Analyzing the Relationship Between Personal Finance and Academic Performance

STA304 Written Report
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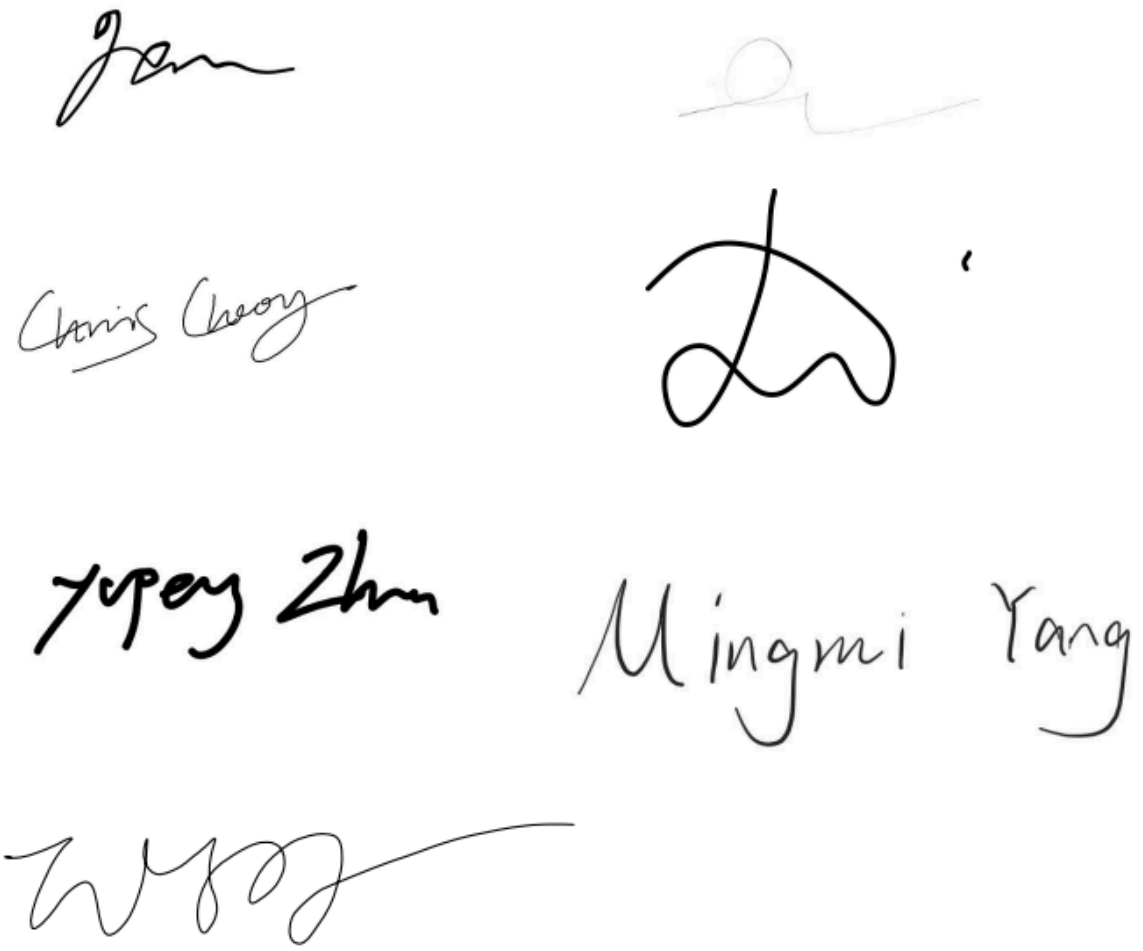
Nov 24, 2023



Introduction

The relationship between student's personal finance and their grades (CGPA) has always been a hot topic in society. With the rising costs of education and living, understanding how financial stress could impact students' academic performance is of paramount importance. This is particularly relevant when financial burdens are increasingly becoming a part of the student experience.

This study investigates the relationship between academic performance and personal finances among students at UTM, enrolled in STA304H5 during Fall 2023. Personal finance, including variables such as income, rent, and tuition, is a critical aspect of student life that can be related to educational outcomes

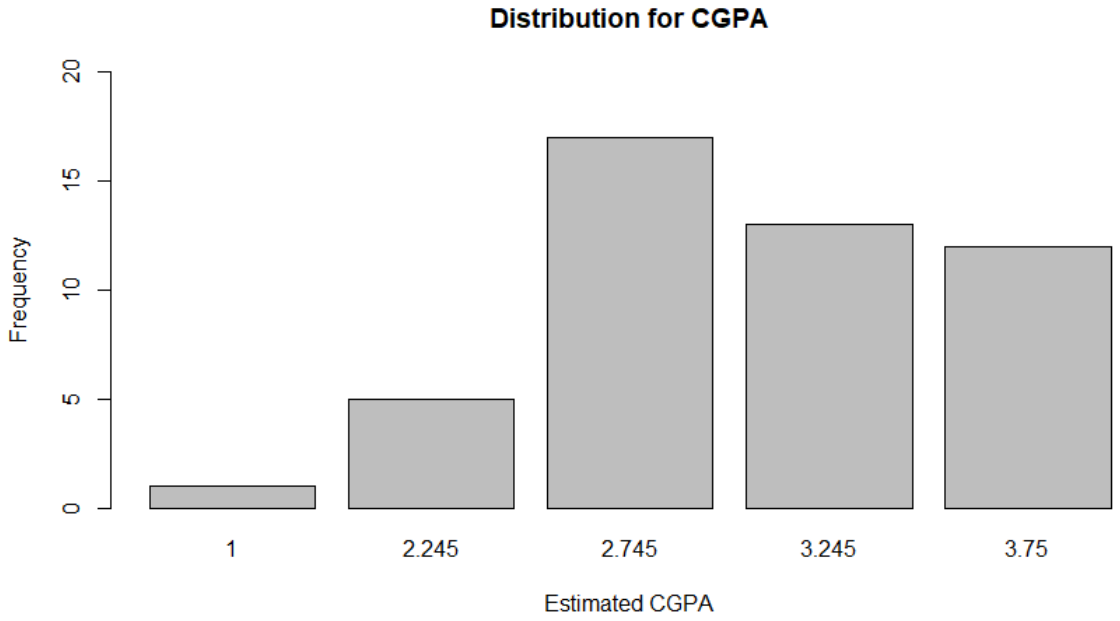
All the data was collected from University of Toronto Mississauga's statistics course STA304. We distributed the questionnaires to students, and separated the sample into two groups: International Students and Domestic Students. All of the surveys were distributed either online through Piazza or in lectures.

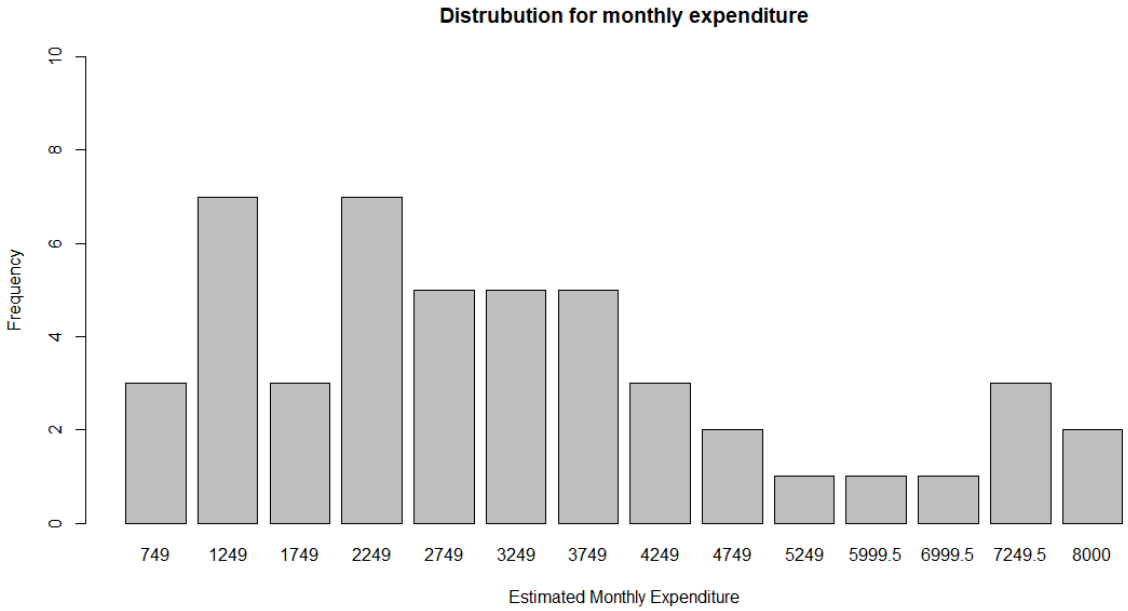
Variables in the Data

- **Gender**: Define the gender of the student, whether they are male, female, non-binary or other.
- **Nationality**: Define if the student is International or Domestic.
- **Program Type**: Determine if the student is enrolled in a Deregulated or Regulated Program, as well as if the student is Full-time or Part-time.
- **Current Course Confidence Level**: See how confident the student is for the course.
- **CGPA**: The current CPGA of the student.
- **Financial Stress**: Determine if the student is suffering from financial stress or not.
- **Source of Financial Stress**: If the student is suffering from financial stress, what is/are the reason(s), such as Tuition or Education expenses, rent or food expenses etc.
- **Source of Income**: How the student gets the income.
- **House Expenditure**: How much the student spends on the rent monthly.
- **Other Expenditure**: How much the student spends other than rent, such as food, transportation or entertainment etc.

Interpretation of our Results

Since our target is to analyze if there is a relation between students' CGPA and their financial situation, we want to prove that students' financial level has no impact on their academic performance. As mentioned before, we have conducted a questionnaire that is targeted to STA304 students but it can be confusing to analyze just from the raw data. Therefore, we transformed our results to be more interpretable.

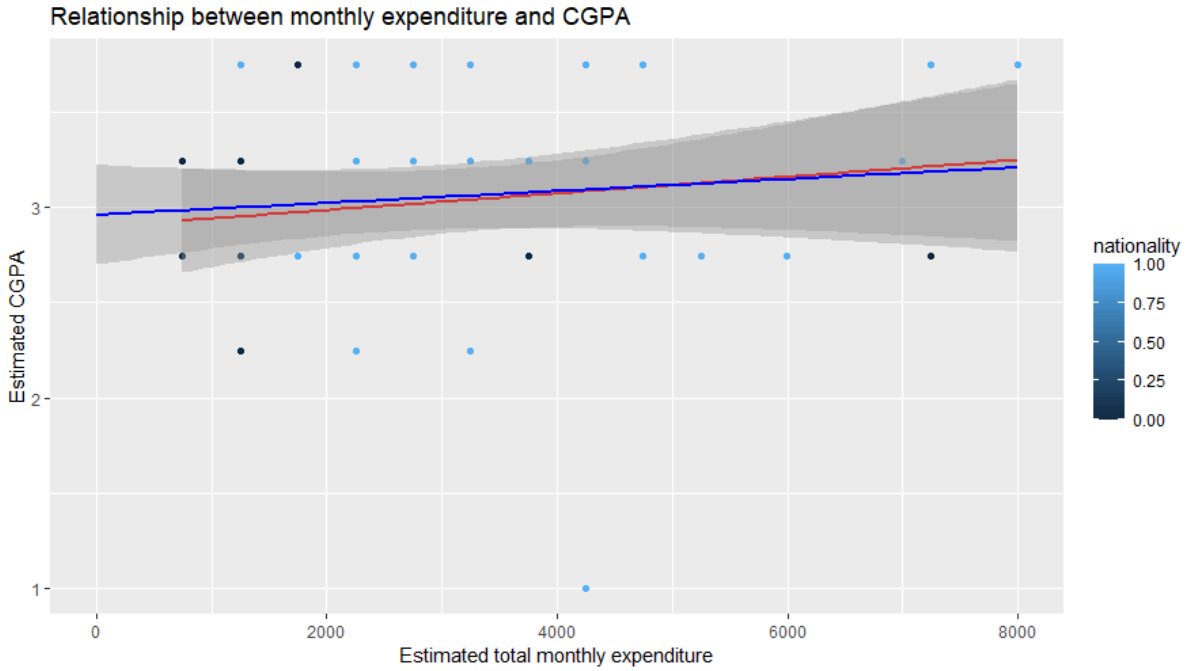




Based on the survey results and the above bar charts, it seems that our initial hypothesis might be true.

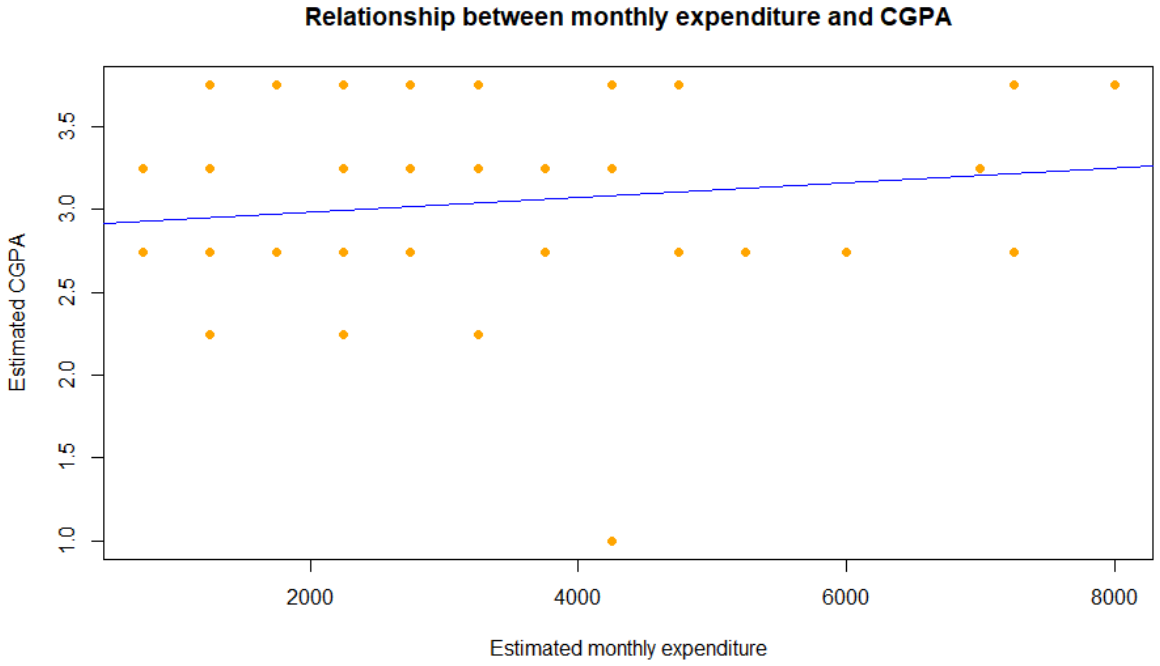
To verify and investigate our results, we used a number of regression models to check if there is a relationship between CGPA and all kinds of financial indicators. We used the numbers from the model and used a statistical method called T-test to verify our assumption. Below is our thought process:

1. Investigate if the relationship between academic performance and personal finances (measured by estimated total monthly expenditure) are different between international and domestic students.



This is a graph plotting the relationship between CGPA and estimated total monthly expenditure for 2 groups: international students and domestic students. The blue line indicates the linear relationship for domestic students and the red line indicates the linear relationship for international students. Here, we can see that the slopes of the blue and red line are approximately equal to each other, which means that there is no difference between the 2 groups under the relationship of interest. Hence, we do not need to do separate analyses for the 2 groups since they have very similar characteristics under the topic of interest.

2. Investigate the relationship between academic performance and personal finances (measured by estimated monthly expenditure excluding tuition fee)



This is a graph plotting the relationship between CGPA and monthly expenditure. From the graph, we can see that the line is almost horizontal, and the slope is close to 0, which means there's almost no linear relationship between monthly expenditure and CGPA.

Advanced Methodology

We conducted three types of advanced methodologies, LASSO Regression, Elastic Net Regression and Chi-Square Test. The objective of using LASSO and Elastic Net Regression is to select the most important variables that influence academic performance. In the end, we found out that there are no such variables. Hence, we can conclude that there is no relationship between the variable studied and academic performance.

The reason why we conduct the Chi-Square Test is to study the relationship between CGPA and other categorical variables that are related to personal finance, such as financial stress level, current course confidence level, and sources of financial stress. The result also shows that there is no relation between CGPA and examined financial attributes.

Conclusion

The goal of this study is to examine the relationship between personal finance and the academic success of the STA304 student population at the UTM. Initially, we hypothesized no relationship between CGPA and all kinds of financial-level indicators, such as monthly expenditure, total expenditure, and tuition.

In the end, through our tests and examinations of the survey results, we are about 95% confident that our initial hypothesis is true and that there indeed is no relationship between a student's personal finance and academic performance.

Limitations

1. Some students do not know about their exact monthly spending. So they give out subjective approximations which can be biased/inaccurate.
2. Personal finance can be a very private term. Although we used a relative euphemistic expression in the questionnaire, people may intentionally make untrue inputs. Additionally, some people may feel this to be offensive and decide not to participate in this questionnaire.
3. In the data we gathered through the questionnaire, we noticed there are some outliers. Although there's only a few, the existence of outliers indeed influenced our data analysis. Our sample statistics and regression analysis might be different without outliers.
4. A selection bias might exist due to the way we sample the data. Our questionnaire was distributed through piazza and lecture, and the population for this survey is students who take STA304 in University of Toronto Mississauga in the 2023 Fall term, which is a representation of a relatively smaller group of students in the same major, it has limitations on representing the general public.

Appendix

```
#Make a scatterplot on the relation between CGPA and monthly expenditure.
plot(STA304_output_final_$monthly_expenditure, STA304_output_final_$cgpa, xlab =
"Estimated monthly expenditure", ylab = "Estimated CGPA", col = "orange", main =
"Relationship between monthly expenditure and CGPA", pch = 19)

#Make a regression line; regress CGPA on monthly expenditure
abline(lm(STA304_output_final_$cgpa ~ STA304_output_final_$monthly_expenditure), col
= "blue")

#Draw a barplot about the distribution of monthly expenditure
barplot(table(STA304_outputfinal$monthly_expenditure), ylim = c(0,10),
      xlab = "Monthly Expenditure", ylab = "Frequency", main = "Distrubution for monthly
expenditure")

#Draw a barplot about the distribution of CGPA
barplot(table(STA304_outputfinal$cgpa), ylim = c(0,20), xlab = "CGPA",
      ylab = "Frequency", main = "Distribution for CGPA")

#Draw Plot to see if relationship between academic performance and personal finances for
international students and domestic students are different
```

```
ggplot(STA304_output_final_, aes(x = monthly_expenditure, y = cgpa)) + labs(x =
"Estimated total monthly expenditure", y = "Estimated CGPA", title = "Relationship between
monthly expenditure and CGPA") + geom_point(aes(color = nationality)) +
geom_smooth(method = "lm", col = "red") + geom_smooth(aes(x =
monthly_expenditure*nationality, y = cgpa), method = "lm", col = "blue")
```