

Bus 273: Statistical Analysis for Business

Fall 2011

PROBLEM SHEET # 5

Problem 1: The result of an elementary analysis of monthly returns (end of month closing quotations) in percent on the Chinese stock index SSEC (Shanghai Securities Exchange Center) in the period from January 2000 through October 2008 (105 observations) is:

arithmetic mean, \bar{r}	0.83	minimum	-20.31
variance, s^2	67.96	lower quartile	-4.68
standard deviation, s	8.24	median	0.81
skewness, γ_1	0.03	upper quartile	5.57
kurtosis, γ_2	0.76	maximum	27.45

- What does the three-sigma-rule say in this case?
- Give a rough sketch of the distribution of monthly returns, which reflects the parameters given in the table.

Problem 2: Rolling a die. Consider the events $A = \{1, 3, 5\}$ and $B = \{1, 2, 3, 4\}$.

- Show that A and B are independent if the die is fair.
- Show that A and B need not be independent if the die is biased.

(This problem shows that the independence of events is a *probabilistic* property.)

Problem 3: There is an alarm system in a factory building. In long series of experiments, it was found that the accuracy of the alarm system can be described as follows:

- In the case of a burglary, the alarm will be activated with probability 0.99.
- In a night without burglary, the alarm will be activated with probability 0.01.

The probability of a burglary in a typical night is $p_1 = 1/250$.

- The alarm is activated. Find the probability that the building is actually being burgled.
- Now assume that the watchman has heard a suspicious noise even before the alarm was activated. He concludes: The probability of a burglary tonight is not $p_1 = 1/250$, but $p_2 = 1/10$! Indeed, the alarm is activated. Find the probability that the alarm was triggered by a burglar.