NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: BACHELOR OF SCIENCE IN APPLIED MATHEMATICS AND STATISTICS	
QUALIFICATION CODE: 07BAMS	**LEVEL:** 7
COURSE CODE: AEM702S	**COURSE NAME:** APPLIED ECONOMETRIC MODELLING
SESSION: JANUARY 2019	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

SECOND OPPORTUNITY EXAMINATION	
EXAMINER:	MR O.P.L. MTAMBO
MODERATOR:	PROF P. NJUHO

INSTRUCTIONS
1. Answer ALL the questions in the booklet provided.
2. Show clearly all the steps used in the calculations.
3. All written work must be done in blue or black ink and sketches must be done in pencil.

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.
2. Attached statistical tables (t-table, χ^2-table and F-table).

THIS QUESTION PAPER CONSISTS OF 5 PAGES (Including this front page)

QUESTION 1 [20 MARKS]

In your own words, briefly explain how each of the following estimation methods works. [Hint: Consider a situation in which each of them is applicable.]

(a) Generalised least squares (GLS) [4]

(b) Weighted least squares (WLS) [3]

(c) 2-stage least squares (2SLS) [4]

(d) 3-stage least squares (3SLS) [4]

(e) Iteratively Re-weighted least squares (IRWLS) [5]

QUESTION 2 [20 MARKS]

Consider a multiple linear regression model given by the formula $\underline{y} = X\underline{\beta} + \underline{u}$ in matrix version. Let the OLS hat matrix and residual matrix be H and M respectively.

(a) Without showing methods, state the formulas for H and M in terms of X only. [2]

(b) Show that H is both symmetric and idempotent. [4]

(c) Show that $\underline{\hat{\beta}} = (X^T X)^{-1} X^T \underline{y}$ is an unbiased OLS estimator of $\underline{\beta}$. [4]

(d) Show that $var\text{-}cov\left(\underline{\hat{\beta}}\right) = \sigma^2 (X^T X)^{-1}$. [4]

(e) Show that, for simple linear, $S.E.\left(\hat{\beta}_0\right) = \sigma\sqrt{\dfrac{1}{n} + \dfrac{\bar{x}^2}{SS_{xx}}}$ where $X^T X = \begin{bmatrix} n & \sum x \\ \sum x & \sum x^2 \end{bmatrix}$. [6]

QUESTION 3 [20 MARKS]

A researcher wants to model food expenditure (Y) using total expenditure (X). She wishes to consider the following Engel expenditure models.

Model	Engel expenditure curve	Functional form
1	$Y_i = \beta_0 + \beta_1 X_i + u_i$	Linear
2	$Y_i = \beta_0 + \beta_1(1/X_i) + u_i$	
3	$\ln(Y_i) = \ln(\beta_0) + \beta_1 \ln(X_i) + u_i$	
4	$\ln(Y_i) = \ln(\beta_0) + \beta_1(1/X_i) + u_i$	
5	$Y_i = \beta_0 + \beta_1 \ln(X_i) + u_i$	

The SPSS results of models 1 and 5 are summarised in the table below.

Model		Estimate	Std Error	t	n	R square
1	Constant	66.706	58.191		22	0.499
	Predictor	0.490	0.110			
5	Constant		334.915	-3.684	22	0.520
	Predictor		53.583	4.651		

(a) State the functional forms for models 2, 3, 4, and 5. [4]

(b) Find the t-values for model 1. [2]

(c) Find the estimates for model 5. [2]

(d) Interpret the predictor estimate for model 1. [2]

(e) Interpret the predictor estimate for model 5. [2]

(f) Determine whether the constant estimate for model 1 is significant at 5% level. [3]

(g) With reasons, state the better model between models 1 and 5. [2]

(h) Explain how you could estimate elasticity of Y with respect to X using model 5. [3]

QUESTION 4 [20 MARKS]

(a) State any 4 consequences of multicollinearity in linear regression analysis. [4]

(b) Assess the presence severe multicollinearity in the EVIEWS output below. [4]

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Dependent variable: Y
Sample: 1947-1962
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Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3482259	890420.4	-3.910803	0.0036
X_1	15.06187	84.91493	0.177376	0.8631
X_2	-0.035819	0.033491	-1.069516	0.3127
X_3	-2.020230	0.488400	-4.136427	0.0025
X_4	-1.033227	0.214274	-4.821985	0.0009
X_5	-0.051104	0.226073	-0.226051	0.8262
X_6	1829.151	455.4785	4.015890	0.0030

R-squared	0.995479	Mean dependent var	65317.00
Adjusted R-squared	0.992465	S.D. dependent var	3511.968
S.E. of regression	304.8541	Akaike info criterion	14.57718
Sum squared resid	836424.1	Schwartz criterion	14.91519
Log likelihood	-109.6174	F-statistic	330.2853
Durbin-Watson stat	2.559488	Prob (F-statistic)	0.000000

(c) Briefly explain how you can detect the presence of severe multicollinearity by using:

    i.   correlation matrix. [2]

    ii.   variance inflation factor (VIF). [2]

(d) The data given in the table below pertain to the average annual return (R, %) and the standard deviation of annual return (σ, %) of 10 different mutual funds. Using the capital market line (CML) of portfolio theory, the fitted linear regression model is $\hat{R}_i = 5.8194 + 0.4590\sigma_i$ and the residuals ($\hat{u}_i$) are as shown in the data table.

Mutual fund	R_i	σ_i	$\hat{R}_i$	$\hat{u}_i = R_i - \hat{R}_i$
1	12.4	12.1	11.37	1.03
2	14.4	21.4	15.64	-1.24
3	14.6	18.7	14.40	0.20
4	16.0	21.7	15.78	0.22
5	11.3	12.5	11.56	-0.26
6	10.0	10.4	10.59	-0.59
7	16.2	20.8	15.37	0.83
8	10.4	10.2	10.50	-0.10
9	13.1	16.0	13.16	-0.06
10	11.3	12.0	11.33	-0.03

Use Spearman's correlation test to determine whether there is evidence of significant heteroscedasticity for these data at 5 % level. [8]

QUESTION 5 [20 MARKS]

(a) Consider the following demand-and-supply simultaneous structural equations model.

Demand function: $Q_t = \alpha_0 + \alpha_1 P_t + \alpha_2 I_t + u_{1t}$ $\alpha_1 < 0, \alpha_2 > 0$

Supply function: $Q_t = \beta_0 + \beta_1 P_t + \beta_2 P_{t-1} + u_{2t}$ $\beta_1 > 0, \beta_2 > 0$

where Q_t = demand/supply quantity at time t

P_t = commodity's price at time t

I_t = consumer's income at time t

    i.   Derive the reduced-form equation for equilibrium price. [3]

    ii.   Derive the reduced-form equation for equilibrium quantity. [4]

    iii.   Determine whether the whole given system is identifiable. [2]

(b) State the general principle for identifiability of structural equations in a system of M simultaneous equations using both order and rank conditions of identification. [5]

(c) Use order and rank conditions to determine the identifiability of equation 1 in the following simultaneous structural equations. [6]

$$Y_{1t} = \beta_{10} + \beta_{12}Y_{2t} + \beta_{13}Y_{3t} + \gamma_{11}X_{1t} + u_{1t} \quad \text{................... equation 1}$$

$$Y_{2t} = \beta_{20} + \beta_{23}Y_{3t} + \gamma_{21}X_{1t} + \gamma_{22}X_{2t} + u_{2t} \quad \text{................... equation 2}$$

$$Y_{3t} = \beta_{30} + \beta_{31}Y_{1t} + \gamma_{31}X_{1t} + \gamma_{32}X_{2t} + u_{3t} \quad \text{................... equation 3}$$

$$Y_{4t} = \beta_{40} + \beta_{41}Y_{1t} + \beta_{42}Y_{2t} + \gamma_{43}X_{3t} + u_{4t} \quad \text{................... equation 4}$$

END OF QUESTION PAPER

t-Distribution Table
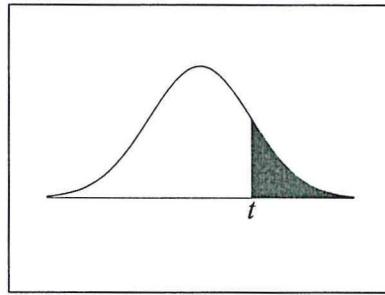
The shaded area is equal to α for $t = t_\alpha$.

df	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
32	1.309	1.694	2.037	2.449	2.738
34	1.307	1.691	2.032	2.441	2.728
36	1.306	1.688	2.028	2.434	2.719
38	1.304	1.686	2.024	2.429	2.712
∞	1.282	1.645	1.960	2.326	2.576

Chi-Square Distribution Table
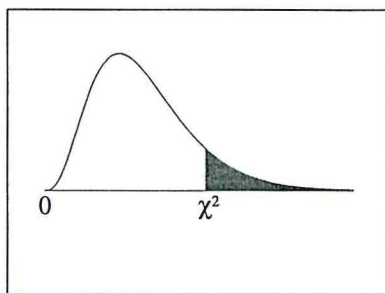
The shaded area is equal to α for $\chi^2 = \chi^2_\alpha$.

df	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$	$\chi^2_{.100}$	$\chi^2_{.050}$	$\chi^2_{.025}$	$\chi^2_{.010}$	$\chi^2_{.005}$
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

F distribution critical value landmarks

Table entries are critical values for *F** with probably *p* in right tail of the distribution.

Figure of *F* distribution (like in Moore, 2004, p. 656) here.

						Degrees of freedom in numerator (df1)							
	p	1	2	3	4	5	6	7	8	12	24	1000
1	0.100	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	60.71	62.00	63.30
	0.050	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	243.9	249.1	254.2
	0.025	647.8	799.5	864.2	899.6	921.8	937.1	948.2	956.6	976.7	997.3	1017.8
	0.010	4052	4999	5404	5624	5764	5859	5928	5981	6107	6234	6363
	0.001	405312	499725	540257	562668	576496	586033	593185	597954	610352	623703	636101
2	0.100	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.41	9.45	9.49
	0.050	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.41	19.45	19.49
	0.025	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.41	39.46	39.50
	0.010	98.50	99.00	99.16	99.25	99.30	99.33	99.36	99.38	99.42	99.46	99.50
	0.001	998.38	998.84	999.31	999.31	999.31	999.31	999.31	999.31	999.31	999.31	999.31
3	0.100	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.22	5.18	5.13
	0.050	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.74	8.64	8.53
	0.025	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.34	14.12	13.91
	0.010	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.05	26.60	26.14
	0.001	167.06	148.49	141.10	137.08	134.58	132.83	131.61	130.62	128.32	125.93	123.52
4	0.100	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.90	3.83	3.76
	0.050	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	5.91	5.77	5.63
	0.025	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.75	8.51	8.26
	0.010	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.37	13.93	13.47
	0.001	74.13	61.25	56.17	53.43	51.72	50.52	49.65	49.00	47.41	45.77	44.09
5	0.100	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.27	3.19	3.11
	0.050	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.68	4.53	4.37
	0.025	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.52	6.28	6.02
	0.010	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	9.89	9.47	9.03
	0.001	47.18	37.12	33.20	31.08	29.75	28.83	28.17	27.65	26.42	25.13	23.82
6	0.100	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.90	2.82	2.72
	0.050	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.00	3.84	3.67
	0.025	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.37	5.12	4.86
	0.010	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.72	7.31	6.89
	0.001	35.51	27.00	23.71	21.92	20.80	20.03	19.46	19.03	17.99	16.90	15.77
7	0.100	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.67	2.58	2.47
	0.050	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.57	3.41	3.23
	0.025	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.67	4.41	4.15
	0.010	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.47	6.07	5.66
	0.001	29.25	21.69	18.77	17.20	16.21	15.52	15.02	14.63	13.71	12.73	11.72
8	0.100	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.50	2.40	2.30
	0.050	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.28	3.12	2.93
	0.025	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.20	3.95	3.68
	0.010	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.67	5.28	4.87
	0.001	25.41	18.49	15.83	14.39	13.48	12.86	12.40	12.05	11.19	10.30	9.36
9	0.100	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.38	2.28	2.16
	0.050	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.07	2.90	2.71
	0.025	7.21	5.71	5.08	4.72	4.48	4.32	4.20	4.10	3.87	3.61	3.34
	0.010	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.11	4.73	4.32
	0.001	22.86	16.39	13.90	12.56	11.71	11.13	10.70	10.37	9.57	8.72	7.84

Degrees of freedom in denominator (df2)

Critical values computed with Excel 9.0

df2	p	Degrees of freedom in numerator (df1)										
		1	2	3	4	5	6	7	8	12	24	1000
10	0.100	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.28	2.18	2.06
	0.050	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	2.91	2.74	2.54
	0.025	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.62	3.37	3.09
	0.010	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.71	4.33	3.92
	0.001	21.04	14.90	12.55	11.28	10.48	9.93	9.52	9.20	8.45	7.64	6.78
12	0.100	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.15	2.04	1.91
	0.050	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.69	2.51	2.30
	0.025	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.28	3.02	2.73
	0.010	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.16	3.78	3.37
	0.001	18.64	12.97	10.80	9.63	8.89	8.38	8.00	7.71	7.00	6.25	5.44
14	0.100	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.05	1.94	1.80
	0.050	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.53	2.35	2.14
	0.025	6.30	4.86	4.24	3.89	3.66	3.50	3.38	3.29	3.05	2.79	2.50
	0.010	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	3.80	3.43	3.02
	0.001	17.14	11.78	9.73	8.62	7.92	7.44	7.08	6.80	6.13	5.41	4.62
16	0.100	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	1.99	1.87	1.72
	0.050	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.42	2.24	2.02
	0.025	6.12	4.69	4.08	3.73	3.50	3.34	3.22	3.12	2.89	2.63	2.32
	0.010	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.55	3.18	2.76
	0.001	16.12	10.97	9.01	7.94	7.27	6.80	6.46	6.20	5.55	4.85	4.08
18	0.100	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	1.93	1.81	1.66
	0.050	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.34	2.15	1.92
	0.025	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.77	2.50	2.20
	0.010	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.37	3.00	2.58
	0.001	15.38	10.39	8.49	7.46	6.81	6.35	6.02	5.76	5.13	4.45	3.69
20	0.100	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.89	1.77	1.61
	0.050	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.28	2.08	1.85
	0.025	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.68	2.41	2.09
	0.010	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.23	2.86	2.43
	0.001	14.82	9.95	8.10	7.10	6.46	6.02	5.69	5.44	4.82	4.15	3.40
30	0.100	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.77	1.64	1.46
	0.050	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.09	1.89	1.63
	0.025	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.41	2.14	1.80
	0.010	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	2.84	2.47	2.02
	0.001	13.29	8.77	7.05	6.12	5.53	5.12	4.82	4.58	4.00	3.36	2.61
50	0.100	2.81	2.41	2.20	2.06	1.97	1.90	1.84	1.80	1.68	1.54	1.33
	0.050	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	1.95	1.74	1.45
	0.025	5.34	3.97	3.39	3.05	2.83	2.67	2.55	2.46	2.22	1.93	1.56
	0.010	7.17	5.06	4.20	3.72	3.41	3.19	3.02	2.89	2.56	2.18	1.70
	0.001	12.22	7.96	6.34	5.46	4.90	4.51	4.22	4.00	3.44	2.82	2.05
100	0.100	2.76	2.36	2.14	2.00	1.91	1.83	1.78	1.73	1.61	1.46	1.22
	0.050	3.94	3.09	2.70	2.46	2.31	2.19	2.10	2.03	1.85	1.63	1.30
	0.025	5.18	3.83	3.25	2.92	2.70	2.54	2.42	2.32	2.08	1.78	1.36
	0.010	6.90	4.82	3.98	3.51	3.21	2.99	2.82	2.69	2.37	1.98	1.45
	0.001	11.50	7.41	5.86	5.02	4.48	4.11	3.83	3.61	3.07	2.46	1.64
1000	0.100	2.71	2.31	2.09	1.95	1.85	1.78	1.72	1.68	1.55	1.39	1.08
	0.050	3.85	3.00	2.61	2.38	2.22	2.11	2.02	1.95	1.76	1.53	1.11
	0.025	5.04	3.70	3.13	2.80	2.58	2.42	2.30	2.20	1.96	1.65	1.13
	0.010	6.66	4.63	3.80	3.34	3.04	2.82	2.66	2.53	2.20	1.81	1.16
	0.001	10.89	6.96	5.46	4.65	4.14	3.78	3.51	3.30	2.77	2.16	1.22

Degrees of freedom in denominator (df2)

Use StaTable, WinPepi > WhatIs, or other reliable software to determine specific p values