Department of Statistics

University of Sri Jayewardenepura

Research Report

Association Between Financial Status and Academic Performance Among Third Year Students in the Faculty of Applied Sciences at the University of Sri Jayewardenepura

STA 330 2.0 Data Analysis and Preparation of Reports
Group Assignment
Group 02
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1. Introduction

1.1 Background of study

Academic performance, often measured by Grade Point Average (GPA), is a critical indicator of a student's success at the university level. Maintaining a high GPA is essential for students as it influences future academic and career opportunities. However, academic performance is shaped by a range of factors, including internal factors such as motivation, time management, and mental health, as well as external factors like financial background, family support, and environmental conditions. Among these, financial challenges are often a significant concern for university students, potentially affecting their ability to perform well academically.

Financial difficulties can introduce additional stress, limit access to necessary academic resources, and reduce the time available for studying, especially for students who take on part-time employment to manage their expenses. Balancing work and academic responsibilities can be challenging, often leading to reduced study time and lower academic performance.

This study aims to explore the association between financial background and academic performance among third-year students in the Faculty of Applied Sciences at the University of Sri Jayewardenepura. Specifically, it seeks to examine how financial factors such as family income, financial aid, and part-time employment influence students' GPA.

1.2 Objectives of the Study

- To examine the relationship between financial background and academic performance (GPA) using a regression model with predictors such as family income, financial aid, and part-time work.
- To identify the factors influencing individuals' decisions to engage in part-time employment.

1.3 Variables

A structured questionnaire was administered to third-year undergraduates of the Faculty of Applied Sciences, yielding 62 valid responses. The study employs 20 predictor variables to investigate the determinants of part-time employment. A comprehensive description of these variables is provided below.

Table 1: Description of variables

Type	Variable	Description
Quantitative	GPA	Current overall GPA
	StudyWeek	Hours studying on weekdays
	StudyWeekend	Hours studying on weekends
	Retakes	Number of courses retaken
	Rent	Monthly rent for a student in rupees
	Expenses	Monthly personal expenses of a student in rupees
	FamilyCover	Percentage of Amount of student expenses covered by family
	Siblings	Number of siblings financially supported by the family

	WorkHours	Part-time work hours per week
	Earnings	Monthly earnings from part-time job in rupees
Qualitative	Gender	Gender of a student (Male, Female)
	Residence	Current residential status (Boarding room, Hostel, Home)
	Attendance	Lecture attendance percentage (0%-20%, 20%-40%, 40%-60%, 60%-80%, 80%-100%)
	Satisfaction	Satisfaction with academic performance (Very Dissatisfied, Dissatisfied, Neutral, Satisfied, Very Satisfied)
	Income	Students' family monthly income (Less than LKR 50,000, LKR 50,000 - LKR 100,000, More than LKR 100,000)
	Aid	Receiving financial aid/scholarships (Yes, No)
	Worry	Frequency of worrying about expenses (Never, Rarely, Sometimes, Often)
	FinImpact	Agreement on financial issues affecting academic focus (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)
	JobDistraction	Agreement on part-time job distracting studies (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree)
	PartTime	Currently doing a part-time job (Yes, No)

1.4 Scope and limitations

1.4.1 Scope

This study investigates the relationship between financial background and academic performance, specifically focusing on students' Grade Point Average (GPA) and their working hours dedicated to study, among third-year students in the Faculty of Applied Sciences at the University of Sri Jayewardenepura. The primary objective is to understand how financial factors, such as family income, financial aid, and part-time employment, influence the number of hours students can allocate for studying and their academic performance. Data was collected through a structured questionnaire that includes questions about financial background and academic status. Regression analysis was applied to explore the influence of these financial factors on GPA.

1.4.2 Limitations

One of the primary limitations of this study is the relatively small sample size, consisting of only 62 respondents. Furthermore, the research is limited to third-year students from the Faculty of Applied Sciences at the University of Sri Jayewardenepura. As a result, the findings may lack generalizability to students from other faculties, academic years, or institutions. Consequently, the results may not fully capture the broader experiences and perspectives of the wider undergraduate population.

Another limitation is that the study relies on self-reported data. Since students are asked to fill out a questionnaire, there's a chance they may not accurately report their financial status, study habits, or work hours. Students might exaggerate or downplay certain aspects of their situation, which can introduce bias into the results. This means the findings might not entirely reflect the reality of the students' financial background or study behaviors.

Additionally, the study is constrained by time limitations. The data is collected within a single academic term, so it only captures a snapshot of students' financial situations and academic performance over a short period. This makes it difficult to observe long-term trends or changes that may occur throughout the academic year, and it may not account for any seasonal variations in students' financial situations or academic pressures.

The study also doesn't consider other important factors that might affect academic performance and study hours. For example, mental health, personal motivation, and social support could all play a significant role in how well students perform academically. However, these factors are not included in this research, which means the study may overlook some other important influences.

1.5 Significance of the study

The significance of this study lies in its potential to deepen the understanding of how financial background influences the academic performance of university students, particularly in the context of the Faculty of Applied Sciences at the University of Sri Jayewardenepura. By exploring the relationship between factors such as family income, financial aid, and part-time employment, this study aims to provide insights that could inform educational policies and support mechanisms designed to help students from financially disadvantaged backgrounds.

- This research will offer valuable insights into how financial constraints impact students' Grade Point Average (GPA), which is a key indicator of academic success. Given the pressure that financial instability can place on students, this study may help identify specific areas where financial background can hinder academic performance, enabling universities to better understand the challenges faced by their students.

- The findings from this study will provide evidence that can be used by policymakers to improve financial aid programs and scholarship opportunities. If the research shows that financial aid positively influences academic performance, it could help strengthen the case for expanding these programs or improving their accessibility for students in need.

- With many students turning to part-time jobs to cover their expenses, this study will shed light on the relationship between the number of working hours and academic performance. Understanding this relationship is important for academic institutions, as it could lead to recommendations on how students can better balance their work and study commitments.

- By exploring the role of financial aid and scholarships, the study could contribute to enhancing student support services. If financial support is found to mitigate the negative effects of financial constraints, universities may prioritize expanding these services, ensuring that students are not forced to choose between financial stability and academic success. This could lead to the development of more comprehensive support structures that provide not only financial assistance but also academic guidance.

- The findings of this study will add to the growing body of literature on the intersection of socioeconomic factors and academic performance. By focusing on undergraduate students

in a specific region and faculty, the study will provide a unique perspective that can be compared with studies conducted in different contexts.

1.6 Literature review

The relationship between financial background and academic performance has been a prominent focus in educational research, with numerous studies highlighting how socioeconomic factors influence student outcomes. This literature review explores existing research on how financial circumstances shape academic outcomes, focusing on three key areas:

1. Financial Background and Academic Performance: Examining how factors such as family income, parental education, and employment status influence students' grades and academic engagement.
2. Financial Aid and Scholarships
3. Re-sit Exams and Financial Constraints

1.6.1 Financial Background and Academic Performance

The relationship between financial background and academic performance has been extensively studied, with research highlighting that students from financially disadvantaged backgrounds face significant educational challenges. Financial stability affects access to educational resources, stress levels, and the ability to focus on studies, all of which impact academic performance (Tinto, 2012). Socioeconomic disparities are linked to differences in GPA, course completion rates, and the likelihood of re-sitting exams due to poor academic outcomes (York et al., 2015).

Financial background is often assessed through indicators such as family income, parental education, financial aid, and employment status. Several studies have established a strong link between financial stability and student performance. For instance, Kim and Sin (2018) found that students from lower-income backgrounds reported higher stress levels and lower GPAs due to limited access to study materials and technological resources. Similarly, Berg et al. (2020) observed that students from wealthier backgrounds had better academic outcomes, benefiting from financial security, private tutoring, and a stable study environment.

A study by Shahiri and Osman (2015) analyzed the correlation between socioeconomic status and GPA among university students, concluding that family income was a significant predictor of academic success. Additionally, Walpole (2003) found that students from low-income families were more likely to work part-time, which reduced their available study time and negatively impacted academic engagement. In a survey of 5,000 undergraduates, Walpole noted that students working over 20 hours per week experienced a 15% drop in their average GPA.

1.6.2 The Role of Financial Aid and Scholarships

Given the challenges posed by financial instability, financial aid and scholarships play a crucial role in mitigating these effects. Bettinger (2004) found that students receiving need-based financial aid performed better academically and had 20% higher retention and graduation rates than those

without such support. Similarly, Alon (2007) emphasized that the effectiveness of financial aid depends on its sufficiency to cover students' living and educational expenses.

Moreover, financial support reduces students' reliance on part-time employment, allowing them to focus on their studies. Hossler et al. (2009) found that students receiving scholarships were 30% less likely to engage in part-time work compared to their peers without aid. This aligns with findings by Deming and Dynarski (2009), who suggested that financial assistance reduces dropout rates by 25% and improves long-term academic performance.

Despite the benefits of financial aid, gaps remain in its accessibility. Callender and Jackson (2005) reported that 40% of low-income students felt their financial aid was insufficient to meet living expenses, forcing them to work while studying and compromising their academic outcomes.

1.6.3 Re-sit Exams and Financial Constraints

The need to re-sit exams is often associated with financial difficulties, as students facing economic hardships may struggle to afford tuition fees and academic resources. To cover living costs, many students take up part-time jobs, reducing their study time and increasing their risk of academic failure (Hossler et al., 2009). Evans and Schamberg (2009) found that chronic financial stress negatively affects cognitive performance, leading to lower exam scores and a higher likelihood of failing courses. Additionally, Callender and Wilkinson (2013) found that students from low-income families were twice as likely to experience academic delays and re-sit exams due to financial and psychological stress. These students often lacked access to academic support services, such as tutoring and counseling, further exacerbating their struggles.

In a university-wide survey, Callender and Wilkinson (2013) reported that 55% of students from low-income families had re-sat at least one exam during their undergraduate studies, compared to only 20% of students from wealthier backgrounds. The same study highlighted that student who received emergency financial aid reduced their risk of re-sitting by 30%, emphasizing the importance of targeted support programs.

Existing literature strongly supports the notion that financial background plays a significant role in shaping academic performance. Students from wealthier backgrounds generally have better access to resources, lower stress levels, and higher academic achievements. Conversely, financial difficulties can lead to increased stress, reduced study time, and a higher likelihood of failing courses and needing to re-sit exams. Financial aid and scholarships are critical in addressing these disparities, but their effectiveness depends on accessibility and adequacy in covering students' educational needs.

2 Methodology

2.1 Data Collection

Primary data for this study were collected through a structured questionnaire designed to gather information on students' financial backgrounds and academic performance. The target population consisted of all third-year undergraduate students in the Faculty of Applied Sciences at the University of Sri Jayewardenepura.

The questionnaire was administered via a Google Form and distributed through the official WhatsApp group of third-year students to ensure broad reach and engagement. The form could be accessed through the following link: https://forms.gle/yZZN3jSGDqNv3myQ8

A total of 62 valid responses were received and used for analysis. Participation was entirely voluntary, and respondents were clearly informed about the objectives of the study. All collected data were kept strictly confidential and used solely for academic research purposes.

2.2 Data Cleaning and Descriptive Analysis

Once the data were collected, a thorough data cleaning process was conducted. For qualitative variables, one-way frequency tables were used to detect and address inconsistencies. For quantitative variables, box plots were employed to identify potential univariate outliers, while scatterplots were used to detect two-dimensional outliers. Additionally, standardized z-scores were computed to flag extreme values, with those exceeding ±3 considered potential outliers.

Following data cleaning, descriptive analyses were performed. The composition of the sample was examined using pie charts, bar charts, and one-way frequency tables for qualitative variables. For quantitative variables, dot plots and histograms were used to visualize the distribution of responses. Measures of central tendency were selected based on the shape of the distribution: the mean for symmetric distributions and the median for skewed distributions.

Furthermore, dot plots were constructed for each level of qualitative variables to describe the distribution of associated quantitative variables, accompanied by relevant summary statistics. To assess the relationship between two quantitative variables, scatterplots were drawn, and the Pearson correlation coefficient was calculated.

2.3 Analysis of Relationship Between Financial Background and Academic Performance (GPA)

The primary objective of this study was to examine the relationship between financial background related predictor variables and academic performance, measured by GPA.

Initially, bivariate associations between each predictor variable and GPA were explored:

For quantitative predictor variables, scatterplots were used to assess linearity and detect bivariate outliers. If the relationship appeared linear and no influential outliers were present, the Pearson correlation coefficient was used to quantify the strength of the association. If a nonlinear pattern

was observed, a suitable nonlinear regression model was fitted, and the coefficient of determination (R^2) was calculated to evaluate model fit. For qualitative variables with two levels, the association with GPA was tested using the independent two-sample *t*-test, provided that both populations were approximately normally distributed. If the normality assumption was violated for at least one group, the non-parametric Mann–Whitney *U* test was used instead.

For qualitative variables with more than two levels, one-way ANOVA was used to assess the association with GPA under the assumptions of normality, equal variances, and independence. When any of these assumptions were violated, the Kruskal–Walli's test was applied as a non-parametric alternative.

After the bivariate analysis, a regression model was fitted to examine the joint effect of the financial background–related predictor variables on GPA.

2.4 Analysis of Factors Influencing Part-Time Employment

A secondary objective of the study was to identify factors associated with students' engagement in part-time employment, a binary qualitative variable.

For associations between qualitative predictor variables and part-time employment, the Chi-square test of independence was used. For quantitative predictor variables, the independent two-sample *t*-test was used if both groups (engaged and not engaged in part-time work) followed approximately normal distributions. When the assumption of normality was not met in either group, the Mann–Whitney *U* test was employed.

All exploratory and inferential analyses were conducted using Minitab software, with a significance level of 0.05 maintained throughout the study.

3 Data Analysis

3.1 Composition of the sample

3.1.1 Composition of the sample with respect to the Gender

Table 2: One-way frequency Table for Gender

Gender	Count	Percent
Female	29	46.77
Male	33	53.23
N=	62	

According to table 2, the gender distribution in the study is relatively balanced, with males slightly higher at 53.23% compared to females at 46.77%, from a total of 62 participants.

3.1.2 Composition of the sample with respect to the Residence

Table 3: One-way frequency Table for Residence

Residence	Count	Percent
Boarding room	38	61.29
Home	21	33.87
Hostel	3	4.84
N=	62	

According to table 3, the majority of students reside in a Boarding room (61.29%), followed by Home at 33.87% and Hostel at only 4.84%, indicating that boarding accommodations are most common among participants.

3.1.3 Composition of the sample with respect to the Satisfaction

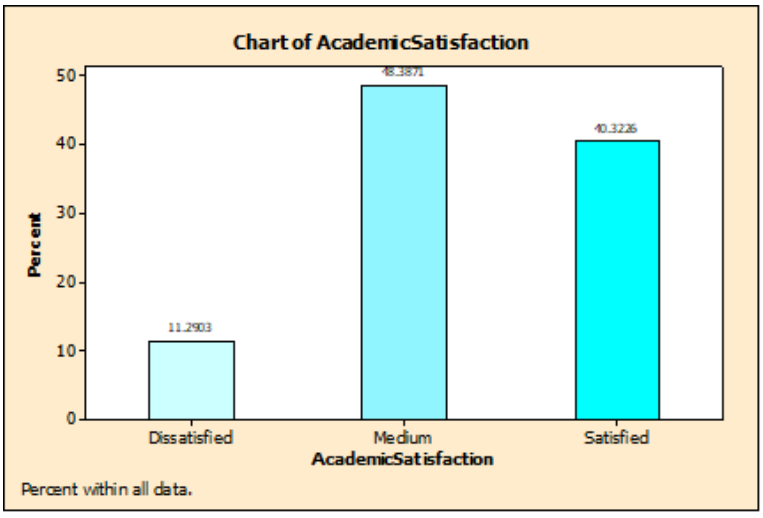

Figure 1: Bar graph of Academic Satisfaction of Students

Figure 1 illustrates that nearly half of the students reported medium academic satisfaction, while about 40% expressed high satisfaction. Only around 11% were dissatisfied, suggesting generally positive academic contentment among participants.

3.1.4 Composition of the sample with respect to the Income

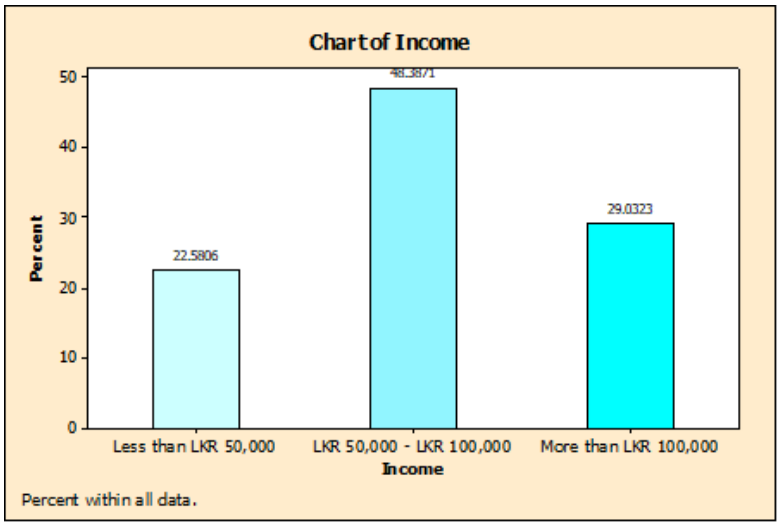

Figure 2: Bar graph for Income

The income distribution (Figure 2) shows a predominant middle-income group, followed by a substantial portion from high-income families, while about one-fifth of students come from lower-income backgrounds, suggesting diverse economic backgrounds among the student population.

3.1.5 Composition of the Sample with respect to Part Time

Table 4: One-way frequency Table for Part Time

PartTime	Count	Percent
No	38	61.29
yes	24	38.71
N=	62	

Table 4 indicates that roughly two-thirds of respondents are not part-time workers, whereas about one-third engage in part-time work, suggesting varied employment statuses in the sample.

3.1.6 Composition of the sample with respect to Worry About Expenses

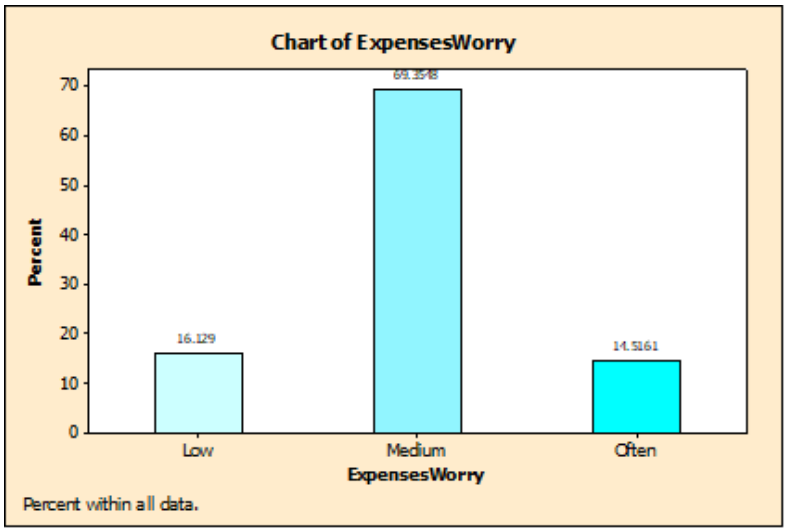

Figure 3: Bar graph for Expenses worry of Students

According to figure 3, seven out of ten respondents report medium-level expense concerns, while the remaining third is almost evenly split between low and often worry levels.

3.1.7 Composition of the Sample with respect to Financial Impact

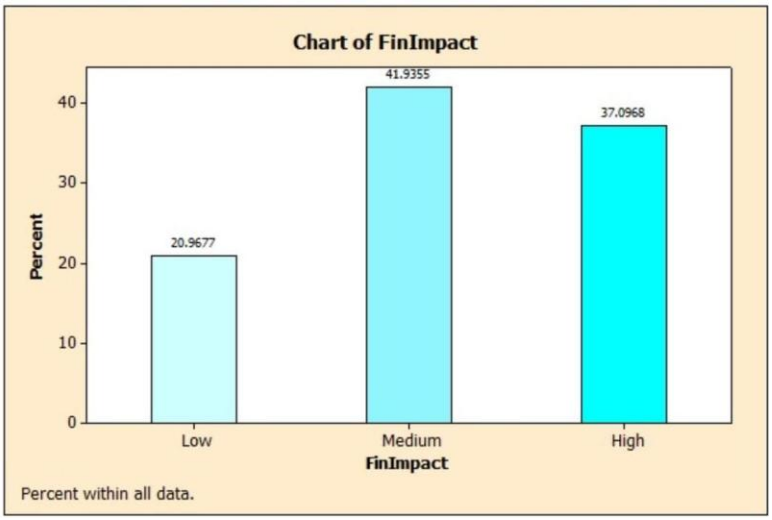

Figure 4: Bar graph for affecting Financial Issues on Focus of Students

According to figure 4, about two-fifths of them say the financial impact on academics is not considerable, while slightly more than one-third report a high impact, and one-fifth say the impact is low.

3.1.8 Composition of the Sample by Gender and Part Time

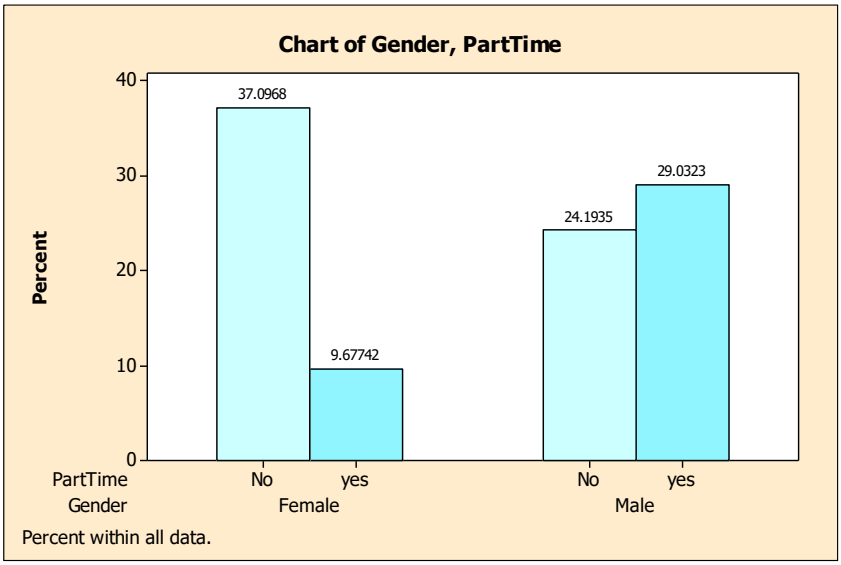

Figure 5: Cluster Bar graph for Gender and Parttime Status of Students

According to figure 5, more female students do not work part-time, while more male students do. 37.1% of females are not part-time, whereas 29% of males are part-time workers among all students.

3.1.9 Composition of the Sample by Residence and Part Time

Table 5: cross tabulation for Residence and Part Time

Rows: PartTime Columns: Residence

	Boarding room	Home	Hostel	All
No	22	15	1	38
	57.89	39.47	2.63	100.00
yes	16	6	2	24
	66.67	25.00	8.33	100.00
All	38	21	3	62
	61.29	33.87	4.84	100.00

Cell Contents
Count
% of Row

According to table 5, more students from homes do not work part-time. Hostel residents have the highest part-time rate (66.7%), while home students have the lowest (28.6%) part-time participation among all groups.

3.1.10 Composition of the Sample by Attendance and Part Time

Table 6: Cross tabulation for Attendance and Part Time

Rows: PartTime Columns: Attendance

	Low	Medium	High	All
No	16	10	12	38
	42.11	26.32	31.58	100.00
yes	16	2	6	24
	66.67	8.33	25.00	100.00
All	32	12	18	62
	51.61	19.35	29.03	100.00

Cell Contents
Count
% of Row

According to table 6, students who do not work part-time have higher attendance overall. Part-time students show a higher rate of low attendance (66.7%) and a very low rate of medium attendance (8.3%).

3.1.11 Composition of the Sample by Academic Satisfaction and Financial Impact

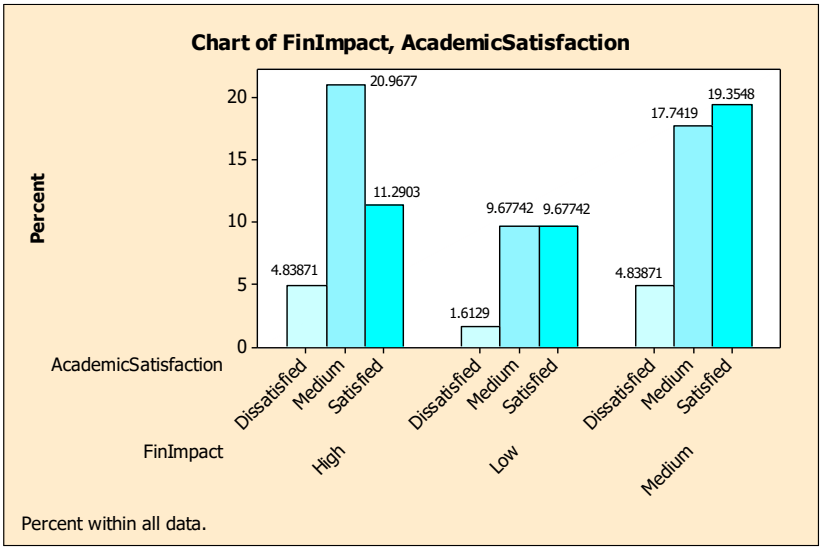

Figure 6: Cluster Bar graph for Academic Satisfaction and affecting Financial Issues on Focus of Students

According to figure 6, students with high financial impact tend to be more academically satisfied. Medium financial impact also links with higher satisfaction. In contrast, the low financial impact shows no clear trend in satisfaction levels.

3.2 Distribution of Quantitative Variables

3.2.1 Distribution of Study Hours

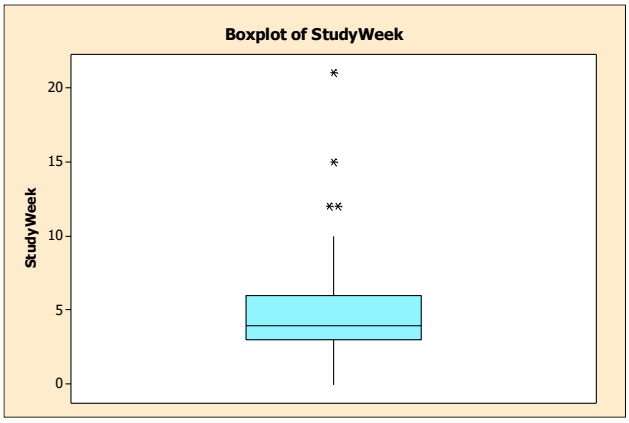

Figure 7: Boxplot of Weekdays study hours

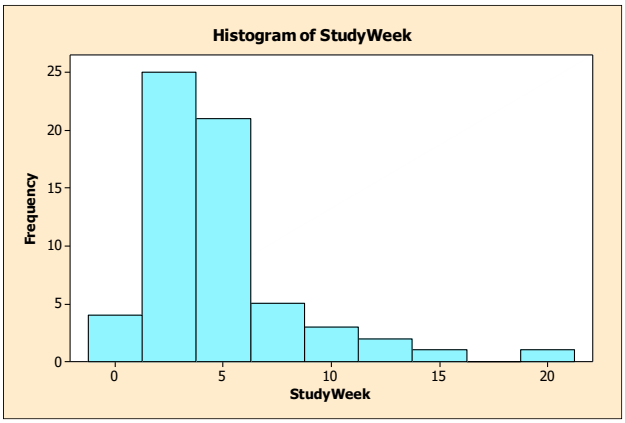

Figure 8: Histogram of Weekday study hours

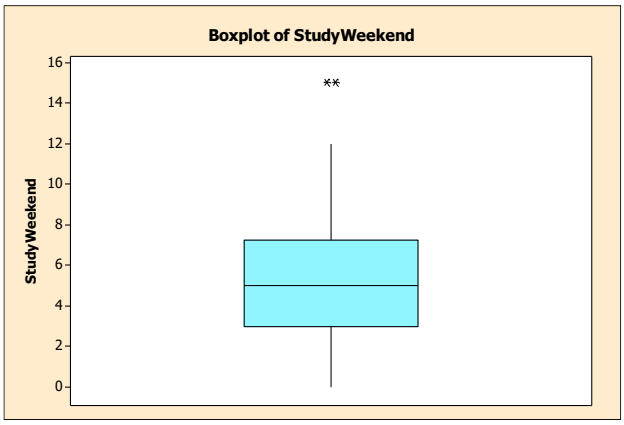

Figure 9: Boxplot of Weekend days study hours

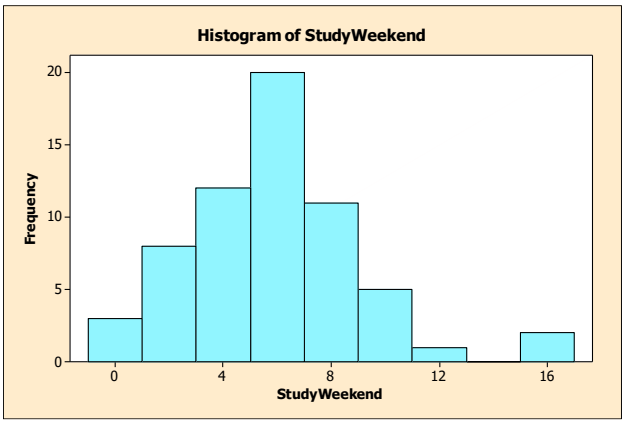

Figure 10: Histogram of Weekend days study hours

Table 7: Descriptive Statistics of Weekly part-time work hours and earnings from part-time

Variable	N	N*	Mean	SE Mean	StDev	Min	Q1	Median	Q3	Max
StudyWeek	62	0	4.79	0.459	3.6175	0	3	4	6	21
StudyWeekend	62	0	5.47	0.404	3.1815	0	3	5	7.25	15

After removing outliers, Figure 8 shows weekday study hours are positively skewed with median 4h, indicating most students study less, while Figure 10 reveals approximate symmetric weekend hours with mean 5.47 hours, suggesting more consistent and longer study sessions. Table 7 confirms that.

3.2.2 Distribution of Weekly Part-Time Work Hours and Earnings from Part-Time

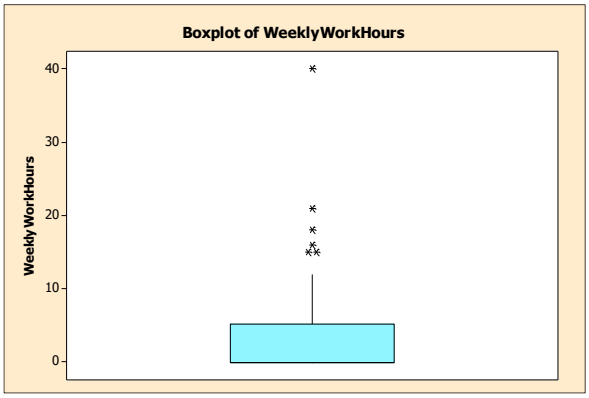

Figure 11: Boxplot of Weekly part-time work hours

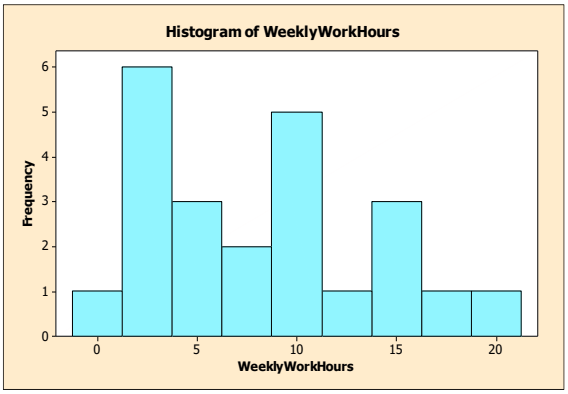

Figure 12: Histogram of Weekly part time work hours

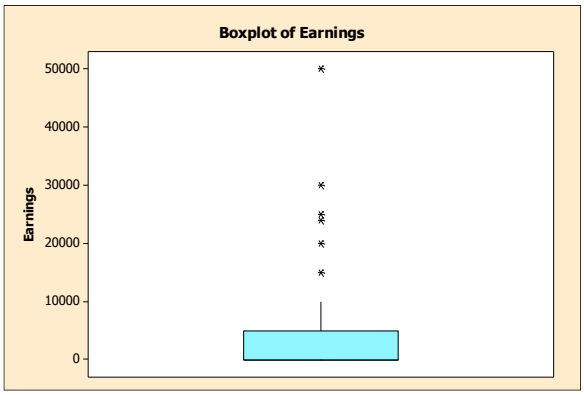

Figure 13: Boxplot of earnings from part time

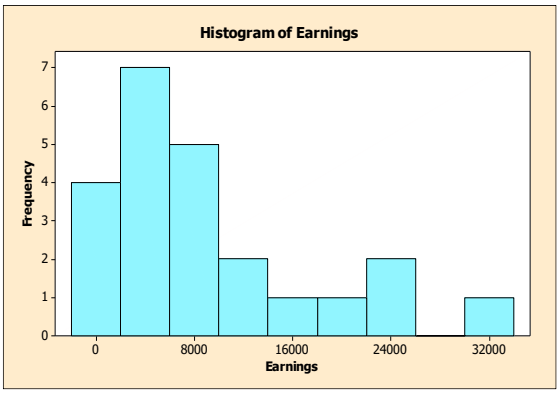

Figure 14: Histogram of earnings from part time

Table 8: Descriptive Statistics of Weekly part-time work hours and earnings from part-time

Variable	StDev	Min	Q1	Median	Q3	Max
Weekly Work Hours	5.74	0	3	8	12	21
Earnings	8517	0	2000	6000	10000	30000

After removing outliers, Figure 12 shows weekly part-time work hours are positively skewed with a median 8 hours, while Figure 14 reveals earnings are also positively skewed with median 6000 rupees.

3.2.3 Distribution of Expenses

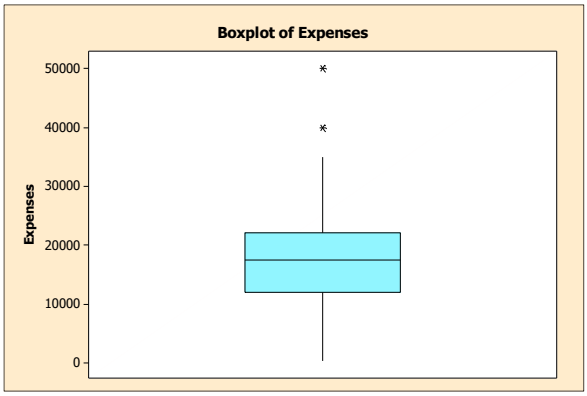

Figure 15: Boxplot of Expenses

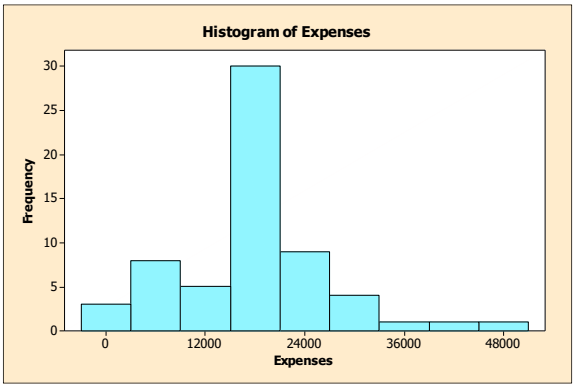

Figure 16: Histogram of Expenses

Table 9: Descriptive Statistics for Expenses

Variable	N	N*	Mean	SE Mean	StDev	Min	Q1	Q3	Maximum
Expenses	62	0	17685.5	1165.75	9179.11	500	12000	22125	50000

Figure 16 shows expenses follow an approximately symmetric distribution with a mean of 17,685 rupees, indicating balanced spending patterns among respondents with no extreme skewness in either direction.

3.2.4 Distribution of Rent

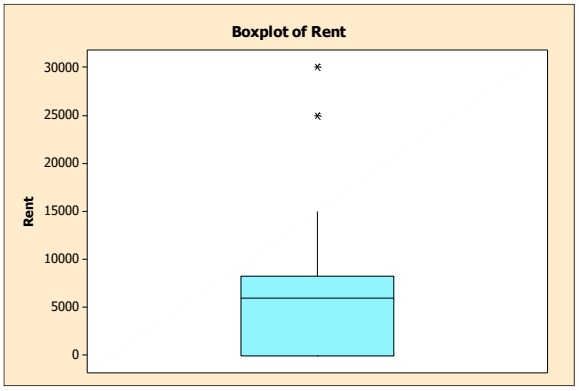

Figure 17: Boxplot of Rent

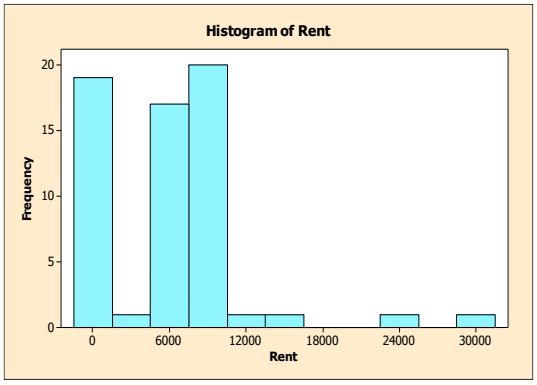

Figure 18: Histogram of Rent

Table 10: Descriptive Statistics of Rent

Variable	N	N*	StDev	Minimum	Q1	Median	Q3	Maximum
Rent	61	1	5624.56	0	0	6000	8250	30000

After removing outliers, Figure 18 shows rent distribution is positively skewed with a median 6000 rupees, indicating most rents are lower, with a few significantly higher values.

3.2.5 Distribution of Percentage of Family Cover Expenses

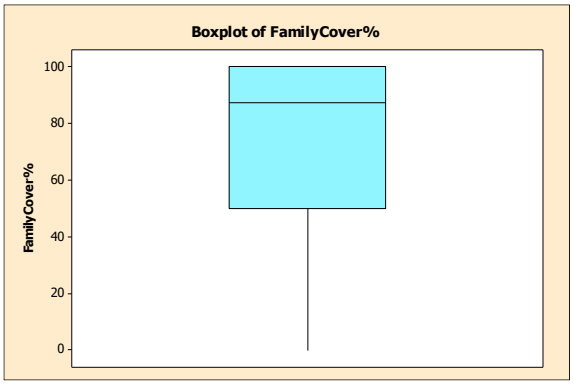

Figure 19: Box plot of family cover%

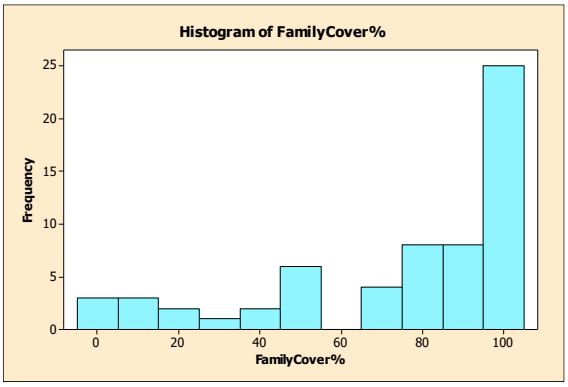

Figure 20: Histogram of family cover percentage

Table 11: Descriptive Statistics of Family Cover Percentage

Variable	N	N*	StDev	Minimum	Q1	Median	Q3	Maximum
FamilyCover%	62	0	31.6504	0	50	87.5	100	100

Figure 20 shows family cover percentage has a negatively skewed distribution with median of 87.5%, indicating most families have high coverage, with fewer at lower percentages.

3.2.6 Distribution of Number of Retakes of Course Units

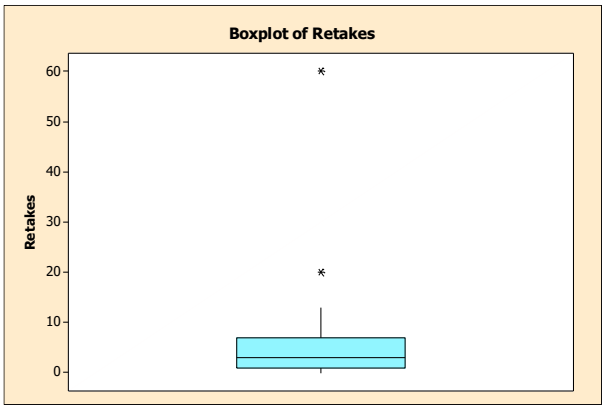

Figure 21: Box plot of retakes of course units

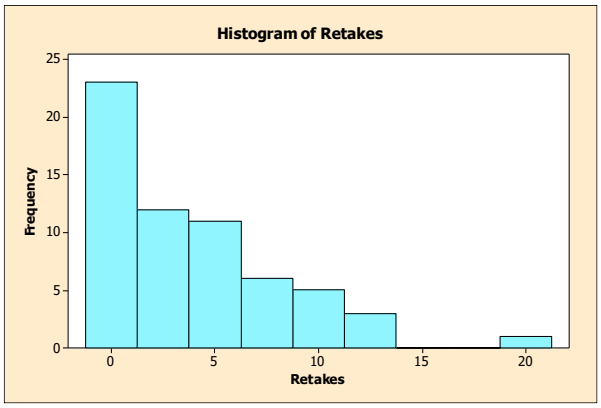

Figure 22: Histogram of Retakes

Table 12: Descriptive Statistics of Retakes of course units

Variable	N	N*	StDev	Minimum	Q1	Median	Q3	Maximum
Retakes	61	1	4.28162	0	1	3	6.5	20

After removing outliers, Figure 22 shows retakes follow a positively skewed distribution with median of three exam retakes, indicating most students required few retakes while a small number needed significantly more. Table 12 confirms that.

3.2.7 Distribution of GPA

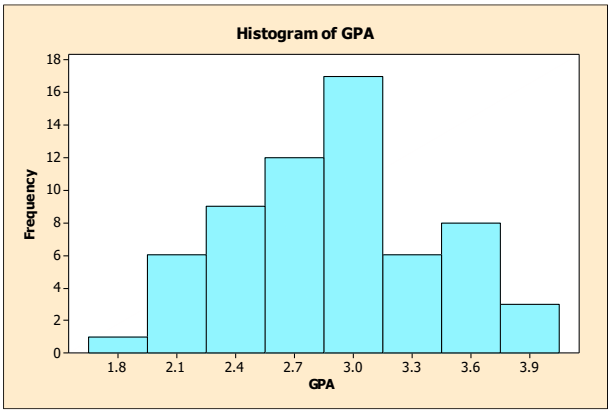

Figure 23: Histogram of GPA

Table 13: Descriptive Statistics of GPA

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Q3	Maximum
GPA	62	0	2.88901	0.0648690	0.510779	1.77	2.5	3.223	3.9077

There are no outliers in the distribution of GPA (see figure 74 in appendix). Figure 23 shows GPA follows an approximately symmetric distribution with a mean of 2.89 (Table 13), indicating most students' grades cluster around this central value with balanced variation above and below.

3.3 One qualitative with one quantitative

3.3.1 Distribution of GPA by Gender

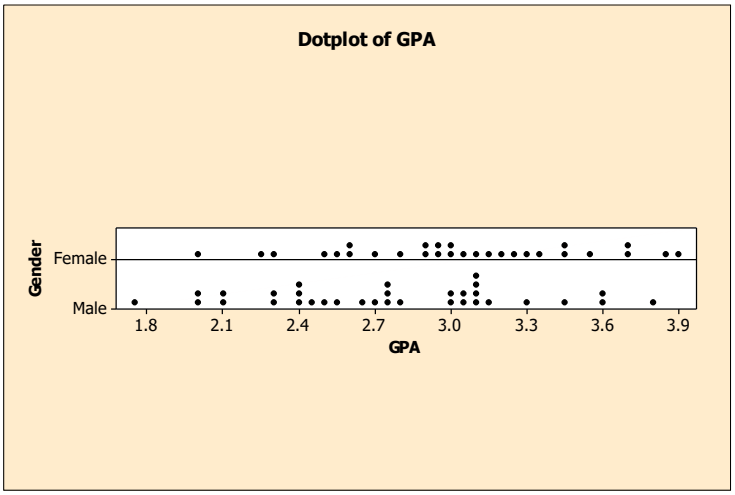

Figure 24: Dot plots of GPA by Gender

Table 14: Descriptive Statistics of GPA by Gender

Variable	Gender	N	N*	Mean	SE Mean	StDev	Min	Q1	Median	Q3	Max
GPA	Female	29	0	3.03437	0.0896191	0.482614	1.987	2.652	3.02	3.39455	3.9077
	Male	33	0	2.76127	0.0883441	0.507498	1.77	2.3975	2.758	3.1	3.82

According to figure 24 female GPAs are more concentrated at higher values, while male GPAs show slightly more spread toward lower scores. The median GPA for females is 3.02, higher than the male median of 2.76, with dot plots also showing a higher mean GPA for females according to table 14.

3.3.2 Distribution of GPA by Residence

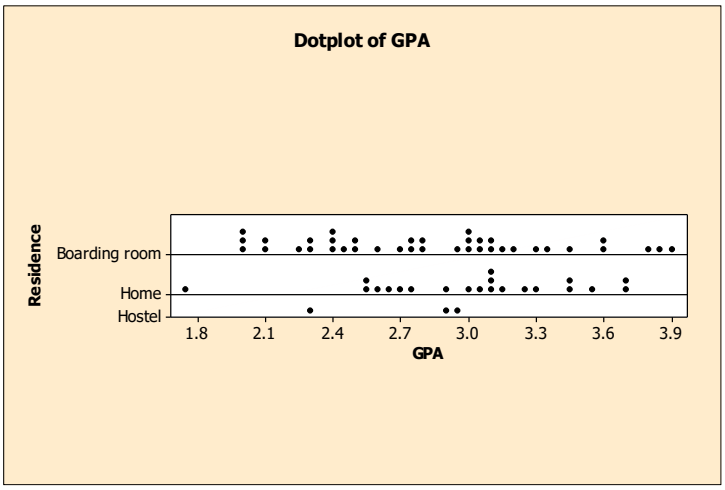

Figure 25: Dot plots of GPA by Residence

Table 15: Descriptive Statistics of GPA by Residence

Variable	Residence	N	N*	Mean	SE Mean	StDev	Min	Q1	Median	Q3	Max
GPA	Boarding	38	0	2.82973	0.0881	0.5428	1.987	2.398	2.8075	3.183	3.908
	Home	21	0	3.01939	0.0999	0.4576	1.77	2.669	3.099	3.378	3.686
	Hostel	3	0	2.72733	0.2061	0.3570	2.318	2.318	2.89	2.974	2.974

Boarding room students display wider GPA spread, while hostel residents have lower, more tightly clustered GPAs. The dot plot (Figure 25) confirms these patterns, highlighting stronger academic performance among home-residing students. Students residing at home have the highest median GPA, with GPAs more concentrated in the higher range and showing greater variability.

3.3.3 Distribution of GPA by Attendance

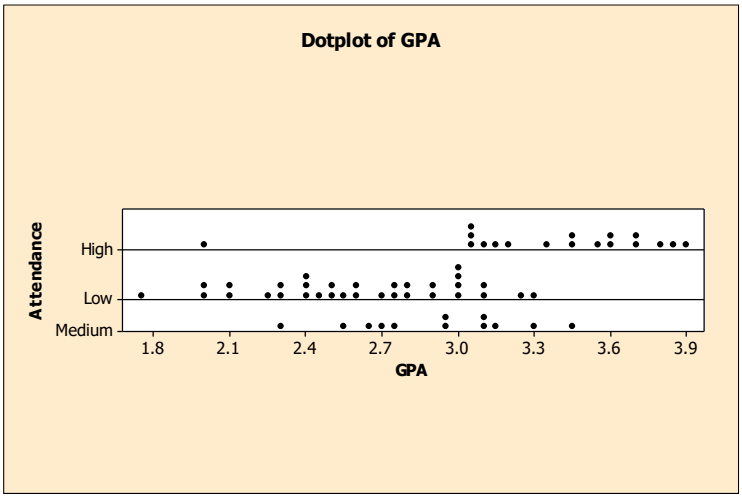

Figure 26: Dot plots of GPA by Attendance

Table 16: Descriptive Statistics of GPA by Attendance

Variable	Attendance	N	N*	Mean	SE Mean	StDev	Min	Q1	Median	Max
	Low	32	0	2.61078	0.0691804	0.391343	1.77	2.33725	2.6025	3.301
	Medium	12	0	2.91783	0.0966752	0.334893	2.3	2.661	2.963	3.468

Students with high attendance have the highest GPA, followed by those with medium attendance, while low-attendance students have the lowest GPA (Table 16). The dot plot (figure 26) clearly illustrates this pattern in academic performance across attendance levels.

3.3.4 Distribution of GPA by Part Time Status

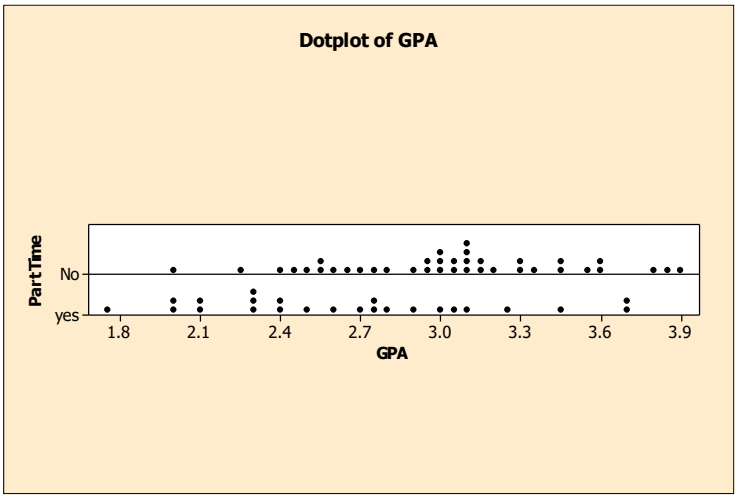

Figure 27: Dot plots of GPA by part time status

Table 17: Descriptive Statistics of GPA by part time status

Variable	PartTime	N	N*	Mean	SE Mean	StDev	Min	Q1	Median	Q3	Max
GPA	No	38	0	3.0328	0.0726	0.4478	1.987	2.677	3.063	3.309	3.908
	yes	24	0	2.6614	0.1082	0.5302	1.77	2.287	2.6455	3.038	3.686

Students without part-time employment exhibit a higher median GPA compared to their employed counterparts. The dot plot (Figure 27) reveals greater clustering of GPA values above 3.0 for non-working students, indicating a potential negative association between part-time work and academic performance. (Table 17).

3.4 Relationship Between Continuous Quantitative Variables

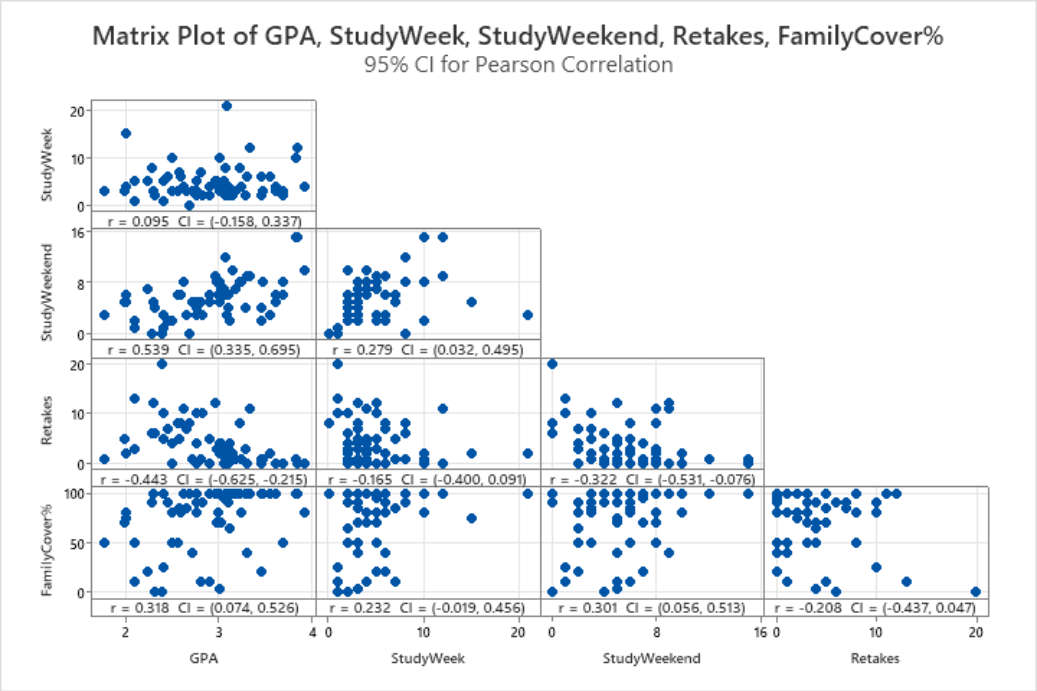

Figure 28: Matrix plot of quantitative variables

Table 18: Correlations of Quantitative Variables

	GPA	StudyWeek	StudyWeekend	Retakes
StudyWeek	0.095			
StudyWeekend	0.539	0.279		
Retakes	-0.443	-0.165	-0.322	
FamilyCover%	0.318	0.232	0.301	-0.208

Studying hours on weekdays and GPA have positive relationship with correlation of 0.539. Students who study more during weekends tend to have higher GPAs. A moderate positive relationship is shown between GPA and students' expenses covered by family with 0.318 correlation. Students with more family financial support have higher GPAs. Course retaken/ repeat

and GPA have negative relationship with correlation of -0.444. Higher GPA is associated with fewer retakes. Hours of studying on weekday study time doesn't have impact on GPA.

Relationship between Hours studying on week and hours studying on weekend, relationship between hours studying on week and Family Cover have week positive correlation with 0.279 and 0.232 respectively.

Studying hours on weekends have a negative correlation with exam retakes. More weekend study is associated with fewer repeats. Students' expenses, covered by family and studying hours on weekend have moderate positive correlation with 0.301. Course retakes negatively correlated with all other variables.

3.5 Analysis of Relationship between Financial Background and Academic Performance (GPA)

3.5.1 Association between each Predictor Variable with GPA

Table 19: Correlation between quantitative variables and GPA

Predictor	Response	N	Correlation	95% CI for ρ	P-Value
Study Week	GPA	62	0.095	(-0.158, 0.337)	0.462
StudyWeekend	GPA	62	0.539	(0.335, 0.695)	0.000
Retakes	GPA	61	-0.443	(-0.625, -0.215)	0.000
Rent	GPA	61	-0.007	(-0.258, 0.245)	0.957
Expenses	GPA	62	-0.211	(-0.438, 0.041)	0.099
Family Cover	GPA	62	0.318	(0.074, 0.526)	0.012
Siblings	GPA	62	-0.082	(-0.325, 0.171)	0.527

3.5.1.1 Association between Study Hours in Weekdays and GPA

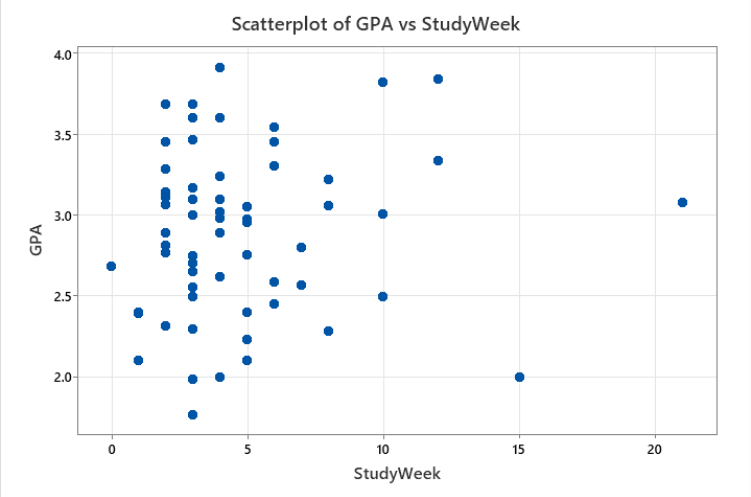

Figure 29: Study hours in Weekdays and Current Overall GPA

Sample correlation coefficient = 0.095
p-value = 0.462
95% CI = (-0.158, 0.337)

Let ρ be the population correlation coefficient between GPA and Study hours in Weekdays.

Hypothesis to be tested:
H_0: ρ = 0 vs H_1: ρ ≠ 0

Since p-value (0.462) > 0.05, we do not reject H_0 at 5% level of significance.

There is sufficient evidence to conclude that there is no linear relationship between GPA and Hours Studying Weekdays. The weak positive correlation observed is not statistically significant, suggesting weekday study hours do not strongly influence GPA.

3.5.1.2 Association between Study Hours in Weekends and GPA

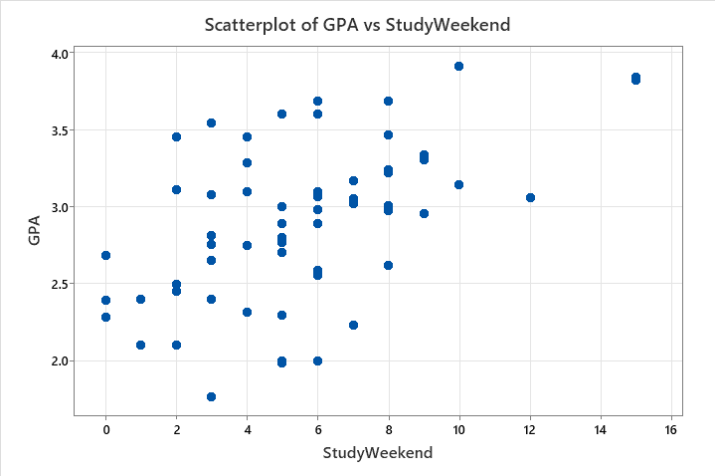

Figure 30: Scatter plot of Study hours in weekend and current overall GPA

Sample correlation coefficient = 0.539
95% CI = (0.335, 0.695)
p-value = < 0.001

Let ρ be the population correlation coefficient between GPA and Hours Studying Weekends.

Hypothesis to be tested:
H_0: ρ = 0 vs H_1: ρ ≠ 0

p-value < 0.05, so we reject H_0 at 5% level of significance. The correlation is moderate and positive. There is strong evidence of a significant positive linear relationship between GPA and Hours Studying Weekends. Students who study more on weekends tend to have higher GPAs.

3.5.1.3 Association between Study Hours in Week and GPA

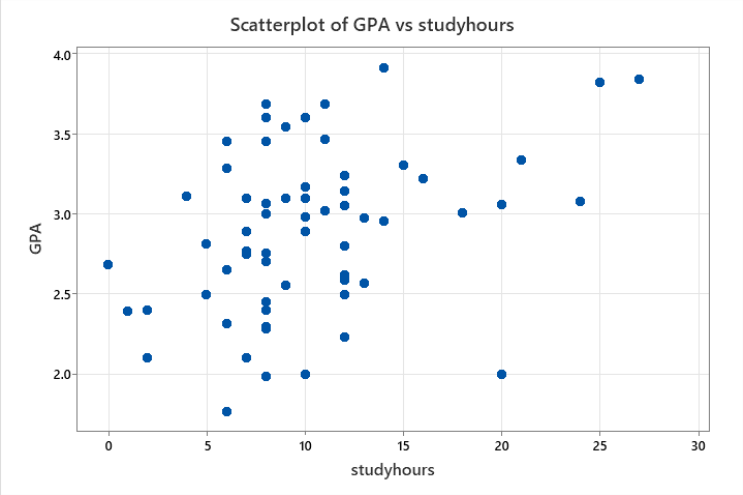

Figure 31: Scatter plot of Study hours in weekdays and current overall GPA

Sample correlation coefficient = 0.378
p-value = 0.002
95% CI = (0.142,0.574)

Let ρ be the population correlation coefficient between GPA and Study hours.

Hypothesis to be tested:
H_0: ρ = 0 vs H_1: ρ ≠ 0

Since p-value (0.002) < 0.05, we reject H_0 at 5% level of significance. There is enough evidence of a significant positive linear relationship between GPA and study hours. Students who study tend to have higher GPAs.

3.5.1.4 Association between Monthly Boarding House Rent and Current Overall GPA

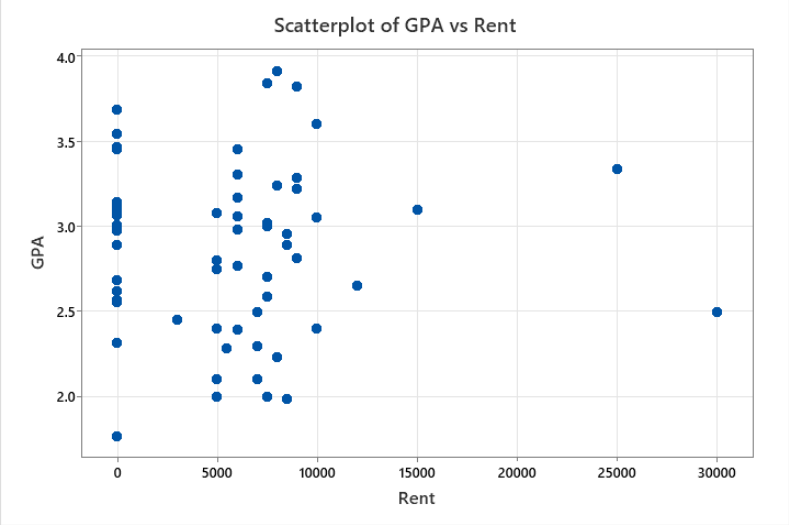

Figure 32: Scatter plot of Rent and current overall GPA

Sample correlation coefficient = −0.007
95% CI = (-0.258, 0.245)
p-value = 0.957

Let ρ be the population correlation coefficient between GPA and Monthly boarding house Rent.

Hypothesis to be tested:
H_0: ρ = 0 vs H_1: ρ ≠ 0

Since p-value > 0.05, fail to reject H_0 at 5% level of significance. No evidence of a linear relationship between Monthly boarding house Rent and GPA.

3.5.1.5 Association between Number of Courses Retaken and Current Overall GPA

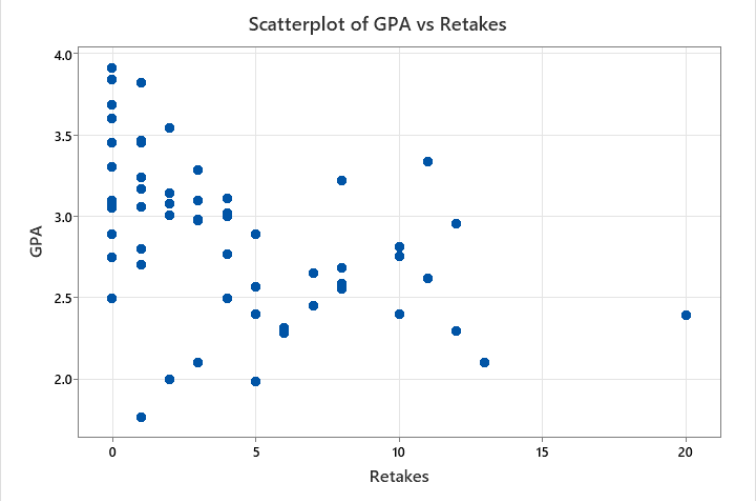

Figure 33: Scatter plot of Number of Retakes and current overall GPA

Sample correlation coefficient = −0.443
95% CI = (-0.625, -0.215)
p-value = < 0.001

Let ρ be the population correlation coefficient between GPA and Courses Retaken (Retakes).

Hypothesis to be tested:
H_0: ρ = 0 vs H_1: ρ ≠ 0

Since p-value < 0.05, so we reject H_0 at 5% level of significance. The correlation is moderate and negative. There is significant evidence that more courses retaken is associated with lower GPA.

3.5.1.6 Association between Monthly Personal Expenses and Current Overall GPA

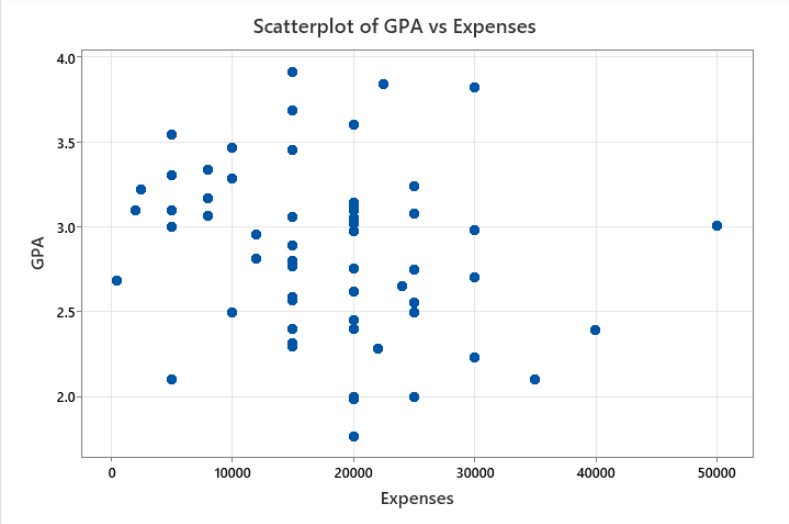

Figure 34: Scatter plot of Monthly personal Expenses and current overall GPA

Sample correlation coefficient = −0.211
95% CI = (-0.438, 0.041)
p-value = 0.099

Let ρ be the population correlation coefficient between GPA and Monthly Personal Expenses.

Hypothesis to be tested:
H_0: ρ = 0 vs H_1: ρ ≠ 0

Since p-value > 0.05, fail to reject H_0 at 5% level of significance.

No significant linear relationship between Monthly Personal Expenses and GPA, though a weak negative trend is observed.

3.5.1.7 Association between Current GPA and Total Expenses

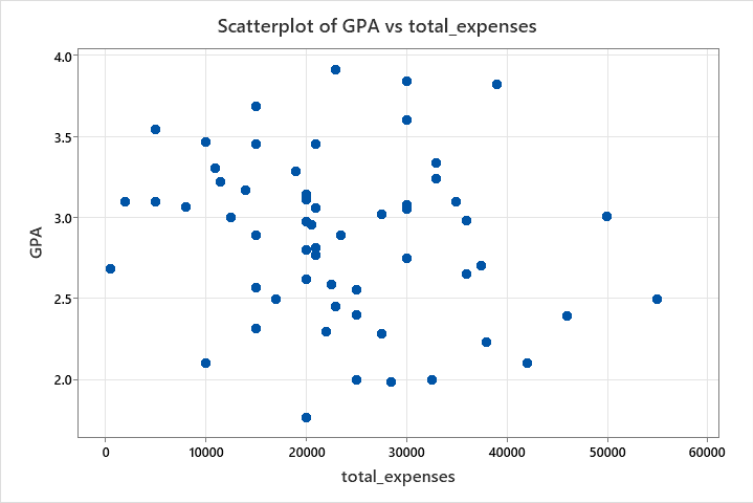

Figure 35: Scatter plot of total Expenses and current overall GPA

Sample correlation coefficient = −0.176
95% CI = (-0.410,0.079)
p-value = 0.174

Let ρ be the population correlation coefficient between GPA and Monthly total Expenses.

Hypothesis to be tested:
H_0: ρ = 0 vs H_1: ρ ≠ 0

Since p-value > 0.05, fail to reject H_0 at 5% level of significance. Therefore, there is no significant linear relationship between Monthly total Expenses and GPA.

3.5.1.8 Expenses Covered by Family (%) and Current Overall GPA

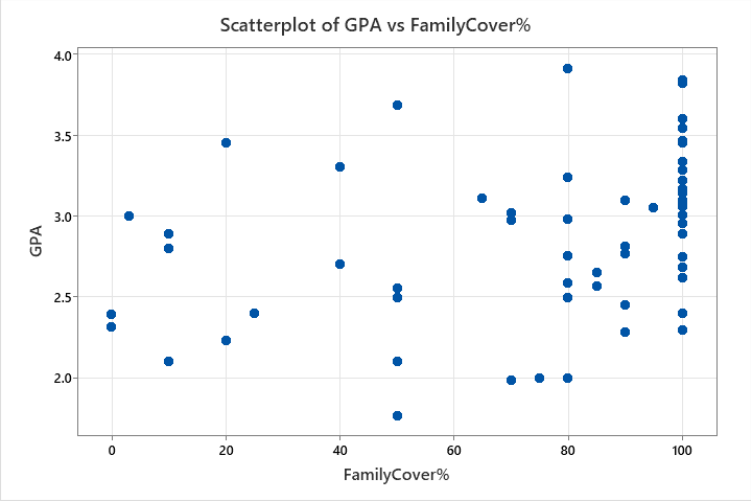

Figure 36: Scatter plot of Expenses Covered by Family (%) and current overall GPA

Sample correlation coefficient = 0.318
95% CI = (0.074, 0.526)
p-value = 0.012

Let ρ be the population correlation coefficient between GPA and Expenses Covered by Family.

Hypothesis to be tested:
H_0: ρ = 0 vs H_1: ρ ≠ 0

Since p-value < 0.05, reject H_0 at 5% level of significance. There is a significant positive correlation between the percentage of expenses covered by family and GPA. Greater family financial support is associated with higher GPA.

3.5.1.9 Association between Gender and GPA

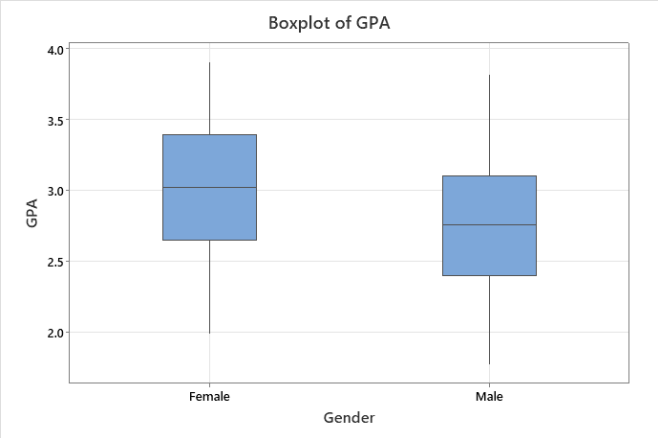

Figure 37: Boxplots of GPA by gender

According to figure 37, there are no outliers in GPA with respect to gender. The median GPA for females (around 3.0) is higher than that for males (around 2.75).

- **Normality Test for GPA (Male)**

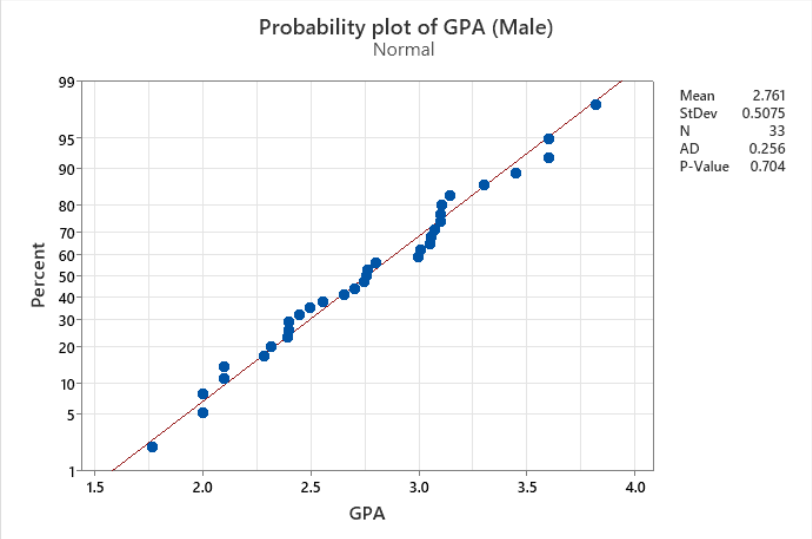

Figure 38: Probability plot of GPA (Male)

Hypothesis to be tested:
H_0: The GPA of male students is normally distributed. Vs
H_1: The GPA of male students is not normally distributed.

Since the p-value (0.704) > 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the GPA distribution for male students is consistent with a normal distribution.

- **Normality Test for GPA (Female)**

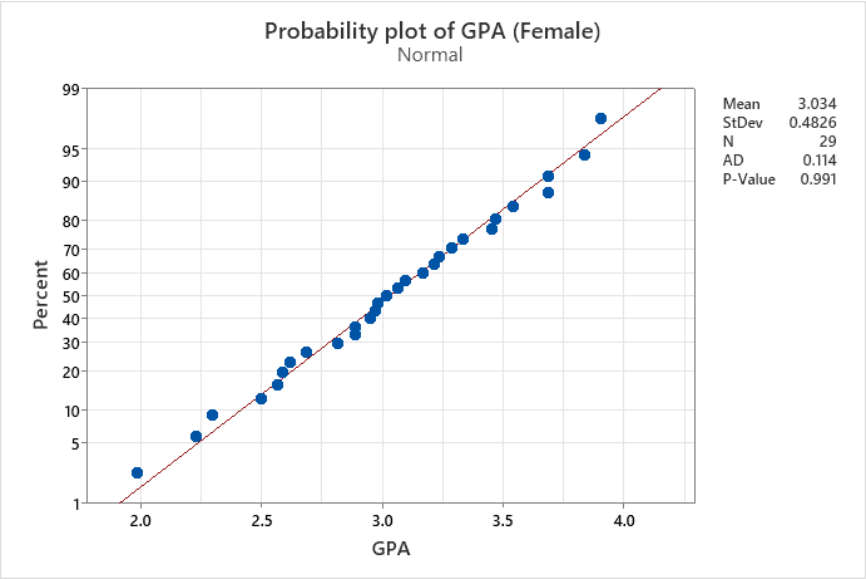

Figure 39: Probability plot of GPA (Female)

Hypothesis to be tested:
H_0: The GPA of female students is normally distributed. Vs
H_1: The GPA of female students is not normally distributed.

Since the p-value (0.991) > 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the GPA distribution for female students is consistent with a normal distribution.

- **Hypothesis Test for Equality of Variances of GPA by Gender**

Table 20: Variance test results

Gender	N	St Dev	Variance	95% CI for σ
Female	29	0.483	0.233	(0.389, 0.643)
Male	33	0.507	0.258	(0.419, 0.653)

Method	Test Statistic	DF1	DF2	P-Value
Bonett	*			0.756
Levene	0.19	1	60	0.661

Let σ_1 be the population variance of GPA for female students, and σ_2 be the population variance of GPA for male students.

Hypotheses to be tested: $H_0: \sigma_1 / \sigma_2 = 1$ vs $H_1: \sigma_1 / \sigma_2 \neq 1$

Since the p-value (0.661) > 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the population variances of GPA for female and male students are equal. The variability in GPA does not differ significantly by gender.

- **Hypothesis Test for Difference in Mean GPA by Gender (Equal Variances Assumed)**

Table 21: Two sample T test results

Gender	N	Mean	St Dev	SE Mean
Female	29	3.034	0.483	0.090
Male	33	2.761	0.507	0.088

T-Value	DF	P-Value
2.16	60	0.035

Let μ_1 be the population mean GPA for Female students and μ_2 for Male students.

Hypothesis to be tested: $H_0: \mu_1 - \mu_2 = 0$ vs $H_1: \mu_1 - \mu_2 \neq 0$

Since the p-value (0.035) < 0.05, we reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the mean GPA differs between Female and Male students.

3.5.1.10 Association between Financial Aid and GPA

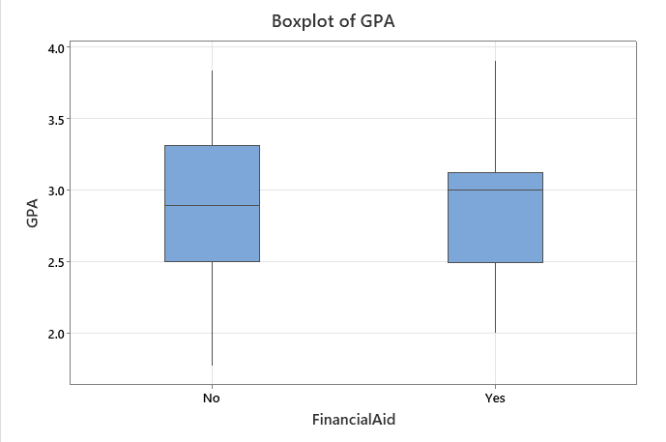

Figure 40; Boxplot of GPA by Financial AID

According to figure 41, there is no outlier in GPA with respect to levels of financial aid. This boxplot shows that students who do not receive financial aid have a slightly higher median GPA (around 2.9) compared to those who do (around 2.8).

- **Normality Test for GPA (Students Without Financial Aid)**

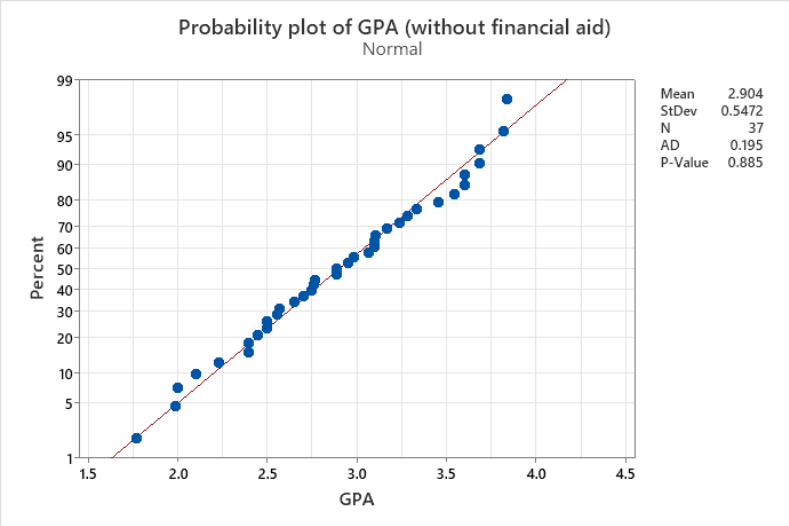

Figure 41: probability plot of GPA (without financial aid)

Hypothesis to be tested:
H_0: The GPA of students without financial aid is normally distributed. Vs
H_1: The GPA of students without financial aid is not normally distributed.

Since the p-value (0.885) > 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the GPA distribution for students without financial aid is normally distributed.

- **Normality Test for GPA (Students with Financial Aid)**

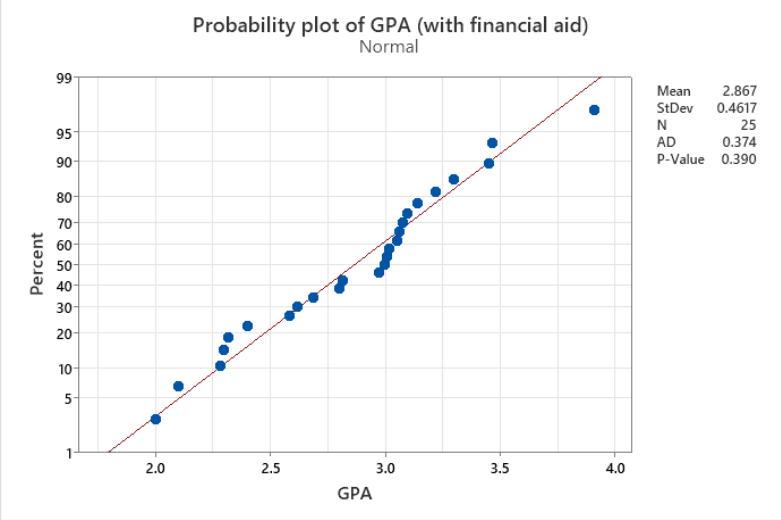

Figure 42: probability plot of GPA (with financial aid)

Hypothesis to be tested:
H_0: The GPA of students with financial aid is normally distributed. Vs
H_1: The GPA of students with financial aid is not normally distributed.

Since the p-value (0.390) is greater than 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the GPA distribution for students with financial aid is normally distributed.

- **Hypothesis Test for Equality of Variances of GPA by Financial Aid Status**

Let σ_1 be the population variance of GPA for students without financial aid, and σ_2 be the population variance of GPA for students with financial aid.

Hypotheses:

$H_0: \sigma_1 / \sigma_2 = 1$ vs $H_1: \sigma_1 / \sigma_2 \neq 1$

Table 22: Variance test results

Financial Aid		N	St Dev	Variance	95% CI for σ
No		37	0.547	0.299	(0.462, 0.684)
Yes		25	0.462	0.213	(0.361, 0.641)

Method	Test Statistic	DF1	DF2	P-Value
Bonett	*			0.311
Levene	1.32	1	60	0.256

Since the p-value (0.256) > 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the population variances of GPA for students without and with financial aid are equal.

- **Hypothesis Test for Difference in Mean GPA by Financial Aid Status (Equal Variances Assumed)**

Table 23: Two sample t test results

Financial Aid	N	Mean	St Dev	SE Mean
No	37	2.904	0.547	0.090
Yes	25	2.867	0.462	0.092

T-Value	DF	P-Value
0.27	60	0.785

Let μ_1 be the population mean GPA for students without financial aid and μ_2 for students with financial aid.

Hypotheses to be tested: H_0: $\mu_1 - \mu_2 = 0$ vs H_1: $\mu_1 - \mu_2 \neq 0$

Since the p-value (0.785) is greater than 0.05, we do not reject H_0 at the 5% level of significance. There is insufficient evidence to conclude a difference in mean GPA between students with and without financial aid.

3.5.1.11 Association Between Part Time and GPA

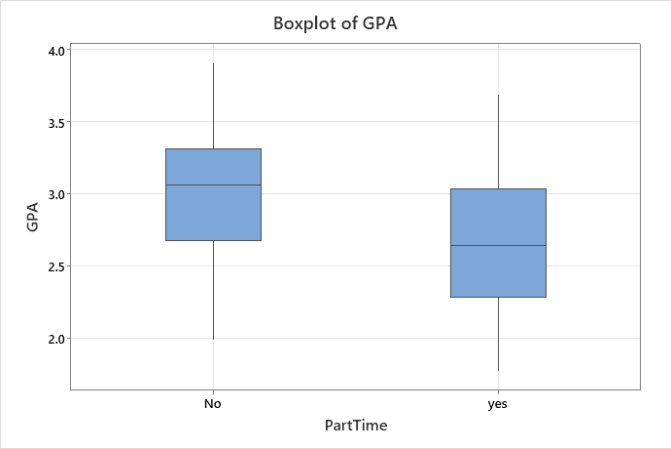

Figure 43: Boxplot of GPA (part time job)

Figure 44 indicates that students who do not work part-time generally have higher GPAs, with a median around 3.05, compared to students who work part-time, whose median GPA is lower at approximately 2.65.

- **Normality Test for GPA (Students Without Part-Time Job)**

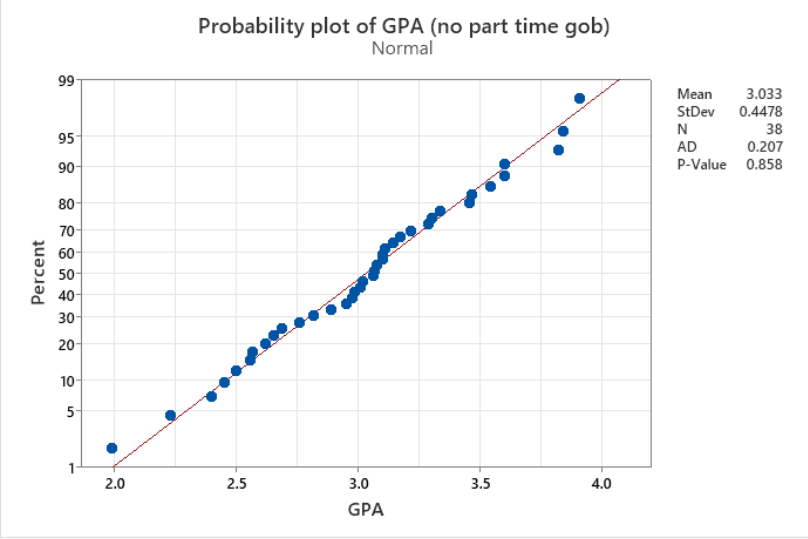

Figure 44: Probability plot of GPA (no part time job)

Hypothesis to be tested:
H_0: The GPA of students without a part-time job is normally distributed. vs
H_1: The GPA of students without a part-time job is not normally distributed.

Since the p-value (0.858) is greater than 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the GPA distribution for students without a part-time job is normally distributed.

- **Normality Test for GPA (Students with Part-Time Job)**

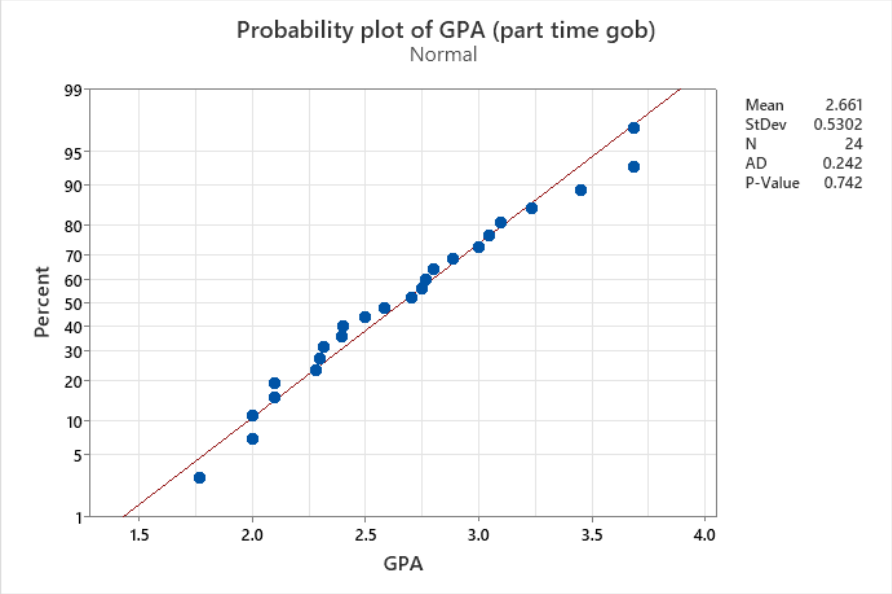

Figure 45: Probability plot of GPA (part time job)

Hypothesis to be tested:

H_0: The GPA of students with a part-time job is normally distributed. Vs
H_1: The GPA of students with a part-time job is not normally distributed.

Since the p-value (0.742) is greater than 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the GPA distribution for students with a part-time job is normally distributed.

- **Hypothesis Test for Equality of Variances of GPA by Part-Time Job Status**

Let σ_1 be the population variance of GPA for students without a part-time job, and σ_2 be the population variance of GPA for students with a part-time job.

Hypotheses to be tested: H_0: $\sigma_1 / \sigma_2 = 1$ vs H_1: $\sigma_1 / \sigma_2 \neq 1$

Since p-values 0.240 (in table 24) is greater than 0.05, we do not reject the null hypothesis H_0 at the 5% significance level. There is sufficient evidence to conclude that the population variances of GPA for students without and with part-time job are equal.

Table 24: Variance test results

Part Time	N	St Dev	Variance	95% CI for σ
No	38	0.448	0.201	(0.367, 0.576)
yes	24	0.530	0.281	(0.419, 0.731)

Method	Test Statistic	DF1	DF2	P-Value
Bonett	*			0.310
Levene	1.41	1	60	0.240

- **Hypothesis Test for Difference in Mean GPA by Part-Time Job Status (Equal Variances Assumed)**

Table 25: two sample T test results

Part Time	N	Mean	St Dev	SE Mean
No	38	3.033	0.448	0.073
yes	24	2.661	0.530	0.11

T-Value	DF	P-Value
2.96	60	0.004

Let μ_1 be the population mean GPA for students without part-time job and μ_2 for students with part-time job.

Hypotheses to be tested: H_0: $\mu_1 - \mu_2 = 0$ vs H_1: $\mu_1 - \mu_2 \neq 0$

Since the p-value (0.004) < 0.05, we reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the mean GPA differs significantly between students with and without part-time jobs.

3.5.1.12 Association between Residence and GPA

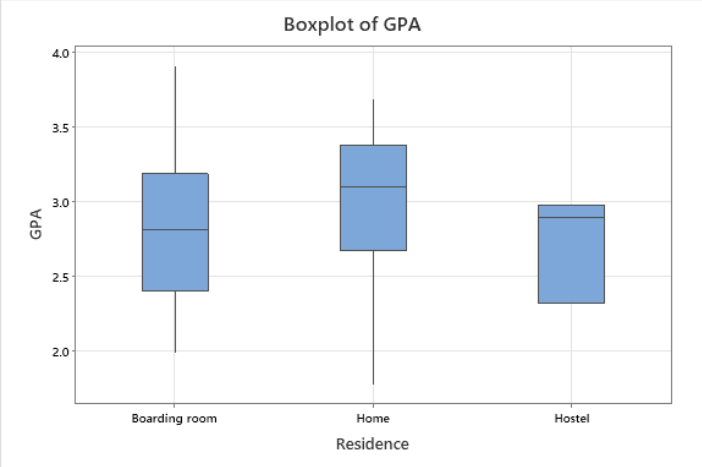

Figure 46: Boxplot of GPA (Residence)

Figure 47 shows that students living at home tend to have the highest median GPA (around 3.1) and the widest variability in GPAs. Students residing in hostels have the most consistent (narrowest spread) GPAs with a median of about 2.9, while those in boarding rooms have a slightly lower median GPA (around 2.8) with a moderate spread.

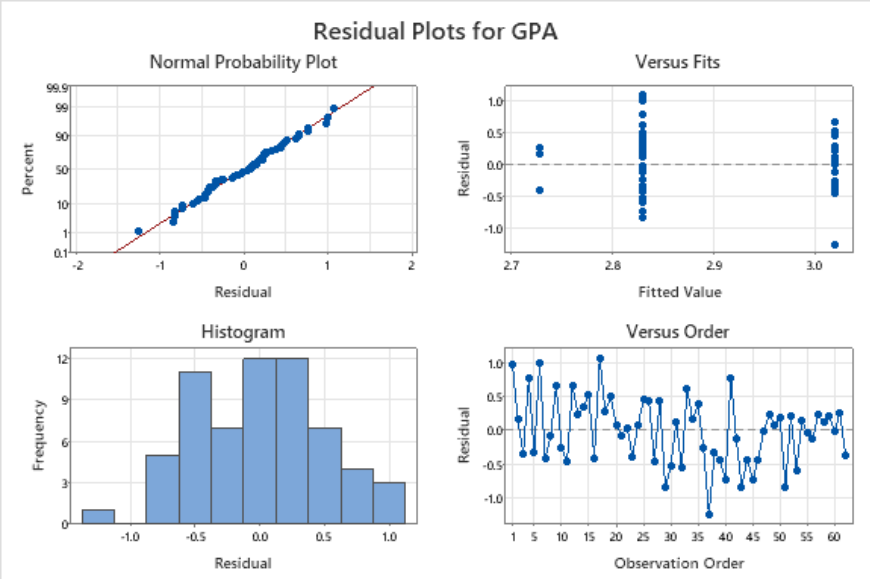

Figure 47: Residual plots for GPA (Residence)

The Normal Probability Plot indicates that the residuals are approximately normally distributed. The Residuals Versus Fits plot shows that the variances are not equal across these groups.

Table 26: Kruskal Wallis test results

Method	DF	H-Value	P-Value
Not adjusted for ties	2	3.23	0.198
Adjusted for ties	2	3.23	0.198

Hypotheses to be tested:
H_0: All group medians are equal. Vs H_1: At least one median differs significantly.

Since the p-value (0.198) is greater than the significance level α=0.05, we do not reject H_0 at the 5% level of significance. There is insufficient evidence to conclude that the medians differ across groups.

3.5.1.13 Association between Attendance and GPA

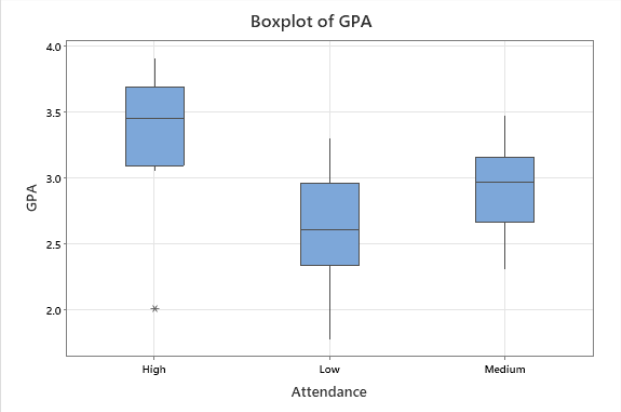

Figure 48: Boxplot of GPA (attendance)

Figure 49 shows that higher attendance is linked to higher GPA, with most data close together, and although there is one noticeable outlier, it was kept in the study. because it is possible value have in data set.

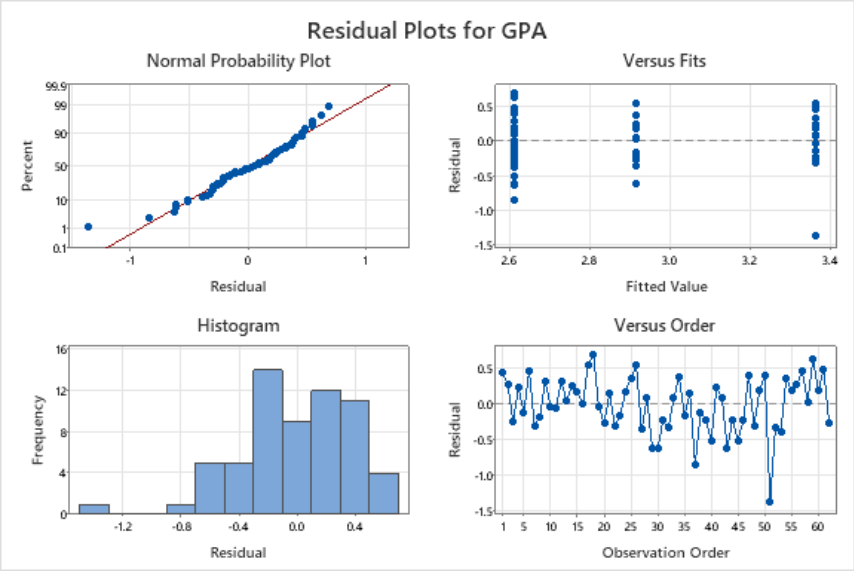

Figure 49: Residual plots of GPA (Attendance)

The Normal Probability Plot indicates that the residuals are approximately normally distributed. The Residuals Versus Fits plot shows that the variances are equal across these groups.

Table 27: Analysis of variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Attendance	2	6.556	3.2778	20.66	0.000
Error	59	9.359	0.1586		
Total	61	15.915			

H_0: There is no significant difference in the mean GPA across the different levels of lecture attendance percentage.
H_1: At least one group mean GPA differs significantly.

Since the p-value (0.000) is less than the significance level α=0.05, we reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the mean GPA differs significantly across the different levels of lecture attendance percentage.

Attendance	N	Mean	Grouping
High	18	3.364	A
Medium	12	2.9178	B
Low	32	2.6108	B

Means that do not share a letter are significantly different.

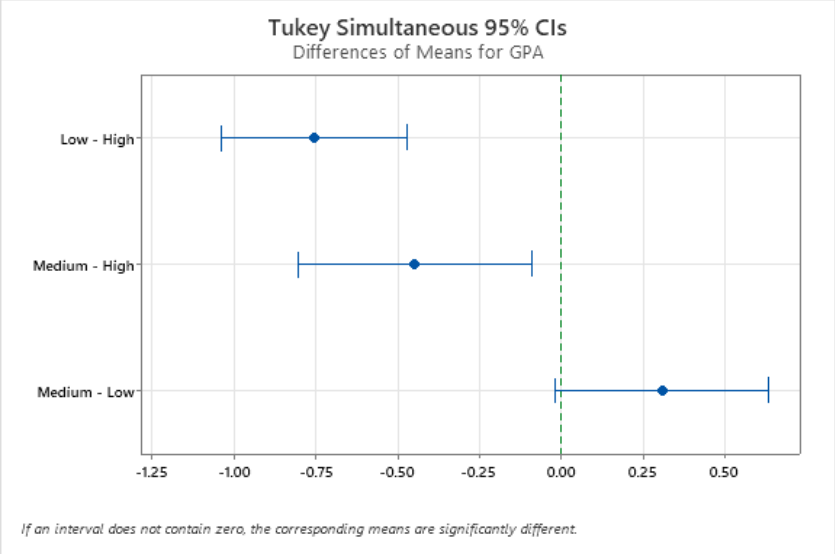

Figure 50: Tukey Simultaneous test results (Attendance)

Students with High attendance have a significantly higher mean GPA (3.364) than students with medium attendance (2.9178) and students with Low attendance (2.6108). There is no statistically significant difference in mean GPA between students with medium attendance (2.9178) and students with Low attendance (2.6108).

3.5.1.14 Association between GPA and Income levels

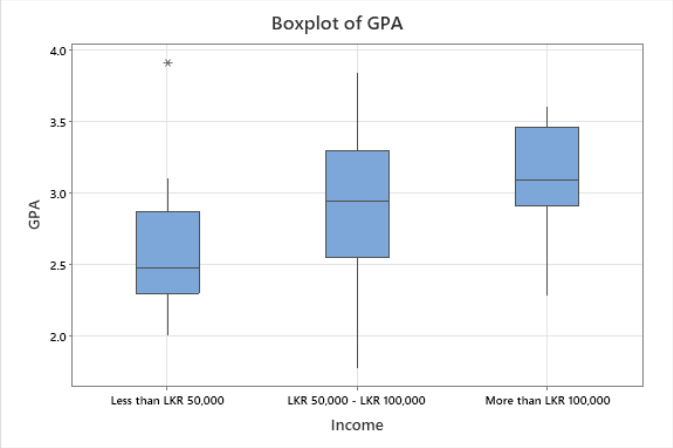

Figure 51: Boxplot of GPA by income levels

This boxplot indicates a positive association between income level and GPA, with students from families earning "More than LKR 100,000" having the highest median GPA (around 3.1), while those with "Less than LKR 50,000" have the lowest median (around 2.5), despite a high outlier. The middle-income group ("LKR 50,000 - LKR 100,000") exhibits the widest variability in GPAs

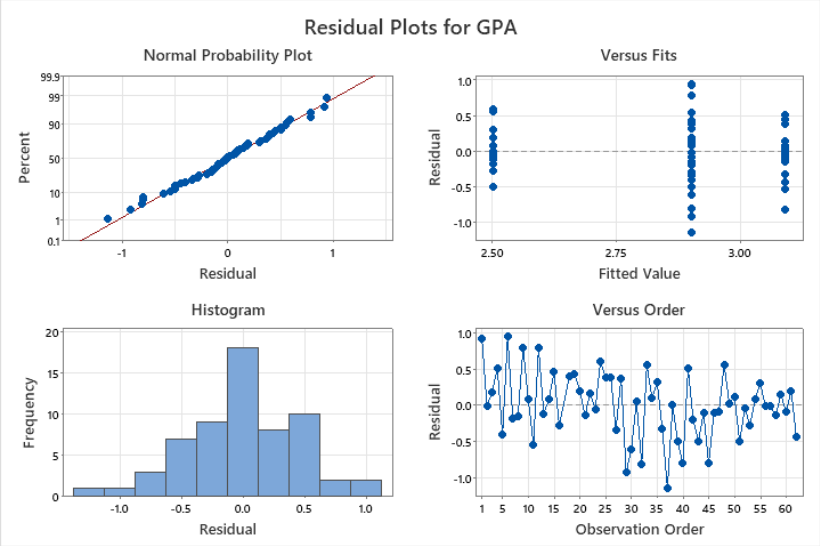

Figure 52: Residual plots

The Normal Probability Plot indicates that the residuals are approximately normally distributed. The Residuals Versus Fits plot shows that the variances are not equal across these groups. Therefore, Kruskal Wallis test is applied.

Table 28: Kruskal Wallis test results

Method	DF	H-Value	P-Value
Not adjusted for ties	2	11.74	0.003
Adjusted for ties	2	11.74	0.003

Hypothesis to be tested:
H_0: There is no significant difference in the median GPA across different family monthly income groups. Vs
H_1: At least one family income group has a significantly different median GPA.

Since the p-value (0.003) < 0.05, we reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the median GPA differs significantly across different family monthly income groups. This suggests that family income has a statistically significant effect on students' academic performance as measured by GPA.

3.5.1.15 Association between Expenses Worry and GPA

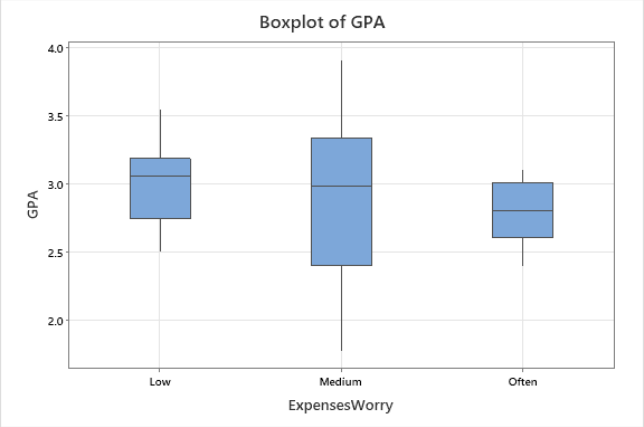

Figure 53: Boxplot of GPA (Expenses worry)

Figure 55 reveals that students with "Low" worry about expenses tend to have the highest median GPA (around 3.05), while those who worry "Often" have the lowest (around 2.8). Interestingly, the "Medium" worry group exhibits by far the widest variability in GPAs, with a median (around 3.0) close to the "Low" worry group.

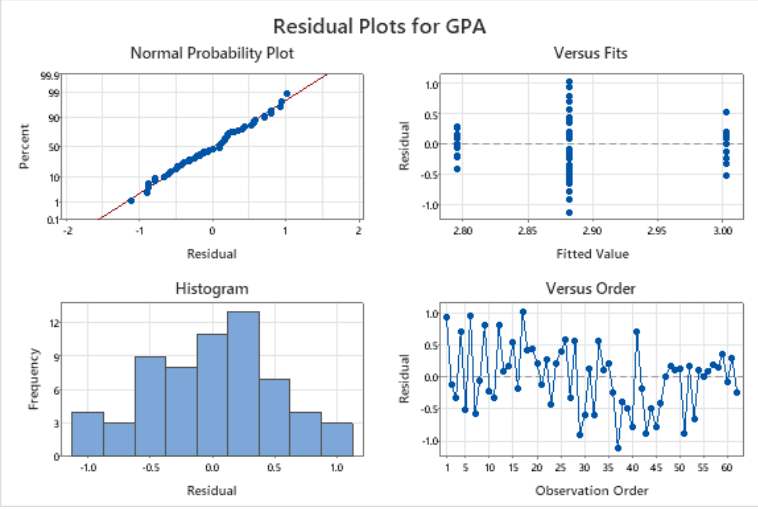

Figure 54: Residual plots for GPA (expenses worry)

The Normal Probability Plot indicates that the residuals are approximately normally distributed. The Residuals Versus Fits plot suggests that the variances are not equal across these groups. Since the assumptions are not satisfied, Kruskal Wallis test is applied.

Table 22: Kruskal-Wallis Test: GPA versus Expenses Worry

Method	DF	H-Value	P-Value
Not adjusted for ties	2	1.33	0.513
Adjusted for ties	2	1.33	0.513

Hypothesis to be tested:
H_0: All group medians of GPA are equal across different levels of worry about expenses. Vs
H_1: At least one group median of GPA differs significantly.

Since the p-value (0.513) > 0.05 we do not reject H_0 at the 5% level of significance. There is insufficient evidence to conclude that the median GPA differs across groups with different levels of worry about expenses.

3.5.1.16 Association between Financial Impact and GPA

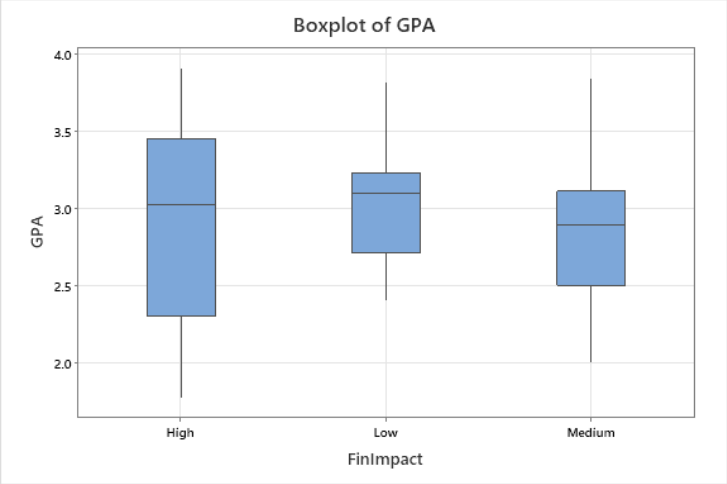

Figure 55: Boxplot of GPA (financial impact)

Figure 57 shows that students reporting a “Low" financial impact tend to have a slightly higher median GPA (around 3.1) compared to those reporting "High" (around 3.05) or "Medium" (around 2.9) financial impact.

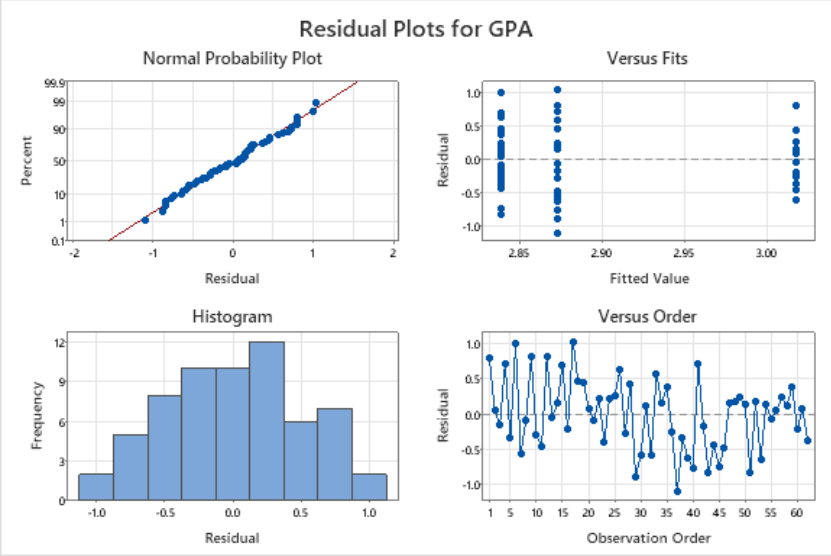

Figure 56: Residual plots for GPA (financial impact)

The Normal Probability Plot indicates that the residuals are approximately normally distributed. The Residuals Versus Fits plot suggests that the variances are equal across these groups.

Table 29 Analysis of variance (financial impact)

Source	DF	Adj SS	Adj MS	F-Value	P-Value
FinImpact	2	0.2894	0.1447	0.55	0.582
Error	59	15.6253	0.2648		
Total	61	15.9146			

Hypotheses to be tested:

H_0: There is no significant difference in the mean GPA across different levels of financial issues affecting focus. vs

H_1: At least one group has a significantly different mean GPA.

Since the p-value (0.582) > 0.05, we do not reject H_0 at the 5% level of significance. There is insufficient evidence to conclude that the mean GPA differs significantly across groups with different levels of financial issues affecting focus.

3.5.1.17 Association between Job distraction and GPA

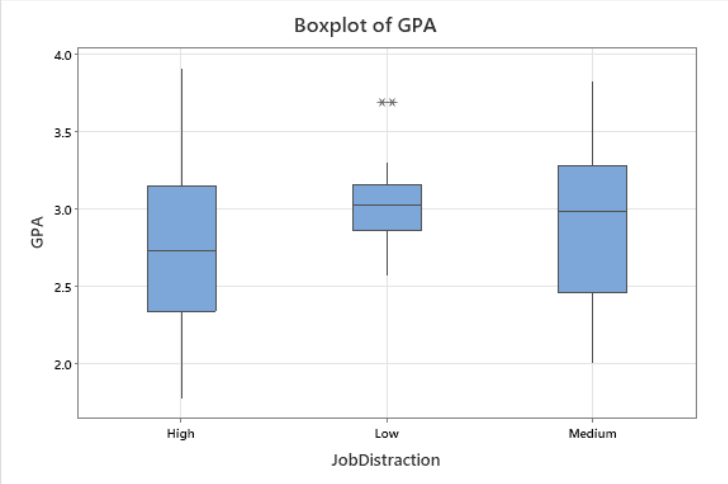

Figure 57: Boxplot of GPA (job distraction)

Figure 59 indicates that students reporting "Low" or "Medium" job distraction generally achieve higher median GPAs (both around 3.0) compared to those with "High" job distraction (median around 2.75).

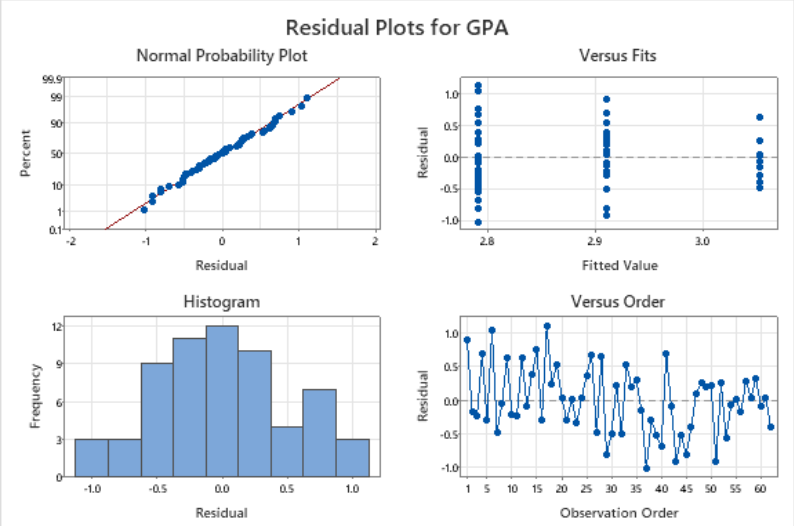

Figure 58: Residual plots for GPA (job distraction)

The Normal Probability Plot indicates that the residuals are approximately normally distributed. The Residuals Versus Fits plot shows that the variances are not equal across these groups. Therefore, Kruskal Wallis test is applied.

Table 30: Kruskal Wallis test results

Method	DF	H-Value	P-Value
Not adjusted for ties	2	2.75	0.253
Adjusted for ties	2	2.75	0.253

Hypotheses to be tested:
H_0: There is no significant difference in the median GPA across different levels of part-time job distraction. Vs
H_1: At least one group has a significantly different median GPA.

Since the p-value (0.253) > 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the median GPA does not differ significantly across groups with different levels of part-time job distraction.

3.5.1.18 Association between Academic satisfaction and GPA

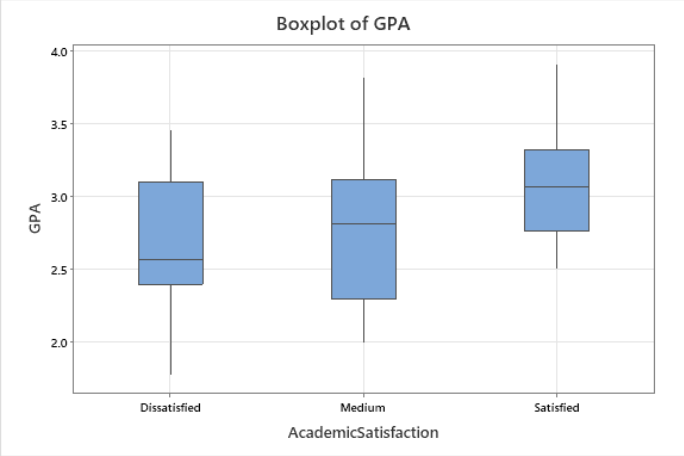

Figure 59: Boxplot of GPA (Academic satisfaction)

Figure 61 shows a positive relationship between academic satisfaction and GPA, with "Satisfied" students having the highest median GPA (around 3.05) and a relatively tight distribution, while "Dissatisfied" students have the lowest median GPA (around 2.55).

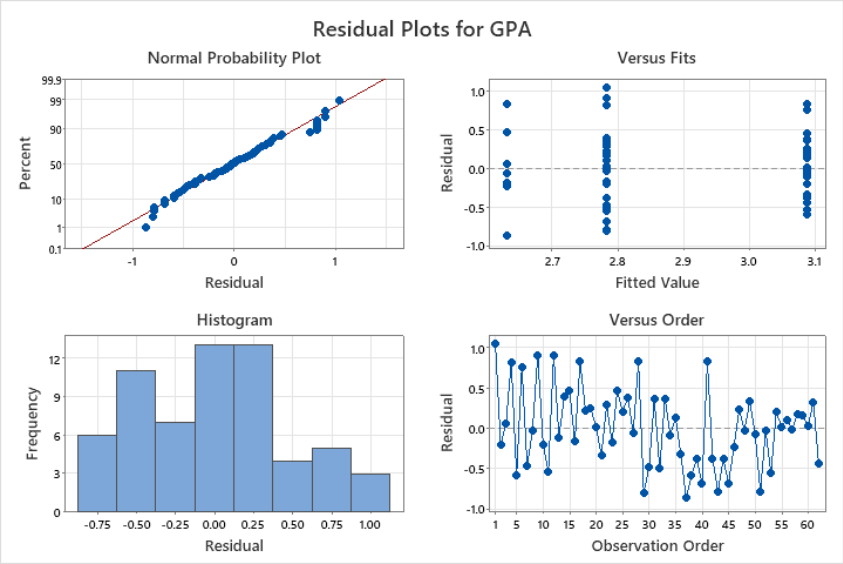

Figure 60: Residual plots

The Normal Probability Plot indicates that the residuals are approximately normally distributed. The Residuals Versus Fits plot shows that the variances are not equal across these groups.

Hypothesis to be tested:
H_0: Medians of GPA are same for all three groups of academic satisfaction vs
H_1: Medians of GPA are not same for all three groups of academic satisfaction

Table 31: Kruskal Wallis test results.

Method	DF	H-Value	P-Value
Not adjusted for ties	2	5.66	0.059
Adjusted for ties	2	5.67	0.059

Since the p-value (0.059) > 0.05, we do not reject H_0 at the 5% level of significance. There is sufficient evidence to conclude that the median GPA does not differ significantly across groups with different levels of academic satisfaction

3.5.2 Fit Regression Model

General Regression Analysis: GPA versus study week, Retakes, Attendance, ...

```
Regression Equation

Attendance  AcademicSatisfaction
High        Dissatisfied          GPA  =  3.0899 + 0.0170352 study week -
                                         0.0253826 Retakes

High        Medium                GPA  =  3.22009 + 0.0170352 study week -
                                         0.0253826 Retakes

High        Satisfied             GPA  =  3.3166 + 0.0170352 study week -
                                         0.0253826 Retakes

Low         Dissatisfied          GPA  =  2.46701 + 0.0170352 study week -
                                         0.0253826 Retakes

Low         Medium                GPA  =  2.5972 + 0.0170352 study week -
                                         0.0253826 Retakes

Low         Satisfied             GPA  =  2.69371 + 0.0170352 study week -
                                         0.0253826 Retakes

Medium      Dissatisfied          GPA  =  2.76593 + 0.0170352 study week -
                                         0.0253826 Retakes

Medium      Medium                GPA  =  2.89612 + 0.0170352 study week -
                                         0.0253826 Retakes

Medium      Satisfied             GPA  =  2.99263 + 0.0170352 study week -
                                         0.0253826 Retakes
```

```
59 cases used, 1 cases contain missing values


Coefficients

Term                       Coef    SE Coef         T       P
Constant                2.89324   0.108727   26.6101   0.000
study week              0.01704   0.008607    1.9793   0.053
Retakes                -0.02538   0.010220   -2.4835   0.016
Attendance
  High                  0.31562   0.067736    4.6596   0.000
  Low                  -0.30727   0.056504   -5.4381   0.000
AcademicSatisfaction
  Dissatisfied         -0.11896   0.088200   -1.3488   0.183
  Medium                0.01123   0.059534    0.1886   0.851


Summary of Model

S = 0.307537     R-Sq = 64.36%        R-Sq(adj) = 60.25%
PRESS = 6.50856  R-Sq(pred) = 52.83%


Analysis of Variance

Source                   DF   Seq SS   Adj SS   Adj MS        F         P
Regression                6   8.8809  8.88085  1.48014  15.6498  0.000000
  study week              1   3.2260  0.37052  0.37052   3.9176  0.053089
  Retakes                 1   1.9578  0.58336  0.58336   6.1680  0.016269
  Attendance              2   3.4346  3.52957  1.76479  18.6594  0.000001
  AcademicSatisfaction    2   0.2624  0.26243  0.13121   1.3873  0.258828
Error                    52   4.9181  4.91812  0.09458
  Lack-of-Fit            48   4.6005  4.60045  0.09584   1.2068  0.486415
  Pure Error              4   0.3177  0.31766  0.07942
Total                    58  13.7990


Fits and Diagnostics for Unusual Observations

Obs    GPA      Fit    SE Fit   Residual  St Resid
 29  1.987  2.60657  0.069379  -0.619568  -2.06792  R
 37  1.770  2.54384  0.140204  -0.773837  -2.82713  R
 45  2.395  1.97639  0.184964   0.418608   1.70375     X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.
```

Figure 61: Regression model output

The regression model shows a moderate fit, with an R^2 of 64.36%, meaning it explains about 64% of the variation in GPA. The standard error (S) of 0.3075 shows that actual GPA values typically deviate from predicted values by about 0.31 points according to the figure 61.

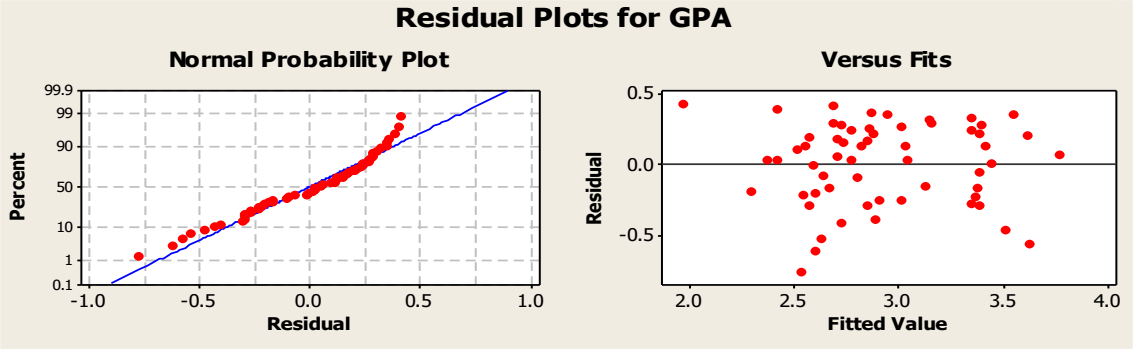

Figure 31: Residual plots

Assumption Checking for the Model

- Normality: The residuals follow the normal line closely, with only small deviations, suggesting that they follow a normal distribution. Hence, residuals satisfy normality assumption.
- Zero mean and constant variance (Homoscedasticity): Residuals are distributed around zero and there is no any significant pattern. Therefore, assumption of zero mean and constant variance assumptions are satisfied.

Interpretation of Regression Coefficients

- The average value of GPA of the students will increase by 0.01704 units for a one-hour increase of study hours per week after adjusting for other variables.
- The average value of GPA of the students will decrease by 0.02538 units for unit increase of number of retake exams after adjusting for other variables.
- On average, students with high attendance scores about 0.316 points higher GPA than those with medium attendance after adjusting for other variables.
- On average, students with low attendance score about 0.307 points lower GPA than those with medium attendance after adjusting for other variables.
- On average, students who reported being dissatisfied with their academic experience tend to have a GPA lower by 0.119 points compared to those who are satisfied, holding all other variables constant.
- On average, students with a medium level of academic satisfaction have a slightly higher GPA of 0.011 points than those who are satisfied after controlling for other variables.

3.6 Analysis of Factors Influencing Part-Time Employment

3.6.1 Association between each qualitative predictor variable with the response variable (part time employment)

To investigate the associations between qualitative predictor variables and the response variable, Chi-Square Tests of Independence were conducted. This analysis assessed whether there were statistically significant relationships between the categorical predictors and the doing or not doing part time. Each qualitative variable was individually tested against the response variable.

3.6.1.1 Association between gender and part time status

Hypothesis to be tested:
H_0: Gender and part-time status are independent.
H_1: Gender and part-time status are associated.

Rows: Gender Columns: PartTime

Table 32: Cross tabulation of gender and part time status

	No	yes	All
Female	23	6	29
	17.77	11.23	
Male	15	18	33
	20.23	12.77	
All	38	24	62

Cell Contents
Count
Expected count

Table 33: Chi-Square tests results

	Chi-Square	DF	P-Value
Pearson	7.457	1	0.006
Likelihood Ratio	7.718	1	0.005

Since the p-value in table 33 is less than 0.05, there is sufficient evidence to reject the H_0 at the 5% level of significance. Therefore, it can be concluded that gender is significantly associated with part time status.

3.6.1.2 Association between attendance and part time status

Hypothesis to be tested:
H_0: Attendance and part-time status are independent.
H_1: Attendance and part-time status are associated.

Rows: Attendance Columns: PartTime

Table 34: Cross tabulation of Attendance and part time status

	No	yes	All
High	12	6	18
	11.032	6.968	
Low	16	16	32
	19.613	12.387	
Medium	10	2	12
	7.355	4.645	
All	38	24	62

Cell Contents
Count
Expected count

Table 35: Chi-Square test results

	Chi-Square	DF	P-Value
Pearson	4.396	2	0.111
Likelihood Ratio	4.672	2	0.097

1 cell(s) with expected counts less than 5.

Since the p-value is greater than 0.05, there is sufficient evidence to not reject the H_0 at 5% level of significance. Therefore, it can be concluded that attendance levels are independent of part-time status.

3.6.1.3 Association between academic satisfaction and part time status

Hypothesis to be tested:
H_0: Academic satisfaction and part-time status are independent.
H_1: Academic satisfaction and part-time status are associated.

Since the p-value in table 37 is greater than 0.05, there is sufficient evidence to not reject the H_0 at 5% level of significance. Therefore, it can be concluded that academic satisfaction levels are independent of part-time status.

Rows: AcademicSatisfaction Columns: PartTime

Table 36: Cross tabulation of academic satisfaction and part time status

	No	yes	All
Dissatisfied	5	2	7
	4.290	2.710	
Medium	17	13	30
	18.387	11.613	
Satisfied	16	9	25
	15.323	9.677	
All	38	24	62

Cell Contents
Count
Expected count

Table 37: Chi-Square Test results

	Chi-Square	DF	P-Value
Pearson	0.651	2	0.722
Likelihood Ratio	0.661	2	0.719

3.6.1.4 Association between Income level and part time status

Hypothesis to be tested:
H_0: Income level and part-time status are independent.
H_1: Income level and part-time status are associated.

Rows: Income Columns: PartTime

Table 38: Cross tabulation of income level and part time status

	No	yes	All
Less than LKR 50,000	6	8	14
	8.581	5.419	
LKR 50,000 - LKR 100,000	18	12	30
	18.387	11.613	
More than LKR 100,000	14	4	18
	11.032	6.968	
All	38	24	62

Cell Contents
Count
Expected count

Table 39: Chi-square Test results

	Chi-Square	DF	P-Value
Pearson	4.088	2	0.129
Likelihood Ratio	4.190	2	0.123

Since the p-value is greater than 0.05, there is sufficient evidence to not reject the H_0 at 5% level of significance. Therefore, it can be concluded that income levels are independent of part-time status.

3.6.1.5 Association between Financial aid and part time status

Hypothesis to be tested:
H_0: financial aid and part-time status are independent.
H_1: financial aid and part-time status are associated.

Since the p-value in table 41 is greater than 0.05, there is sufficient evidence to not reject the H_0 at 5% level of significance. Therefore, it can be concluded that income levels are independent of part-time status.

Table 40: Cross tabulation of financial aid and part time status
Rows: FinancialAid Columns: PartTime

	No	yes	All
No	24	13	37
	22.68	14.32	
Yes	14	11	25
	15.32	9.68	
All	38	24	62

Cell Contents
Count
Expected count

Table 41: Chi-Square test results

	Chi-Square	DF	P-Value
Pearson	0.494	1	0.482
Likelihood Ratio	0.492	1	0.483

3.6.1.6 Association between expenses worry and part time status

Hypothesis to be tested:
H_0: expenses worry, and part-time status are independent.
H_1: expenses worry, and part-time status are associated.

Rows: ExpensesWorry Columns: PartTime

Table 42: Cross tabulation of expenses worries and part time status

	No	yes	All
Low	8	2	10
	6.129	3.871	
Medium	25	18	43
	26.355	16.645	
Often	5	4	9
	5.516	3.484	
All	38	24	62

Cell Contents
Count
Expected count

Table 43: Chi-square test results

	Chi-Square	DF	P-Value
Pearson	1.780	2	0.411
Likelihood Ratio	1.922	2	0.382

2 cell(s) with expected counts less than 5.

Since the p-value is greater than 0.05, there is sufficient evidence to not reject the H_0 at 5% level of significance. Therefore, it can be concluded that expenses worry levels are independent of part-time status.

3.6.1.7 Association between financial impact and part time status

Hypothesis to be tested:
H_0: financial impact and part-time status are independent.
H_1: financial impact and part-time status are associated.

Rows: FinImpact Columns: PartTime

Table 44: Cross tabulation of financial impact and part time status

	No	yes	All
High	10	13	23
	14.097	8.903	
Low	11	2	13
	7.968	5.032	
Medium	17	9	26
	15.935	10.065	
All	38	24	62

Cell Contents
Count
Expected count

Table 45:Chi-square test results

	Chi-Square	DF	P-Value
Pearson	6.241	2	0.044
Likelihood Ratio	6.565	2	0.038

Since the p-value is less than 0.05, there is sufficient evidence to reject the H_0 at the 5% level of significance. Therefore, it can be concluded that financial impact is significantly associated with part time status.

3.6.2 Association between each quantitative predictor variable and the part time status

3.6.2.1 Association between GPA and part time status

Based on the results presented in Section 3.5.1.11, there is sufficient statistical evidence to conclude that the mean GPA differs significantly between students who engage in part-time employment and those who do not.

3.6.2.2 Association between weekly study hours and part time status

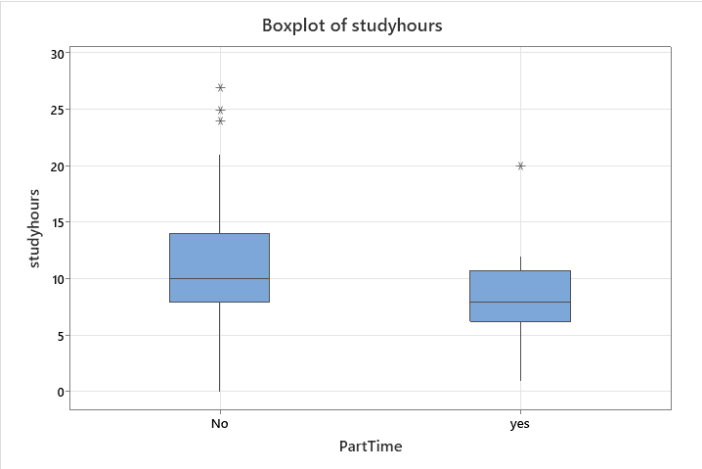

Figure 62: Boxplot of study hours by part time status

According to figure 62 there are outliers in study hours with respect to part time status. It seems that distribution of study hours is positively skewed for both levels of part time status. The median study hours is slightly higher for students who do not engage in part-time jobs than students who engage in part-time jobs.

- **Normality Test of study hours for Students who do not engage in part-time jobs**

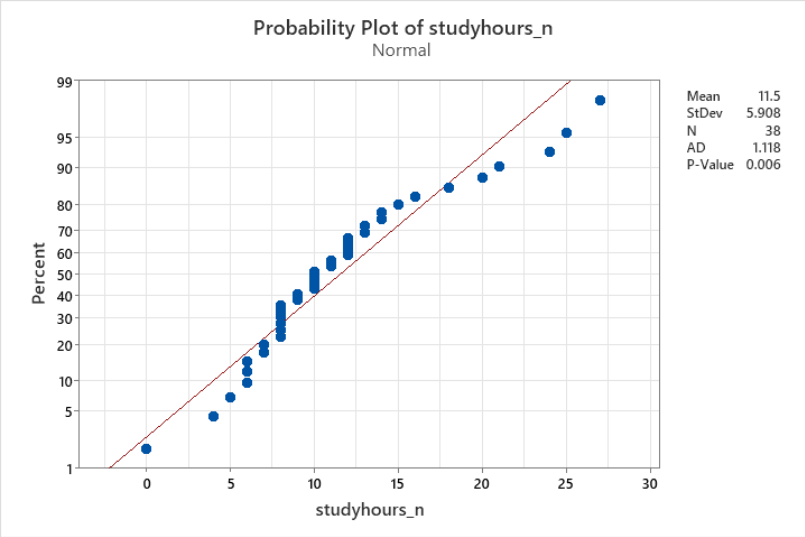

Figure 63: Probability of study hours for students who are not engaged in part time jobs

Since the p-value in figure 63 is less than 0.05, we do not reject H0 at the 5% level of significance. There is sufficient evidence to conclude that the distribution of study hours for students without a part-time job is not normally distributed.

- **Apply Mann-Whitney U test**

Let η_1: median of weekly study hours for students who are not engage in part time jobs
η_2: median of weekly study hours for students who are engage in part time jobs
Difference: $\eta_1 - \eta_2$

Hypothesis to be tested: $H_0: \eta_1 - \eta_2 = 0$ vs $H_1: \eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	1350.00	0.028
Adjusted for ties	1350.00	0.027

Descriptive Statistics

Sample	N	Median
studyhours_n	38	10
studyhours_y	24	8

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
2	(0.0000000, 5)	95.15%

Figure 64: Mann-Whitney U test results

Consider Figure 64. Since p-value < 0.05, it can be concluded that median of weekly study hours for students who are not engaged in part time jobs and students who are engaged in part time jobs are not same at 5% level of significance.

3.6.2.3 Association between exam retakes and part time status

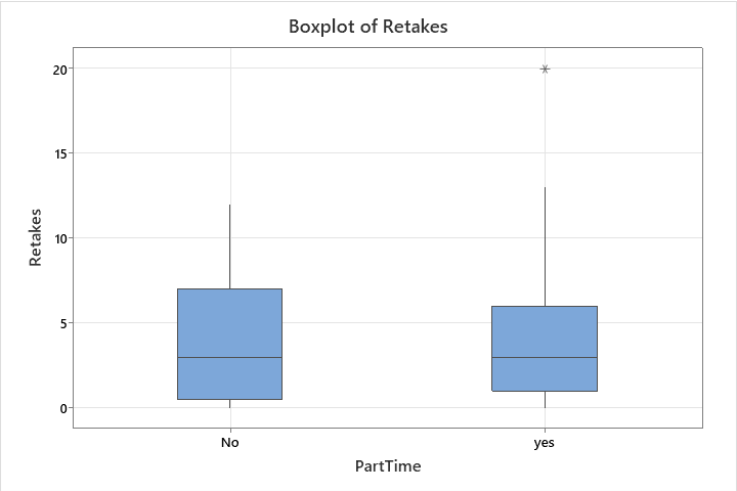

Figure 65: Boxplot of exam retakes by part time status

According to figure 65 there is one outlier. It seems that distribution of exam retakes is positively skewed for both levels of part-time status and the median study hours are similar for both students who do not engage in part-time jobs and students who engage in part-time jobs.

- Normality Test of exam retakes for Students who do not engage in part-time jobs

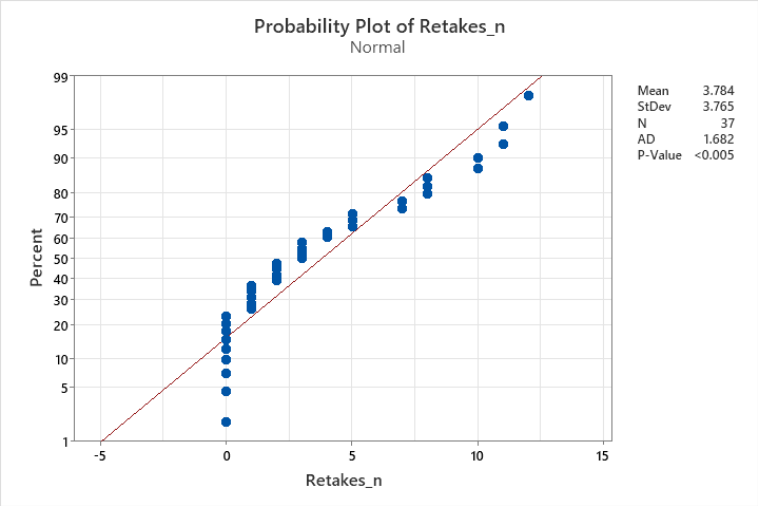

Figure 66 : Probability of exam retakes for students who are not engaged in part time jobs

p-value in figure 66 confirms that the distribution of exam retakes for students without a part-time job is not normally distributed.

- **Apply Mann-Whitney U test**

Let η_1: median of exam retakes for students who are not engage in part time jobs
η_2: median of exam retakes for students who are engage in part time jobs
Difference: $\eta_1 - \eta_2$

Hypothesis to be tested: $H_0: \eta_1 - \eta_2 = 0$ vs $H_1: \eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	1128.00	0.785
Adjusted for ties	1128.00	0.783

Descriptive Statistics

Sample	N	Median
Retakes_n	37	3
Retakes_y	24	3

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
0.0000000	(-2, 1)	95.13%

Figure 67: Mann-Whitney U test results

Consider Figure 64. Since p-value >0.05, it can be concluded that median of exam retakes for students who are not engaged in part time jobs and students who are engaged in part time jobs are same at 5% level of significance.

3.6.2.4 Association between expenses and part time status

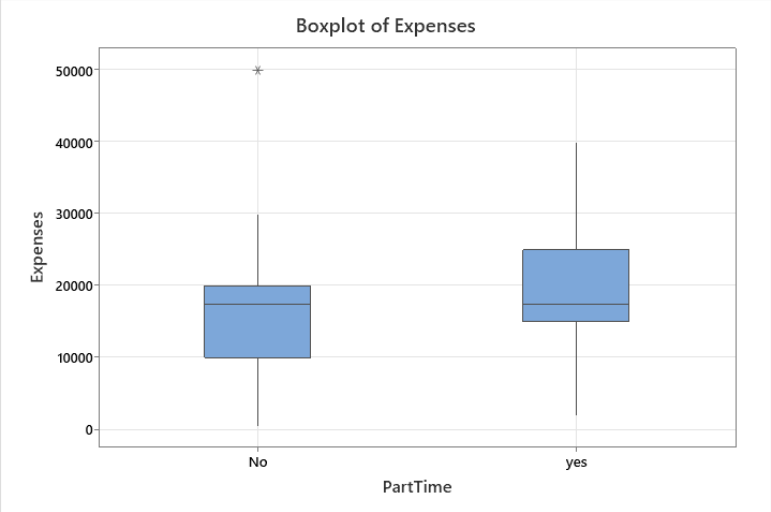

Figure 68: Boxplot of expenses by part time status

According to Figure 68, there appears to be one outlier. The distribution of expenses for students who do not engage in part-time employment is negatively skewed, whereas the distribution for students who do engage in part-time work is positively skewed. Despite these differences in distribution shape, the median expenses appear to be similar for both groups.

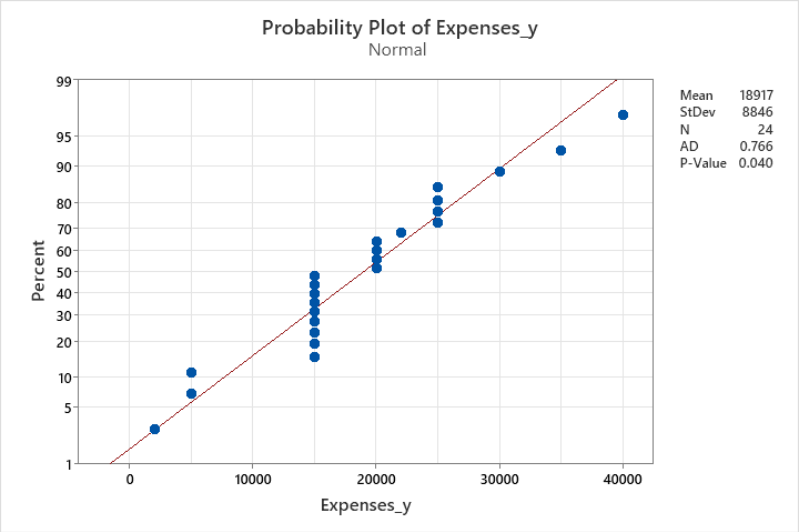

Figure 69: Probability plot of expenses for students who are engaged in part time jobs

p-value in figure 69 confirms that the distribution of expenses for students without a part-time job is not normally distributed.

- **Apply Mann-Whitney U test**

Let η_1: median of expenses for students who are not engage in part time jobs
η_2: median of expenses for students who are engage in part time jobs
Difference: $\eta_1 - \eta_2$

Hypothesis to be tested: $H_0: \eta_1 - \eta_2 = 0$ vs $H_1: \eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	1131.50	0.348
Adjusted for ties	1131.50	0.340

Descriptive Statistics

Sample	N	Median
Expenses_n	38	17500
Expenses_y	24	17500

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
-2000	(-7000, 3000)	95.15%

Figure 70: Mann-Whitney U test results

Consider Figure 70. Since p-value > 0.05, it can be concluded that median expenses for students who are not engaged in part time jobs and students who are engaged in part time jobs are same at 5% level of significance.

3.6.2.5 Association between the percentage of expenses covered by family and part time status

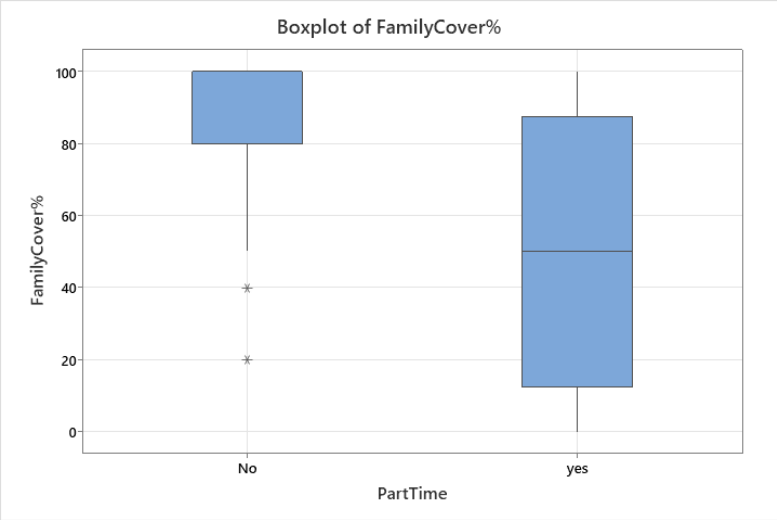

Figure 71: Boxplot of percentage of expenses covered by family by part time status

According to Figure 71, there are two outliers in the distribution of the percentage of expenses covered by family among students who do not engage in part-time employment. The distribution appears to be positively skewed for this group. Additionally, the median percentage of expenses covered by family is slightly higher for students who do not engage in part-time jobs compared to those who do.

- **Normality Test of the percentage of expenses covered by family for Students who do not engage in part-time jobs**

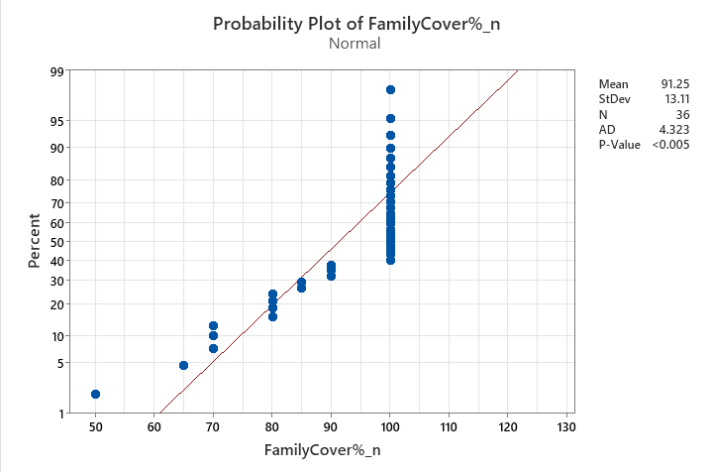

Figure 72: Probability plot of families covers percentage of expenses who are not engaged in part time jobs

p-value in figure 72 confirms that the distribution of percentage of expenses covered by family for students without a part-time job is not normally distributed.

- **Apply Mann-Whitney U test**

Let η_1: median of expenses percentage covered by family for students who are not engage in part time jobs
η_2: median of expenses percentage covered by family for students who are engage in part time jobs
Difference: $\eta_1 - \eta_2$

Hypothesis to be tested: H_0: $\eta_1 - \eta_2 = 0$ vs H_1: $\eta_1 - \eta_2 \neq 0$

Method	W-Value	P-Value
Not adjusted for ties	1400.00	0.000
Adjusted for ties	1400.00	0.000

Descriptive Statistics

Sample	N	Median
FamilyCover%_n	36	100
FamilyCover%_y	24	50

Estimation for Difference

Difference	CI for Difference	Achieved Confidence
40	(20, 50)	95.11%

Figure 73: Mann-Whitney U test results

Consider Figure 73. Since p-value < 0.05, it can be concluded that median of expenses percentage covered by family for students who are not engaged in part time jobs and students who are engaged in part time jobs are not same at 5% level of significance.

4 Discussion

This study has considered records for 22 variables from 62 Third year undergraduates in the faculty of applied science university of Sri Jayewardenepura to identify the association between financial status and academic performance. During the data preparation phase, it was identified that some responses in variables such as monthly rent, number of siblings in the family, spending on personal expenses, percentage of expenses covered by family contains texts instead of numbers. They were all converted into numbers. Also, some individuals who had said that they are doing part time work responded that the number of hours they work and how much they earn from their work as zero. Therefore, those values were replaced by the average of the corresponding variable.

When conducting the descriptive analysis, it was observed that the number of females in the dataset are slightly lower than the number of males indicating minimal bias. However, the composition of the sample with respect to the residence revealed that more than half of the respondents are in a boarding room. This overrepresentation could introduce bias into the model's generalizability. Outliers in quantitative variables which were identified using boxplots in the descriptive analysis phase were treated as missing values in further analysis.

Additionally, two new variables were created for analysis. Variable study hours per week calculated by summing the study hours on weekends and weekdays. Variable total expenses, obtained by combining general expenses and rent. These two variables were introduced into this study for better capture of students' overall study commitment and financial burden. Since the dataset contains only 62 observations and some entries appear to be misleading or inaccurately reported, the adjusted R^2 value is not particularly high. This limitation may be partly due to the respondents not providing accurate and complete information when filling out the questionnaire, which can have a big impact on reliability and explanatory power of the regression model.

It should be noted that during the Chi-square test, some cases exhibited more than 25% of the cells containing expected frequencies less than 5, violating one of the test's key assumptions. Although the Fisher's Exact Test is commonly used for small 2x2 tables, it is not applicable here because those tables are not 2x2. Therefore, the Chi-square test was retained as it is more suitable for the data structure and sample size. To address the issue of low expected frequencies, alternative methods such as applying the Yates' Continuity Correction or using a likelihood ratio test (G-test) could be explored for a more reliable interpretation of the results.

It was assumed that factors not explicitly measured were consistent across the sample. However, as this is an observational study, this assumption may not fully hold. Variability in unmeasured factors, such as socioeconomic background, family dynamics, or external stressors, could have influenced the academic performance and financial behaviors of the students. Consequently, the findings should be interpreted with caution, acknowledging the potential impact of these confounding variables. Future research incorporating these variables and considering a more diverse sample composition is recommended for a deeper understanding and broader applicability of the results.

5 Conclusion

Most students lived in boarding rooms, while those living at home showed better academic outcomes. Nearly 90% reported moderate to high academic satisfaction. About 50% came from middle-income families, and approximately one-third engaged in part-time work. Most students expressed moderate concern about expenses, and many indicated that financial issues strongly impacted their academic focus.

Part-time workers generally had lower lecture attendance, suggesting a possible conflict between employment and academic participation. Students studied more on weekends, with a median of 5 hours, compared to a median of 4 hours on weekdays, and weekend study time was more evenly distributed. The analysis shows that students who study more on weekends and in total each week tend to have better academic results.

Among part-time workers, most earned less than LKR 10,000 per month. The average monthly personal expenses were around LKR 17,685, and while the typical rent paid by students was approximately LKR 6,000, a few students reported paying significantly higher amounts.

Most students had retaken at least one course, and a higher number of retakes was associated with a lower GPA. Higher GPAs were linked to female students, those living at home, and students with better attendance. Weekend study hours showed a positive relationship with GPA, while more course retakes and part-time employment were negatively associated with GPA. However, weekday study hours, boarding rent, and overall expenses did not significantly influence academic performance. Similarly, financial aid, type of residence, worry about expenses, job-related distractions, and self-reported academic satisfaction did not show a meaningful relationship with academic performance in this study.

The study identified several factors significantly associated with students' engagement in part-time employment. Gender, GPA, weekly study hours, agreement on the impact of financial issues on academic focus, and the percentage of expenses covered by family were found to be related to part-time job status. Male students were more likely to work part-time compared to female students. Students who did not engage in part-time jobs reported higher weekly study hours, with a median of 10 hours, whereas those who worked part-time reported a lower median of 8 hours. Moreover, students who engaged in part-time work had only 50 percent of their expenses covered by family on average, while those who did not work part-time had full coverage of their expenses. On the other hand, lecture attendance percentage, academic satisfaction, financial aid, worry about expenses, number of exam retakes, and monthly personal expenses showed no significant association with part-time job engagement.

6 References

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7 Appendix

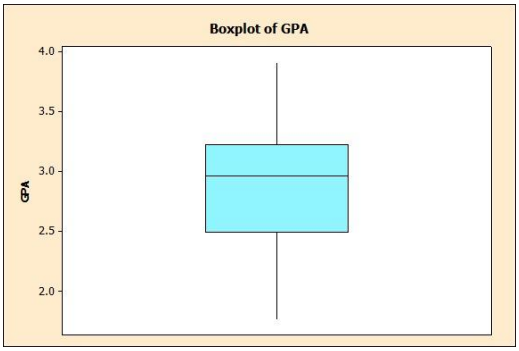

Figure 74: Boxplot of GPA

General Linear Model: GPA versus Gender, Residence, ...

```
Factor                Type   Levels  Values
Gender                fixed       2  Female, Male
Residence             fixed       3  Boarding room, Home, Hostel
Attendance            fixed       3  High, Low, Medium
AcademicSatisfaction  fixed       3  Dissatisfied, Medium, Satisfied
Income                fixed       3  Less than LKR 50,000, LKR 50,000 - LKR
                                     100,000, More than LKR 100,000
FinancialAid          fixed       2  No, Yes
ExpensesWorry         fixed       3  Low, Medium, Often
FinImpact             fixed       3  High, Low, Medium
JobDistraction        fixed       3  High, Low, Medium
PartTime              fixed       2  No, yes


Analysis of Variance for GPA, using Adjusted SS for Tests

Source                DF   Seq SS  Adj SS  Adj MS      F      P
Gender                 1   1.1512  0.2361  0.2361   1.73  0.196
Residence              2   0.4203  0.0276  0.0138   0.10  0.904
Attendance             2   5.6337  3.5470  1.7735  12.98  0.000
AcademicSatisfaction   2   1.2965  0.9618  0.4809   3.52  0.038
Income                 2   0.3827  0.3479  0.1740   1.27  0.290
FinancialAid           1   0.0001  0.0089  0.0089   0.07  0.800
ExpensesWorry          2   0.1779  0.2048  0.1024   0.75  0.479
FinImpact              2   0.0272  0.0943  0.0472   0.35  0.710
JobDistraction         2   0.4359  0.3141  0.1571   1.15  0.326
PartTime               1   0.3758  0.3758  0.3758   2.75  0.104
Error                 44   6.0134  6.0134  0.1367
Total                 61  15.9146

S = 0.369687   R-Sq = 62.21%   R-Sq(adj) = 47.62%

Unusual Observations for GPA

Obs      GPA      Fit   SE Fit  Residual  St Resid
  1  3.82000  3.13228  0.17984   0.68772      2.13 R
 51  2.00000  2.86912  0.19301  -0.86912     -2.76 R
R denotes an observation with a large standardized residual.
```

Figure 75: Regression model output 1

Regression Analysis: GPA versus study week

```
The regression equation is
GPA = 2.54 + 0.0354 study week


Predictor      Coef  SE Coef      T      P
Constant     2.5406   0.1275  19.93  0.000
study week  0.03537  0.01098   3.22  0.002


S = 0.466675   R-Sq = 15.0%   R-Sq(adj) = 13.5%


Analysis of Variance

Source          DF       SS      MS      F      P
Regression       1   2.2620  2.2620  10.39  0.002
Residual Error  59  12.8493  0.2178
Total           60  15.1113


Unusual Observations

     study
Obs   week     GPA     Fit  SE Fit  Residual  St Resid
  1   25.0  3.8200  3.4249  0.1724    0.3951      0.91 X
  6   27.0  3.8390  3.4956  0.1932    0.3434      0.81 X
 37    6.0  1.7700  2.7528  0.0759   -0.9828     -2.13R
 43   20.0  2.0000  3.2480  0.1224   -1.2480     -2.77R
 56   24.0  3.0750  3.3895  0.1622   -0.3145     -0.72 X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage.
```

Figure 76: Regression model output 2

Correlations: FamilyCover%, Siblings, total expenses, Retakes, RESI5

```
                 FamilyCover%        Siblings  total expenses         Retakes
Siblings               -0.073
                        0.575

total expenses         -0.111          -0.069
                        0.398           0.599

Retakes                -0.207          -0.060           0.203
                        0.113           0.650           0.122

RESI5                   0.221          -0.104          -0.228          -0.386
                        0.087           0.427           0.080           0.002

Cell Contents: Pearson correlation
               P-Value
```

Figure 77: Correlation matrix

Regression Analysis: GPA versus study week, Retakes

```
The regression equation is
GPA = 2.83 + 0.0257 study week - 0.0446 Retakes

60 cases used, 1 cases contain missing values

Predictor       Coef  SE Coef      T      P
Constant      2.8329   0.1451  19.52  0.000
study week   0.02572  0.01049   2.45  0.017
Retakes     -0.04457  0.01347  -3.31  0.002

S = 0.425429   R-Sq = 29.6%   R-Sq(adj) = 27.1%

Analysis of Variance

Source          DF       SS      MS      F      P
Regression       2   4.3336  2.1668  11.97  0.000
Residual Error  57  10.3164  0.1810
Total           59  14.6500


Source      DF  Seq SS
study week   1  2.3509
Retakes      1  1.9827

Unusual Observations

     study
Obs   week     GPA     Fit  SE Fit  Residual  St Resid
  6   27.0  3.8390  3.5273  0.1767    0.3117      0.81 X
 19   21.0  3.3340  2.8827  0.1755    0.4513      1.16 X
 37    6.0  1.7700  2.9426  0.0883   -1.1726     -2.82R
 43   20.0  2.0000  3.2581  0.1122   -1.2581     -3.07R
 46    1.0  2.3950  1.9672  0.2145    0.4278      1.16 X

R denotes an observation with a large standardized residual.
X denotes an observation whose X value gives it large leverage
```

Figure 78: Regression model output 3

8 Group Members

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