**LAND ECONOMY TRIPOS Part IA**
**LAND ECONOMY TRIPOS Part IB**

**Monday 25 May 2009, 09.00 – 12.00**

**Paper 3**

**ACCOUNTING AND DATA EVALUATION**

*Answer* **five** *questions*

**Section A** *has six questions, of which you are to answer* **four.**
*You must answer each subpart of each question you choose.*
**Section B** *has two questions, of which you are to answer* **one.**

**Section A** *will be* **weighted two-thirds** *of the final mark for this examination and* **Section B** *will be* **weighted one-third** *of the final mark for this examination.*

**An answer to each section must be tied up separately with its own cover sheet.**

*A copy of the statistical tables is on your desk together with a list of statistical formulae.*

*Unless otherwise stated each part of each question carries equal weight.*

**SECTION A**

1.

   a) In order to improve the climate for doing business, a developing country implements a package of reforms in an attempt to reduce the time taken to start a new business. Prior to the introduction of the package, a random survey of 10 firms reveals that the mean number of days required to start a new business is 78 with $SS$ = 1420, where $SS$ denotes the sum of squares. One year after the introduction of the package, a separate random survey of 15 firms reveals that the mean number of days is 66 with $SS$ = 2030. Stating any assumptions made in your analysis clearly, test using $\alpha$ = 0.05 whether there has been a significant change in the number of days required to start a new business. (**7 marks**)

   b) A researcher wishes to assess the effectiveness of a new government jobs creation programme in which firms are subsidised to hire people who have been long-term unemployed. To do this, the researcher obtains data for a sample of 7 firms on the number of long-term unemployed they recruited in the six month period prior to the introduction of the programme and the number of long-term unemployed they recruited in the six-month period following the introduction of the programme. The data obtained were as follows:

| Firm | A | B | C | D | E | F | G |
|--------|---|---|----|----|---|---|---|
| Before | 0 | 0 | 3 | 3 | 2 | 0 | 0 |
| After | 4 | 0 | 14 | 23 | 9 | 8 | 6 |

Based on this data, what would the researcher conclude about the effectiveness of the programme? If the programme had been pre-announced six months prior to its introduction, how might this affect the validity of the conclusion obtained? (**10 marks**)

   c) For a hypothesis test to be valid, it is important that sampling from a population be random with replacement:

     i) What do we mean by the phrase "random sampling with replacement"?

     ii) Assume that an employer is randomly selecting a person to perform a task from an initial group of six people and that once selected a person cannot be asked to perform a task again. What is the probability of any given member of the initial group being selected at the third time of asking? (**3 marks**)

**[TURN OVER]**

2.

a) A researcher wishes to assess whether traders in the City of London takes lunch breaks which are shorter than those taken by quantity surveying professionals. To do this, she surveys 7 employees from each profession matched according to age, number of years of experience and academic background. The data she obtained were as follows:

| Matched pair | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| Length of lunch break (city) | 30 | 31 | 29 | 29 | 32 | 34 | 28 |
| Length of lunch break (quantity surveying) | 31 | 34 | 29 | 33 | 35 | 32 | 35 |

Based on this data, would the researcher be able to conclude that City traders take significantly shorter lunch breaks at the 5% significance level?
(**8 marks**)

b) Outline possible sources of bias associated with the matching process which might affect the research study in part a). (**2 marks**)

c) Suppose 2 out of every 10 used cars bought in the UK is a "lemon" (i.e. not roadworthy despite its appearance). If a random second-hand car dealer in Cambridgeshire is selected which has a stock of 100 used cars, what is the probability that:

i) Exactly 95 of the cars are not "lemons"?
ii) Less than 95 of the cars are not "lemons"? (**7 marks**)

d) Suppose a researcher knows from census data that the distribution of earnings in the UK is positively skewed with a mean of £25,000 and a standard deviation of £5000. Given this, she wishes to test the hypothesis that graduates of the University of Cambridge working in the UK earn significantly more than the national average. What implications will the information on the population distribution of earnings have for the design of the research study? (**3 marks**)

**[TURN OVER]**

3. Prior to choosing a location for a new hotel in London, a large hotel group is interested in finding out the relationship between the charge for one-night of accommodation in a standard double hotel room and the distance of the hotel to Buckingham Palace. To uncover this relationship, consultants working on behalf of the hotel group collect the following data from a sample of 12 hotels (they do their best to control for differences in the quality and facilities of the hotels):

| Hotel | Distance to Buckingham Palace (km) | Overnight price of a standard room (£) |
|---|---|---|
| 1 | 0.2 | 199 |
| 2 | 0.9 | 195 |
| 3 | 1.3 | 183 |
| 4 | 2.2 | 165 |
| 5 | 2.4 | 170 |
| 6 | 3.3 | 160 |
| 7 | 3.9 | 165 |
| 8 | 5.0 | 159 |
| 9 | 5.2 | 152 |
| 10 | 6.2 | 148 |
| 11 | 6.8 | 161 |
| 12 | 8.0 | 165 |

Perform a regression analysis to assess the relationship between distance of a hotel to Buckingham Palace and the charge for one night of accommodation in a standard double hotel room. **(20 marks)**

4.

a) A large multinational employer wishes to monitor the impact of introducing more flexible working hours for its employees on levels of customer satisfaction. Prior to introducing the more flexible hours, it conducts a telephone survey of 6 customers asking them to rank their level of satisfaction on a 0 – 100 scale. 3 months after introducing the more flexible hours, it re-contacts the same 6 customers and, once again, asks them to rank their level of satisfaction on the same 0 – 100 scale. The responses which the large multinational receives are as follows:

**[TURN OVER]**

**Question 4 continued**

| Customer | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Satisfaction level before | 53 | 50 | 55 | 52 | 55 | 51 |
| Satisfaction level after | 58 | 54 | 56 | 51 | 57 | 57 |

    i) Calculate a 95% confidence interval estimate of the mean difference between levels of customer satisfaction before and after the introduction of the flexible working hours.

    ii) Is it is reasonable to conclude that the introduction of flexible working hours has had no impact on levels of customer satisfaction?
       (**6 marks**)

b) A researcher wishes to establish whether, for a group of randomly selected countries, there is a relationship between their ranking in terms of an index of corruption (1 = lowest level of corruption; 11 = highest) and the income classification (very high income, high income, upper-middle income, lower-middle income and low income). The data which she obtains is as follows:

| Ranking on corruption index | Income status |
|---|---|
| 1 | Very high |
| 2 | High |
| 3 | Very high |
| 4 | High |
| 5 | High |
| 6 | Upper-middle |
| 7 | Lower-middle |
| 8 | Upper-middle |
| 9 | Upper-middle |
| 10 | Lower-middle |
| 11 | Low |

At the 5% level, is there evidence of a relationship between a country's ranking on the corruption index and its income status? (**7 marks**)

c) Describe the method of Ordinary Least-Squares, making clear the conditions under which its application is appropriate. (**7 marks**)

**[TURN OVER]**

5.

a) Assume that the size distribution of firms in the UK is known to be normal with the mean number of employees being 50 and the population standard deviation being 6. If a random sample of $n = 22$ firms from the retail sector has a mean number of employees of 47, is it possible to conclude that the size of retail sector firms is significantly different from that of firms in the general population? (**4 marks**)

b) Individuals who are risk-loving should be willing to bet a larger amount of money for a given probability of winning a monetary prize than individuals who are risk averse. It might also be suspected that risk-averse individuals are more likely to bet less as the probability of winning a monetary prize declines, even if the expected payoff remains the same. To investigate the possibility of such effects, a researcher performs an experiment using two sets of individuals. The first set consists of individuals who have identified themselves as risk-averse, whilst the second set consists of individuals who have identified themselves as risk-loving. The researcher then separates each set into two to give a total of four groups. Members of one of the risk-averse groups and one of the risk-loving groups are then asked individually how much they would be willing to pay for a 20% chance of winning £30. Meanwhile, the members of the remaining two groups are asked how much they would be willing to pay for a 10% chance of winning £60. The data which the researcher obtains are as follows:

| | Amount willing to bet | |
| | 20% chance of winning £30 | 10% chance of winning £60 |
| --- | --- | --- |
| Risk-loving | £5 | £6 |
| | £6 | £8 |
| | £4 | £5 |
| | £3 | £10 |
| | £6 | £7 |
| | £7 | £4 |
| | £10 | £4 |
| | £5 | £7 |
| | £8 | £8 |
| | £5 | £6 |

**[TURN OVER]**

**Question 5 continued**

|  | Amount willing to bet | |
|---|---|---|
|  | 20% chance of winning £30 | 10% chance of winning £60 |
| Risk-averse | £3 | £1 |
|  | £4 | £0 |
|  | £5 | £0 |
|  | £3 | £1 |
|  | £2 | £1 |
|  | £2 | £2 |
|  | £3 | £1 |
|  | £4 | £2 |
|  | £2 | £0 |
|  | £4 | £1 |

Use a two-factor ANOVA to examine these data. Describe and explain the interaction. (**16 marks**)

6.

a) The following set of observed values is obtained by a researcher investigating levels of consumer confidence as measured on a 0 – 100 scale where 0 represents "the outlook for the future is bleak", 100 "the outlook for the future is extremely positive" and 50 "the outlook for the future is reasonable".

8   12   12   18   22   26   32   48   50   52

The researcher calculates several measures of central tendency and variability for this set of observed values, only then to discover that she made an error in reading one of the values. In particular, one of the 12s is really a 14. Which of the following measures will be changed from the original calculations?

i) Median;
ii) Mode;
iii) Range;
iv) Standard deviation.

Explain your answers. (**4 marks**)

**[TURN OVER]**

**Question 6 continued**

b) Consider the following set of descriptive statistics for levels of GDP per capita in selected years across a global sample of countries (assume that the sample of countries is the same throughout the study period):

| Measure | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 |
|---|---|---|---|---|---|---|
| Mean ($, constant prices) | 6000 | 6970 | 8200 | 8800 | 9500 | 10,040 |
| Median ($, constant prices) | 6050 | 6900 | 8000 | 8200 | 8500 | 8700 |

Describe the shape and evolution of the world distribution of GDP per capita levels over time. (**4 marks**)

c) An important property of estimators of population parameters is unbiasedness:

   i) Explain precisely what is meant by unbiasedness.
   ii) Why is it necessary to divide the *SS* by $n - 1$ to obtain an unbiased estimator for $\sigma^2$ from a random sample of observations from a population?
   iii) Why, in the calculation of $s^2$, is $n - 1$ in the denominator of the formula referred to as the degrees of freedom? (**3 marks**)

d) The means from one or more random samples are often used to make inferences about unknown population means in studies designed to evaluate the impact of a public policy intervention. Describe the potential problems associated with using simple hypothesis tests based on the *z*- and *t*-statistics in public policy evaluation, and the extent to which different research designs might be able to mitigate these problems. (**9 marks**)

**[TURN OVER]**

**SECTION B**

7. The following trial balance was extracted from the accounting records of Jericho Ltd for the year ended 30 June 2008.

| | £000 | £000 |
|---|---|---|
| Ordinary share capital | | 1,000 |
| Debentures | | 250 |
| Retained earnings as at 1 July 2008 | | 120 |
| Share premium account | | 98 |
| General reserve | | 27 |
| Land and buildings at cost | 1,800 | |
| Motor vehicles at cost | 65 | |
| Fixtures and fittings at cost | 35 | |
| Land and buildings accumulated depreciation as at 1 July 2007 | | 115 |
| Motor Vehicles accumulated depreciation as at 1 July 2007 | | 30 |
| Fixtures and Fittings accumulated depreciation as at 1 July 2007 | | 15 |
| Stock (Inventory) as at 1 July 2007 | 40 | |
| Cash at bank | 316 | |
| Bank loan | | 300 |
| Sales | | 1,650 |
| Purchases | 925 | |
| Debtors (trade receivables) | 40 | |
| Provision for bad and doubtful debts | | 12 |
| Creditors (trade payables) | | 37 |
| Business rates | 34 | |
| Salaries and wages | 135 | |
| Bank loan interest | 84 | |
| Dividends | 38 | |
| Utilities (gas, oil and electricity) | 27 | |
| Printing, stationery | 6 | |
| Advertising | 80 | |
| Insurance | 17 | |
| General administration expenses | 12 | |
| | 3,654 | 3,654 |

**[TURN OVER]**

**Question 7 continued**

Notes (all figures are in 000s):

    i) Stock as at 30 June 2008 is £58;
    ii) A plot of land was sold during the year for £125. The book cost was £100 and depreciation to date is £30;
    iii) Depreciation is to be charged as follows:
        a) Land and Buildings     2% on cost;
        b) Motor Vehicles       20% on cost;
        c) Fixtures and Fittings    5% on cost;
    iv) Debenture interest is to be charged at 10%;
    v) Auditors' fees are £200;
    vi) The provision for bad and doubtful debts is to be increased to £15;
    vii) Authorised share capital is £1,000.

a) Prepare for internal management purposes, after taking the above adjustments into account, the revised trial balance and the income statement for the year ended 30 June 2008 and the balance sheet as at 30 June 2008. **(75% of mark for this question)**

b) Business profitability is determined by the matching principle. Discuss. **(25% of mark for this question)**

8. Answer **three** questions from the following. (**All questions carry equal marks**):

a) If a company makes a profit, does this mean that it will have a positive cash flow?

b) What is financial accounting and why is its study so important?

c) The interests of regulators, users and preparers of financial information may conflict. Discuss.

d) Why may it be necessary to place a valuation on a business? Identify the mechanics of valuing a business on the balance sheet basis.

e) The valuation of stock is a crucial factor in producing accounts which show a true and fair view of a company's profit and loss account and its state of affairs. Discuss.

**END OF PAPER**