Intro. to Errors

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BUS 301: Int. Bus. Stats
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Notes

Today's Lecture

- Announcements: Assignment 1 due next Friday (4 October).
- Null and Alternative Hypotheses, revisited
- Errors – Type I and Type II
- Simulation

Notes

Assignment 1, due at the START of class, 4 October

1. I recently came across this news article in The Independent (`http://goo.gl/cfYWQK`):

   > *Sun-lovers can take solace. The risk of you getting skin cancer may increase but you will be less likely to have heart disease or to die prematurely, an important new study reveals. Research based on more than four million people shows that men and women with non-melanoma skin cancer had nearly half the risk of an early death as people without the disease. Those with skin cancer also had reduced risk of heart attacks and hip fracture, according to the study, reported in the International Journal of Epidemiology.*

   - What null hypothesis and alternative hypothesis do you think the researchers were using? Clearly state both.
   - In words, what would a Type I error be in this research?
   - In words, what would a Type II error be in this research?
   - Of the two error types, which do you think is worse in this context?
2. Chapter 11.1, pg 358, exercise 11.5.

Notes

Example 1:

Historically, demand for a particular product has averaged 20 units per day. If demand varies significantly from this average, a manufacturer will face an overstock or an out-of-stock condition – neither of which is appealing. The manufacturer collects sales data for 48 days and wishes to determine if the average demand is significantly different from 20 units per day.

- What is the null hypothesis?
- What is the alternative hypothesis?

Notes

When do errors happen?

- When you reject a true null hypothesis (Type I)
  - When you convict an innocent person.
- When you accept a false null hypothesis (Type II)
  - When you let a guilty person go free.

In words, what does a Type I error mean in the context of Example 1? What does a Type II error mean in the context of Example 1?

Notes

Error in Table Form

H_0	True	False
Reject	Type I α	–
Don't Reject	–	Type II β

There are probabilities associated with committing each error.

Notes

Error Probability Simulation, Type I

Recall: Historically, demand for a particular product has averaged 20 units per day. If demand varies significantly from this average, a manufacturer will face an overstock or an out-of-stock condition – neither of which is appealing. The manufacturer collects sales data for 48 days and wishes to determine if the average demand is significantly different from 20 units per day.

Experiment 1: In reality, the null hypothesis is true (ie. the assumption that $\mu = 20$ is true.) tested with $\alpha = 0.05$.

- What outcome represents a Type I error?
- In this setting, can we have a Type II error?

Notes

Error Probability Simulation, Type II

Recall: Historically, demand for a particular product has averaged 20 units per day. If demand varies significantly from this average, a manufacturer will face an overstock or an out-of-stock condition – neither of which is appealing. The manufacturer collects sales data for 48 days and wishes to determine if the average demand is significantly different from 20 units per day.

Experiment 2: In reality, the null hypothesis is false (ie. the assumption that $\mu = 20$ is false.); tested with $\alpha = 0.05$.

- What outcome represents a Type II error?
- In this setting, can we have a Type I error?

Notes

Error Probability Simulation, Type I and Type II are Related

Recall: Historically, demand for a particular product has averaged 20 units per day. If demand varies significantly from this average, a manufacturer will face an overstock or an out-of-stock condition – neither of which is appealing. The manufacturer collects sales data for 48 days and wishes to determine if the average demand is significantly different from 20 units per day.

Experiment 3: In reality, the null hypothesis is true (ie. the assumption that $\mu = 20$ is true.); tested with $\alpha = 0.10$.

Experiment 4: In reality, the null hypothesis is false (ie. the assumption that $\mu = 20$ is false.); tested with $\alpha = 0.10$.

Notes