

MA4104 - Question 2 - Inference Procedures

Types of Inference Procedure

1. Confidence Intervals
2. Hypothesis Testing

Parameter

1. Single-Sample Means
2. Difference of Means
3. Single-Sample Proportions
4. Difference of Proportions

Types of Sample Size

1. Sample Size is usually denoted n
2. Large Sample ($n > 30$)
3. Hypothesis Testing

Part A

The mean hourly wage in an EU country is 10. A sample of 55 individuals in the capital city of the country has a mean hourly wage of 10.83 with a standard deviation of 3.25 per hour.

- (i) Calculate a 95% confidence interval for the mean hourly wage in the capital city. Interpret this interval.
- (ii) Test the hypothesis that workers in the capital city earn more than the mean hourly wage for the country using a 5% level of significance.

Clearly state your null and alternative hypotheses and your conclusion. Give a p-value for this hypothesis test and interpret this p-value.

Part B

- A retail business would like to estimate the proportion of gift vouchers sold by the business that expire without being used by the customer.
- The accounts department selects a random sample of 250 gift vouchers from a sales database and finds that 120 expired without being used.

Questions

- (i) Construct and interpret a 95% confidence interval for the proportion of gift vouchers that expire without being used.
- (ii) Using your answer to the previous part, is there evidence that at least 40% of the gift vouchers sold by the business expire without being used?

Point Estimate

...The accounts department selects a **random sample of 250 gift vouchers** from a sales database and finds that **120 expired without being used**.

- **Sample Size:** $n = 250$
- **Number of Occurences:** $x = 120$
- Therefore the **Sample Proportion** \hat{p} is given by

$$\hat{p} = \frac{x}{n} = \frac{120}{250} = 0.48$$

Standard Error

Things to note

- We are dealing with single sample proportions
- The standard error for confidence intervals is different to the standard error for hypothesis testing, in the case of single sample proportions.

$$S.E.(p) = \sqrt{\frac{\hat{p} \times (1 - \hat{p})}{n}}$$

Part C

- A marketing manager working in a large retail business would like to determine if a text messaging service alerting customers to special offers has been successful in increasing sales.
- The manager selects a random sample of 20 customers from the businesss loyalty card database and computes the amount spent by each customer for the month before and the month after the introduction of the text messaging service.
- The computed mean difference (*After* - *Before*) for the sample was 29.34 with the standard deviation of the differences was 21.21.

Question Have sales increased following the introduction of the text messaging service? Test this hypothesis using a 5% significance level.

(8 marks)