Programme: PGDM (International Business)

Batch: 2016-18

Trimester: 1st

PGDM (IB) (16-18)

Statistics for Business Analysis

IB-101

Trimester – I, End-Term Examination: September 2016

Time allowed: 2 hrs 30 min

Max Marks: 50

Roll No: ___________

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means.** In case of rough work please use answer sheet.

Sections	No. of Questions to attempt	Marks	Marks
A	3 out of 5 (Short Questions)	5 Marks each	3*5 = 15
B	2 out of 3 (Long Questions)	10 Marks each	2*10 = 20
C	Compulsory Case Study	15 Marks	15
		Total Marks	**50**

SECTION A

A1. Ship collisions in the Sethusamundram ship channel are rare. Suppose the number of collisions is poission distributed with mean of 1.2 collisions every four months.

a) What is the probability of having no collisions occur over a four- month period?
b) What is the probability of having exactly two collisions in a two- month period?
c) What is the probability of having one or fewer collisions in a six- month period?

A2. Smitty moyer knows that the probability that any one of the 20 individual floodlights in a light tower fails during a football game is 0.05. The individual floodlights in a tower fail independently of each other.

Using both the binomial and the poisson approximation, determine the probability that seven floodlight from a given tower will fail during the same game.

A3. Complete the One-Way ANOVA summary table.

20

Turn Over

Source	SS	df	MS	F
Between (group)	80	_____	40	_____
Within/Error	_____	_____	_____	
Total	100	14		

A4. The annual salaries of employees in a large company are approximately normally distributed with a mean of $50,000 and a standard deviation of $20,000.

a) What percent of people earn less than $40,000?
b) What percent of people earn between $45,000 and $65,000?
c) What percent of people earn more than $70,000?

A5. A national publication reported that a college student living away from home spends, on average, no more than Rs.15 per month on laundry. You believe this figure is too low and want to disprove this claim. To conduct the test, you randomly select 17 college students and ask them to keep track of the amount of money they spend during a given month for laundry. The sample produces an average expenditure on laundry of Rs.19.34, with a population standard deviation of Rs. 4.52. Use these sample data to conduct the hypothesis test. Assume you are willing to take a 10% risk of making a Type I error and that spending on laundary per month is normally distributed in the population.

SECTION B

B1. An educator has the opinion that the grades high school students make depend on the amount of time they spend listening to music. To test this theory, he has randomly given 400 students a questionnaire. Within the questionnaire are the two questions: "How many hours per week do you listen to music?" "What is the average grade for all your classes?" The data from the survey are in the following table. Using a 5 percent significance level, test whether grades and time spent listening to music are independent or dependent.

Hours Spent Listening to Music	Average Grade				Total
	A	B	C	D	
< 5 hrs	13	10	11	21	55

Turn Over

5-10 hrs.	20	27	27	21	95
11-20 hrs.	19	37	73	26	155
>20 hrs.	14	15	41	25	95
Total	66	89	152	93	400

B2. Pepsi is studying the effect of its latest advertising campaign. People chosen at random were called and asked and asked how many cans of Pepsi they had bought in the past week and how many Pepsi advertisements they had either read or seen in the past week.

X (number of ads)	3	7	4	2	0	4	2	2
Y (cans purchased)	11	16	9	6	5	6	3	8

a) Develop an equation for the relationship between cans purchased and number of ads read or seen.

b) Interpret the slope of the regression line

c) Plot appropriate graphs for observed sales and estimated sales.

d) If a customer has seen or read 5 ads, how many Pepsi cans he is expected to purchase?

B3. The Department of transportation has mandated that the average speed of cars on interstate highway must be no more than 67 miles per hour in order for state highway department to retain their federal funding. North Carolina troopers in unmarked cars clocked a sample of 186 cars and found that the average speed was 66.3 miles per hour and standard deviation was 0.6 mph.

a) Find the standard error of mean

b) What is the interval around the sample mean that would contain the population mean 95 percent of time?

c) Can North Carolina truthfully report that the true mean speed on its highways is 67mph or less with 95 percent confidence?

SECTION C

Case # Frozen Pizza Targets Teens

McCain Foods Limited is one of the most recognizable and popular brand names. This company was founded in Florenceville, New Brunswick, in 1957, and today it is the world's leading producer of French fries and various frozen food items.

One of McCain's most well-known and well-liked frozen food product is its frozen pizza. In 1998, McCain introduced Crescendo Rising Crust Pizza, its first rising crust pizza. The concept of a rising crust pizza was developed in order to replicate as much as possible the taste and look of takeout pizza. However, sales for this pizza were not as McCain originally anticipated. This was due to the fact that just a few months after the Crescendo introduction, Kraft introduced its Delissio frozen pizza, and with extensive advertising, Delissio became the brand leader while McCain's Crescendo followed in second place.

In 2004, McCain's research experts concluded that the main reason for Crescendo's lagging leadership in its field was its lack of appeal and absence of a "cool factor" with the teenage market. Teenagers were not able to relate to the Crescendo Rising Crust Pizza because they did not see it as a cool and trendy product. As such, McCain needed to change its image in order to attract the important teenage market. Research conducted in the year 2000 found that 66% of teenagers purchase a product that reflects their style and image as "hip" and trendy; therefore portraying Crescendo as "cool" would make the product more desirable to teens. At the time, McCain was focused on attracting teens, since research showed that they represented a significant growth factor in the food product industry and were the main consumers of frozen pizzas.

In order for McCain to attract teens, it had to change its advertising strategy. The first change that McCain made was to introduce more creative advertisements specifically targeted at the teenage population. These advertisements included "The Tan Lines" campaign. This was a fun and innovative ad that focused on young people and how intriguing Crescendo could be. The desired effect of the advertising was to capture sufficient interest that in turn would distract the teenagers sufficiently and make them unaware of anything else around them. Featuring young people in the advertisements was very important to McCain so that the teenage population could easily relate to the characters portrayed. Research also indicated that television was the most powerful form of media; therefore McCain chose to advertise on both English and French channels.

McCain went even further and used outdoor billboards in busy areas such as Toronto, Ottawa, Montreal, and Vancouver.

Turn Over

As a result of this research, McCain was able to launch its new advertisements in December 2004. Its new ads were very successful. Within the first six months of the new advertising campaign, McCain was able to double its sales goal of a 15% increase for the Crescendo Rising Crust Pizza to a 34% year-over-year increase in ex-factory sales.

Discussion

In the research process for McCain Foods Limited, many different numerical questions were raised regarding advertising techniques and purchase patterns among teenagers. In each of these areas, statistics, in particular hypothesis testing plays a central role. Using the case information and the concepts of hypothesis testing, discuss the following:

a. The case information stated that 66% of teenagers purchase products that reflect their style and image as being hip and trendy. How would you test the appropriateness and validity of that percentage? In a test where 900 teens are randomly selected across Canada, 625 state that they purchase products that reflect their style and image as being hip and trendy. Test the claim made in the case regarding the purchase of products by teenagers reflecting their style and image. Assume normality.

b. Historically, it has been verified that 72% of all teens that ate frozen pizza were girls. Due to apparent changes in gender tastes, it is believed that more teen boys are now eating frozen pizzas. From a random sample of 653 teens that eat frozen pizza, 513 are girls. Does this sample result provide sufficient evidence to conclude that a higher proportion of teenage girls than before eat frozen pizza? Assume normality.

c. McCain is interested in knowing the average age of the teenage consumer of the Crescendo Rising Crust Pizza? Suppose that initial beliefs indicate that the mean age is 15. Is this figure really correct? To test whether it is, a researcher randomly contacts 30 teenage consumers of Crescendo Rising Crust Pizza, for this sample mean is 16.92 and variance is 30.2963.

Determine whether the mean age exceeds 15. Let α be 0.01. Assume normality.

Some important Formulae

$$P(x) = \binom{n}{x} p^x q^{(n-x)} = \frac{n!}{x!(n-x)!} p^x q^{(n-x)} \quad ; \mu = np \quad ; \sigma^2 = npq$$

$$P(x) = \frac{\mu^x e^{-\mu}}{x!} \text{ for } x = 1,2,3,\ldots \quad ; \quad z = \frac{x-\mu}{\sigma}$$

$$\frac{\bar{X}-\mu}{\sigma/\sqrt{n}} \qquad \frac{\bar{X}-\mu}{s/\sqrt{n}} \qquad \frac{\hat{p}-p}{\sqrt{\frac{p(1-p)}{n}}}$$

$$\frac{\bar{X}-\mu_0}{\sigma/\sqrt{n}} \qquad \frac{\bar{X}-\mu_0}{s/\sqrt{n}} \qquad \frac{(\hat{p}-p_0)}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

$$\bar{x} \pm z\alpha/2 \frac{\sigma}{\sqrt{n}} \qquad \bar{X} \pm t_{(\frac{\alpha}{2}, n-1)} \frac{s}{\sqrt{n}} \qquad n = \frac{(z\alpha/2)^2 \sigma^2}{E^2}$$

Finite Correction Factor : $\sqrt{\frac{N-n}{N-1}}$

$$N\bar{X} \pm N\left(t_{\alpha/2, n-1}\right)\frac{S}{\sqrt{n}}\sqrt{\frac{(N-n)}{(N-1)}}$$

$$SS(B) = \sum_{i=1}^{k} n_i(\bar{x}_i - \bar{\bar{x}})^2 \quad \text{d.f.} = k-1$$

$$X^2 = \sum \frac{(f_o - f_e)^2}{fe}$$

$$SS(W) = \sum_{i=1}^{k} df_i s_i^2 \quad \text{d.f} = n-k$$

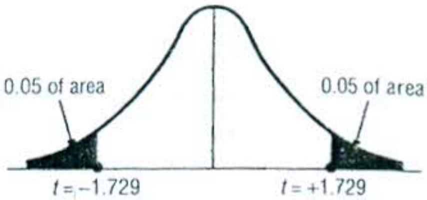
SST = SSB + SSW d.f = n-1

$$F_{(k-1, n-k \text{ at } \alpha)} = \frac{MSB}{MSW}$$

$$Y_i = b_0 + b_1 X \qquad b_0 = \bar{y} - b_1 \bar{x}$$

$$b_1 = \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}} \qquad b_1 = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sum (x-\bar{x})^2}$$

EXAMPLE: TO FIND THE VALUE OF *t* THAT CORRESPONDS TO AN AREA OF 0.10 IN BOTH TAILS OF THE DISTRIBUTION COMBINED, WHEN THERE ARE 19 DEGREES OF FREEDOM, LOOK UNDER THE 0.10 COLUMN, AND PROCEED DOWN TO THE 19 DEGREES OF FREEDOM ROW; THE APPROPRIATE *t* VALUE THERE IS 1.729.



APPENDIX TABLE 2 AREAS IN BOTH TAILS COMBINED FOR STUDENT'S *t* DISTRIBUTION

Degrees of Freedom	Area in Both Tails Combined			
	0.10	0.05	0.02	0.01
1	6.314	12.706	31.821	63.657
2	2.920	4.303	6.965	9.925
3	2.353	3.182	4.541	5.841
4	2.132	2.776	3.747	4.604
5	2.015	2.571	3.365	4.032
6	1.943	2.447	3.143	3.707
7	1.895	2.365	2.998	3.499
8	1.860	2.306	2.896	3.355
9	1.833	2.262	2.821	3.250
10	1.812	2.228	2.764	3.169
11	1.796	2.201	2.718	3.106
12	1.782	2.179	2.681	3.055
13	1.771	2.160	2.650	3.012
14	1.761	2.145	2.624	2.977
15	1.753	2.131	2.602	2.947
16	1.746	2.120	2.583	2.921
17	1.740	2.110	2.567	2.898
18	1.734	2.101	2.552	2.878
19	1.729	2.093	2.539	2.861
20	1.725	2.086	2.528	2.845
21	1.721	2.080	2.518	2.831
22	1.717	2.074	2.508	2.819
23	1.714	2.069	2.500	2.807
24	1.711	2.064	2.492	2.797
25	1.708	2.060	2.485	2.787
26	1.706	2.056	2.479	2.779
27	1.703	2.052	2.473	2.771
28	0.701	2.048	2.467	2.763
29	1.699	2.045	2.462	2.756
30	1.697	2.042	2.457	2.750
40	1.684	2.021	2.423	2.704
60	1.671	2.000	2.390	2.660
120	1.658	1.980	2.358	2.617
Normal Distribution	1.645	1.960	2.326	2.576

APPENDIX TABLE 4(b) DIRECT VALUES FOR DETERMINING POISSON PROBABILITIES

FOR A GIVEN VALUE OF λ, ENTRY INDICATES THE PROBABILITY OF OBTAINING A SPECIFIED VALUE OF X.

	λ									
X	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0	0.9048	0.8187	0.7408	0.6703	0.6065	0.5488	0.4966	0.4493	0.4066	0.3679
1	0.0905	0.1637	0.2222	0.2681	0.3033	0.3293	0.3476	0.3595	0.3659	0.3679
2	0.0045	0.0164	0.0333	0.0536	0.0758	0.0988	0.1217	0.1438	0.1647	0.1839
3	0.0002	0.0011	0.0003	0.0072	0.0126	0.0198	0.0284	0.0383	0.0494	0.0613
4	0.0000	0.0001	0.0003	0.0007	0.0016	0.0030	0.0050	0.0077	0.0111	0.0153
5	0.0000	0.0000	0.0000	0.0001	0.0002	0.0004	0.0007	0.0012	0.0020	0.0031
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0005
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
	λ									
X	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
0	0.3329	0.3012	0.2725	0.2466	0.2231	0.2019	0.1827	0.1653	0.1496	0.1353
1	0.3662	0.3614	0.3543	0.3452	0.3347	0.3230	0.3106	0.2975	0.2842	0.2707
2	0.2014	0.2169	0.2303	0.2417	0.2510	0.2584	0.2640	0.2678	0.2700	0.2707
3	0.0738	0.0867	0.0998	0.1128	0.1255	0.1378	0.1496	0.1607	0.1710	0.1804
4	0.0203	0.0260	0.0324	0.0395	0.0471	0.0551	0.0636	0.0723	0.0812	0.0902
5	0.0045	0.0062	0.0084	0.0111	0.0141	0.0176	0.0216	0.0260	0.0309	0.0361
6	0.0008	0.0012	0.0018	0.0026	0.0035	0.0047	0.0061	0.0078	0.0098	0.0120
7	0.0001	0.0002	0.0003	0.0005	0.0008	0.0011	0.0015	0.0020	0.0027	0.0034
8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005	0.0006	0.0009
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002
	λ									
X	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
0	0.1225	0.1108	0.1003	0.0907	0.0821	0.0743	0.0672	0.0608	0.0550	0.0498
1	0.2572	0.2438	0.2306	02177	0.2052	0.1931	0.1815	0.1703	0.1596	0.1494
2	0.2700	0.2681	0.2652	0.2613	0.2565	0.2510	0.2450	0.2384	0.2314	0.2240
3	0.1890	0.1966	0.2033	0.2090	0.2138	0.2176	0.2205	0.2225	0.2237	0.2240
4	0.0992	0.1082	0.1169	0.1254	0.1336	0.1414	0.1488	0.1557	0.1622	0.1680
5	0.0417	0.0476	0.0538	0.0602	0.0668	0.0735	0.0804	0.0872	0.0940	0.1008
6	0.0146	0.0174	0.0206	0.0241	0.0278	0.0319	0.0362	0.0407	0.0455	0.0504
7	0.0044	0.0055	0.0068	0.0083	0.0099	0.0118	0.0139	0.0163	0.0188	0.0216
8	0.0011	0.0015	0.0019	0.0025	0.0031	0.0038	0.0047	0.0057	0.0068	0.0081
9	0.0003	0.0004	0.0005	0.0007	0.0009	0.0011	0.0014	0.0018	0.0022	0.0027
10	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

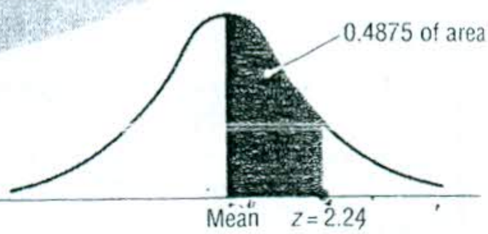
Note: If ν, the number of degrees of freedom, is greater than 30, we can approximate χ^2_α, the chi-square value leaving α of the area the right tail, by

$$\chi^2_\alpha = \nu\left(1 - \frac{2}{9\nu} + z_\alpha\sqrt{\frac{2}{9\nu}}\right)^3$$

where z_α is the standard normal value (from Appendix Table 1) that leaves α of the area in the right tail

Area in Right Tail					Degrees of Freedom
0.20	**0.10**	**0.05**	**0.025**	**0.01**	
1.642	2.706	3.841	5.024	6.635	1
3.219	4.605	5.991	7.378	9.210	2
4.642	6.251	7.815	9.348	11.345	3
5.989	7.779	9.488	11.143	13.277	4
7.289	9.236	11.070	12.833	15.086	5
8.558	10.645	12.592	14.449	16.812	6
9.803	12.017	14.067	16.013	18.475	7
11.030	13.362	15.507	17.535	20.090	8
12.242	14.684	16.919	19.023	21.666	9
13.442	15.987	18.307	20.483	23.209	10
14.631	17.275	19.675	21.920	24.725	11
15.812	18.549	21.026	23.337	26.217	12
16.985	19.812	22.362	24.736	27.688	13
18.151	21.064	23.685	26.119	29.141	14
19.311	22.307	24.996	27.488	30.578	15
20.465	23.542	26.296	28.845	32.000	16
21.615	24.769	27.587	30.191	33.409	17
22.760	25.989	28.869	31.526	34.805	18
23.900	27.204	30.144	32.852	36.191	19
25.038	28.412	31.410	34.170	37.566	20
26.171	29.615	32.671	35.479	38.932	21
27.301	30.813	33.924	36.781	40.289	22
28.429	32.007	35.172	38.076	41.638	23
29.553	33.196	36.415	39.364	42.980	24
30.675	34.382	37.652	40.647	44.314	25
31.795	35.563	38.885	41.923	45.642	26
32.912	36.741	40.113	43.194	46.963	27
34.027	37.916	41.337	44.461	48.278	28
35.139	39.087	42.557	45.722	49.588	29
36.250	40.256	43.773	46.979	50.892	30

Appendix Tables



EXAMPLE: TO FIND THE AREA UNDER THE CURVE BETWEEN THE MEAN AND A POINT 2.24 STANDARD DEVIATIONS TO THE RIGHT OF THE MEAN, LOOK UP THE VALUE OPPOSITE 2.2 AND UNDER 0.04 IN THE TABLE; 0.4875 OF THE AREA UNDER THE CURVE LIES BETWEEN THE MEAN AND A z VALUE OF 2.24.

APPENDIX TABLE 1 AREAS UNDER THE STANDARD NORMAL PROBABILITY DISTRIBUTION BETWEEN THE MEAN AND POSITIVE VALUES OF z

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

Binomial Probabilities

		p																			
n	r	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18	r	n
12	0	0.8864	0.7847	0.6938	0.6127	0.5404	0.4759	0.4186	0.3677	0.3225	0.2824	0.2470	0.2157	0.1880	0.1637	0.1422	0.1234	0.1069	0.0924	12	
	1	0.1074	0.1922	0.2575	0.3064	0.3413	0.3645	0.3781	0.3837	0.3827	0.3766	0.3663	0.3529	0.3372	0.3197	0.3012	0.2821	0.2627	0.2434	11	
	2	0.0060	0.0216	0.0438	0.0702	0.0988	0.1280	0.1565	0.1835	0.2082	0.2301	0.2490	0.2647	0.2771	0.2863	0.2924	0.2955	0.2960	0.2939	10	
	3	0.0002	0.0015	0.0045	0.0098	0.0173	0.0272	0.0393	0.0532	0.0686	0.0852	0.1026	0.1203	0.1380	0.1553	0.1720	0.1876	0.2021	0.2151	9	
	4	0.0000	0.0001	0.0003	0.0009	0.0021	0.0039	0.0067	0.0104	0.0153	0.0213	0.0285	0.0369	0.0464	0.0569	0.0683	0.0804	0.0931	0.1062	8	
	5	–	0.0000	0.0000	0.0001	0.0002	0.0004	0.0008	0.0014	0.0024	0.0038	0.0056	0.0081	0.0111	0.0148	0.0193	0.0245	0.0305	0.0373	7	
	6	–	–	–	0.0000	0.0000	0.0000	0.0001	0.0001	0.0003	0.0005	0.0008	0.0013	0.0019	0.0028	0.0040	0.0054	0.0073	0.0096	6	
	7	–	–	–	–	–	–	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0004	0.0006	0.0009	0.0013	0.0018	5	
	8	–	–	–	–	–	–	–	–	–	–	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0002	4	
	9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0000	0.0000	0.0000	0.0000	3	
	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	
	11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	
	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	12
15	0	0.8601	0.7386	0.6333	0.5421	0.4633	0.3953	0.3367	0.2863	0.2430	0.2059	0.1741	0.1470	0.1238	0.1041	0.0874	0.0731	0.0611	0.0510	15	
	1	0.1303	0.2261	0.2938	0.3388	0.3658	0.3785	0.3801	0.3734	0.3605	0.3432	0.3228	0.3006	0.2775	0.2542	0.2312	0.2090	0.1878	0.1678	14	
	2	0.0092	0.0323	0.0636	0.0988	0.1348	0.1691	0.2003	0.2273	0.2496	0.2669	0.2793	0.2870	0.2903	0.2897	0.2856	0.2787	0.2692	0.2578	13	
	3	0.0004	0.0029	0.0085	0.0178	0.0307	0.0468	0.0653	0.0857	0.1070	0.1285	0.1496	0.1696	0.1880	0.2044	0.2184	0.2300	0.2389	0.2452	12	
	4	0.0000	0.0002	0.0008	0.0022	0.0049	0.0090	0.0148	0.0223	0.0317	0.0428	0.0555	0.0694	0.0843	0.0998	0.1156	0.1314	0.1468	0.1615	11	
	5	–	0.0000	0.0001	0.0002	0.0006	0.0013	0.0024	0.0043	0.0069	0.0105	0.0151	0.0208	0.0277	0.0357	0.0449	0.0551	0.0662	0.0780	10	
	6	–	–	0.0000	0.0000	0.0000	0.0001	0.0003	0.0006	0.0011	0.0019	0.0031	0.0047	0.0069	0.0097	0.0132	0.0175	0.0226	0.0285	9	
	7	–	–	–	–	–	0.0000	0.0000	0.0001	0.0001	0.0003	0.0005	0.0008	0.0013	0.0020	0.0030	0.0043	0.0059	0.0081	8	
	8	–	–	–	–	–	–	–	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0003	0.0005	0.0008	0.0012	0.0018	7	
	9	–	–	–	–	–	–	–	–	–	–	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0003	6	
	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0000	0.0000	0.0000	0.0000	5	
	11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	
	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	
	13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	
	14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	
	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	15
20	0	0.8179	0.6676	0.5438	0.4420	0.3585	0.2901	0.2342	0.1887	0.1516	0.1216	0.0972	0.0776	0.0617	0.0490	0.0388	0.0306	0.0241	0.0189	20	
	1	0.1652	0.2725	0.3364	0.3683	0.3774	0.3703	0.3526	0.3282	0.3000	0.2702	0.2403	0.2115	0.1844	0.1595	0.1368	0.1165	0.0986	0.0829	19	
	2	0.0159	0.0528	0.0988	0.1458	0.1887	0.2246	0.2521	0.2711	0.2818	0.2852	0.2822	0.2740	0.2618	0.2466	0.2293	0.2109	0.1919	0.1730	18	
	3	0.0010	0.0065	0.0183	0.0364	0.0596	0.0860	0.1139	0.1414	0.1672	0.1901	0.2093	0.2242	0.2347	0.2409	0.2428	0.2410	0.2358	0.2278	17	
	4	0.0000	0.0006	0.0024	0.0065	0.0133	0.0233	0.0364	0.0523	0.0703	0.0898	0.1099	0.1299	0.1491	0.1666	0.1821	0.1951	0.2053	0.2125	16	
	5	–	0.0000	0.0002	0.0009	0.0022	0.0048	0.0088	0.0145	0.0222	0.0319	0.0435	0.0567	0.0713	0.0868	0.1028	0.1189	0.1345	0.1493	15	
	6	–	–	0.0000	0.0001	0.0003	0.0008	0.0017	0.0032	0.0055	0.0089	0.0134	0.0193	0.0266	0.0353	0.0454	0.0566	0.0689	0.0819	14	
	7	–	–	–	0.0000	0.0000	0.0001	0.0002	0.0005	0.0011	0.0020	0.0033	0.0053	0.0080	0.0115	0.0160	0.0216	0.0282	0.0360	13	
	8	–	–	–	–	–	0.0000	0.0000	0.0001	0.0002	0.0004	0.0007	0.0012	0.0019	0.0030	0.0046	0.0067	0.0094	0.0128	12	
	9	–	–	–	–	–	–	–	0.0000	0.0000	0.0001	0.0001	0.0002	0.0004	0.0007	0.0011	0.0017	0.0026	0.0038	11	
	10	–	–	–	–	–	–	–	–	–	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0004	0.0006	0.0009	10	
	11	–	–	–	–	–	–	–	–	–	–	–	–	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	9	
	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0000	0.0000	0.0000	8	
	13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	
	14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	
	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	
	16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	
	17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	
	18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	
	19	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	
	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	20
n	r	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89	0.88	0.87	0.86	0.85	0.84	0.83	0.82	r	n
		p																			