Statistical Methods in Economics and Business I

Assignment

1. The assignment is worth 12% of the final grade.
2. Assignments are due at the beginning of the tutorial on April 3rd.
3. No late assignments will be accepted.
4. Students may work in groups, of 5 or fewer individuals.
5. Each individual must hand in their own assignment.
6. You must list your group members' names, if any, on your assignment.
7. Each question is worth 20 marks.
8. Within each question, all subquestions are equally weighted.

Standard Normal p-values

Use the table provided to calculate the following probabilities. For each question, provide a rough sketch with a normal curve, and the area that you are calculating shaded in.
Recall that the provided table gives the probability that $0 \leq z \leq Z$.

1. What is the probability that $-1.54 \leq z \leq 1.44$?
2. What is the probability that $z \geq 1.72$?
3. What is the probability that $z \leq 1.57$?
4. What is the probability that $z \leq -2.05$ **or** $z \geq 2.15$?
5. What is the probability that $1.63 \leq z \leq 2.52$?

Samples of Standard Normal Random Variables

1. Use a computer to generate a sample of 20 normally distributed observations with a mean of 3 and a standard deviation of 2. Generate a histogram for your sample. Set the random number seed to the sum of your group members birth dates, display the seed, and a list of the numbers. For example if your three group members were born on the 5th, 12th, and 21st, then use the seed $5 + 12 + 21 = 38$.
2. Calculate the sample mean.
3. Calculate the sample standard deviation.
4. We know that population $\mu = 3$ and $\sigma = 2$. Use this information to construct a 95% confidence interval for the sample mean.
5. Does your confidence interval contain μ?.

Sample Means of Real Data - NHL Goals

Download the NHL dataset, used in an earlier tutorial, reposted to CULearn.

1. Calculate the population mean of points.
2. Calculate the population standard deviation of points.
3. Select a random sample of 20 players from the population. One way to do this in excel is to add a column of randomly generated uniform$(0, 1)$ variables, sort the sheet by this column, and use the first 20 observations for points. Create a histogram of points for your sample.
4. Calculate the sample mean.
5. Calculate the sample standard deviation.
6. Calculate a 91% confidence interval for the sample mean. Does this interval contain μ?
7. Construct the smallest possible confidence interval for your sample mean that contains μ. (Hint, do this by using the formula for a confidence interval and setting $\mu =$ to either the upper or lower limit, depending on whether μ is above or below $\bar{x}$, and solve for the critical value.

Samples of Random Variables

This question asks you to generate several samples of a given size, and to analyze the set of sample means.

1. Generate 50 samples of size 10, drawn from the standard normal distribution. What is the expected mean of the sample means? What is the expected standard deviation of the sample means? What is the actual mean (calculated) of the sample means? What is the actual standard deviation (calculated) of the sample means? Produce a histogram of the sample means.
2. Generate 50 samples of size 10, drawn from an uniform(1,2) distribution. What is the expected mean of the sample means? What is the expected standard deviation of the sample means? What is the actual mean (calculated) of the sample means? What is the actual standard deviation (calculated) of the sample means? Produce a histogram of the sample means.
3. Generate 50 samples of size 100, drawn from the standard normal distribution. What is the expected mean of the sample means? What is the expected standard deviation of the sample means? What is the actual mean (calculated) of the sample means? What is the actual standard deviation (calculated) of the sample means? Produce a histogram of the sample means.
4. Generate 50 samples of size 100, drawn from an uniform(1,2) distribution. What is the expected mean of the sample means? What is the expected standard deviation of the sample means? What is the actual mean (calculated) of the sample means? What is the actual standard deviation (calculated) of the sample means? Produce a histogram of the sample means.

Table 1: Standard Normal Table

Z	**0**	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
0	0	0.004	0.008	0.012	0.016	0.02	0.024	0.028	0.032	0.036
0.1	0.04	0.044	0.048	0.052	0.056	0.06	0.064	0.068	0.071	0.075
0.2	0.079	0.083	0.087	0.091	0.095	0.099	0.103	0.106	0.11	0.114
0.3	0.118	0.122	0.126	0.129	0.133	0.137	0.141	0.144	0.148	0.152
0.4	0.155	0.159	0.163	0.166	0.17	0.174	0.177	0.181	0.184	0.188
0.5	0.192	0.195	0.199	0.202	0.205	0.209	0.212	0.216	0.219	0.222
0.6	0.226	0.229	0.232	0.236	0.239	0.242	0.245	0.249	0.252	0.255
0.7	0.258	0.261	0.264	0.267	0.27	0.273	0.276	0.279	0.282	0.285
0.8	0.288	0.291	0.294	0.297	0.3	0.302	0.305	0.308	0.311	0.313
0.9	0.316	0.319	0.321	0.324	0.326	0.329	0.332	0.334	0.337	0.339
1	0.341	0.344	0.346	0.349	0.351	0.353	0.355	0.358	0.36	0.362
1.1	0.364	0.367	0.369	0.371	0.373	0.375	0.377	0.379	0.381	0.383
1.2	0.385	0.387	0.389	0.391	0.393	0.394	0.396	0.398	0.4	0.402
1.3	0.403	0.405	0.407	0.408	0.41	0.412	0.413	0.415	0.416	0.418
1.4	0.419	0.421	0.422	0.424	0.425	0.427	0.428	0.429	0.431	0.432
1.5	0.433	0.435	0.436	0.437	0.438	0.439	0.441	0.442	0.443	0.444
1.6	0.445	0.446	0.447	0.448	0.45	0.451	0.452	0.453	0.454	0.455
1.7	0.455	0.456	0.457	0.458	0.459	0.46	0.461	0.462	0.463	0.463
1.8	0.464	0.465	0.466	0.466	0.467	0.468	0.469	0.469	0.47	0.471
1.9	0.471	0.472	0.473	0.473	0.474	0.474	0.475	0.476	0.476	0.477
2	0.477	0.478	0.478	0.479	0.479	0.48	0.48	0.481	0.481	0.482
2.1	0.482	0.483	0.483	0.483	0.484	0.484	0.485	0.485	0.485	0.486
2.2	0.486	0.486	0.487	0.487	0.488	0.488	0.488	0.488	0.489	0.489
2.3	0.489	0.49	0.49	0.49	0.49	0.491	0.491	0.491	0.491	0.492
2.4	0.492	0.492	0.492	0.493	0.493	0.493	0.493	0.493	0.493	0.494
2.5	0.494	0.494	0.494	0.494	0.495	0.495	0.495	0.495	0.495	0.495
2.6	0.495	0.496	0.496	0.496	0.496	0.496	0.496	0.496	0.496	0.496
2.7	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497
2.8	0.497	0.498	0.498	0.498	0.498	0.498	0.498	0.498	0.498	0.498
2.9	0.498	0.498	0.498	0.498	0.498	0.498	0.499	0.499	0.499	0.499
3	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499