UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013

COURSE NAME	:	STATISTICS FOR MANAGEMENT
COURSE CODE	:	BPA 12303 / BWM 11003 / BSM 1823
PROGRAMME	:	1 BPA, 1 BPB, 1 BPC
DATE	:	JUNE 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **ELEVEN (11)** PAGES

Q1 (a) The postal service reported that 85 percent of first class mail within the same city is delivered within three days of the time of mailing. Six letters are randomly sent to different locations.

(i) State the special probability distribution for the postal service.
(4 marks)

(ii) Calculate the probability that exactly five arrive within three days.
(2 marks)

(iii) Compute the mean number of letters that will arrive within three days.
(2 marks)

(iv) Compute the variance of the number of letters that will arrive within three days.
(2 marks)

(b) It is known that more than 50 millions guests stay at the Puteri Resort, Malacca each year. The website for the Resort, which averages approximately seven visitors per minute, attracts guests according to Poisson distribution.

(i) State the Poisson distribution function for website visitors.
(2 marks)

(ii) Compute the probability of two or more website visitors in a one-minute period.
(3 marks)

(iii) Determine the probability of one or more website visitors in a 30-second period.
(5 marks)

Q2 (a) A recent article reported that the mean labor cost to repair a heat pump is RM90 with a standard deviation of RM22. A company completed repairs on two heat pumps this morning. The first labor cost for the first heat pump was RM75 and it was RM100 for the second heat pump. Assume the distribution of labor costs follows the normal probability distribution.

(i) Convert each labor cost to a Z value.

(4 marks)

(ii) Calculate the probability of the labor cost between RM75 and RM100.

(4 marks)

(iii) Assume that 220 heat pumps were repaired. Examine the number of the labor cost between RM75 and RM100.

(2 marks)

(b) Suppose the individual annual income in a country has an approximately normal distribution with a mean of RM35 000 and a standard deviation of RM4 000. An economics student at the country collects a random survey of 50 adults. Assume that each person in the country is willing to give information about his or her annual salary.

(i) State the sampling distribution the economics student shall use.

(2 marks)

(ii) Describe the distribution as stated in Q2 (b) (i).

(4 marks)

(iii) Calculate the probability that the average salary is between RM34 000 and RM36 000.

(4 marks)

Q3 The length of metal rods manufactured for industrial fans on two different machines is being investigated. Two random samples of size $n_1 = 10$ and $n_2 = 10$ are selected. The sample mean for machine A is $\bar{x}_1 = 9.82$ cm with the variance of $s_1^2 = 0.25$, while the sample mean for machine B is $\bar{x}_2 = 9.75$ cm with the variance of $s_2^2 = 0.30$.

(a) Construct a 95% confidence interval for the difference between means length of the metal rods manufactured by machines A and B.

(8 marks)

(b) Test the hypothesis that the length of metal rods manufactured by machine A is greater than those manufactured by machine B. Use $\alpha = 0.10$.

(12 marks)

Q4 A particular brand of bread was analyzed to determine the level of carbohydrate in percentage. A sample of 15 breads resulted in the standard deviation of 1.2.

(a) Construct a 99% confidence interval for the variance of the brand of bread.
(8 marks)

(b) Test the hypothesis that the brand of bread has a standard deviation less than 1.8 by using $\alpha = 0.05$.
(12 marks)

Q5 (a) A firm wishes to compare four programs for training workers to perform a certain manual task. Twenty new employees are randomly assigned to the training programs with five in each program. At the end of the training period, a test is conducted to see how quickly trainees can perform the task. The number of times the task is performed per minute is recorded for each trainee with the following results:

Program 1: 9, 12, 14, 11, 13
Program 2: 10, 6, 9, 9, 10
Program 3: 12, 14, 11, 13, 11
Program 4: 9, 8, 11, 7, 8

(i) Construct the ANOVA table.
(8 marks)

(ii) Determine whether the treatments differ in their effectiveness. Use $\alpha = 0.05$.
(2 marks)

(b) The success of a shopping center can be represented as a function of the distance (in mile) from the center of the population and the number of clients (in hundreds of people) who will visit. The data is shown in Table Q5 (b).

Table Q5 (b): Data of Shopping Center

No. Customer (x)	8	7	6	4	2	1
Distance (y)	15	19	25	23	34	40

(i) Calculate the coefficients of linear regression line.
(7 marks)

(ii) Determine the expected number of customers if the shopping center is located 2 miles from the center of the population.
(3 marks)

- END OF QUESTION -

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2012/2013 PROGRAMME : 1BPA, 1BPB, 1BPC
COURSE : STATISTICS FOR MANAGEMENT COURSE CODE : BPA12303/BWM11003/BSM1823

TABLE 3 **AREA IN TAIL OF THE NORMAL DISTRIBUTION**

$$P(Z > z_\alpha) = \alpha$$

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.02275	0.02222	0.02169	0.02118	0.02068	0.02018	0.01970	0.01923	0.01876	0.01831
2.1	0.01786	0.01743	0.01700	0.01659	0.01618	0.01578	0.01539	0.01500	0.01463	0.01426
2.2	0.01390	0.01355	0.01321	0.01287	0.01255	0.01222	0.01191	0.01160	0.01130	0.01101
2.3	0.01072	0.01044	0.01017	0.00990	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842
2.4	0.00820	0.00798	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00508	0.00494	0.00480
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193
2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2012/2013 PROGRAMME : 1BPA, 1BPB, 1BPC
COURSE : STATISTICS FOR MANAGEMENT COURSE CODE : BPA12303/BWM11003/BSM1823

TABLE 4 PERCENTAGE POINTS OF THE t DISTRIBUTION

$P(T > t_{\alpha,v}) = \alpha$

	α =	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
ν =	1	3.078	6.314	12.706	31.821	63.657	318.31	636.62
	2	1.886	2.920	4.303	6.965	9.925	22.327	31.599
	3	1.638	2.353	3.182	4.541	5.841	10.215	12.924
	4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
	5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
	6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
	7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
	8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
	9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
	10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
	11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
	12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
	13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
	14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
	15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
	16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
	17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
	18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
	19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
	20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
	21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
	22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
	23	1.319	1.714	2.069	2.500	2.807	3.485	3.768
	24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
	25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
	26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
	27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
	28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
	29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
	30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
	40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
	60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
	80	1.292	1.664	1.990	2.374	2.639	3.195	3.416
	100	1.290	1.660	1.984	2.364	2.626	3.174	3.390

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2012/2013 PROGRAMME : 1BPA, 1BPB, 1BPC
COURSE : STATISTICS FOR MANAGEMENT COURSE CODE : BPA12303/BWM11003/BSM1823

TABLE 5 PERCENTAGE POINTS OF THE $\chi 2$ DISTRIBUTION

$$P(\chi^2 > \chi^2_{\alpha,v}) = \alpha$$

α =	0.995	0.99	0.98	0.975	0.95	0.90	0.80	0.75	0.70	0.50
v = 1	0.000039	0.000157	0.000628	0.000982	0.00393	0.0158	0.0642	0.102	0.148	0.455
2	0.0100	0.0201	0.0404	0.0506	0.103	0.211	0.446	0.575	0.713	1.386
3	0.0717	0.115	0.185	0.216	0.352	0.584	1.005	1.213	1.424	2.366
4	0.207	0.297	0.429	0.484	0.711	1.064	1.649	1.923	2.195	3.357
5	0.412	0.554	0.752	0.831	1.145	1.610	2.343	2.675	3.000	4.351
6	0.676	0.872	1.134	1.237	1.635	2.204	3.070	3.455	3.828	5.348
7	0.989	1.239	1.564	1.690	2.167	2.833	3.822	4.255	4.671	6.346
8	1.344	1.646	2.032	2.180	2.733	3.490	4.594	5.071	5.527	7.344
9	1.735	2.088	2.532	2.700	3.325	4.168	5.380	5.899	6.393	8.343
10	2.156	2.558	3.059	3.247	3.940	4.865	6.179	6.737	7.267	9.342
11	2.603	3.053	3.609	3.816	4.575	5.578	6.989	7.584	8.148	10.341
12	3.074	3.571	4.178	4.404	5.226	6.304	7.807	8.438	9.034	11.340
13	3.565	4.107	4.765	5.009	5.892	7.042	8.634	9.299	9.926	12.340
14	4.075	4.660	5.368	5.629	6.571	7.790	9.467	10.165	10.821	13.339
15	4.601	5.229	5.985	6.262	7.261	8.547	10.307	11.037	11.721	14.339
16	5.142	5.812	6.614	6.908	7.962	9.312	11.152	11.912	12.624	15.338
17	5.697	6.408	7.255	7.564	8.672	10.085	12.002	12.792	13.531	16.338
18	6.265	7.015	7.906	8.231	9.390	10.865	12.857	13.675	14.440	17.338
19	6.844	7.633	8.567	8.907	10.117	11.651	13.716	14.562	15.352	18.338
20	7.434	8.260	9.237	9.591	10.851	12.443	14.578	15.452	16.266	19.337

\continues ...

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2012/2013 PROGRAMME : 1BPA, 1BPB, 1BPC
COURSE : STATISTICS FOR MANAGEMENT COURSE CODE : BPA12303/BWM11003/BSM1823

...continues/

0.30	0.25	0.20	0.10	0.05	0.025	0.02	0.01	0.005	0.001	= α
1.074	1.323	1.642	2.706	3.841	5.024	5.412	6.635	7.879	10.828	ν = 1
2.408	2.773	3.219	4.605	5.991	7.378	7.824	9.210	10.597	13.816	2
3.665	4.108	4.642	6.251	7.815	9.348	9.837	11.345	12.838	16.266	3
4.878	5.385	5.989	7.779	9.488	11.143	11.668	13.277	14.860	18.467	4
6.064	6.626	7.289	9.236	11.070	12.833	13.388	15.086	16.750	20.515	5
7.231	7.841	8.558	10.645	12.592	14.449	15.033	16.812	18.548	22.458	6
8.383	9.037	9.803	12.017	14.067	16.013	16.622	18.475	20.278	24.322	7
9.524	10.219	11.030	13.362	15.507	17.535	18.168	20.090	21.955	26.124	8
10.656	11.389	12.242	14.684	16.919	19.023	19.679	21.666	23.589	27.877	9
11.781	12.549	13.442	15.987	18.307	20.483	21.161	23.209	25.188	29.588	10
12.899	13.701	14.631	17.275	19.675	21.920	22.618	24.725	26.757	31.264	11
14.011	14.845	15.812	18.549	21.026	23.337	24.054	26.217	28.300	32.909	12
15.119	15.984	16.985	19.812	22.362	24.736	25.472	27.688	29.819	34.528	13
16.222	17.117	18.151	21.064	23.685	26.119	26.873	29.141	31.319	36.123	14
17.322	18.245	19.311	22.307	24.996	27.488	28.259	30.578	32.801	37.697	15
18.418	19.369	20.465	23.542	26.296	28.845	29.633	32.000	34.267	39.252	16
19.511	20.489	21.615	24.769	27.587	30.191	30.995	33.409	35.718	40.790	17
20.601	21.605	22.760	25.989	28.869	31.526	32.346	34.805	37.156	42.312	18
21.689	22.718	23.900	27.204	30.144	32.852	33.687	36.191	38.582	43.820	19
22.775	23.828	25.038	28.412	31.410	34.170	35.020	37.566	39.997	45.315	20

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2012/2013
COURSE : STATISTICS FOR MANAGEMENT
PROGRAMME : 1BPA, 1BPB, 1BPC
COURSE CODE : BPA12303/BWM11003/BSM1823

TABLE 6 PERCENTAGE POINTS OF THE F DISTRIBUTION α = 0.05

$$P\left(F > f_{\alpha,\nu_1,\nu_2}\right) = \alpha$$

	ν1 =	1	2	3	4	5	6	7	8	10
ν2 =	1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	241.88
	2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.40
	3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.79
	4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	5.96
	5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.74
	6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.06
	7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.64
	8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.35
	9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.14
	10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	2.98
	11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.85
	12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.75
	13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.67
	14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.60
	15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.54
	16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.49
	17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.45
	18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.41
	19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.38
	20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.35
	22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.30
	24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.25
	26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.22
	28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.19
	30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.16
	40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.08
	60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	1.99
	80	3.96	3.11	2.72	2.49	2.33	2.21	2.13	2.06	1.95
	100	3.94	3.09	2.70	2.46	2.31	2.19	2.10	2.03	1.93

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2012/2013 PROGRAMME : 1BPA, 1BPB, 1BPC
COURSE : STATISTICS FOR MANAGEMENT COURSE CODE : BPA12303/BWM11003/BSM1823

STATISTICAL FORMULAS

Probability :

$$P(B_i \cap A) = P(B_i)P(A \mid B_i), \quad P(A) = \sum_{i=1}^{k} P(B_i \cap A) = \sum_{i=1}^{k} P(B_i)P(A \mid B_i)$$

Random Variables :

$$\sum_{i=-\infty}^{\infty} P(x_i) = 1, \qquad E(X) = \sum_{\forall x} x \cdot P(x), \qquad E(X^2) = \sum_{\forall x} x^2 \cdot P(x),$$

$$\int_{-\infty}^{\infty} f(x)\,dx = 1, \quad E(X) = \int_{-\infty}^{\infty} x \cdot P(x)\,dx, \quad E(X^2) = \int_{-\infty}^{\infty} x^2 \cdot P(x)\,dx,$$

$$Var(X) = E(X^2) - [E(X)]^2.$$

Special Probability Distributions :

$$X \sim B(n, p),\ P(x = r) = {}^{n}C_r \cdot p^r \cdot q^{n-r},\ r = 0, 1, \ldots, n,$$

$$X \sim P_0(\mu),\ P(X = r) = \frac{e^{-\mu} \cdot \mu^r}{r!},\ r = 0, 1, \ldots, \infty,$$

$$X \sim N(\mu, \sigma^2),\ Z \sim N(0,1),\ Z = \frac{X - \mu}{\sigma}.$$

Sampling Distributions :

$$\bar{X} \sim N(\mu, \sigma^2/n),\ \bar{X}_1 - \bar{X}_2 \sim N\left(\mu_1 - \mu_2, \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right),\ Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} \sim N(0,1),\ T = \frac{\bar{x} - \mu}{s/\sqrt{n}}.$$

Estimations :

$$n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E}\right)^2,\ \left(\bar{x}_1 - \bar{x}_2\right) - Z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + Z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}},$$

$$\left(\bar{x}_1 - \bar{x}_2\right) - Z_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + Z_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}},$$

$$\left(\bar{x}_1 - \bar{x}_2\right) - t_{\alpha/2,v} \cdot S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + t_{\alpha/2,v} \cdot S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

where the pooled estimate of variance is $S_p^2 = \dfrac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$ with $v = n_1 + n_2 - 2$,

$$\left(\bar{x}_1 - \bar{x}_2\right) - t_{\alpha/2,v}\sqrt{\frac{1}{n}\left(s_1^2 + s_2^2\right)} < \mu_1 - \mu_2 < \left(\bar{x}_1 - \bar{x}_2\right) + t_{\alpha/2,v}\sqrt{\frac{1}{n}\left(s_1^2 + s_2^2\right)} \text{ with } v = 2(n-1),$$

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2012/2013 PROGRAMME : 1BPA, 1BPB, 1BPC
COURSE : STATISTICS FOR MANAGEMENT COURSE CODE : BPA12303/BWM11003/BSM1823

$$\left(\bar{x}_1-\bar{x}_2\right)-t_{\alpha/2,v}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}<\mu_1-\mu_2<\left(\bar{x}_1-\bar{x}_2\right)+t_{\alpha/2,v}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}} \text{ with } v=\frac{\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1-1}+\frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2-1}},$$

$$\frac{(n-1)\cdot s^2}{\chi^2_{\alpha/2,v}}<\sigma^2<\frac{(n-1)\cdot s^2}{\chi^2_{1-\alpha/2,v}} \text{ with } v=n-1,$$

$$\frac{s_1^2}{s_2^2}\cdot\frac{1}{f_{\alpha/2}(v_1,v_2)}<\frac{\sigma_1^2}{\sigma_2^2}<\frac{s_1^2}{s_2^2}\cdot f_{\alpha/2}(v_2,v_1) \text{ with } v_1=n_1-1 \text{ and } v_2=n_2-1.$$

Hypothesis Testing :

$$Z=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}},\ T=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{S_p\cdot\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}} \text{ with } v=n_1+n_2-2,$$

$$Z=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}},\ T=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{1}{n}\left(s_1^2+s_2^2\right)}},\ T=\frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}},$$

$$v=\frac{\left(\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1-1}+\frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2-1}};\ S_p^2=\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2};\ \chi^2=\frac{(n-1)s^2}{\sigma^2};\ F=\frac{\sigma_2^2S_1^2}{\sigma_1^2S_2^2}.$$

Simple Linear Regressions :

$$S_{xy}=\sum x_iy_i-\frac{\sum x_i\cdot\sum y_i}{n},\ S_{xx}=\sum x_i^2-\frac{\left(\sum x_i\right)^2}{n},\ S_{yy}=\sum y_i^2-\frac{\left(\sum y_i\right)^2}{n},\ \bar{x}=\frac{\sum x_i}{n},$$

$$\bar{y}=\frac{\sum y_i}{n},\ \hat{\beta}_1=\frac{S_{xy}}{S_{xx}},\ \hat{\beta}_0=\bar{y}-\hat{\beta}_1\bar{x},\ \hat{y}=\hat{\beta}_0+\hat{\beta}_1x,\ r=\frac{S_{xy}}{\sqrt{S_{xx}\cdot S_{yy}}},\ SSE=S_{yy}-\hat{\beta}_1S_{xy},$$

$$MSE=\frac{SSE}{n-2},\ T=\frac{\hat{\beta}_1-\beta_1^*}{\sqrt{\frac{MSE}{S_{xx}}}}\sim t_{n-2},\ T=\frac{\hat{\beta}_0-\beta_0^*}{\sqrt{MSE\left(\frac{1}{n}+\frac{\bar{x}^2}{S_{xx}}\right)}}\sim t_{n-2}.$$