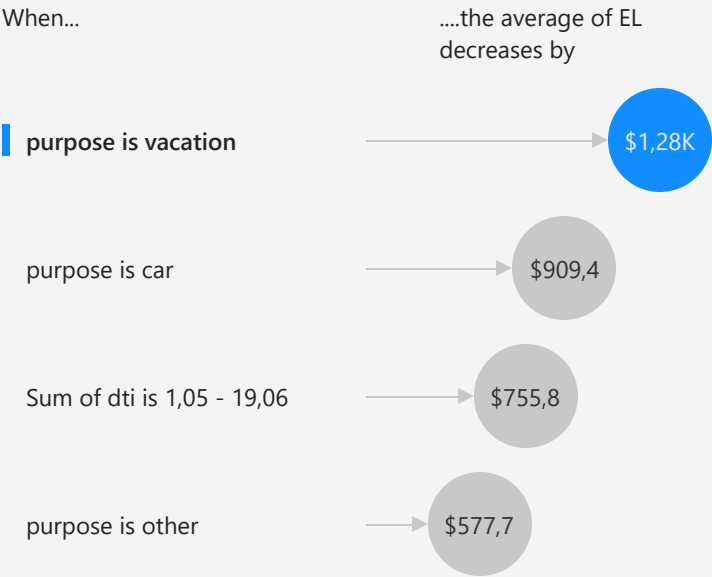
EL_calculation

Influencers - decrease EL

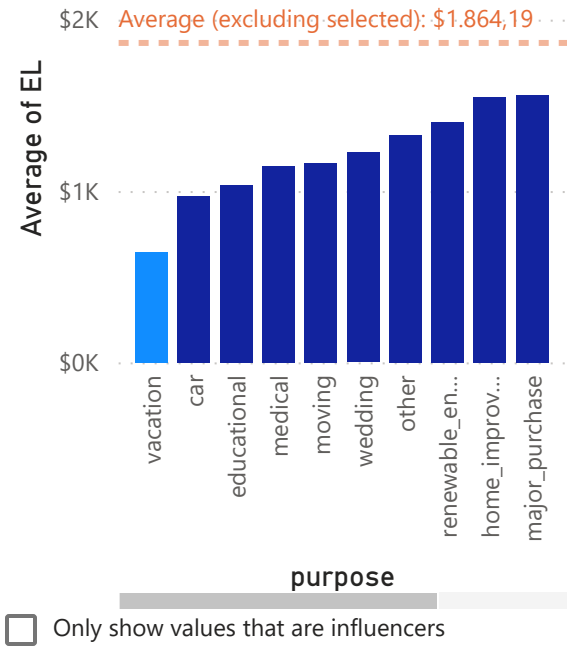


Key influencers Top segments

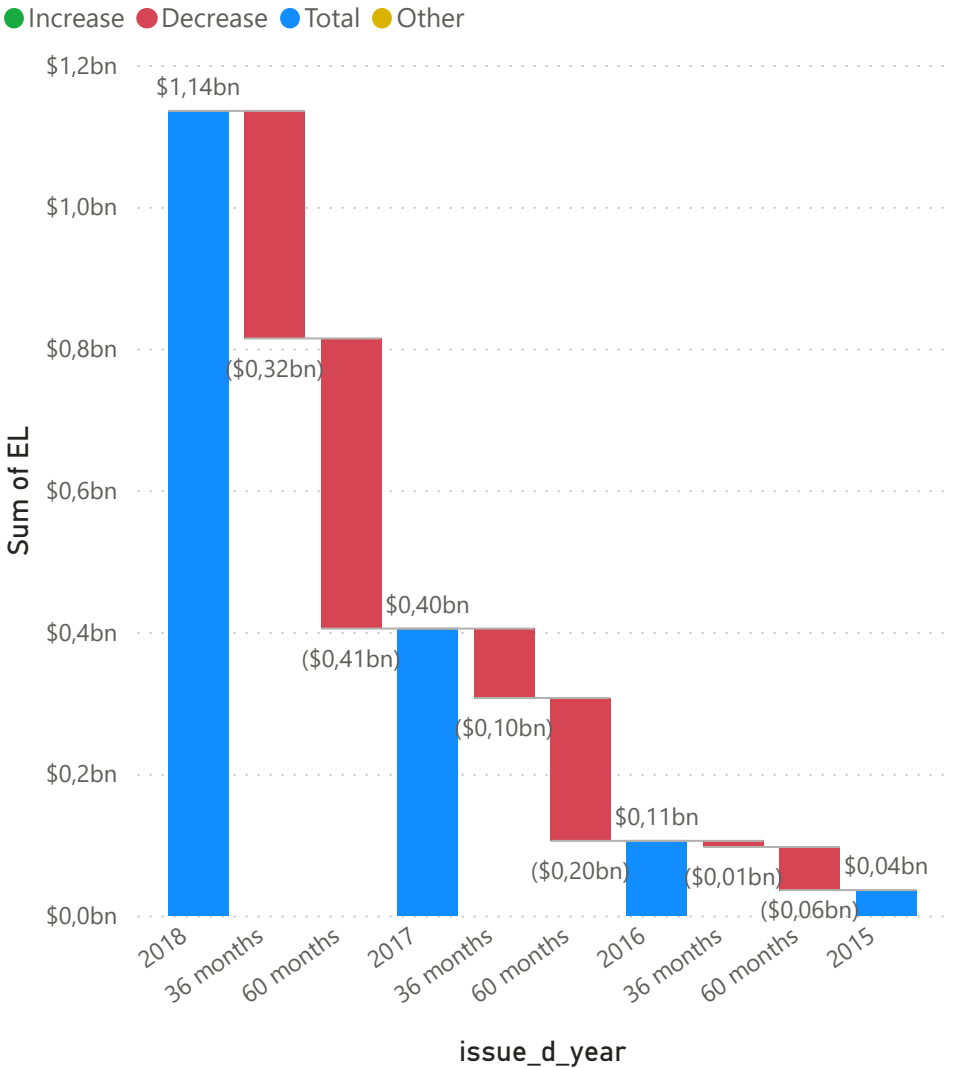
What influences EL to Decrease ?



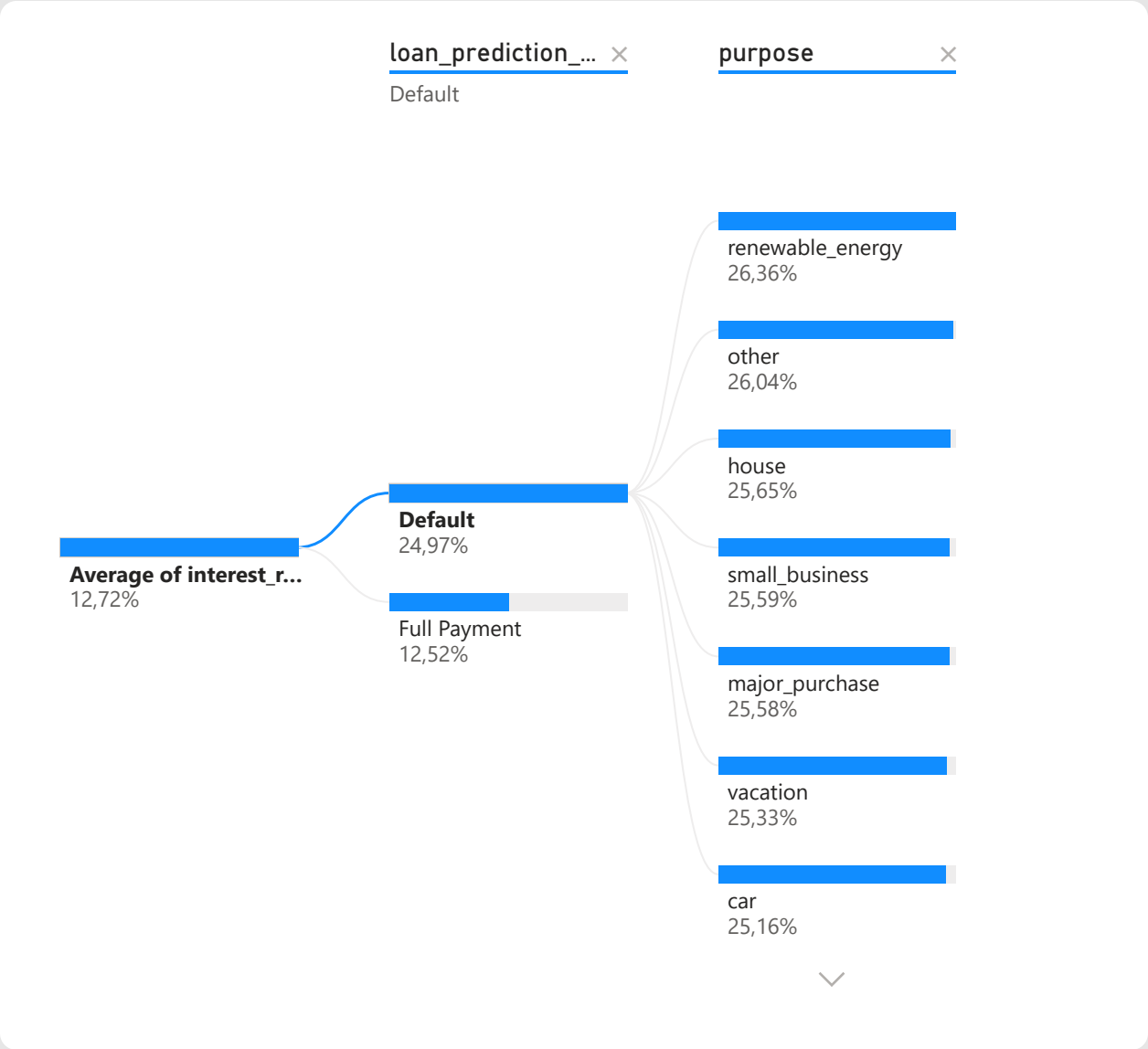
← EL is more likely to decrease when purpose is vacation than otherwise (on average).



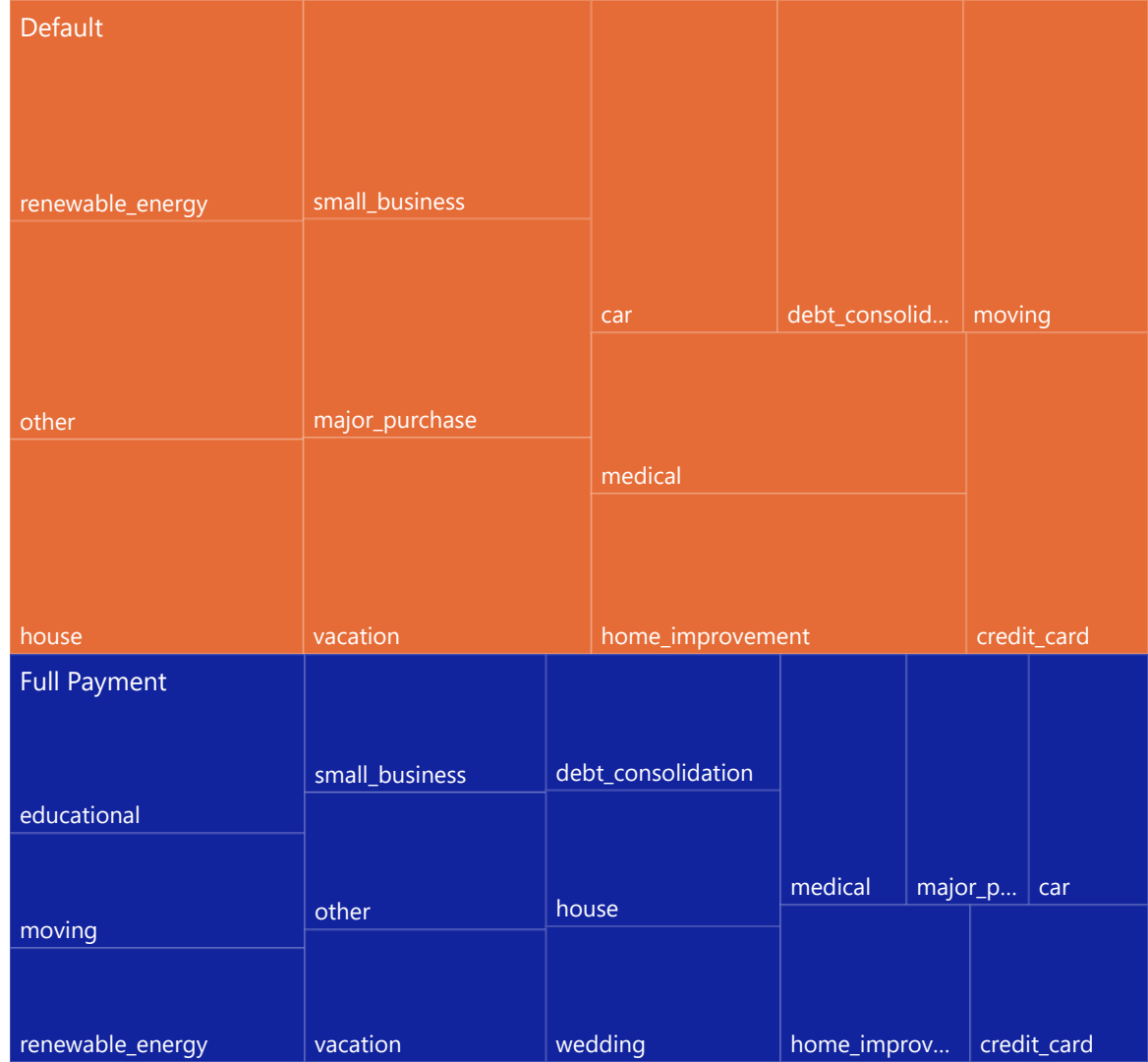
Sum of EL by issue_d_year and term



Interest rate by loan purpose and loan payment prediction



Average of int_rate by loan_prediction_str and purpose



Expected loss by state in 2018



906,2K

number_of_contracts

\$1.855,4

Average of EL

12,72%

Average of interest_rate_pct

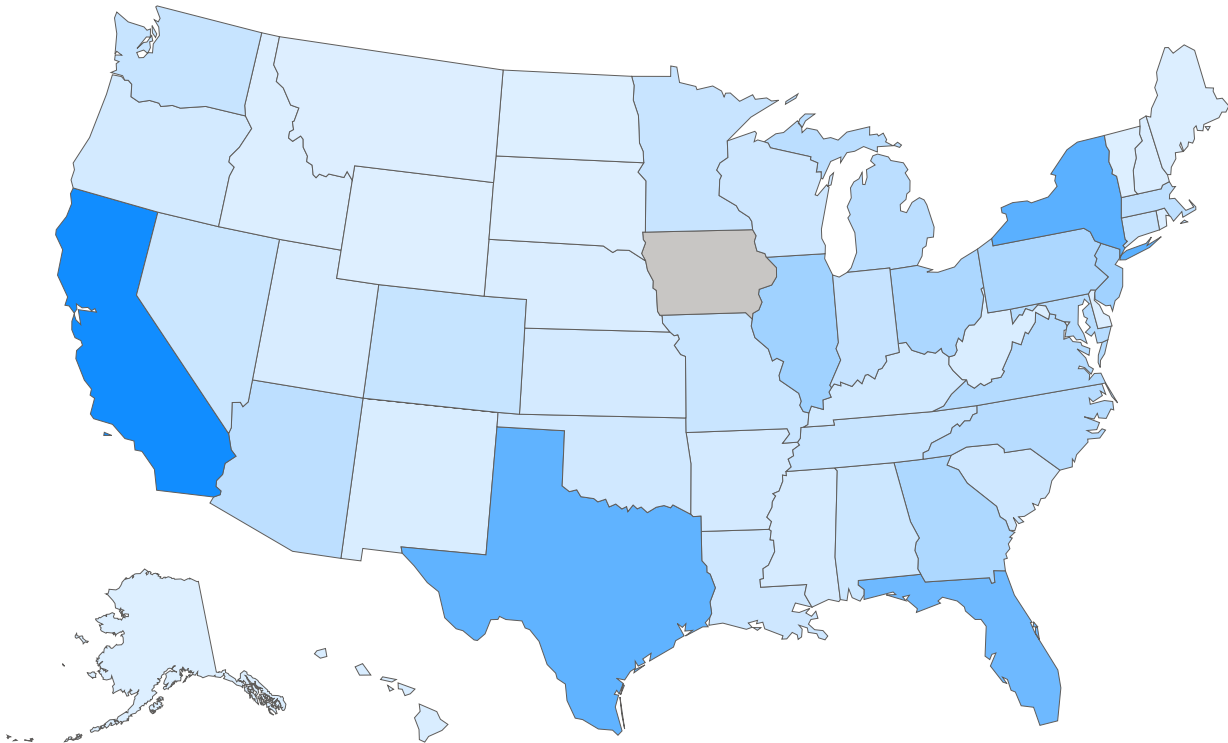
\$454,7

Average of installment

21,97%

Average of PD

Sum of EL by addr_state



addr_state	number_of_contracts
CA	117196
TX	75525
NY	75318
FL	65557
IL	39135
NJ	34178
OH	31114
PA	30947
GA	30448
NC	24720
VA	24578
MI	23333
MD	22291
AZ	20973
MA	20559
CO	18477
WA	17804
CT	15836
Total	906193

Expected loss by state in 2018 - Texas example



75,5K

number_of_contracts

\$1.830,2

Average of EL

12,63%

Average of interest_rate_pct

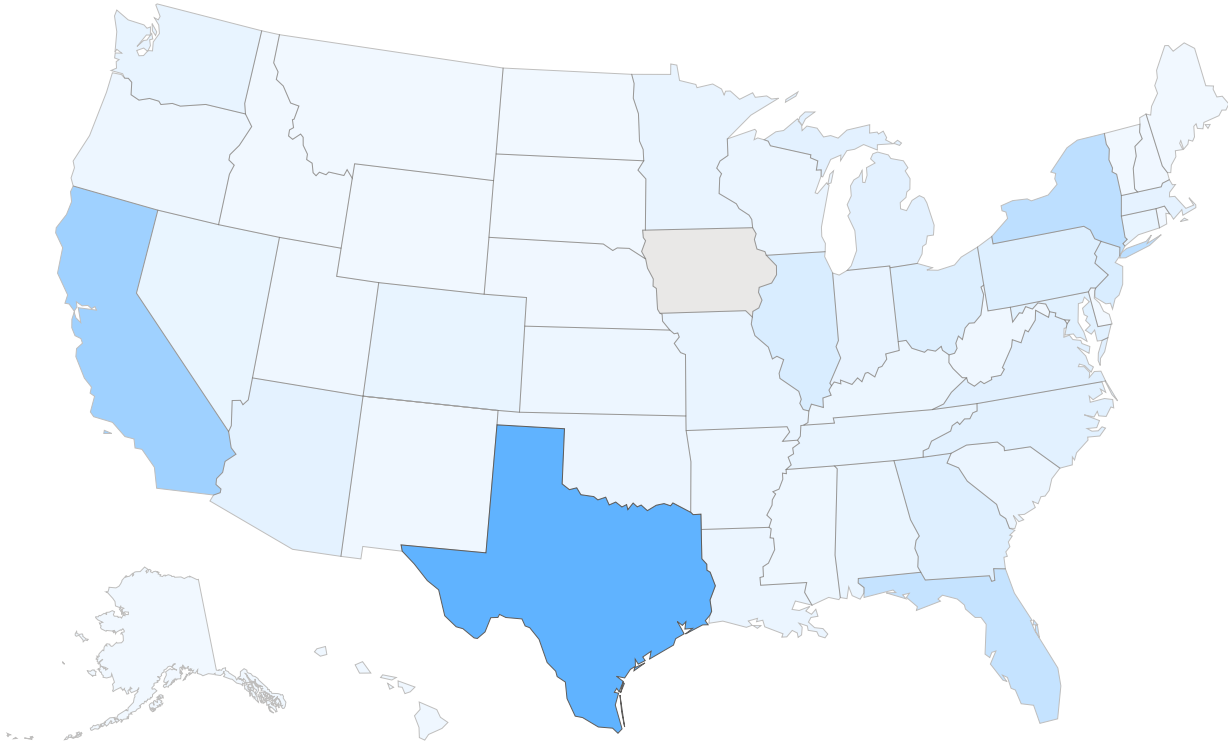
\$472,6

Average of installment

21,31%

Average of PD

Sum of EL by addr_state



addr_state	number_of_contracts
TX	75525
Total	75525

Dashboard

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EL_by_State_TX

Loan_contract_ID

EL_calculation

Loan - contract ID value report filter

Contract_ID id Filter

All



contract_id	addr_state	title	issue_d	loan_amnt	total_pymnt	interest_rate_pct	EL	PD	recovery_rate_pct_predict_gbm	loan_prediction_str
42949693601	CA	Debt consolidation	Dec-2018	\$40.000	\$2.615,16	11,31%	\$34.654,0	99,98%	4,38%	Default
42949752634	OK	Debt consolidation	Nov-2018	\$40.000	\$2.704,65	13,56%	\$34.591,9	98,70%	5,79%	Default
42949678418	VA	Credit card refinancing	Dec-2018	\$40.000	\$1.593,00	8,19%	\$34.531,4	96,80%	5,76%	Default
42949706643	TX	Debt consolidation	Dec-2018	\$40.000	\$1.813,15	13,56%	\$34.447,4	96,65%	6,53%	Default
42949692009	AZ	Debt consolidation	Dec-2018	\$40.000	\$2.455,30	7,02%	\$34.430,9	99,59%	4,19%	Default
42949768230	CA	Debt consolidation	Oct-2018	\$40.000	\$3.774,70	15,02%	\$34.080,2	99,62%	6,03%	Default
42949737101	CA	Credit card refinancing	Nov-2018	\$40.000	\$2.554,24	10,47%	\$33.395,6	95,56%	5,48%	Default
42949794197	OH	Debt consolidation	Oct-2018	\$40.000	\$3.471,58	10,47%	\$33.220,1	98,16%	5,92%	Default
42949688074	TX	Credit card refinancing	Dec-2018	\$40.000	\$2.887,97	18,94%	\$33.158,4	97,24%	7,11%	Default
42949892325	WA	Debt consolidation	Jul-2018	\$40.000	\$5.469,57	13,56%	\$32.393,7	100,00%	5,86%	Default
42949769281	FL	Debt consolidation	Oct-2018	\$38.600	\$3.783,55	16,14%	\$32.262,2	98,98%	7,50%	Default
42949843766	MD	Debt consolidation	Aug-2018	\$40.000	\$4.778,40	8,46%	\$31.599,2	99,34%	5,62%	Default
42949804807	TX	Credit card refinancing	Sep-2018	\$40.000	\$4.494,76	12,73%	\$31.419,4	95,83%	6,97%	Default
42949839946	PA	Debt consolidation	Sep-2018	\$40.000	\$4.234,90	10,08%	\$31.355,9	94,62%	5,13%	Default
42949737860	KY	Credit card refinancing	Nov-2018	\$40.000	\$4.209,46	6,11%	\$31.268,1	99,99%	5,23%	Default
42949699818	GA	Credit card refinancing	Dec-2018	\$37.000	\$2.487,18	11,80%	\$31.170,5	99,99%	7,27%	Default
42949901710	AL	Business	Jul-2018	\$40.000	\$7.317,33	19,92%	\$31.072,5	97,08%	6,99%	Default
42949693893	NM	Credit card refinancing	Dec-2018	\$38.000	\$1.633,10	11,80%	\$30.982,5	90,94%	5,74%	Default
42949736160	TN	Debt consolidation	Nov-2018	\$35.000	\$2.289,43	11,55%	\$30.863,0	99,93%	4,74%	Default
42949836777	NC	Credit card refinancing	Sep-2018	\$40.000	\$4.272,58	10,47%	\$30.676,9	94,97%	7,66%	Default
42949751018	UT	Debt consolidation	Nov-2018	\$38.000	\$3.891,80	14,47%	\$30.593,1	99,78%	7,14%	Default

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Credit risk modeling - Expected Loss (EL) calculation



Quick review

Expected Loss (EL) is the amount of money a lender can expect to lose on average over the life of a loan due to default. It takes into account the probability of default, the exposure at default, and the loss given default. Here's how to calculate the Expected Loss:

$$EL = PD \times LGD \times EAD$$

Where:

- PD = Probability of Default: the likelihood that the borrower will default on the loan during the life of the loan.
 - Machine Learning model (classification problem) with a PD of 10%
- LGD = Loss Given Default: the amount of money the lender expects to lose if the borrower defaults on the loan.
 - $LDG = (Total\ exposure - Recoveries) / Total\ exposure = (USD\ 100,000 - USD\ 20,000) / USD\ 100,000 = 80\%$
- EAD = Exposure at Default: the amount of money the lender is exposed to when the borrower defaults on the loan.
 - $EAD = Total\ exposure \times (1 - Recovery\ rate) = USD\ 100,000 \times (1 - 0.20) = USD\ 80,000$
 - The recovery rate of current loan is going to be calculated with GBM model - recovery rate (regression problem)

To calculate the Expected Loss, you need to estimate each of these components based on historical data.

For example, suppose a lender has a USD 100,000 loan to a borrower with a probability of default of 10%, a loss given default of 80%, and an exposure at default of USD 80,000. The Expected Loss with formulas and number above, would be:

$$EL\ (result) = 10\% \times 80\% \times \$80,000 = \$6,400$$

This means that the lender can expect to lose \$6,400 on average over the life of the loan due to default. The Expected Loss is an important metric for lenders because it helps them estimate the amount of risk they are taking on and set appropriate loan pricing and risk management strategies.