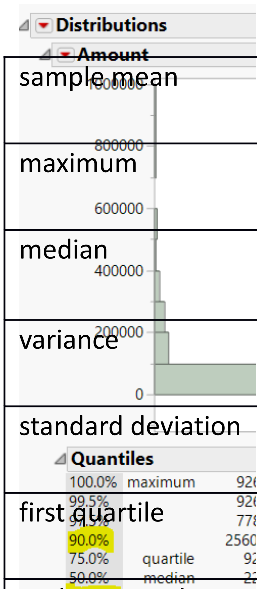
OPIM 5604 B15 – Predictive Modeling Assignment   Meghana Kasula (Net ID=mek15120)

"The work contained and presented here is my work and my work alone."

1. Obtaining Descriptive Statistics (10 points)



sample mean	91044.915
maximum	926500
median	22750
variance	2.706e + 10
standard deviation	164501.8
first quartile	7500
90th percentile	256004.2
skewness	3.1642868
kurtosis	11.15371

Figure (1)

The statistics in Figure (1) was obtained through the following steps :

Analyze> Distribution> summary statistics> customize summary statistics

2. Used the distribution function in JMP to explorer the data and list at least four facts that relate total amount paid with the other variables. (20 Points)

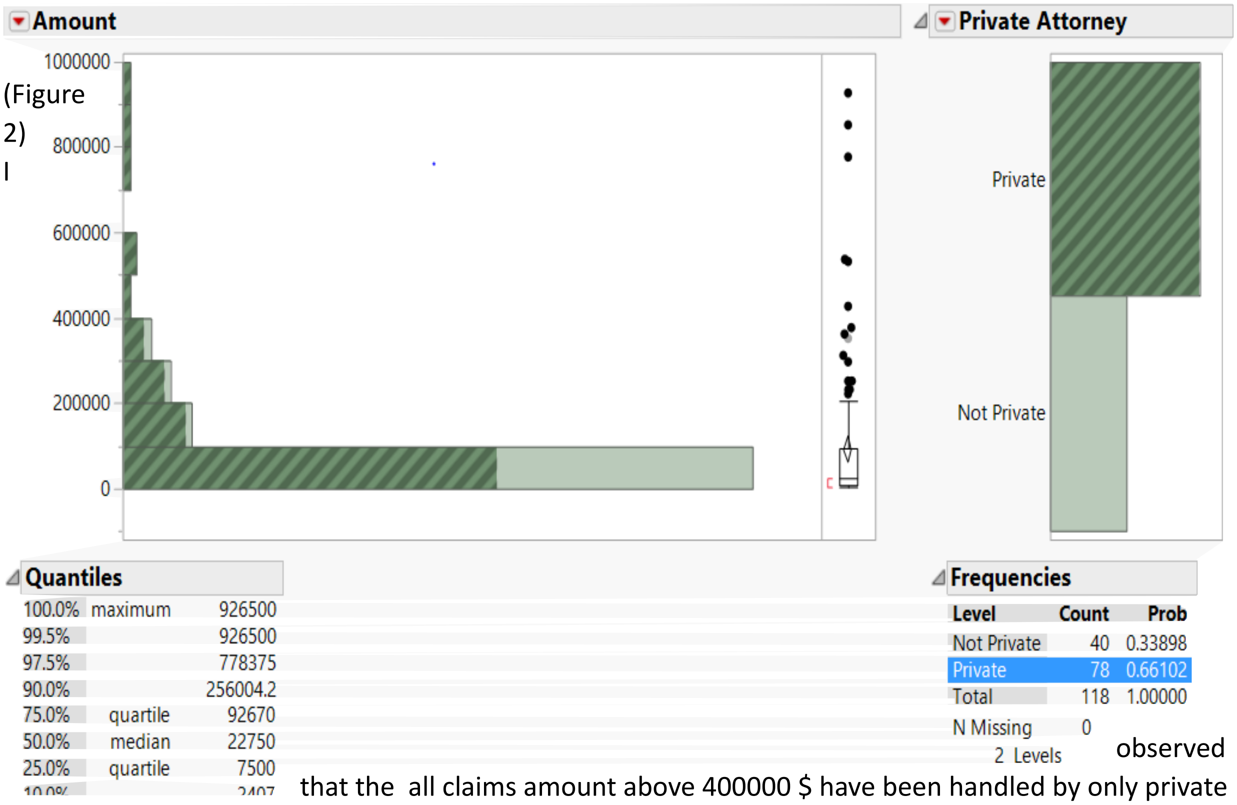
1. Claims above 400000 $ are all from private attorneys (Figure. 2)

2. Highest claim amount is from dermatology. (Figure 3)

3. Cases with highest severity have paid amount less than 400000 $. (Figure 4)

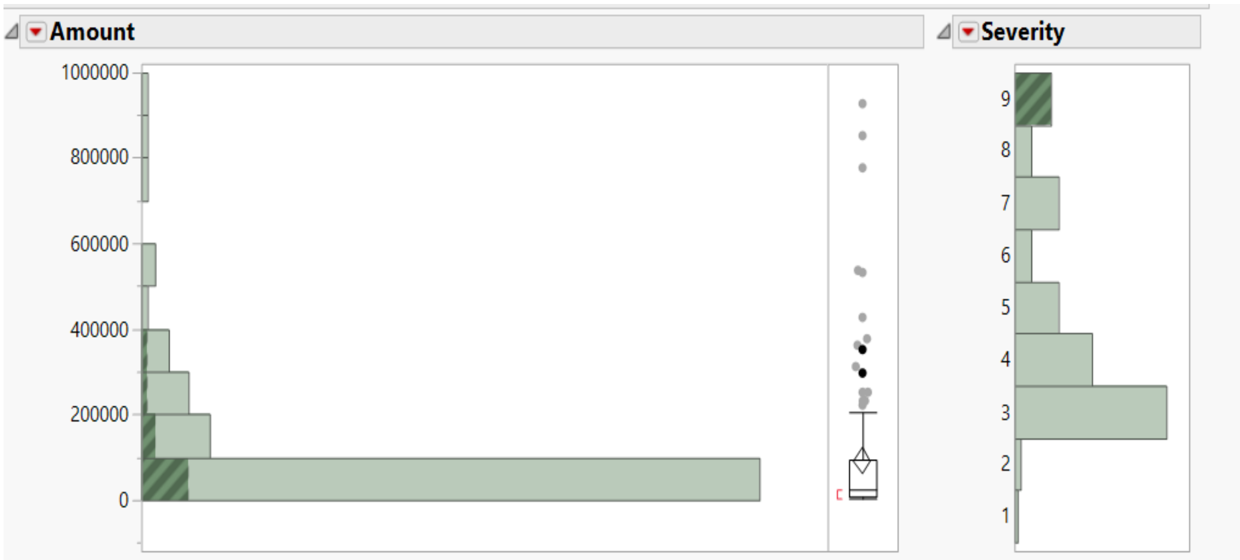
4. Non privat

e firms could make maximum claim amount only up to 400000 $. (Figure 5)

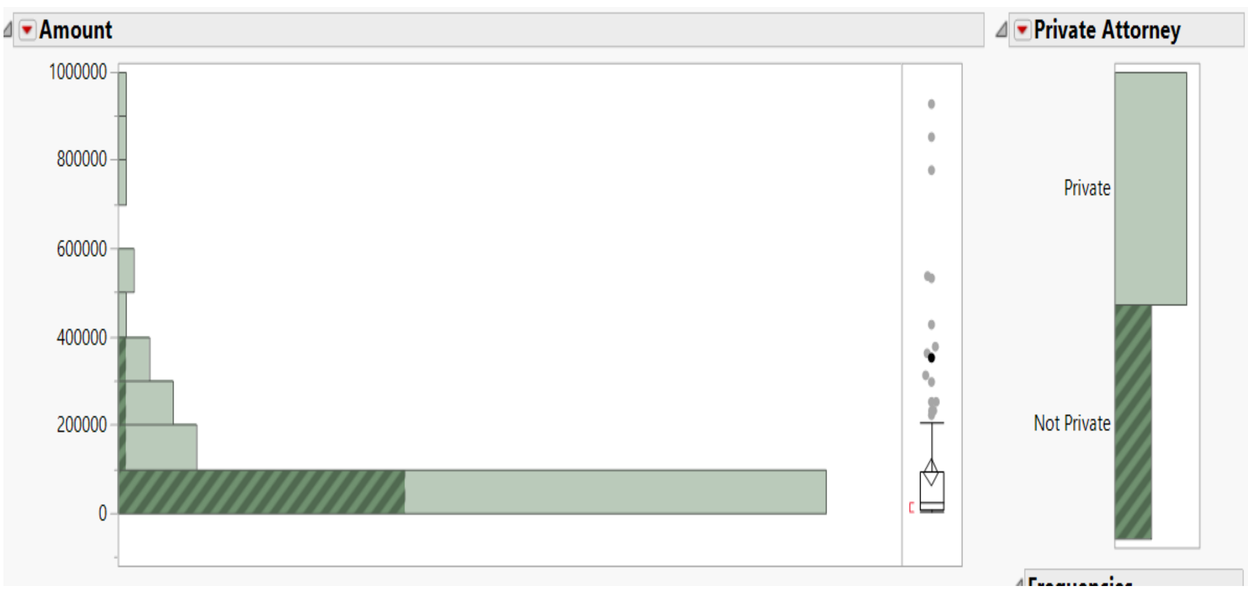


(Figure 2) I observed that the all claims amount above 400000 $ have been handled by only private attorneys.

(Figure 3) The highest claim amount is from Dermatology specialty. And also dermatology has the biggest range of claim amount compared to other specialties starting from least to highest claim amount which we can observe in the above distribution.



(Figure 4) As we click on the severity 9 which is the highest one, the claim amount that are highlighted are all below 400000 $.



(Figure 5) When I clicked on Non private attorney, only claim amount below 400000 $ have been highlighted. Which means, the claim amounts for private attorneys are up to 400000 $.

3. Obtaining Confidence Intervals (20 points)
The insurance company claims that the Amount of the claim payment is about $80000 for each claim. The company wants to know if the average amount is significantly different from $ 80000. Complete the
following steps in order to get an answer for the manufacturer.
a) State the assumption to generate a 95% confidence interval.
b) State how you would validate the assumption.
c) Determine the 95% confidence interval for the mean.

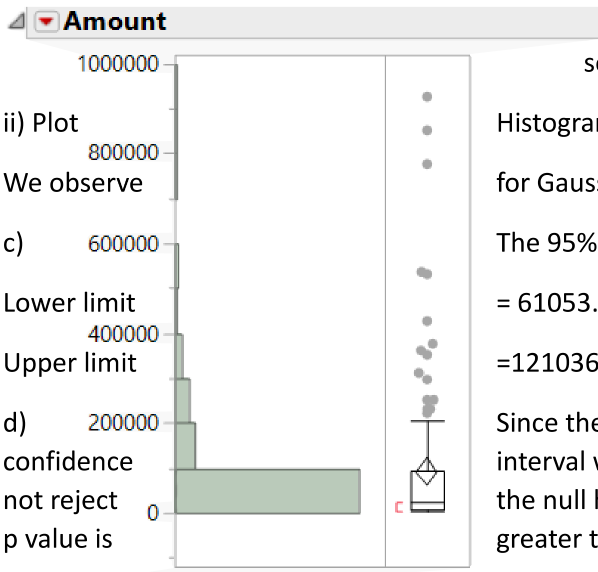
d) Interpret this confidence interval in your own words.

a) The assumption to generate 95% confidence Interval is that

i) the sample is randomly selected;

ii) the sample has symmetric distribution, basically its almost nearly normal.

b) We can validate the assumption by invoking the central Limit Theorem where we need



i) access to the entire population and randomly select samples

ii) Plot Histogram on frequency distribution of means

We observe for Gaussian distribution which will validate our assumption.

c) The 95% Confidence Interval lower and upper limit.

Lower limit = 61053.77

Upper limit =121036.1

d) Since the assumed mean (μ_0= $80000) falls into the 95% confidence interval where α= 0.05, it is a plausible value and since we did not reject the null hypothesis (H_0 : μ_0= $80000), we can assume that the p value is greater than 0.05.

Quantiles

Summary Statistics

Mean	91044.915
Std Dev	164501.8
Std Err Mean	15143.618
Upper 95% Mean	121036.06
Lower 95% Mean	61053.774
N	118

Confidence Intervals

Parameter	Estimate	Lower CI	Upper CI	1-Alpha
Mean	91044.92	61053.77	121036.1	0.950
Std Dev	164501.8	145854.6	188659.3	0.950

4. The insurance company wants to perform a one-sample *t*-test to determine whether the mean Amount is significantly different from $80000. Be sure to validate any assumptions that are associated with the test. Continue to use MedicalMalpractice.jmp.

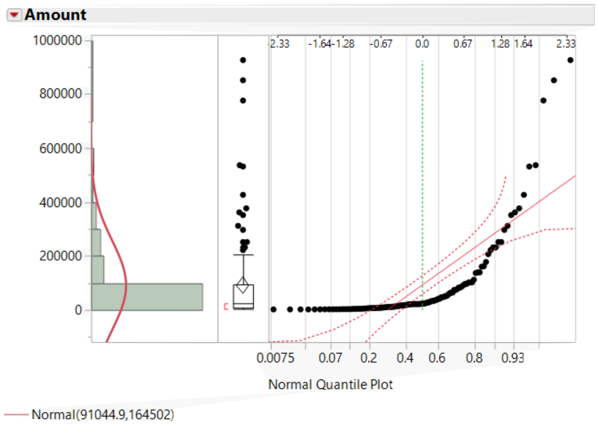
a) Perform the analysis to validate the assumptions of a one-sample *t*-test graphically. Does the data appear normally distributed using the normal curve and the normal quantile plot?

b) Before conducting the test, complete the hypotheses. Is this a one-sided or two-sided test?

Ho: ____________

Ha: ____________

c) Assuming 95% confidence interval , determine whether the mean Amount is significantly different from $80000.

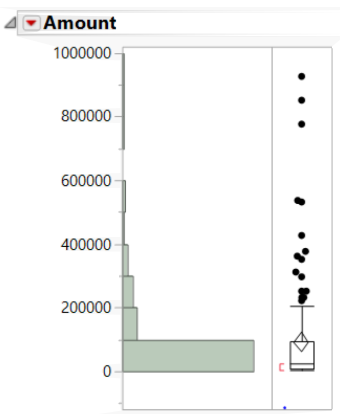


a) When I selected Normal quantile Plot and Normal Plot, I realized that the plot is not normal.

b) It is a two sided test, since we just have to determine if the mean amount is different from the given mean of \$80000(μ_0).

$H_0 : \mu_0 = 80000$

$H_a : \mu_0 \neq 80000$



Quantiles

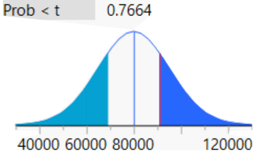
Summary Statistics

Test Mean

Hypothesized Value	80000
Actual Estimate	91044.9
DF	117
Std Dev	164502

t Test

Test Statistic	0.7293
Prob > |t|	0.4672
Prob > t	0.2336
Prob < t	0.7664



c) My hypothesis would go by

$H_0 : \mu_0 = 80000$

$H_a : \mu_0 \neq 80000$

So, I selected the test mean from the distribution table and tested mean hypothesis for \$80000.

I got the two tailed p value (Prob > |t|) as 0.4672 .

Our Confidence Interval is 95% , hence $\alpha = 0.05$

P value > > α

Therefore, I fail to reject the null Hypothesis.

Conclusion: We do not have significance evidence that the mean amount is different from \$80000 at p value – 0.4672

5. Test the following claims (or hypotheses). (10 points)

Claim1: Average Profit Age is greater than 45. Before conducting the test, complete the hypotheses. Is this a one-sided or two-sided test?

Ho: ____________

Ha: ____________

Result (reject or not reject):

p-value:

It is a one-sided test because of the expressions "Average Profit Age is greater than 45". It is a right tailed test.

$H_0 : \mu_0 \leq 45$

$H_a : \mu_0 > 45$

I got the two tailed p value (Prob < t) as 0.9034 . (Figure 9)

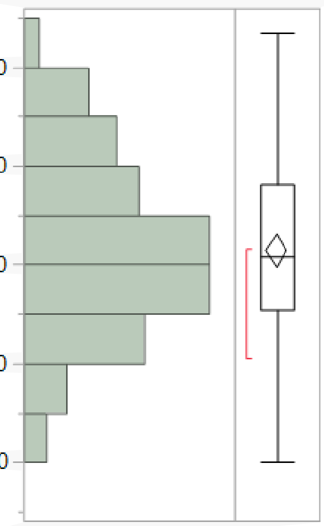
We will consider confidence Interval is 95% , hence α = 0.05,

P Value = 0.9034

P value >> α

Hence, we fail to reject the null hypothesis, since there is no enough evidence to prove that the mean amount is less than or equal to 45.

Age



Quantiles

Summary Statistics

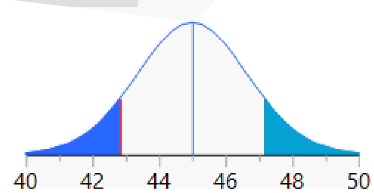
Mean	42.830508
Std Dev	18.004418
Std Err Mean	1.657441
Upper 95% Mean	46.112984
Lower 95% Mean	39.548033
N	118

Test Mean

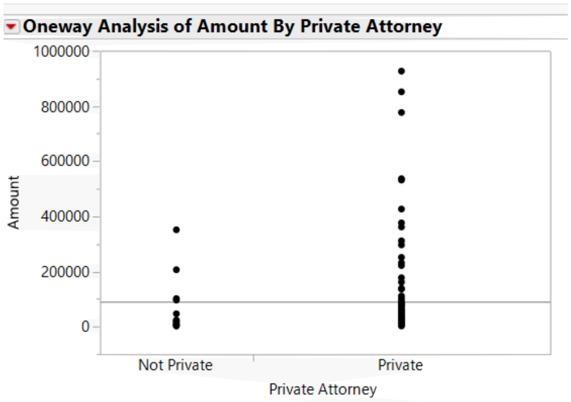
Hypothesized Value	45
Actual Estimate	42.8305
DF	117
Std Dev	18.0044

t Test

Test Statistic	-1.3089
Prob > |t|	0.1931
Prob > t	0.9034
Prob < t	0.0966



6. Is it appropriate to conduct a two-sample *t*-test to test if a difference exists between the averages Amount paid when Private Attorney is used vs Not Private?
a) If appropriate, generate a two-sample *t*-test for both a) and state the null and alternative hypotheses.
Ho: ____________
Ha: ____________
Result (reject or not reject):
p-value:
b) What conclusion do you reach?

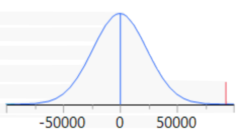


t Test

Private-Not Private

Assuming unequal variances

Difference	92728	t Ratio	3.889361
Std Err Dif	23841	DF	105.6059
Upper CL Dif	139998	Prob > |t|	0.0002*
Lower CL Dif	45458	Prob > t	<.0001*
Confidence	0.95	Prob < t	0.9999



a) Yes, two sample test can be done to test the mean in both samples of similar parameter.

The plot beside gives us a two- sample test of amount paid by private and non-private attorneys.

Here let μ_1 be estimate mean of private attorneys

μ_2 be estimate mean of non private attorneys

$H_0 : \mu_1 = \mu_2$

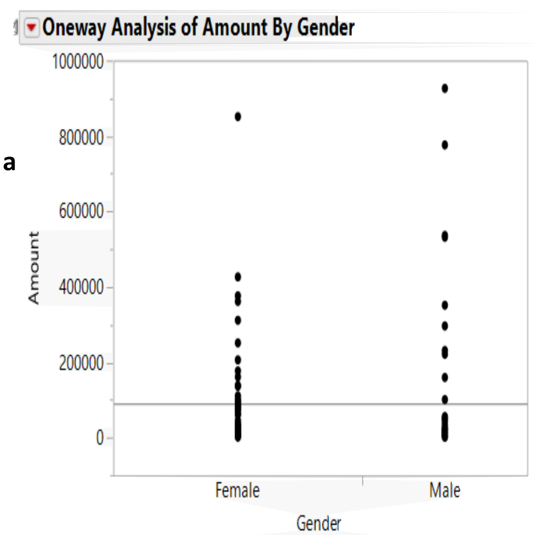
$H_a : \mu_1 \neq \mu_2$

P value = 0.0002, α =0.05 (Figure 10)

Since P value is << α, we reject the null hypothesis.

b) Since p value is less than α , there is sufficient evidence to prove that the means of amount paid to private and non -private attorney is different.

7. Is it appropriate to conduct a two-sample *t*-test to test if a difference exists between the average
Amount paid when Female claimant vs male claimant?
a) If appropriate, generate a two-sample *t*-test for both a) and State the null and alternative
hypotheses. Assume that you are willing to accept a 5% probability of incorrectly rejecting the
null hypothesis.
Ho: ____________
Ha: ____________
Result (reject or not reject):
p-value:

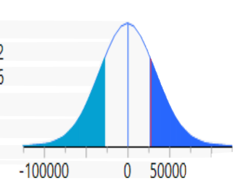


t Test

Male-Female

Assuming unequal variances

Difference	27291	t Ratio	0.81062
Std Err Dif	33667	DF	71.59976
Upper CL Dif	94410	Prob > |t|	0.4203
Lower CL Dif	-39829	Prob > t	0.2101
Confidence	0.95	Prob < t	0.7899



b) What conclusion do you reach?

a) Yes, two sample test can be done to test the mean in both samples of similar parameter.

The plot beside gives us a two- sample test of amount paid by private and non-private attorneys.

Here let μ_1 be estimate mean of amount paid by men

μ_2 be estimate mean of amount paid by women

$H_0 : \mu_1 = \mu_2$

$H_a : \mu_1 \neq \mu_2$

P value = 0.4203, α =0.05 (5 % error)(Figure 11)

Since P value is >> α, we fail to reject the null hypothesis.

b) Hence there is insufficient evidence to prove that the amount paid by men is different from amount paid by women.

8. Analyzing Data from Two Independent Samples (10 Points)

You own two plants and have taken 100 random samples of the output of each plant. If you want to test the hypothesis that the plants are performing equally well, what test would you utilize? Where is the test found in JMP?

Here our null hypothesis would be that there is no difference in the mean of output and the alternate hypothesis is that there is an existing difference.

H_0 : difference in mean is 0.

H_1 : difference in mean in not equal to 0.

To know that the plants are doing equally well we would go to through the following steps.

JMP file > Analyze > Matched pairs.