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# Bus 274: Further Statistics for Business

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## PROBLEM SHEET # 7

**Problem 1:** The average daily return (observations from one year, 250 values) on a stock index was 0.3%, and the standard deviation of the daily returns was 2.6%.

a) Test the null hypothesis that the expected daily return is 0%. (Use a 5% level of significance.)

b) Compute the probability that the average daily return for 250 days takes on a value outside the interval $[-0.3\%, +0.3\%]$ under the assumption that the hypothesis under (a) is true. (This is the $p$-value of the null hypothesis in (a).)

**Problem 2:** When the euro was introduced, statisticians said that the one euro coin does not have an equal chance of landing "heads" or "tails". They allege that, when spun on a smooth surface, the coin comes up heads more often. Let

$p$ = unknown probability (unknown proportion) that a one euro coin lands "heads" when spun on a smooth surface.

In a spin experiment carried out by students, this coin fell heads 1087 times in a series of 2000.

a) Using the students' data, compute a 95% confidence interval for $p$.

b) Test the null hypothesis $H_0 : p = 0.5$ against the alternative $H_1 : p \neq 0.5$. (Assume $\alpha = 0.05$.)

c) Is it correct to say that the probability that the coin is not fair is 95%? (Give reasons for your answer.)

**Problem 3:** A wholesaler is organizing next week's chewing gum supply. According to a forecasting model, next week's demand is normally distributed with expectation 8000 units and standard deviation 1200 units.

a) Why do we consider next week's demand a *random* variable? Explain briefly.

b) Give an interval (with expected demand as midpoint) containing next week's demand with probability 68% (that is, about 2/3). Such an interval is called a 68% prediction interval.

c) Give a 95% prediction interval.

d) Give a value $Q_{95\%}$ such that there is a 95% probability that next week's demand is below $Q_{95\%}$. ($Q_{95\%}$ is the 95% quantile of the demand forecast distribution)

e) If you are a supply manager, why is the value $Q_{95\%} = 9974$ important for you? What can you do with it? Discuss briefly.

f) Explain the difference between a confidence interval and a prediction interval.