Question 1

a) Calculations done in Excel sheet attached

Source	SS	df	MS	Number of obs	=	2298
				F(3, 2294)	=	554
Model	190.873336	3.00	63.624445400	Prob > F	=	0.000
Residual	263.547174	2294.00	0.114885429	R-squared	=	0.420
				Adj R-squared	=	0.419
Total	454.420510	2297.00	0.197832177	Root MSE	=	0.339
lfare	Coef.	Std. Err.	t	P> t	[95% conf.	
					interval]	
ldist	0.4544197	0.128003	3.550	0.0004180	0.204	0.705
lpassen	-0.0678697	0.0084094	-8.071	0.000	-0.084	-0.051
bmktshr	0.3092456	0.0425167	7.274	0.000	0.226	0.393
_cons	2.241328	0.1218621	18.392	0.000	2.002	2.480

(m - in) S = 151
formulas $F(3,2294) = Ms of Model$ $Ms of Residual$
$R^{\prime\prime} = \frac{SSR}{SST}$
$Adj R^{\gamma} = 1 - \frac{\Lambda - 1}{\Lambda - k - 1} \frac{SSR}{SST}$
Root MSE = Sq. rt (MS of Residuals)
p-values = Using 2 tail tooks (Excel)

b) Interpret the Coefficients on Idist and bmktshr in English sentence

Coefficient of Idist(0.4544197) is the elasticity of Ifare with respect to Idist Coefficient of bmktshr(0.3092456) is the elasticity of Ifare with respect to bmktshr

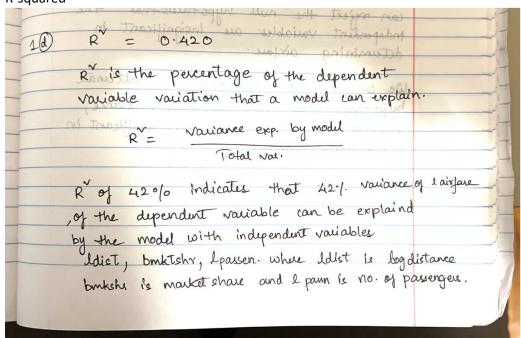
ldist: When ldist increases by 1%, Ifare increases by 0.4544197%, holding all other independent variables fixed.

bmktshr: When bmktshr increases by 1%, Ifare increases by 0.3092456%, holding all other independent variables fixed.

c) Test null hypothesis that the coefficient of bmktshr is equal to zero

10 Test Ho!	Bonkhhi = 0	sitestal -7
	12	
2-touled	t-test	117
	1/1-8-10/ (9-1)	On sa
tsto	otistic = 0.30°	12456 = 7.2735
	0.04	25167
P-val	ue = 0.00	(calculated in (a)
Prahue (o	00) is lus than	the p-value
Jos 5.1.	onfidence level.	040.05
Honcestyub H	o: Blombash = 0 ca	n be rejected.
However, th	re alternate hypo	thusis that
coefficient	of "broktshr" is n	ot zero cannot
be rejected		-12 - A 2 - A 2
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 d) Interpret the R-squared and the overall F-statistic R-squared



F-statistic

f-statistic

$$f_{s+ot} = \frac{R^{3}/k}{(1-R^{3})/(n-k-1)}$$

$$= \frac{0.420/3}{(1-0.42)/(2298-3-1)}$$

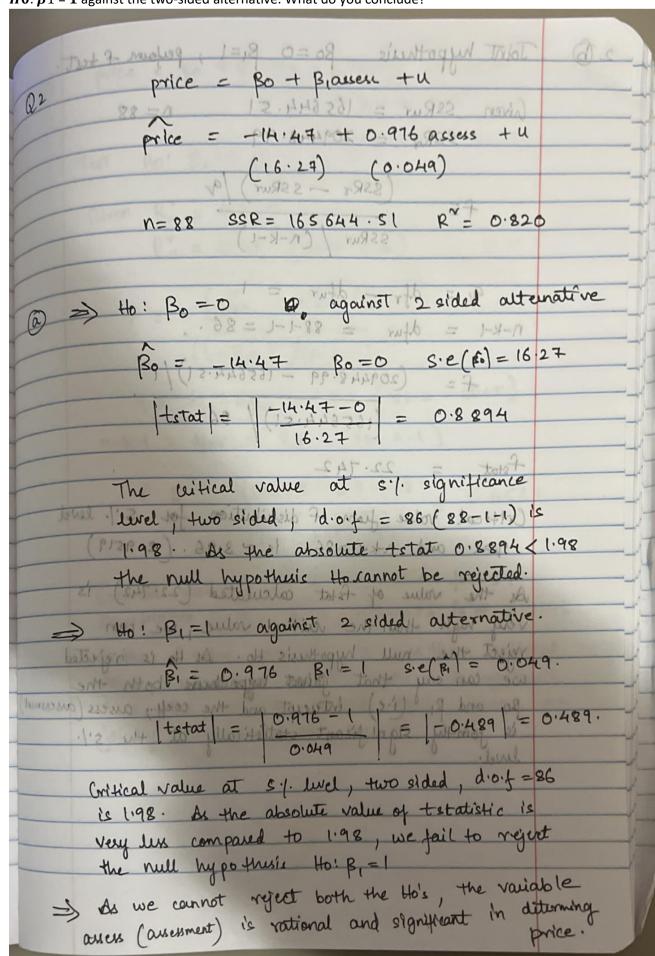
$$= \frac{0.42}{0.58} \times \frac{2294}{3}$$

$$= \frac{0.42}{3} \times \frac{2294}{3}$$
Fralue ≈ 554 = Ms of Restands Model Ms of Residuals

P-value and chated is 0.00, this when compated with s ? significance level (p 0.05). We can reject the null hypothesis that the independent variables are insignificant in determining airfore.

We can however not reject the alternate hypothesis that the variables I distance, booktship I not of passengers are significant in ditermining lairfare.

a) First, test the hypothesis that $H0: \beta\beta 0 = 0$ against the two-sided alternative. Then test $H0: \beta 1 = 1$ against the two-sided alternative. What do you conclude?



2 D Joint hypothesis Bo = 0 B1=1, perform + test.
Given SSRur = 165644.51 n= 88
SSR = 209448.99
CANOLATE (PS. A.)
$\frac{\left(SSR_{8}-SSRur\right)}{2}$ $\frac{\left(SSR_{8}-SSRur\right)}{2}$
SSRur / (n-k-t)
$9 = df_{V} - df_{UV} = 1$ $1 - k - 1 = df_{UV} = 88 - 1 - 1 = 86$
n-k-1 = afur = 88-(-1 = 88)
f= (209448.99 - 165644.51)/1
(165644:51) / 86
$f_{\text{ctat}} = 22.742$
fotat = 22.742 supplier 1.2 to sular losities sult
Critical value from f distribution for 5% level
9=1 and n-k-1=86 is ~ 3.96. (2.9519)
I hatagor and toward the similarity live and
As the value of fetat calculated (22.742) 13
very high than the witheal value, we can
reject the null hypothesis Ho. As Ho is rejected
the can can that makes bourgedonesis both the
Bo and B, (i'e) intercept and the coeff., assess (assessment)
is motoring significant statistically at the sil
Bo and R, (i'e) intercept and the coeff., assess (assessment) is prototog significant statistically at the s.1.
28- forb, behis out lovel 1.3 To sulpre lovely
Also it is effective to use tetatistic over
Also it is effective to use + statistic over f statistic as + is fluxible for single variable
hypothesis and can be used against I sided attemptives
SANAUV SAT"
As we connot reject both the blos , the variable.
aucus (aucument) is notional and significant in price.
and the second s

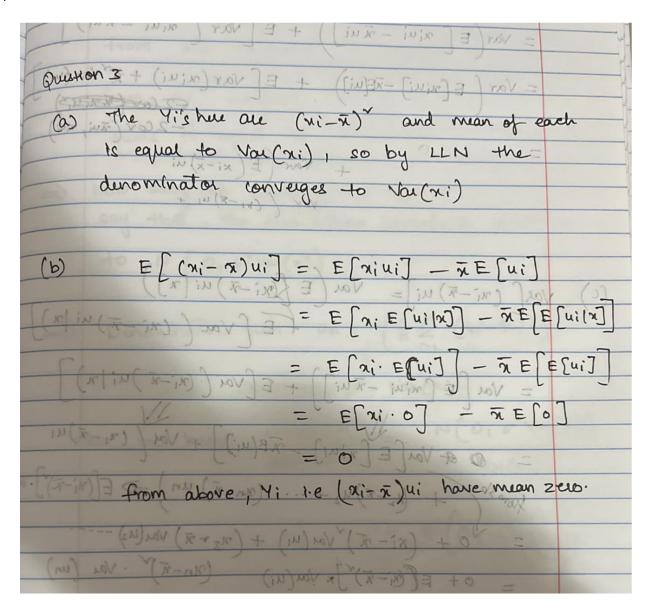
price = Bo + B1 aven + B2 lotsize + B2 sqrft	
20 the training and the Bully ms + U.	I
Test Ho! B2=0 B3=0 B4=0	Ì
The state of the party of the state of the s	4
Given Rur = 0.829 thrp2, esistal will	1
2 1 2 0.82 (from 2 a) at tant	and the
associate and of evitalen al llama told ubardle of hatelights (Rurs - 1Rx) 2 hateries to	1
Figure - Rr) /2 betimen	1
(1-Rur) /(n-K-1)	+
	~
q = dfr - dfur = 3 (88-2-82+5) $n-k-1 = dfur = 8.2 (88-4-1)$	
n-k-1 = dfur = 82 (88-4-1)	-
f = (0.829 - 0.82)/2 = 1.4561	-
	_
(1-0.829) [83	
Critical value from f distribution for 5.1.	
critical value from 7 months is 2.7146 significance level, $q=2$, $n-k-1=92$ is ≈ 2.7146	
significance livel, av=1	
As the f value calculated is less than resition	
value, we cannot reject to the null hypothesis.	
Thus, the variables lot size, sarft, barnes	
Thus, the variables lotsize, sarft, borns are jointly insignificant at the sil. Iwel.	

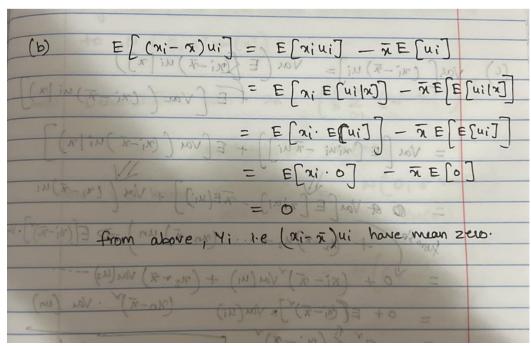
d) If the variance of price changes with assess, lotsize, sqrft, or bdrms, what can you say about the F-test from part (c)

20	In 2c we saw that the variables	
	lotsize, sgrift, borns au jointly insignificant	
	at the s.1. significance level.	
	Justice sever	
	Now if vowance of price changes with	
	all variables, we can say this is attributed	
	to SSR. This is because as per MLR 5, it says	
	that variance of y given x, does not depend on	
	the values of the Independent variables.	
	But this does not make sense, as according	
	to homoskedasticity, it is required that voucance	
-	of u does not depend on independent variables.	
	Company of the control of the contro	
	So when we are saying variance changes with	
	I vailables, then our assumption of homoskedasticity	
	does not apply. That means the f-test from the	
Sul	part 2c does not validate the hypothesis. We	
	need to then test each voulable seperately to see	
	the significance of the variable in the model.	
		1

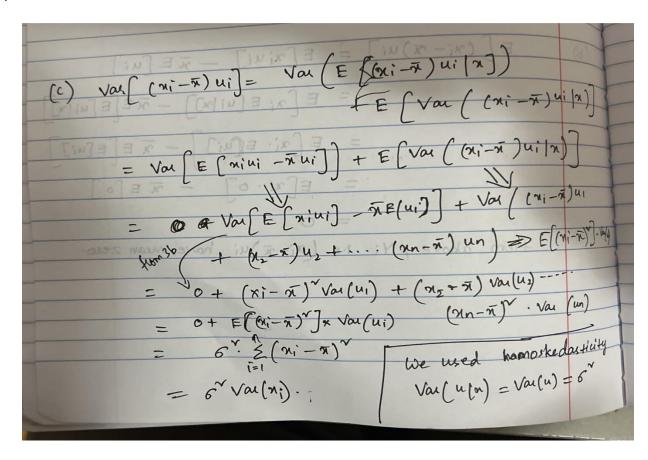
Question 3

a) Question 3a





c) 3c



(d) we know $\sqrt{n} \left(\frac{1}{\beta_1} - \beta_1 \right) = \sqrt{n} \frac{\frac{1}{n}}{\frac{n}{n}} \frac{\frac{n}{n}}{\frac{n}{n}} \left(\frac{n}{n} - \frac{n}{n} \right) u^n$
1 2 (xi-x)ui
Jn (Bi-Bi) = Jn
1001 alua 1 1 3 (x:-x)
$\frac{1}{n} \sum_{i=1}^{n} (x_i - x_i)^2$
from 2b. we found E (numerator) =0
from 26. we found E (numerator) =0
(VX)0) M
from 20 use lound mariance of numerators Vi
from 20 we found variance of numerators Vi
tums is equal to 6" var (xi).
D= ND mile saids (attack)
then for an (duramental with
=) Now using the Central Limit theorem, we can
say that, the distribution formed 62 converges
to N (0, 6 Var(n)) 0 11 of notwork 216
(in) not
, -1
$\sum_{n=1}^{\infty} (x_n - x_n)^{-1}$
$=$ Denominator turn an = $\left(\frac{1}{n} \leq \frac{n}{(n-n)^{\gamma}}\right)^{-1}$
ulles Hot convergesto 2 Vac(ni)
1 10 11 11 11
numerator N(0,6 var(x))
Now we have numerator $N(0,6 \text{ Var}(x))$
denominated Var(ni)
D.
$= N \left(0, \frac{6}{6}\right)$
(var(xi))

Continued...

Criven fact that, If a random variable X is such that In X converges in distribution x is such that In X converges in distribution plim an = a , Tranx converges in distribution to N (O(av). In our case in x = numerator converges to N(o, c'm)

then for an (denominator) where plim an = a. then for an X (i.e) noting (B1-B1) Converges in distribution to N (0, (50 m) 3, 0) 4 of Thus we can say not reteriment In Bi Bi) 75 20 asymptotically (in) of dishibited win (Quotac(xi)) and