THE UNIVERSITY OF MELBOURNE

Sampling Distributions

Concept Review

- Sampling distribution of a statistic is the distribution of the statistic over all possible random samples of the same size from the same population.
- The sampling distribution of the sample mean is:
  - (i) normally distributed if the sampled population is normally distributed, or
  - (ii) approximately normally distributed if the sampled population is not normally distributed but the sample size is large ($n \geq 30$).
- The confidence interval is a range of values that is likely to contain the population parameter with a certain level of confidence.
  - (i) If the population standard deviation (σ) is known and the sample mean is (approximately) normally distributed, use the z-distribution.
  - (ii) If the population standard deviation (σ) is unknown but the population is (approximately) normally distributed, use the t-distribution.

Standardised Moments of a Distribution

Concept Review

- The kth standardised moment of a distribution is defined as:

$$\mu_k = \frac{\mathbb{E}[(X - \mu)^k]}{\sigma^k}$$

- The first standardised moment (μ_1) is always 0; the second (μ_2) is always 1.
- The third standardised moment is called skewness: $\mu_3 = \text{Skew}(X)$.
  - A positive (right) skew means the tail is on the positive (right) side of the distribution.
  - A negative (left) skew means the tail is on the negative (left) side of the distribution.
- The fourth standardised moment is called kurtosis: $\mu_4 = \text{Kurt}(X)$.
  - A kurtosis value greater than 3 indicates a leptokurtic distribution (long, fat tails/higher peak).
  - A kurtosis value less than 3 indicates a platykurtic distribution (short, thin tails/lower peak).