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WHAT AFFECTS INTEREST RATES ON THE PROSPER LOANS?

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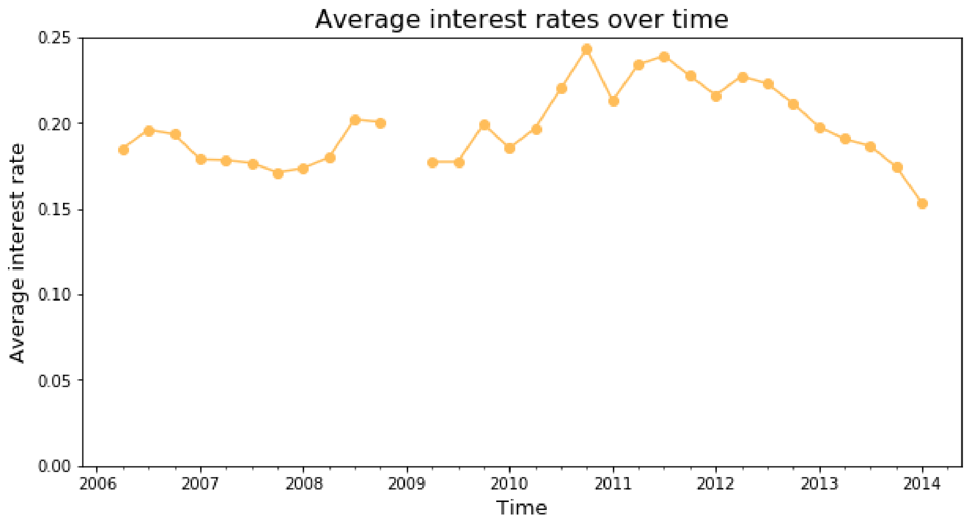
INTRODUCTION

Prosper is a peer to peer lending company that offers personal loans. These loans are unsecured, which means you do not have to put up any collateral (like a house or car) that could get taken away if you can't make payments. Each loan is typically funded by multiple people all over the United States.

In this investigation, I wanted to look at the characteristics of loans granted through the Prosper peer to peer lending company that could be used to predict their interest rates. The main focus was on the credit/risk scores features as these variables are the most important and should be considered by lenders before granting a loan to a particular person.
In addition to that, some other variables such as term, purpose, and income range were used in this particular analysis.
The dataset consisted of over 100 000 of loans with a variety of different attributes. Some of the entries were removed from the given dataset because of quality issues.

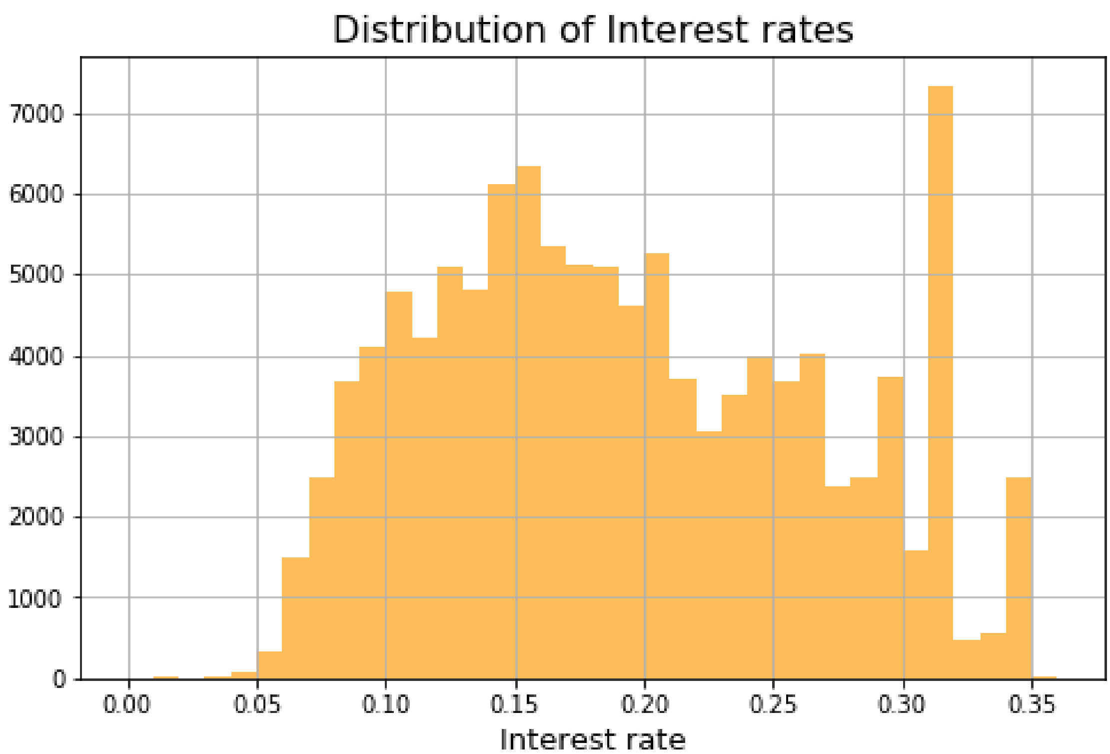
HOW DO AVERAGE INTEREST RATES CHANGE OVER TIME?

Average interest rates are fluctuating over time but not with a large magnitude. There is a consistent increasing trend starting from the Q1 of 2009 right after the so-called "Quiet period" until Q3 of 2010. After that time, we observe mostly downward trend up to 2014 with only minor spikes in the first parts of 2011 and 2012.



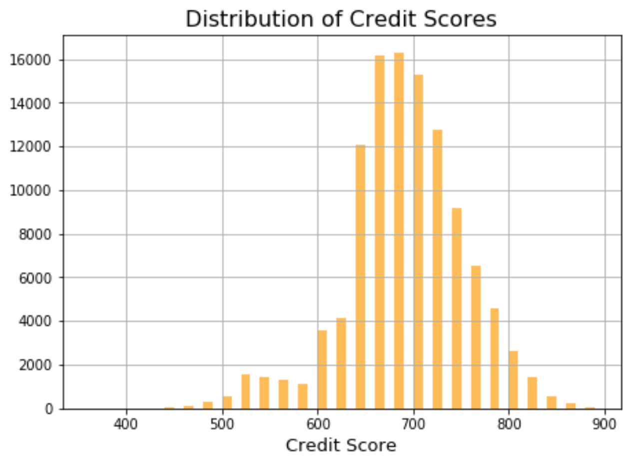
DISTRIBUTION OF INTEREST RATES

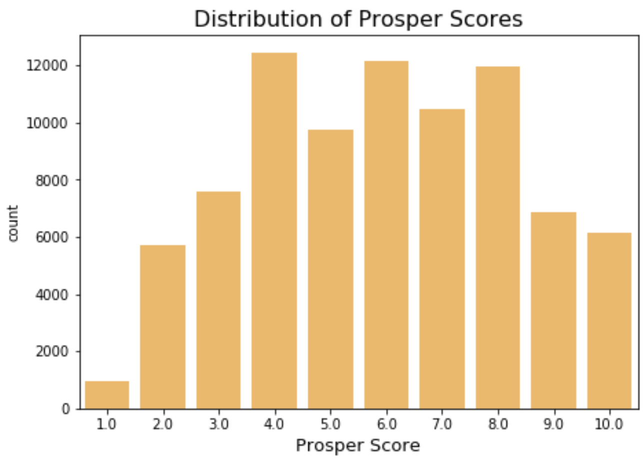
The distribution of interest rates is slightly right-skewed. Some of the loans had extremely low or even zero interest rates. Therefore, after further investigation, I decided to remove these particular rows as only a few of them were valid when the full amount of the loan was granted by a borrower's friend. The interest rate of 31.77% has the highest frequency in the given dataset which is a quite high rate. The majority of the loans granted through the Prosper company have interest rates between 10% and 20%.



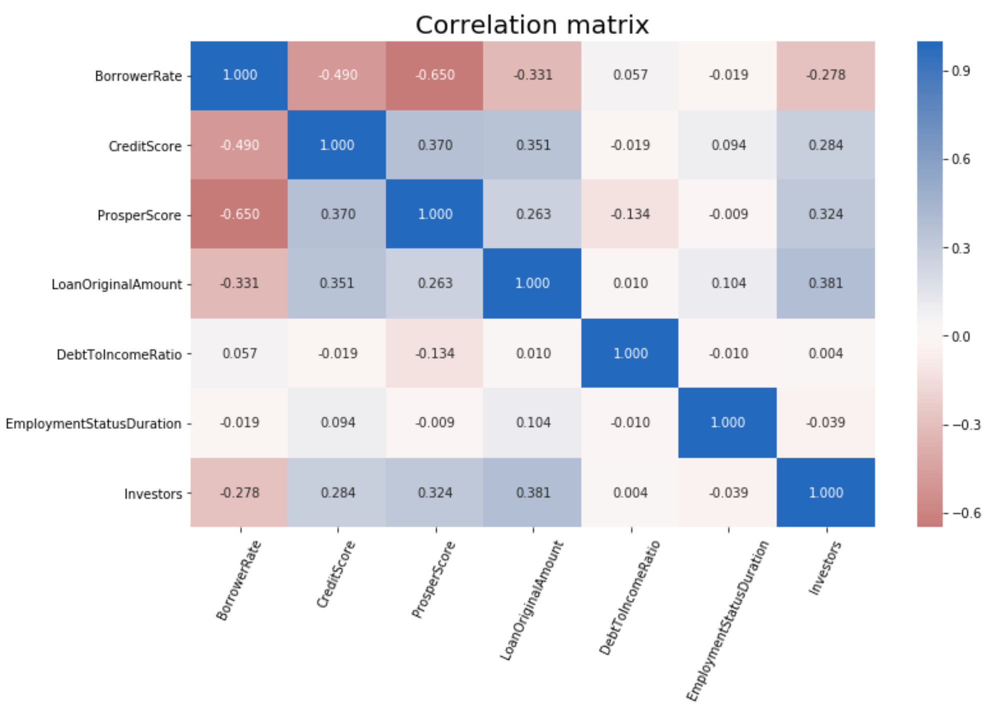
DISTRIBUTIONS OF CREDIT SCORES AND PROSPER SCORES

The distribution of credit scores in this particular dataset follows approximately a normal distribution. There were some rows which had impossibly low values of Credit Score. Therefore, these particular entries were removed from our dataset.
The most of the people have credit scores in range from 650 to 730.
Most of the clients received a Prosper Score of 4,6 or 8.





RELATIONSHIPS BETWEEN INTEREST RATES AND NUMERICAL VARIABLES



	BorrowerRate	CreditScore	ProsperScore	LoanOriginalAmount	DebtToIncomeRatio	EmploymentStatusDuration	Investors
BorrowerRate	1.000	-0.490	-0.650	-0.331	0.057	-0.019	-0.278
CreditScore	-0.490	1.000	0.370	0.351	-0.019	0.094	0.284
ProsperScore	-0.650	0.370	1.000	0.263	-0.134	-0.009	0.324
LoanOriginalAmount	-0.331	0.351	0.263	1.000	0.010	0.104	0.381
DebtToIncomeRatio	0.057	-0.019	-0.134	0.010	1.000	-0.010	0.004
EmploymentStatusDuration	-0.019	0.094	-0.009	0.104	-0.010	1.000	-0.039
Investors	-0.278	0.284	0.324	0.381	0.004	-0.039	1.000

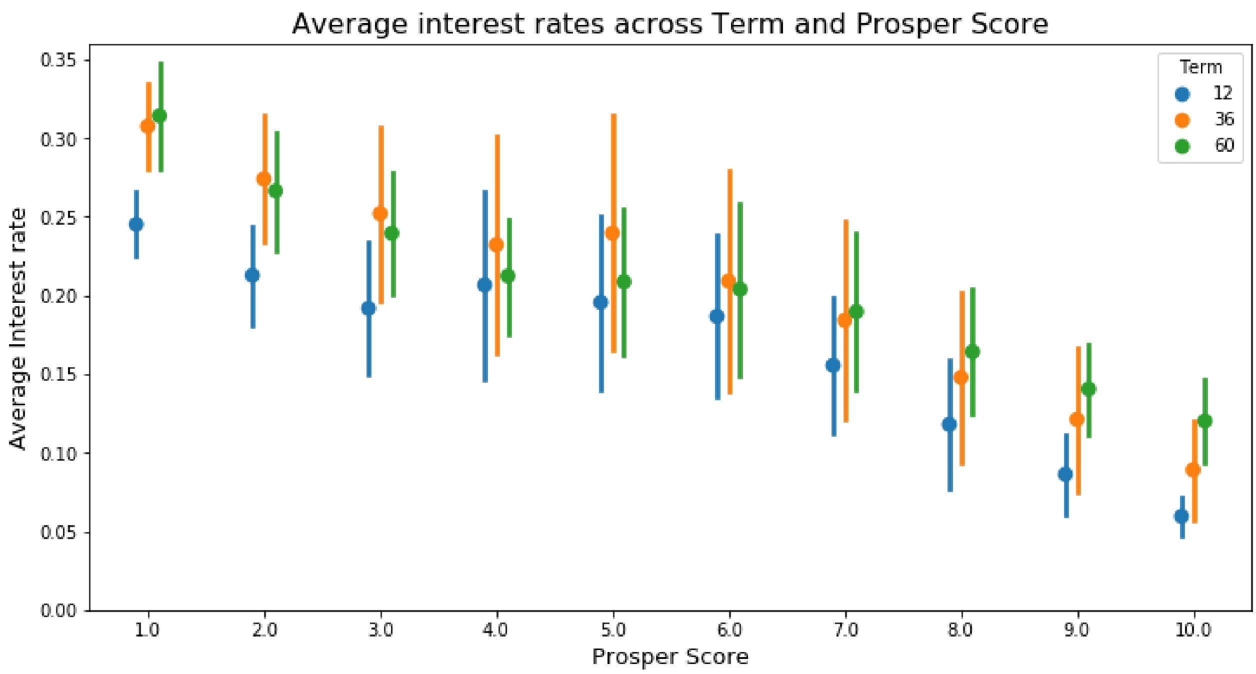
Correlation matrix shows that credit/risk score variables (Credit Score and Proper Score) have the strongest correlation with the variable of interest. Prosper Score has a higher correlation coefficient with interest rate rather than Credit Score because Prosper Scores are developed internally taking into account characteristics of the loan. Contrary, Credit Scores are developed by a third party Consumer Credit Rating Agency and take into consideration only characteristics of the particular individual which allow them to serve as an initial risk score.

INTEREST RATE VS. CREDITSCORE/PROSPER SCORE

The scatterplots below prove these negative correlation coefficients. Therefore, the higher the Credit Score/Prosper Score the lower interest rate will be set for a loan.

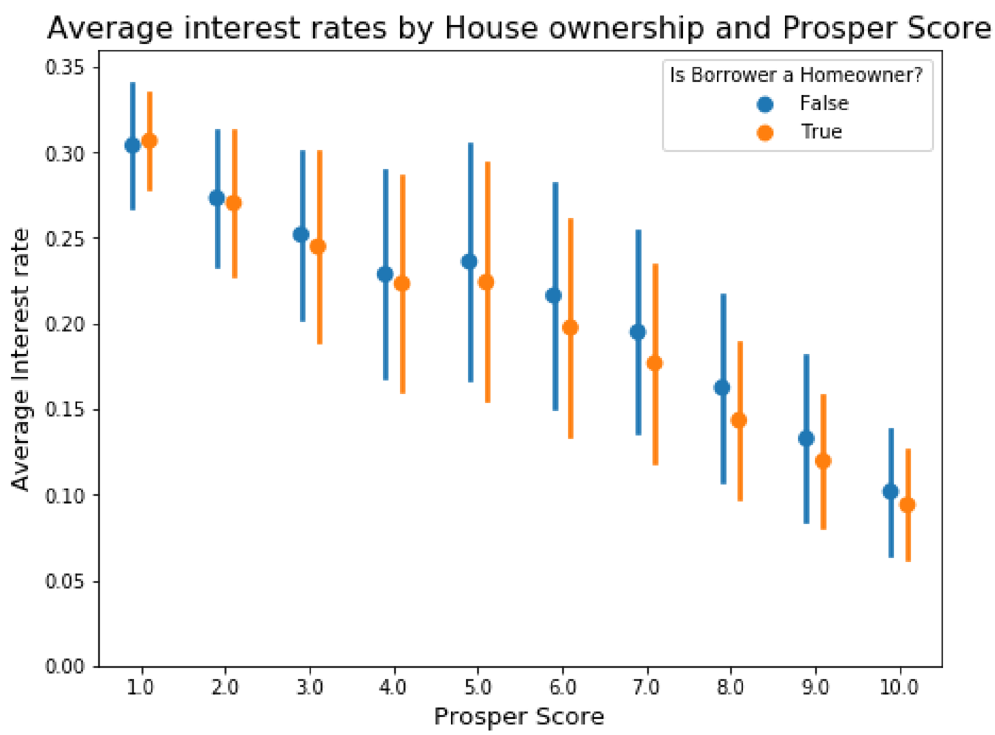
INTEREST RATES BY PROSPER SCORE AND TERM

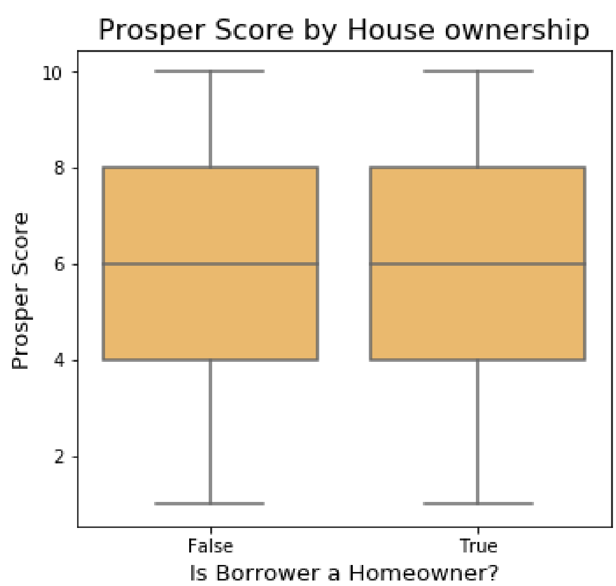
The 1-year loans have the lowest interest rates across all levels of Prosper Score. The 3-years loans tend to have highest interest rates across Prosper Scores in a range of 1 to 6. In the range 6-10 there is an opposite situation, 5 years loans are provided with the highest rates. Overall, the interest rates tend to be higher for the long-term loans as the default risk is increasing within the time.

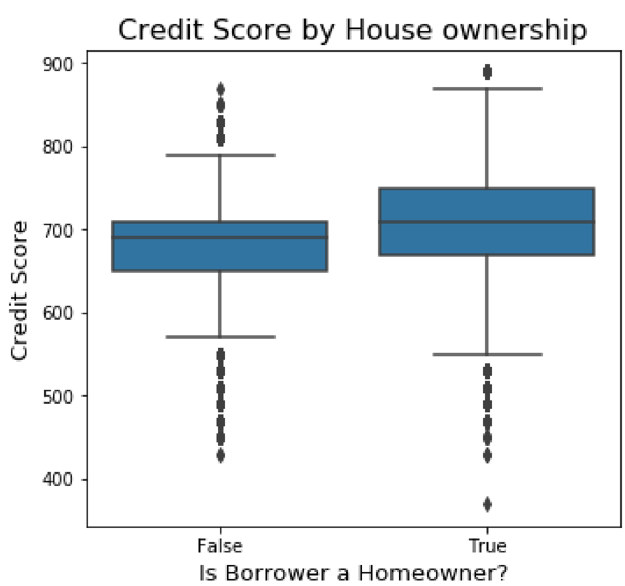


INTEREST RATES BY PROSPER SCORE AND THE FACT OF HOUSE OWNERSHIP

Borrowers who own real estate receive on average slightly lower interest rates comparing to borrowers who don't. However, the Prosper company doesn't take houses as collateral and no difference in Prosper Scores is evidence of that. So, the Prosper Company is indifferent whether a borrower owns a house or not, this feature doesn't affect the risk score developed internally. On the other hand, third party Consumer Credit Rating agencies make their scores by taking into account this feature. That's why we observe the higher Credit Scores for homeowners. Therefore, just slightly lower interest rates for homeowners is partially an effect of the correlation between Credit Scores and Borrower rates.

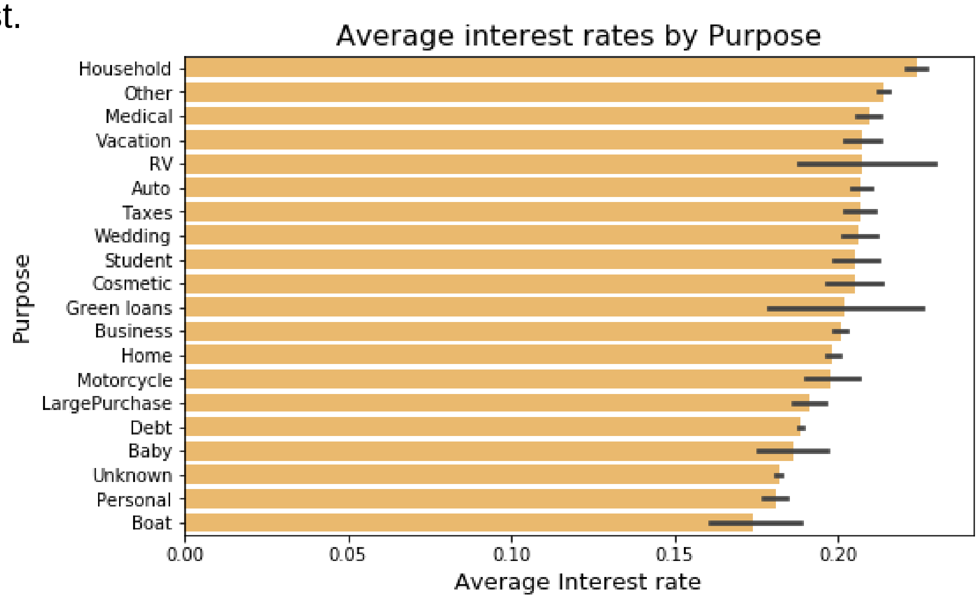






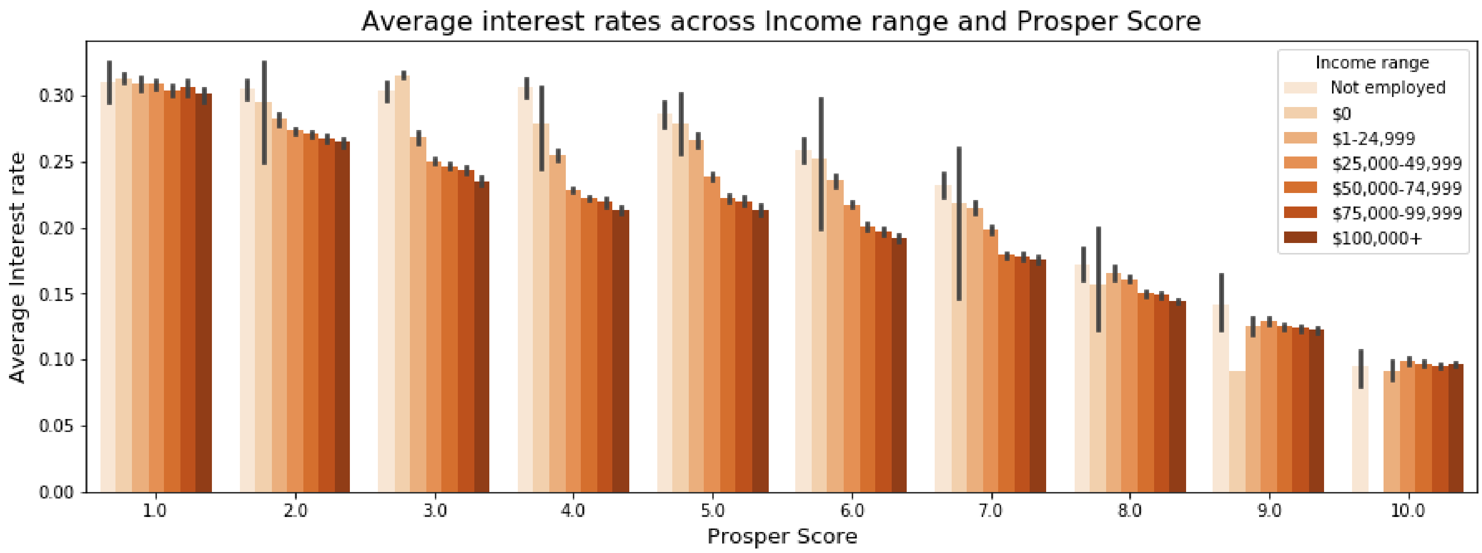
INTEREST RATES BY PURPOSE

Overall, there are no big differences in interest rates across different purposes but still the highest interest rates are set for the loans which are taken for the household expenses. It's due to the fact that these loans have the lowest Prosper Scores.
The lowest rates are set for the purchasing a boat and personal expenses. It's due to the fact that loans taken for a boat have one of the highest Prosper Scores. The loans for personal expenses tend to have low original amounts but a higher number of investors. Therefore, in accordance with these findings, default risks are spread out which makes interest rates one of the lowest.



INTEREST RATES BY INCOME RANGE AND PROSPER SCORE

Average interest rates are lower for individuals with the higher income range and the highest for not employed across all levels of the Prosper Score. However, this difference is negligible in two extreme cases when Prosper Scores are extremely low (min value = 1) or extremely high (max value = 10).



DISTRIBUTION OF LOANS ACROSS AMOUNT, INTEREST RATE AND PROSPER SCORE

Finally, I also checked relationship between loan amounts, Prosper scores and interest rates. It looks like that most of the loans with high ProsperScores and as a result, low-interest rates are for the amounts mostly below 20K dollars.