

## Bus 274: Further Statistics for Business

Spring 2010

**Problem 1:** When equipped with a three-class layout, the Airbus A380 has a seating capacity of 525. We assume that the weight (in kg) of a passenger, including carry-on baggage weight, is normally distributed with expectation 84 and standard deviation 20, and that passenger weights are independent.

- Why is it meaningful to assume that the weight of a passenger is a *random* variable?
- Compute the probability that a randomly selected passenger's weight is less than 80 kg.
- What is the distribution of the total weight of 525 passengers? In particular, write down the expression for the expectation and the variance.
- Consider two events:

A: "A randomly selected passenger's weight is less than 80 kg."  
B: "The average weight of 525 passengers is less than 80 kg."

Which event has a larger probability?

- Find the 99.9% quantile of the total weight, that is: a value which total weight will not exceed with probability 0.999.

**Problem 2:** In the early days of December 2009, just before the opening of the UN Climate Change Conference in Copenhagen (*Cop15*), the professional services organization *Deloitte* carried out an inquiry among 378 high-ranking decision-makers in business, research, and politics in Germany. One of the questions asked in the inquiry was:

"Do you believe that a leading role of Germany in environmental protection will imply higher profits for German companies?"

The number of those who replied "Yes" was 208 (= 55% of 378).

- Will the share (proportion) of *all* high-ranking decision-makers in Germany who would say "Yes" when asked this question equal 55%?
- An approximate 95% confidence interval for the share of those who agree is  $[0.50, 0.60]$ . Now suppose that with the *same data*, we compute a 99% confidence interval. Will this 99% confidence interval be longer (wider) or shorter (narrower) than the 95% confidence interval? What will be the center (the mid-point) of the 99% confidence interval?
- In view of the 95% confidence interval, can we say that a *majority* of decision-makers in Germany agree that a leading role of the country will imply higher profits?
- In order to answer the question in (c), would it be helpful to compute a 99% confidence interval for the unknown share?