Analyzing the Relationship Between Personal Finance and Academic Performance

STA304 Written Report
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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.

Distribution for CGPA

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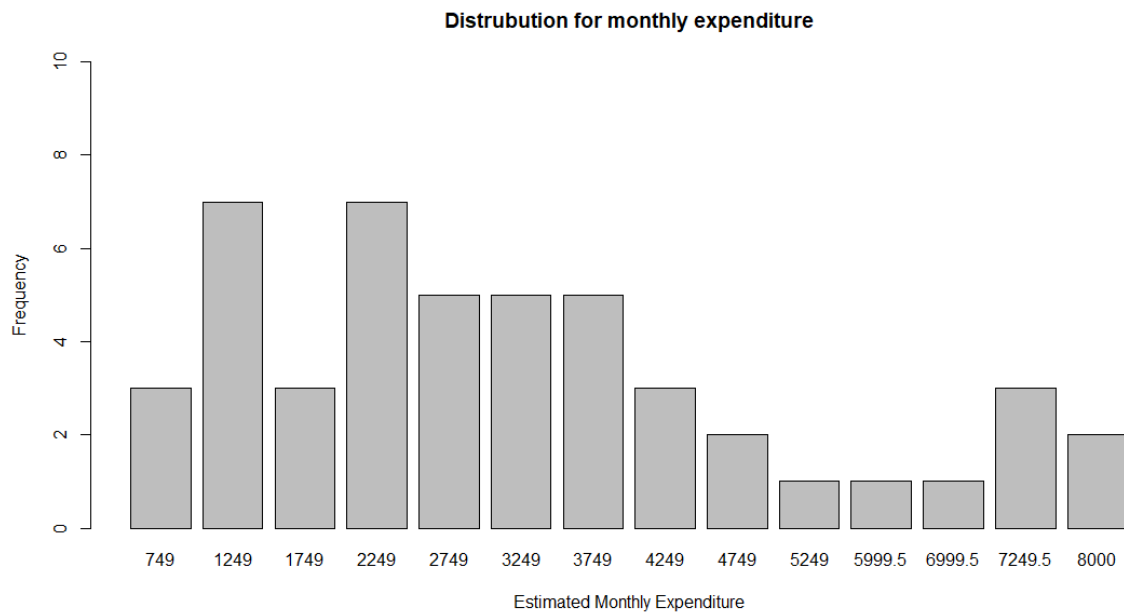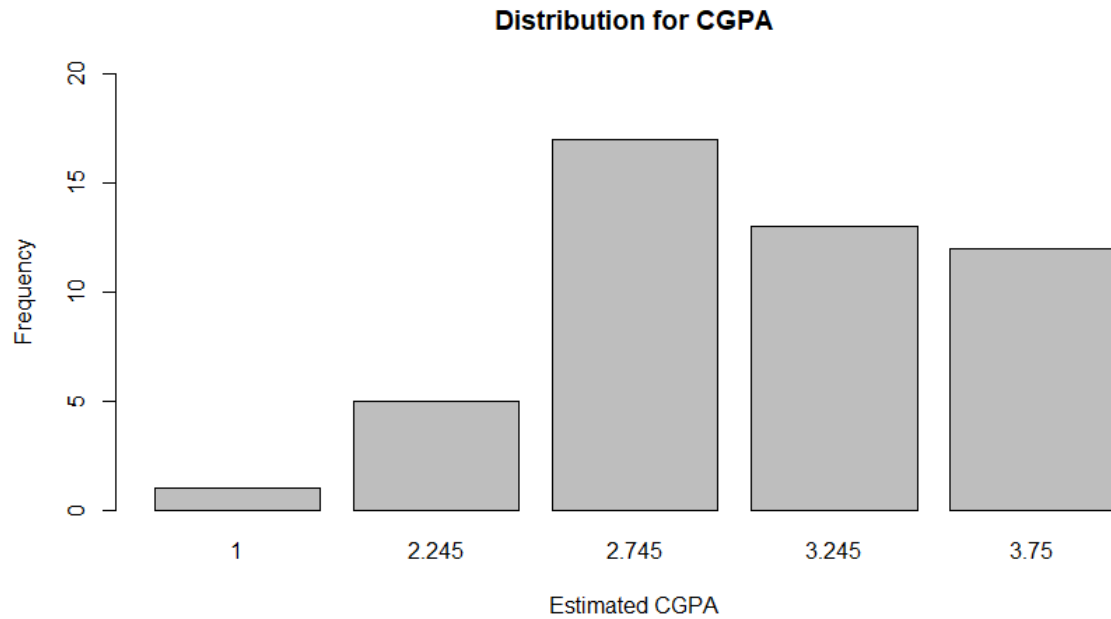
Based on the survey results and the above bar charts, it seems that our initial hypothesis might be true.

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.
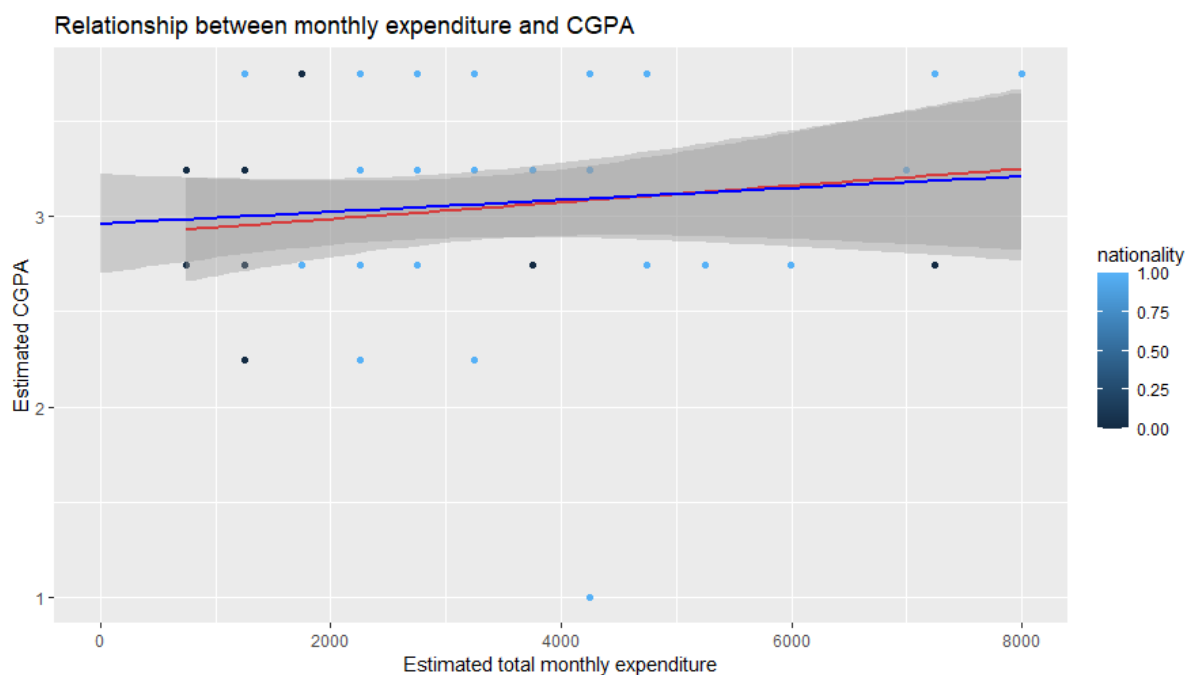
This is a graph plotting the relationship between CGPA and estimated total monthly expenditure for 2 groups: international students and domestic students. The blue line indicates the linear relationship for domestic students and the red line indicates the linear relationship for international students. 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)

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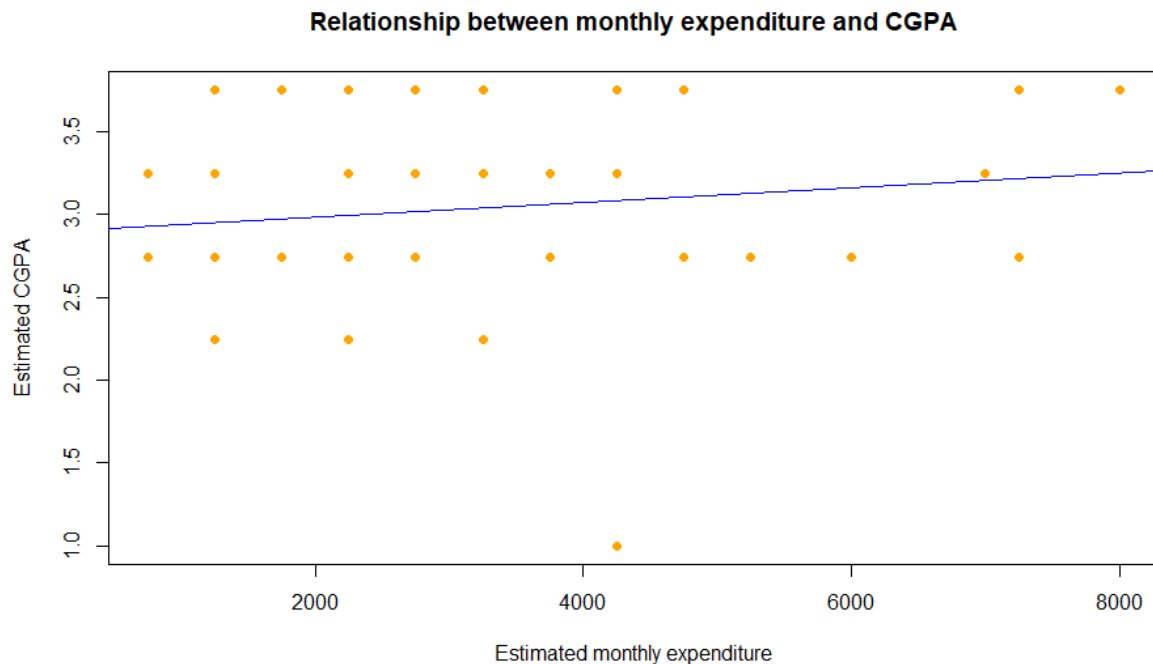
This is a graph plotting the relationship between CGPA and monthly expenditure. From the graph, we can see that the line is almost horizontal, and the slope is close to 0, which means there's almost no linear relationship between monthly expenditure and CGPA.

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")
```

STA304 Questionnaire

We appreciate you taking the time to complete our survey. Your responses are anonymous, and your personal information is kept entirely confidential. Please be honest when responding to the questions. It will take you around 5 minutes to complete the survey. You are not required to participate in the survey and may leave at any time if you so want. Thank you once again for your participation.

* Indicates required question

What is your gender? *

○ Male

○ Female

○ Non-Binary

○ Other:

Are you an International or Domestic student? *

○ International Student

○ Domestic Student

Pre-fill responses, then click "Get link"

Which **category** of student do you belong to? *

Students enrolled in a **deregulated** program (e.g. Commerce Specialist, CCIT, CS Specialist/Major, etc.) are charge with a flat program fee if enrolled in 3.0 credits or more in Fall/Winter session, and per course fee if enrolled in 2.5 credits or less.

Students enrolled in a **regulated** program are charged per course fee regardless of the number of credits enrolled.

You may also refer to the following **List of Programs** to check if your program is regulated or deregulated.

○ Deregulated, and Full-Time Student

○ Deregulated, and Part-Time Student

○ Regulated, and Full-Time Student

○ Regulated, and Part-Time Student

How **confident** do you feel about your current courses? *

	1	2	3	4	5	
Not Confident	○	○	○	○	○	Very Confident

What is your **current** Cumulative Grade Point Average (CGPA)? *

○ less than 2.0

○ 2.0 - 2.49

○ 2.5 - 2.99

○ 3.0 - 3.49

○ 3.5 - 4.0

Pre-fill responses, then click "Get link"

Have you ever experienced/been experiencing financial stress **in your undergraduate degree**?   *

○ Yes

○ No

What are your **sources** of financial stress? (select all that apply) *

☐ Tuition/Education Expenses

☐ Rent

☐ Food

☐ Transportation

☐ Medical Expenses

☐ Sustainability/Stability of Income Sources

☐ I am not experiencing financial stress

☐ Other:

What are your **major sources** of income? *

☐ Family Support

☐ Part-Time/Full-Time Job

☐ Scholarships

☐ Loans/Lines of Credit (e.g. OSAP, bank loans, etc.)

☐ Savings/Investments

Pre-fill responses, then click "Get link"

How much does your living space cost per month? *

○ 0 - 499

○ 500 - 999

○ 1000 -1499

○ 1500 - 1999

○ 2000 - 2499

○ 2500 - 2999

○ 3000 or higher

○ Other:

What is your **monthly expenditure**? (excluding rent) *

○ less than 1000

○ 1000 - 1999

○ 2000 - 2999

○ 3000 - 3999

○ 4000 or higher

Get link

Never submit passwords through Google Forms.

Google Forms

Pre-fill responses, then click "Get link"