RMIT FINAL EXAMINATION

FACULTY OF BUSINESS
Department of Marketing Logistics & Property

PR670 Economic Studies for Real Estate

DATE: Thursday 25th November, 1999
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TIME: 6.00 - 8.00 PM

TIME ALLOWED: TWO (2) HOURS

This exam counts for 70% of the total marks in second semester

INSTRUCTIONS

1. Carry out these instructions and those printed on the front cover of the Examination Book.

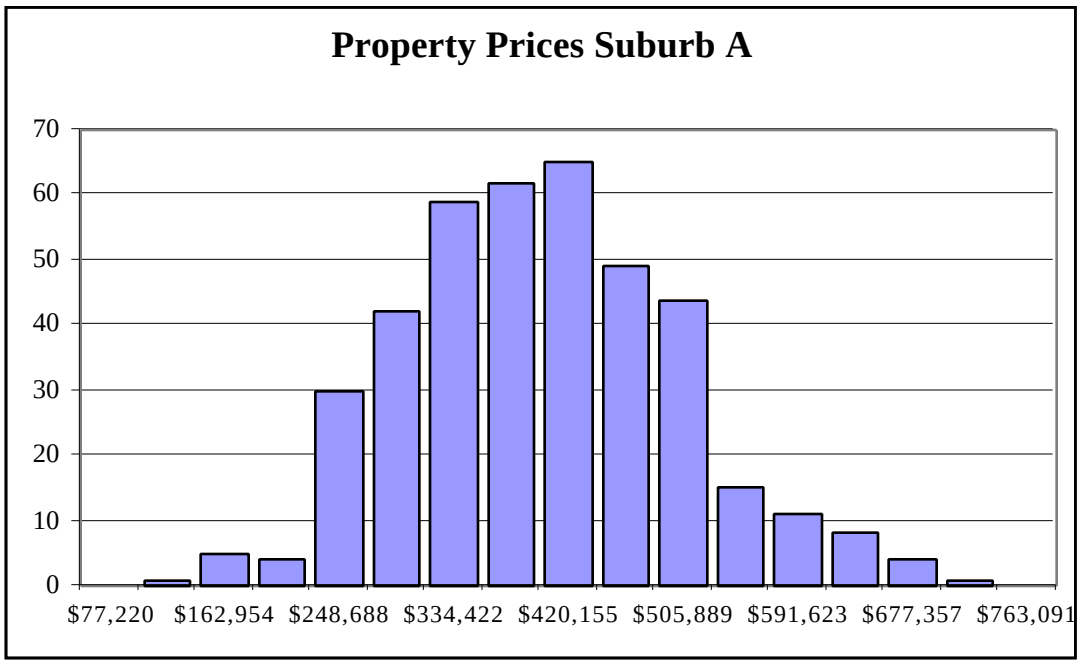
2. Attempt **all** questions.

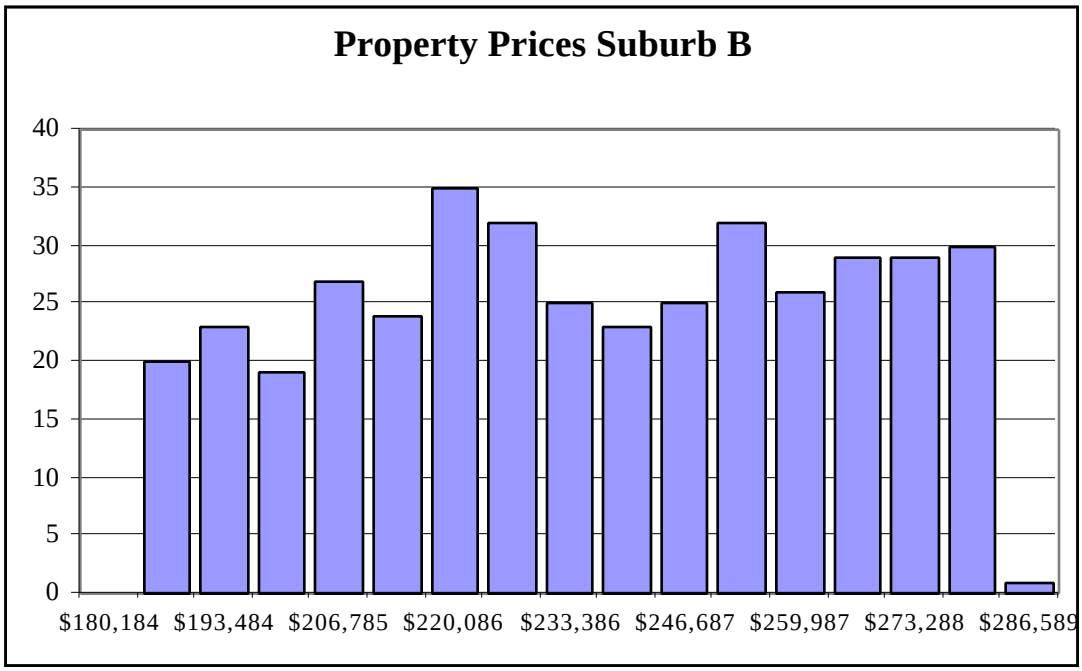
3. Calculators are allowed.

4. Stationary supplied — Normal tables
   — t - tables
   — F - tables

Question 1

The following data represents a sample of 400 property prices during the past six months for two Melbourne suburbs (a sample of 400 from each suburb). Descriptive statistics for each suburb are provided below.





Descriptive Statistics - Summary

	Suburb A	Suburb B
Mean	$378,856	$232,591
Median	$374,787	$231,823
Mode	$420,155	$220,086
Standard Deviation	$102,034	$28,441
Sample Variance	$10,410,861,104	$808,870,875
Kurtosis	0.086	-1.153
Skewness	0.261	-0.059
Range	$642,904	$99,655
Minimum	$77,320	$180,284
Maximum	$720,224	$279,938
Sum	$151,542,482	$93,036,387
Count	400	400
Largest(1)	$720,224	$279,938
Smallest(1)	$77,320	$180,284
Confidence Level(95.0%)	$10,030	$2,796
Percentile - 10%	$249,390	$192,887
Percentile - 25%	$306,566	$209,423
Percentile - 50%	$374,787	$231,823
Percentile - 75%	$445,251	$256,559
Quartile - 1	$306,566	$209,423
Quartile - 2	$374,787	$231,823
Quartile - 3	$445,251	$256,559
Quartile - 4	$720,224	$279,938

(i) Discuss the features of the data using only the charts.

Suburb A the distribution of property prices is mound shape (normal distribution) - most properties are priced within 1 (68%) or 2 (95%) standard deviations of the mean. The are some properties that are a large distance from the mean, the tails of the distribution represent properties with low prices (on the left) and the right tail represents properties with very high prices. These extremes will cause the standard deviation to be relatively high.

Suburb B are uniformally distributed - most are about the same price. The standard deviation or property prices will be relatively low since most properties are similarly priced.

The distributions provide a useful snapshot of how proces are distributed, we can observe how many on the low and to end as well as what the average prices is and how close to the average are most properties. The shape of the distribution also, symmetric, skewed, flat or peaked, provide useful information.

(ii) What additional information is available from the Descriptive Statistics Summary that enables you to make better informed decisions.

The descriptive stats provides some useful aditional information. We have the numeric values for the mean, standard deviation as well as skewness and kurtosis (wheather the distribution is peaked or flat). The percentiles and quartiles provide information about the number of properties in a paricular price range. For example, the 1st quartile indicates that 25% of properties in suburb A are priced below $249,390 while those for suburb B are below $192,887.

(iii) Provide a brief description of the types of properties you might expect to find in Suburb A and Suburb B.

Suburb A: This suburb is likely to have some very old properties in poor condition (the left tail) and some very expensive properties also (right tail). Most of the properties (68%) are close to the mean. This could represent an older suburb where there is quite a diversity among properties.

Suburb B: This may represent a relatively new suburb where all properties are approximately the same age and similar type of construction. The low standard deviation indicates the similarity in price. The magnitude of price will indicate whether the properties in this suburb are identified as being in a low price range or part of a more affluent area. An average price of $232,591 indicates a moderate to low price range for Melbourne.

(iv) Comment on the overall nature of prices in these suburbs.

The two suburbs are fairly different, Suburb A has more expensive properties and is likely to be well established in terms of general infrastructure and services. There are some poor quality properties, low prices, this could be an opportunity for an investor to purchase, renovate and achieve a capital appreciation.
Suburb B: the price range and uniformity of prices in this suburb, suggest that the properties are relatively new and have a similar design and type of construction. This may attract residents from a particular socio economic background.

Depending on the dynamics of the suburbs, the type of new residents entering the area, the nature and number of things like shops, schools, hospitals, as well as access to transport and other services will reflect the current and expected future prices for properties in these suburbs. All of this information is reflected in property prices. However, while statistical measures and charts provide a good deal of valuable and useful information, additional information (about what's happening elsewhere and how these suburbs compare with other areas, etc) is required to make an informed judgement.

(10 + 10 + 5 + 5 = 30 marks)

Question 2

A young residential valuer, who operates on a fee for service basis for a major bank, is trying to set an appropriate fee for her services. She has rented a fully equipped office for $2,650 per month, these are her only fixed operation costs. Variable costs tend to be associated with visiting the property to be valued and preparing valuation reports, which are estimated to be $56 per property.

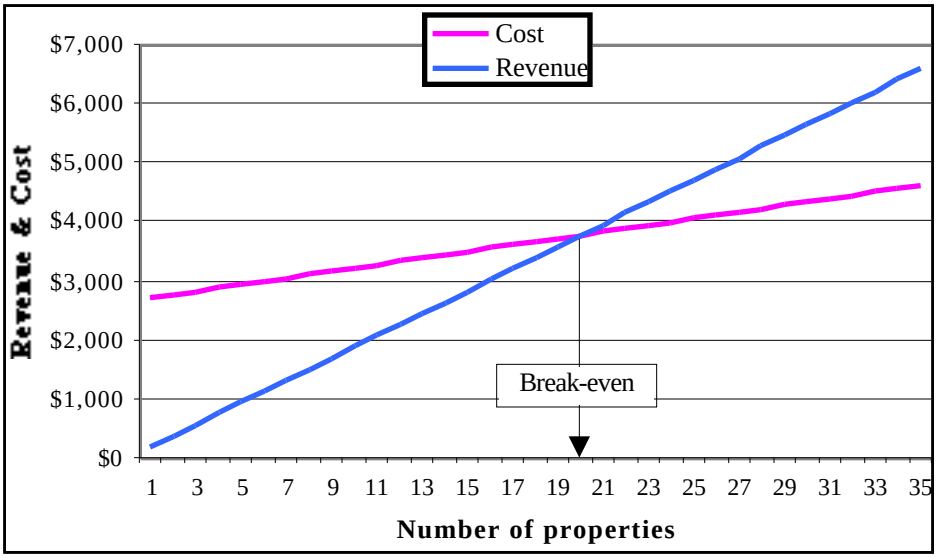
Her client, the bank, is willing to give her up to 45 properties per month to value if she can do the job.

(i) Approximately how many properties should she value each month to break-even if she charged a fee of $188 per property ?

Break-even: $2650 + 56x = 188x$

giving $x = \frac{2650}{188 - 56} = 20.075...$ approximately 20

(ii) Show the break-even number of valuations at this price graphically. Label your axis correctly.



(iii) If she was able to value as many as 45 properties per month, what would be her net revenue each month? Is this a business the valuer should remain in or abandon ?

Revenue:	\$188(45)	= \$8,460
Cost:	\$2,560 + \$56(45)	= \$5,170
Profit		= \$3,290

(10 + 8 + 12 = 30 marks)

Question 3

RENT BREAKDOWN: We are attempting to set rentals in a project consisting of small warehouse and unserviced office units. Rentals for a very similar development, and the respective office and warehouse areas, measured in square feet, are provided below.

Unit Number	Office Area X_1	Warehouse Area X_2	Office & W'house X_1*X_2	Annual Rent Y
1	1815	2310	4125	1200
2	360	2235	2595	5900
3	420	2700	3120	7200
4	350	2050	2400	5700
5	350	1850	2200	5400
6	1097	1103	2200	6750
7	280	1320	1600	3600
8	280	1320	1600	3750
9	280	1160	1440	3400
10	880	560	1440	4560
11	350	1250	1600	3900
12	450	150	600	4120
13	274	4318	4592	5450
14	250	1190	1440	3360
15	302	1426	1728	4200
16	676	1340	2016	5420
17	690	750	1440	4250
18	264	1896	2160	4800
19	274	2606	2880	6450
20	260	1180	1440	3450

Model 1

	Coefficients	Std Error	t Stat	P-value		
Intercept	4318.51	777.41	5.56	0.00003	Observations	20
X_1	-0.95	0.808	-1.17	0.25647	R Square	0.179
X_2	0.49	0.342	1.42	0.17409	Adj. R Square	0.082
				F	Std Error of Estimate	1360.73
					F	1.85

Model 2

	Coefficients	Std Error	t Stat	P-value		
Intercept	1190.80	1017.29	1.17	0.25892	Observations	20
X_1	5.699	1.872	3.05	0.00772	R Square	0.564
X_2	2.027	0.484	4.18	0.00070	Adj. R Square	0.482
X_1*X_2	-0.0034	0.0009	-3.76	0.00173	Std Error of Estimate	1022.55
					F	6.89

Model 3

	Coefficients	Std Error	t Stat	P-value		
Intercept	-1720.47	958.31	-1.80	0.092775	Observations	20
X_1	12.445	1.8217	6.85	0.000006	R Square	0.829
X_2	2.5204	0.5816	4.33	0.000590	Adj. R Square	0.784
X_1*X_1	-0.0072	0.0009	-7.55	0.000002	Std Error of Estimate	660.49
X_2*X_2	-0.0003	0.0001	-2.68	0.017038	F	18.22

(i) Briefly discuss each of the above models and provide a rational for the functional form of each.

Model 1: A reasonable expectation is that both office and warehouse area should contribute positively to rent, that is, the larger the Office and Warehouse areas are the higher we would expect the rent to be. This model does not meet this criteria - the coefficient of X_1 is -0.95. Both the t and F statistics for this model indicate that it is also statistically unacceptable.

The t-stats for X_1 and X_2 are less than the critical t value

Using 5% level of significance and degrees of freedom = 20-3 = 17 from t-table, critical t-value is 2.1098.

The critical F statistics from the F-distribution table:
degrees of freedom for the nuerator = 2 (number of X's)
degrees of freedom for the dedominator = 20 - 3 = 17
Critical F value = 3.59

The F-stat of 1.5 is less than the critical value, hence we would conclude that this model does not explain rents.

Model 2: The inclusion of an additional variable X_1*X_2 with the variables X_1 and X_2improve the model significantly. The coefficients of X_1 and X_2 are both positive and their t-ratios are significant. The F -stat is also significant: (critical $F_{0.05, 3, 16} = 3.24$). The R^2 has also improved significantly, indicating that 56% of the variation in rent is explained by the three independent variables: X_1, X_2 and X_1*X_2.

The coefficient of X_1*X_2 is negative. Since this variable is an interaction term, combining the effect of offcie and warehouse area, predicting its sign is more difficult. The substantial improvement in the model generally, correct signs for X_1, X_2 and the acceptace of the t and F stats would indicate that a negative coefficient for X_1*X_2 is appropriate.

Model 3: All variables have the correct sign and the t and F stats are acceptable based on standard tests.

The variables: X_1*X_1 and X_2*X_2 have negative signs. This is consistent with what we wpould expect - as the office area (or warehouse area) becomes larger and larger, rent will continue to increase but by a smaller and smaller amount - diminishing returns. Note that the coefficients of X_1 and X_2 are positive as required and the magnitude of their coefficients compared to those of X_1*X_1 and X_2*X_2 are very different. When area is relative small, the *pull back* effect of X_1*X_1 and X_2*X_2 is only slight. As area increases, the *pull back* effect becomes larger and larger since these variables represent squared values of X_1 and X_2.

(ii) Select the most appropriate model for the purpose of setting rents. Support your choice.

Model 3 is the most satisfactory model - all variables have the required signs and the t and F stats are acceptable based on the standard tests.

Much of the discussion from (i) applies in this case, particularly for model 3.

t-stats: 5% level of significance, df = 20 - 5 = 15, critical t = 2.1315

F stat: 5% level of significance, df numerator = 4
df denominator = 20 - 5 = 15
Critical F from table = 3.06

(20 + 20 = 40 marks)

Total marks available = 100