Assessment 2: Major Assignment

FIN10002: Financial Statistics
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Introduction:

At foremost, the Super Store Data contain an enormous size of data with 9994 recorded transactions, which will thereby be randomly filtered to a dataset of 200 orders, varies by 9 different variables, including Order Date, Ship Mode, Segment, Region, Category, Quantity, Sales, Discount, and Profit. The ultimate aim of this report is to analyse different variables on their unique features, their relativity amongst other sectors and how they affect the orders suggestively.

In order to accomplish this task, numerous tools such as Excel, Jupyter Notebook Python, Pivot Table, Descriptive Statistics and Graphic analysis with the reasonable methods are required. The initial step is to load the data into Jupyter Notebook, using Python to process the data in Tables and Graphs, followed by analysing the data using various Pivot Table techniques in Excel. After that, Graphical illustration will be deployed to present the data in a visually appealing way.

The variables that will be examined in this report include the Order Date, Ship Mode, Segment, Region, Category, Quantity, Sales, Discount, and Profit. The project scope is to investigate and determine the relationships between variables and how they affect the identity of orders in tally.

The processes used in this report will include data clarification and preparation, data analysis using Pivot Table techniques, Graphic analysis and a methodical description. Pivot Table is utilised to summarise and visualise the data to gain insights into the relationships between the different entities. Meanwhile, Graphs can present the data in a visual approaching way, for a better understanding and interpretation.

Eventually, there are also various analytics, in consist of Confidence intervals, Hypothesis testing, Correlation and Regression to play crucial role in clarifying and presenting the data key features. These analytics are vital to perform a strategical approach on the way different variable sets impact the mutual transaction database.

Hence, the investigation are delved into processing data from the sample to acquire the relationship across different entries, therefore, suggestively provide an inform advice for business to have better economic decision.

Part A:

1. Select a random sample

In order to obtain 200 Random transactions from the 9994 Super Store Data on Excel, these steps were implemented:

- Data → Data Analysis → Random Number Generation,
- In the Random Number Generation window, type in:
  - Number of Variables: 1
  - Number of Random Number: 9994
  - Distribution: Uniform
  - Between: 1 and 9994
  - Select the Output Range at the box next to the last right column (Profit)
- Name the column header to be Random,
- Afterwards, go back to Home → Sort → Custom Sort → Sort by – Random – Smallest to Largest (or opposite of your choice),
- Then, select the first 201 rows (or the first 200 order), which is the required Random Sample.

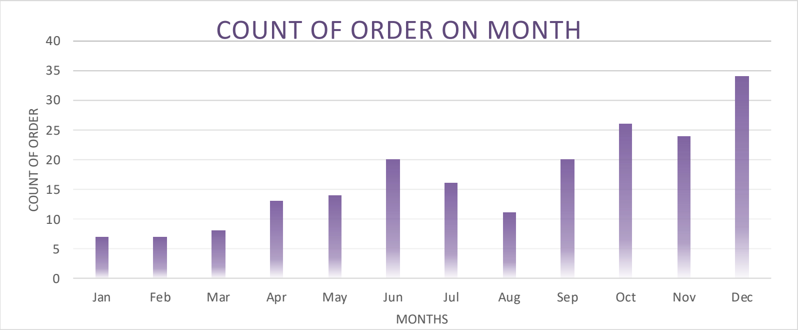
When the Sample is ready, it is optional to make several copies of the Sample for later usages in different tasks.

2. Descriptive statistics

Below are the brief descriptions, summary tables and graphic illustrations accordingly to all 9 variables with data obtained from the Random 200 transactions generated before.

A. Order Date

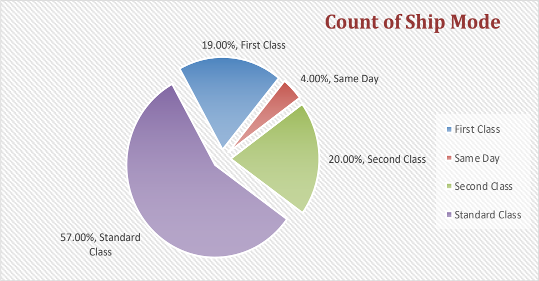
Month	Monthly Order
Jan	7
Feb	7
Mar	8
Apr	13
May	14
Jun	20
Jul	16
Aug	11
Sep	20
Oct	26
Nov	24
Dec	34
Grand Total	**200**



From visual observation of the Pivot Table and the Graph simultaneously, the data depicts the gradual differences in the number of monthly transactions varied from January to December. The data reveals that there is an increasing trend in the number of orders from January to March, which then significantly increases from April to June. Noticeably, the months of June and July show a peak in the number of orders, followed by a slight dip in August. September shows a sudden increase in the count of orders, which further rises and reaches its peak in October and November. Finally, December shows a considerable increase in the Count of Orders, with the highest number of transactions in the entire year.

B. Ship Mode

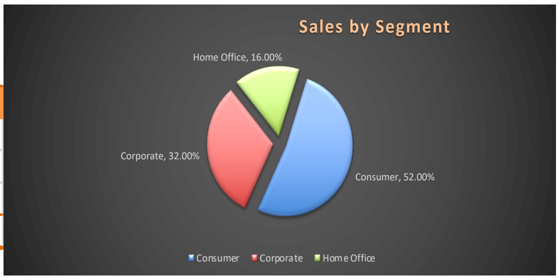
Row Labels	Count of Ship Mode	Relative Frequency
First Class	38	19.00%
Same Day	8	4.00%
Second Class	40	20.00%
Standard Class	114	57.00%
Grand Total	**200**	**100.00%**



From the Pivot Table and the Graphical demonstration, the data emphasizes characterized differences in the number of 4 Ship Modes, in consist of First Class, Second Class, Standard Class and Same Day. The highest number of orders (114) were delivered using the Standard Class, followed by Second Class (40), First Class (38), and Same Day (8). This insinuates customers high preference on the more economical and slower shipping options, like the First, Second Class and especially the Standard Class. Additionally, the remarkable low count of orders shipped using Same Day indicates its unpopularity amongst other methods.

C. Segment

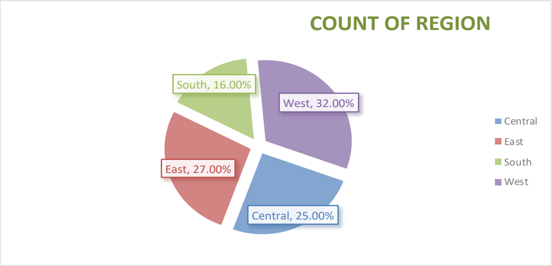
Row Labels	Count of Segment	Segment Frequency
Consumer	104	52.00%
Corporate	64	32.00%
Home Office	32	16.00%
Grand Total	**200**	**100.00%**



The data notations show the distribution of transactions across different Segments, including Consumer, Corporate and Home Office. Consumer segment has the highest number of orders with a count of 104, followed by Corporate counterpart with 64 orders and Home Office with 32 orders. This indicates that the majority of purchases are coming from the Consumer segment, while the other two segments have comparatively fewer orders. It is important to understand this difference in order to make informed decisions for the business, such as targeted marketing or adjusting Sales strategies based on the segment that generates the most revenue.

D. Region

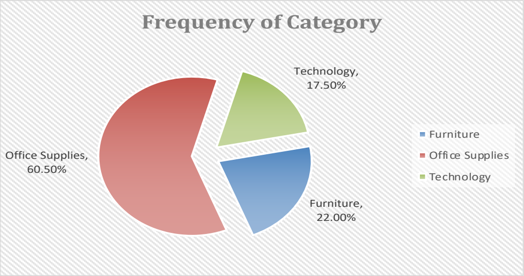
Row Labels	Count of Region	Region Frequency
Central	50	25.00%
East	54	27.00%
South	32	16.00%
West	64	32.00%



The given data shows the count of orders placed from four different Regions - Central, East, South, and West. It can be observed that the West region has the highest count of transactions with 64, followed by the East region with 54. The Central Region has 50 orders, while the South-side has the lowest count of 32 orders. This indicates that the West and East regions are more active and have more orders compared to the other regions. The data suggests that there may be differences in customer behaviour or demand in each region, which analysing data can enable understanding and identifying potential opportunities or challenges.

E. Category

Row Labels	Count of Category	Frequency of Category
Furniture	44	22.00%
Office Suppli	121	60.50%
Technology	35	17.50%
Grand Total	**200**	**100.00%**

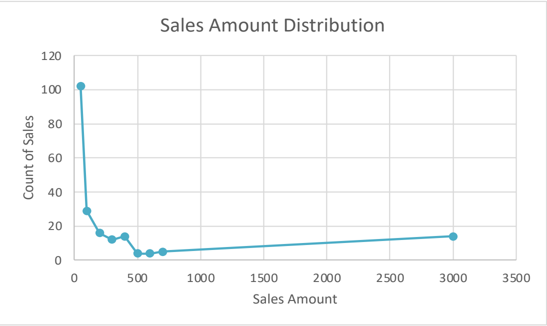


The table above reveal the Count of Category, which presents the number of orders in each category. We can observe that Office Supplies has the highest number of orders (121), followed by Furniture (44) and Technology with the lowest order count (35). This suggests that Office Supplies are more frequently ordered compared to the other categories. The data implies that there may be a significant low and high demand in each of these category customer types.

F. Sales

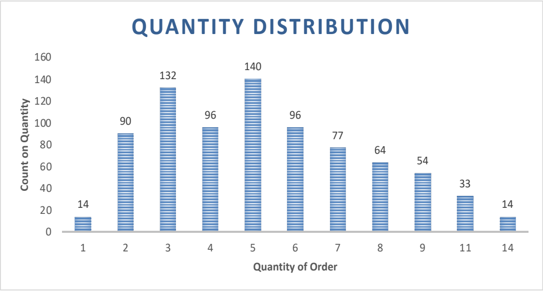
Sales Amount	Count of Sales
<100	131
100-300	28
300-500	18
500-700	9
700-900	4
900-1100	4
1100-1300	2
1300-1500	1
1900-2100	1
2500-2700	1
2700-2900	1
Grand Total	**200**

Bins	Frequency
50	102
100	29
200	16
300	12
400	14
500	4
600	4
700	5
3000	14



The data representations above depict the distribution of Sales amounts based on the count of times a specific amount occurred. The data indicates that the majority of sales were less than 100, with 131 occurrences. Only a small percentage of sales fall into the higher value ranges, with only 1 occurrence each for sales greater than 1900. The distribution of sales is heavily skewed towards lower sales amounts, indicating that the majority of transactions placed in the less costly purchases. The frequency decreases as the sales amount increases, indicating that higher sales amounts were less common.

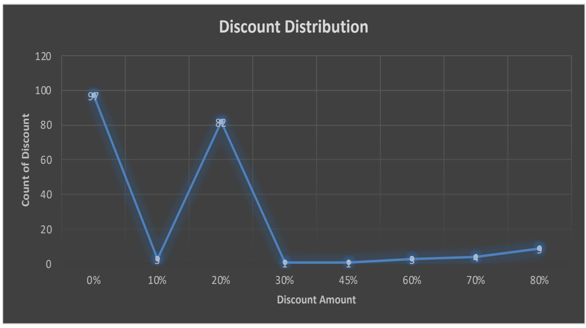
G. Quantity



Quantity Amount	Sum of Quantity
1	14
2	90
3	132
4	96
5	140
6	96
7	77
8	64
9	54
11	33
14	14
Grand Total	**810**

The data reveals the Quantity amounts and the relative Count of Quantity that products sold at each quantity level. The most common quantity size to be sold is 5, with a total of 140 products sold at that quantity. The table shows that most customers tend to buy products in the size of 3 to 6, with a total of 468 products sold at those quantity levels. quantities portion of 1 and 2 are also relatively common, with a total of 104 products sold at those quantity levels. The remaining quantity size (7 to 14) have fewer products sold, with only 290 products sold in total. The average quantity portion to be sold is approximately 4.12.

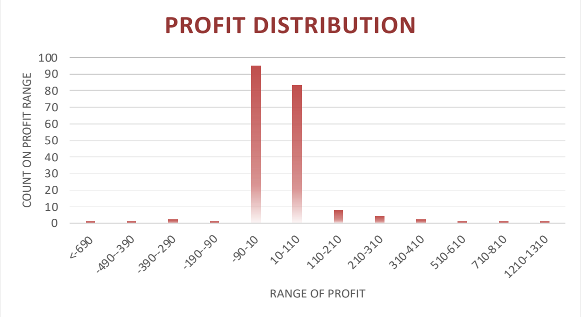
H. Discount



Discount Amount	Count of Discount
0%	97
10%	3
20%	82
30%	1
45%	1
60%	3
70%	4
80%	9
Grand Total	200

These data sets show the Count of Discount and the Discount Amount for each order. The majority of orders (97 out of 200) did not have any discount applied. The most common discount rate applied was 20% (82 out of 200), followed by 0% (no discount) and 80% (9 out of 200). The remaining choices of discount were less common, with only 1 order each for 30% and 45% discounts, and a few orders with higher discounts of 60% and 70%. Overall, the data shows that discounts are not applied very frequently or likely to be at a low rate.

I. Profit



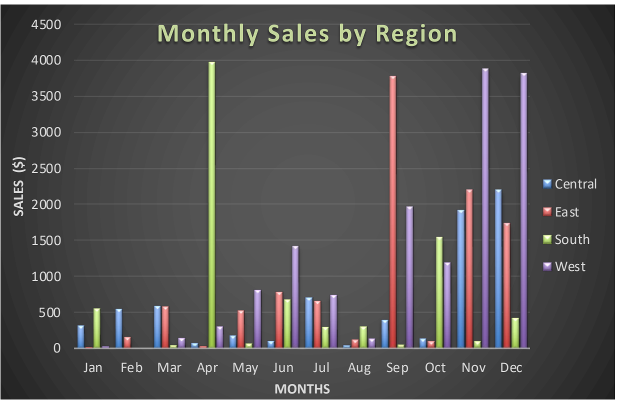
Profit Amount	Count of Profit
<-690	1
-490--390	1
-390--290	2
-190--90	1
-90-10	95
10-110	83
110-210	8
210-310	4
310-410	2
510-610	1
710-810	1
1210-1310	1

Based on the given data source, the majority of the profits fall between the range of -90 to 10, as proved by the highest count of profit falling within that range. There are also noticeable Counts of Profit within the range of 10-110 and 110-210. On the other hand, there are very few Profits falling outside of the range of -390 to 610, indicating a relatively narrow range of profit amounts. Additionally, there are a few extreme values of profit, such as the expense (minus profits) of more than -690 or profits greater than 810, but these are rare occurrences. In overall, the distribution of profits seems to be skewed towards the lower end of the range, with the majority of profits falling within a relatively narrow range.

3. Dashboard

A. Monthly Sales by Region

Sum of Sales	Regional Sales			
Month	Central	East	South	West
Jan	$310.15	$15.17	$545.94	$24.85
Feb	$543.54	$151.04	$0.00	$0.00
Mar	$585.98	$577.84	$42.68	$140.26
Apr	$71.12	$31.10	$3,971.33	$304.19
May	$176.48	$522.36	$66.68	$803.09
Jun	$99.74	$783.98	$675.12	$1,416.94
Jul	$705.21	$655.20	$287.36	$730.80
Aug	$36.88	$117.14	$298.50	$129.75
Sep	$391.99	$3,776.25	$47.56	$1,964.40
Oct	$131.86	$93.04	$1,538.25	$1,186.93
Nov	$1,922.66	$2,200.40	$92.85	$3,876.79
Dec	$2,203.08	$1,735.86	$417.56	$3,820.21



The analysis of the Table and Graphic notations shows that the highest sales occurred in December, with a total sales figure of $11,176.71, which is more than double the sales in the next highest month, November, with a total sales figure of $7,092.70. The Central region has the highest sales in December, with a total sales figure of $2,203.08, followed by the West region with a total sales figure of $3,820.21.

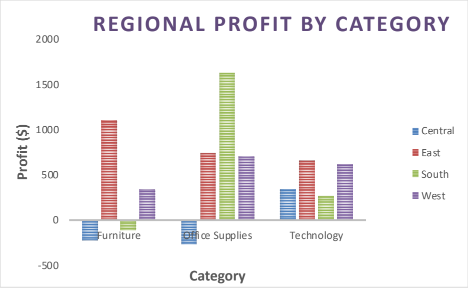
It is also noticeably that there were no sales in the South side in February. Additionally, the South region had the lowest sales in July, with a total sales figure of $287.36. The East region had the lowest sales in January, with a total sales figure of $15.17.

This Graphic investigation can be used to identify the best and worst performing regions by month and to identify sales trends over time. Alongside with the Graph, the Pivot Table can also be used to compare sales figures across different regions and to identify areas for improvement. This analysis is ideal for businesses to make methodical decisions on where and when to focus their marketing efforts and to optimize sales strategy.

B. Regional Profit by Category

Sum of Profit	Region Profit			
Category	Central	East	South	West
Furniture	-$219.22	$1,099.28	-$107.82	$342.70
Office Supplie	-$265.27	$744.54	$1,627.84	$697.48
Technology	$342.82	$654.09	$270.77	$617.76

This data sets illustrate the Regional profit by Category. It presents a comparison of the total profit in each region from three categories: Furniture, Office Supplies, and Technology.

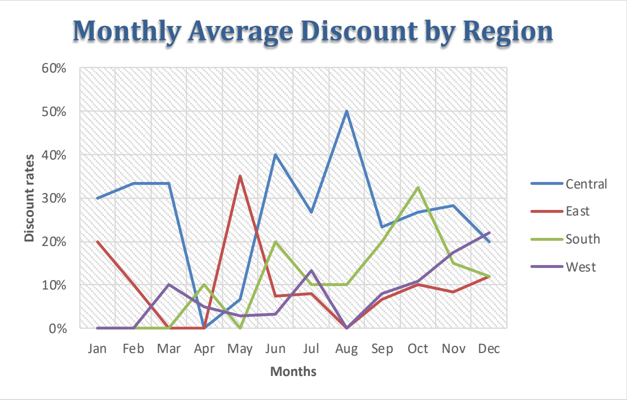


- The South region has the highest profit from Office Supplies, whereas the East region has the highest profit from Furniture.
- The Technology category has contributed positively to the profit of all four regions, and the Central region has the highest profit from this category.
- The Furniture category has resulted in losses for the Central and South regions, whereas the Office Supplies category has resulted in a loss only for the Central region.

This table acknowledge businesses to understand which product categories are most profitable in each region, and enable profitable decisions based on this information.

C. Monthly Average Discount by Region

Average of Discount	Regional Discount			
Month	Central	East	South	West
Jan	30%	20%	0%	0%
Feb	33%	10%	0%	0%
Mar	33%	0%	0%	10%
Apr	0%	0%	10%	5%
May	7%	35%	0%	3%
Jun	40%	8%	20%	3%
Jul	27%	8%	10%	13%
Aug	50%	0%	10%	0%
Sep	23%	7%	20%	8%
Oct	27%	10%	33%	11%
Nov	28%	8%	15%	18%
Dec	20%	12%	12%	22%



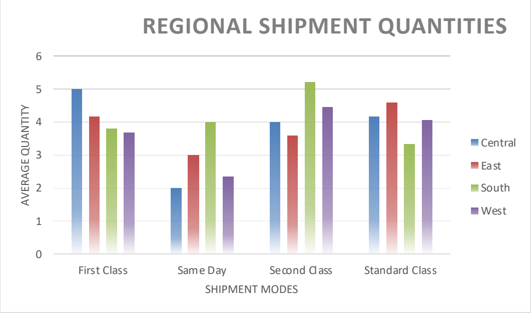
The above Table and Graph shows the Average Regional Discounts offered in different Months by four different regions. From data observation, the discounts offered by each region vary significantly from month to month.

- In January, Central had the highest average discount of 30%, whereas the East had an average discount of 20%. In February, Central had the highest average discount again, but this time at 33%, and the East had an average discount of 10%.
- In March, the East and West regions offered no discounts, while the Central region had an average discount of 33%, and the South region had an average discount of 10%.
- In April, the South region had the highest average discount of 10%, while the other regions had no discounts. In May, the East side had the highest average discount of 35%, while the other regions had lower discounts ranging from 3% to 7%.
- In June, the Central region had the highest average discount of 40%, while the other regions had discounts ranging from 3% to 20%. In July, the Central region had the highest average discount of 27%, while the other regions had discounts ranging from 8% to 13%.
- In August, the Central region had the highest average discount of 50%, while the other regions had no discounts. In September, the South side had the highest average discount of 20%, while the other regions had discounts ranging from 7% to 23%.
- In October, the South region had the highest average discount of 33%, while the other regions had discounts ranging from 10% to 27%. In November, the West zone had the highest average discount of 18%, while the other regions had discounts ranging from 8% to 28%.
- Finally, in December, the West region had the highest average discount of 22%, while the other regions had discounts ranging from 12% to 20%.

Overall, the discounts offered by each region vary significantly by month, with some regions offering higher discounts than others, depending on the month, which can somewhat insinuate the distribution of discount by occasional trends or by the relationship with customers in different area.

D. Regional Shipment Quantities

Average of Quantity	Regional Quantity			
Ship Mode	Central	East	South	West
First Class	5.0	4.2	3.8	3.7
Same Day	2.0	3.0	4.0	2.3
Second Class	4.0	3.6	5.2	4.4
Standard Class	4.2	4.6	3.3	4.1



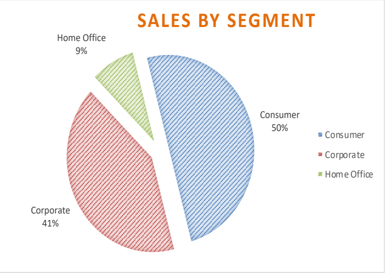
From observation, the Average Quantity of products shipped varies across the different regions and shipping modes. The Central region has the highest average quantity for all shipping modes except for Same Day, where the South region has the highest average quantity. The East region generally has lower average quantities than the Central and West regions. The South region has the lowest average quantity for First Class and Second Class shipments, but the highest for Same Day shipments. The West region has the highest average quantity for Standard Class delivery.

Overall, the fluctuation across each ship modes are minor whereas regional differences in all four areas doesn't seem to have any significant differential level. Thus, this information can be useful for understanding the shipping trends and preferences in different regions for better decisions making related to inventory management and delivery strategies of the business.

E. Sales by Segment

Segments	Sum of Sales
Consumer	20110.5775
Corporate	16677.861
Home Office	3431.684

The Pie chart and Table shows the difference in the Sales by Segment ratio. It summarizes the total sales amount of each segment including Consumer, Corporate and Home Office.



From the table, we can observe that the Consumer segment has the highest sales amount with a total of 20110.5775, followed by Corporate with a sales amount of 16677.861 and Home Office with a sales amount of 3431.684. Based on this information, we can conclude that the Consumer counterpart is the most profitable segment for the company. Hence, this analysis can be used to perform a proper decision on future business strategies related to the segment selling points.

Part B

4. Confidence intervals

A. The average sales for the Consumer sector

We are 95% confident that the sales of any Consumer segment in the smaller sample of 200 transactions falls within the range of $122.88 to $267.62. This means that if we take multiple samples of 200 transactions from the same population, 95% of the time the sales of Consumer segment in those samples would fall within this range.

In contrast, the mean sales to Consumer in the larger sample of 9994 transactions is $268.73 against the 95% intervals mean of $195.25 ± 72.37 in the smaller size. This implies that the small sample underestimates the true average sales of Consumer segment in the total population.

It is important to note that the smaller sample may not be representative of the whole population, and it cannot be certain that the true average sales of Consumer segment in the population is closer to the mean of the smaller or larger sample.

Consumer Average Sales (9994 Sample)	
Mean	268.73
Standard Error	10.87
Median	70.97
Mode	#N/A
Standard Deviation	668.44
Sample Variance	446808.17
Kurtosis	115.60
Skewness	8.75
Range	13999.52
Minimum	0.44
Maximum	13999.96
Sum	1015798.69
Count	3780.00
Confidence Level(95.0%)	21.32

Consumer Average Sales (200 Sample)	
Mean	195.25
Standard Error	36.49
Median	41.37
Mode	#N/A
Standard Deviation	370.30
Sample Variance	137123.24
Kurtosis	28.20
Skewness	4.57
Range	2886.06
Minimum	2.06
Maximum	2888.13
Sum	20110.58
Count	103.00
Confidence Level(95.0%)	72.37
95% Confidence Intervals	
Lower Limit	122.88
Higher Limit	267.62

Under investigation, the analysis of the Consumer segment's average sales in the smaller and larger sample sizes shows that the smaller sample size yields a wider confidence interval than the larger sample size. Besides, the mean sales of Consumer segment in the larger sample is higher than the smaller sample and even out of the 95% confidence interval. This analytic demonstration could emphasize the high uncertainty in random selective technique when grouping any particular random sample from a population, when the sample may not be able to present the exact nature of the population, with potential lack of consistency and accuracy.

B. The average profit for sales from the East

We are 95% confident that accumulated profit of any East region orders in the size 200 sample falls between $16.72 and $75.79 at any time. This conclusion is based on the identity of 95% confidence interval analysis. The two tables depict a comparison between a small sample size of 200 transactions and a large sample size of 9,994 orders in terms of the East region's average profit. The small sample size yielded a mean profit of $46.26 with a 95% confidence interval of ±29.53. On the other hand, the large sample size produced a mean profit of $36.30.

East Average Profit (9994 Sample)	
Mean	36.30
Standard Error	5.36
Median	9.10
Mode	-112.62
Standard Deviation	268.88
Sample Variance	72295.85
Kurtosis	230.16
Skewness	-0.72
Range	11639.96
Minimum	-6599.98
Maximum	5039.99
Sum	91522.78
Count	2521.00
Confidence Level(95.0%)	10.50

East Average Profit (200 Sample)	
Mean	46.26
Standard Error	14.72
Median	10.94
Mode	#N/A
Standard Deviation	108.20
Sample Variance	11707.20
Kurtosis	15.01
Skewness	3.62
Range	686.84
Minimum	-77.13
Maximum	609.72
Sum	2497.91
Count	54.00
Confidence Level(95.0%)	29.53
95% Confidence Intervals	
Lower Limit	16.72
Higher Limit	75.79

The result indicates that the small sample size has a larger confidence interval than the large sample size. This outcome implies that the smaller sample size is less reliable than the larger sample size in terms of predicting the true mean of East region average profit. Additionally, the fact that the true mean of East region average profit falls within the range of the confidence interval derived from the small sample size suggests that the two samples are not significantly different. Therefore, it is unlikely that the small sample size's mean is substantially different from the large sample size's mean.

Overall, the larger sample size may be still needed to ensure reliable and accurate results, therefore, performing a better decision making and provide a strategical advice for the business when analysing economical activities.

5. Hypothesis testing

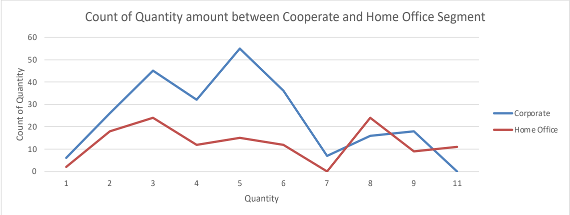
A. Quantity size between Home Office and Corporate Segment

Question: Customers in the Corporate segment are often more likely to place larger orders than their home office counterparts. Thus, the average quantity ordered for corporate customers is more than the average quantity ordered for home office customers. Investigate this contention by carrying out an appropriate hypothesis test.

Count of Quantity	Segment			
Quantity amount	Corporate	Home Office	Cooperate total Quantity	Home Office total Quantity
1	6	2	6	2
2	26	18	52	36
3	45	24	135	72
4	32	12	128	48
5	55	15	275	75
6	36	12	216	72
7	7	0	49	0
8	16	24	128	192
9	18	9	162	81
11	0	11	0	121

Cooperate Quantity Weighted Average	4.78
Home Office Quantity Weighted Average	5.50

In order to obtain the solution to whether customers in Corporate actually tend to purchase larger size of order to the Home Office or not, there are numerous strategies, involving methodical table and graphic analysis to solve this statement by hypothesis testing.



Initially, from visual interpretation, the most frequent quantity amount of order within the Corporate segment is 5 orders, meanwhile, 3 and 8 orders are more likely to be bought from the Home Office, hence, it is impossible to determine the tendency of purchase load within these two client types. Yet, Weighted Average could have been an ideal way to evaluate the situation. By dividing the sum of "Count of Quantity" to the sum of total inventory that these two customer types have purchased, we obtain that the Corporate Quantity Weighted Average is 4.78 (Qty) while the Home Office Quantity Weighted Average is 5.50 (Qty). These two results can suggestively imply that Corporate segment will be less likely to purchase order in a larger size of quantity.

	Corporate	Home Office
n	241	127
Mean	24.1	12.7
SD	17.95952239	8.042249547
Statistic t	*159.6868746*	*97.90792929*
df	240	126
p-value	5.8197E-246	4.7387E-121

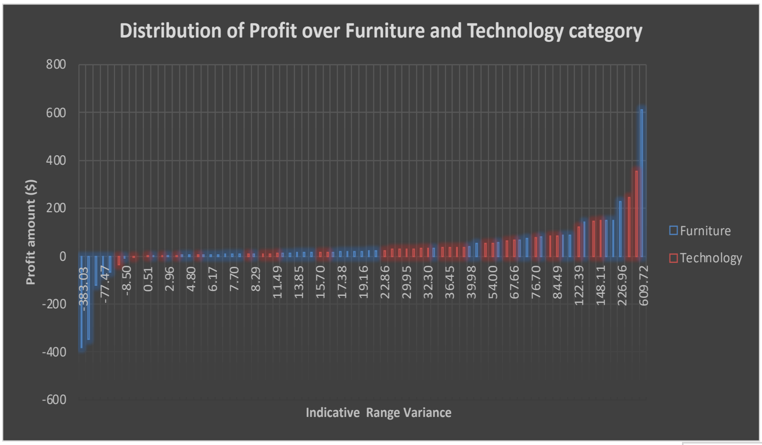
Nonetheless, to investigate whether the average quantity ordered for Corporate customers is more than the Home Office customers, we can conduct a test such as the hypothesis testing. Assuming whether the quantity is greater than 7 to be considered as "Large Order", the null hypothesis would be that the two client types tend to order under the quantity of 7 while the alternative hypothesis state that both are tendentiously greater than 7. If the p-value is less than the significance level (taken 0.05), we would reject the null hypothesis, by utilizing t-test (one tail test with same variance) formulas.

From the table (retrieved from Excel file - Task 5), the p-value is significantly less than 0.05 for Corporate and Home Office segments dually. Nonetheless, by the identity of one tail test, we can conclude that the Corporate are less likely to purchase with larger than the size of 7 orders, compared to the Home Office segments, due to the higher p-value testing of Corporate ($5.820*10^{-246}$) to the Home Office ($4.739*10^{-121}$).

Conclusively, the two methods of testing indicate that the statement was wrong, and the Customers in the Corporate segment are often less likely to place larger orders than their Home Office counterparts.

B. Average Profit per transaction between Furniture and Technology category

Question: It is often felt that the average profit per transaction would be different between furniture and technology categories. Test if there is a difference in average total profit for furniture and technology.



In order to examine whether the Average Profit per transaction between Furniture and Technology category occur any differences, we can employ a hypothesis test such as the null-alternative hypothesis. Regarding, the null hypothesis would be that the two counterparts share the approximate same average profit, meanwhile, the alternative hypothesis suggest that both are different. If the p-value is less than the significance level (taken 0.05), we would oppose the null hypothesis and infer that the two categories are different in average total profit.

The hypothesis could be concluded by the t-Test: Two Sample Assuming Equal Variances method from Excel.

The data analysis table (retrieved from Excel file - Task 5) present the t-Test of Two Sample Assuming Equal Variances. Obtain from the table, the p-value (of one tail, showing 0.13) is more than 0.05 (null confidence level). Thus, it is concluded that the statement is wrong, and the average profit has the neglect disparity with roughly no difference between the two sections.

t-Test: Two-Sample Assuming Equal Variances		
	Furniture	*Technology*
Mean	25.33944318	53.86986571
Variance	18547.77978	5589.335751
Observations	44	35
Pooled Variance	12825.86943	
Hypothesized Mean Difference	0	
df	77	
t Stat	-1.112273553	
P(T<=t) one-tail	0.134740586	
t Critical one-tail	1.664884537	
P(T<=t) two-tail	0.269481172	
t Critical two-tail	1.991254395	

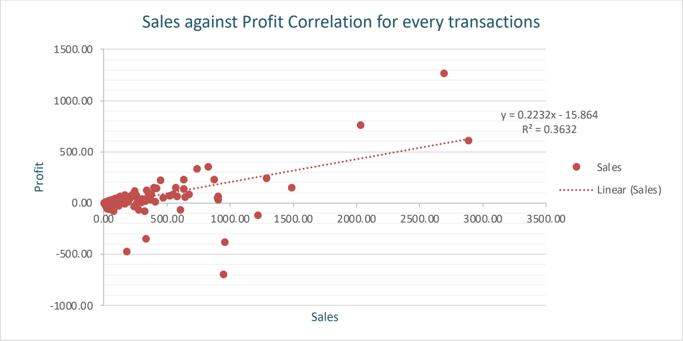
6. Correlation and regression

In order to investigate the relationship between Sales and Profit data for any simulative prediction, we can implement a scatterplot and correlation and regression testing within every single transaction in the 200 - size sample. Initially, conducting a hypothesis test could also examine any linear connection across the two variables.

Correspondingly, we perform a two-tailed hypothesis test, which case the null hypothesis state that there are a 95% confidence possibility to exist a linear relationship between the Profit and Sales sections, meanwhile, the alternative hypothesis reject the statement.

This table (retrieved from Excel file - Task 6) demonstrates two scenarios with the same consequence, whether the p-value is less than the significance level (taken 0.05) or whereas the t-Statistic value is greater than Critical value, we would oppose the null hypothesis and conclude that there are no linear relationship across the two variables. From the table, it is clear that the p-value is significantly less than 0.05 and the t-Statistic value is far more than the Critical value, which therefore oppose the null hypothesis and show that there are no actually linearly correlation among the two entities.

Size	200
Correlation	0.602677074
RSQ	0.363219655
t-Statistic	10.62728778
df	198
Critical value	1.972017478
p-value (two tail)	3.66625E-21



The Scatterplot chart depicts the simulative correlation between Sales and Profit, including record of the values of the slope (regression), intercept, R, and R-squared.

The equation ‘y = 0.2232x - 15.864’ represents the regression line, where y is the predicted Profit and x represents Sales.

The R^2 value of 0.3632 represents the coefficient of determination.

Although the investigation has proved that it is impossible to accumulate a prediction of Profit versus Sales, still, the total Profit can be forecasted from Sales by applying the regression formula ‘y = 0.2232x - 15.864’, which mean that the total Profit ($) equal 0.223 times of Sales ($) minus 15.864 ($).

Above that, it is also mentionable that the R^2 value measure the proportion of the variance in the dependent variable (Profit) that is explained by the independent variable (Sales) in the regression model. In this case, the R^2 value of 0.3632 indicates that approximately 36.32% of the variation in Profit can be explained by the variation in Sales.

Besides, it is also remarkably from the Scatterplot that the positions of the plot series are highly condensed at the start of Sales and Profit axes, close to the regression line when the higher value series tend to falter apart. This could imply the variation of Profit are more predictable on Sales variables at low values and also suggest that most of orders are tendentiously cheaper and less profitable.

Conclusion

In conclusion, the analysis of the Super Store data set, filtered into a sample of 200 orders has provided useful insights into the different variables that affect sales, profit, and other factors that impact business operations. Through the use of various analytic tools such as pivot tables, descriptive statistics, graphical representations, and hypothesis testing, on Excel and Jupyter Notebook, we were able to understand the distribution of the data and the relationship between different variables.

The random sample of 200 transactions provided a lack of accuracy representation from the larger sample, which was evident from the confidence intervals calculated. However, it is indisputable that the sample are still able to keep an acceptable correspondence to the Super Store data, being able to fully provide all key variables, and displaying the relationship across entities, which also mentionable that the smaller sized sample allow better analytic accuracy with minimal effort. The descriptive statistics and graphical representations of each variable support identifying trends, patterns, and outliers. The dashboard with five pivot tables and graphs allowed us to analyse the relationships across different variables and provided us with valuable insights into the segments and regions that contributed the most to sales and profits.

Through hypothesis testing, we were able to conclude within a 95% confidence interval that the Cooperate segment has a smaller quantity amount of order than the Home Office, and that there is actually no remarkable difference in the average profit accumulated in Furniture and Technology categories. Finally, the scatterplot chart with linear regression model allowed us to analyse the relationship between Sales and Profit, which showed a minimal correlation. Yet, the regression model suggests that Sales can be used to predict Profit with reasonable accuracy when the total Profit can be able to be forecasted by applying the regression formula with independent variable Sales.

However, it should be remarked that the analysis was based on a random sample of 200 transactions from the original dataset of 9994 orders. The results may not be fully representative of the larger dataset, and further analysis on a larger sample size may be required to confirm the findings. In addition, it is also noticeable that random and systematic errors from human can be undertaken within the assessment, including applying unappropriated method or graph, using wrong Excel formula, Python code and presenting an untechnical description, with lack of spelling or proper demonstration.

Overall, the assessment has demonstrated the usefulness of various analytical tools, including Pivot Tables, Descriptive Statistics, Confidence Intervals, Hypothesis Testing, and Correlation and Regression analysis. These tools can be utilized to gain insights into various factors and variables that impact business activities and aid in better decision making.