

# STAT4602 Assignment 1

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## Question 1.

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.903071	Pr < W	0.0135
Kolmogorov-Smirnov	D	0.161524	Pr > D	0.0605
Cramer-von Mises	W-Sq	0.135353	Pr > W-Sq	0.0366
Anderson-Darling	A-Sq	0.865181	Pr > A-Sq	0.0233

Figure 1: Var E

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.943201	Pr < W	0.1333
Kolmogorov-Smirnov	D	0.136591	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.075914	Pr > W-Sq	0.2308
Anderson-Darling	A-Sq	0.48184	Pr > A-Sq	0.2213

Figure 3: Var W

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.890924	Pr < W	0.0071
Kolmogorov-Smirnov	D	0.215929	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.194045	Pr > W-Sq	0.0058
Anderson-Darling	A-Sq	1.143588	Pr > A-Sq	<0.0050

Figure 2: Var S

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.908198	Pr < W	0.0179
Kolmogorov-Smirnov	D	0.135115	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.130251	Pr > W-Sq	0.0425
Anderson-Darling	A-Sq	0.84928	Pr > A-Sq	0.0249

Figure 4: Var N

- (a) As shown in the four figures above, the p-value(that calculated using Shapiro-Wilk test since the sample size is small) of E, S and N are about 0.01 so we can reject the hypothesis that they follow univariate normal distributions even at 1% significance level. But since p-value of E is 0.13, we do not sufficient evidence to reject its normality. The Chisq plot can be used to further discuss their joint distribution. As shown from Figure 7, there is no strong deviation from the reference line, so we can reject the multivariate normality.
- (b)  $p - value = 0.0026$ , so the null hypothesis is rejected.
- (c) The null hypothesis is  $\mu_N = \mu_S$  and  $\mu_E = \mu_W$ .  $p - value = 0.82$ , so  $H_0$  is not rejected.

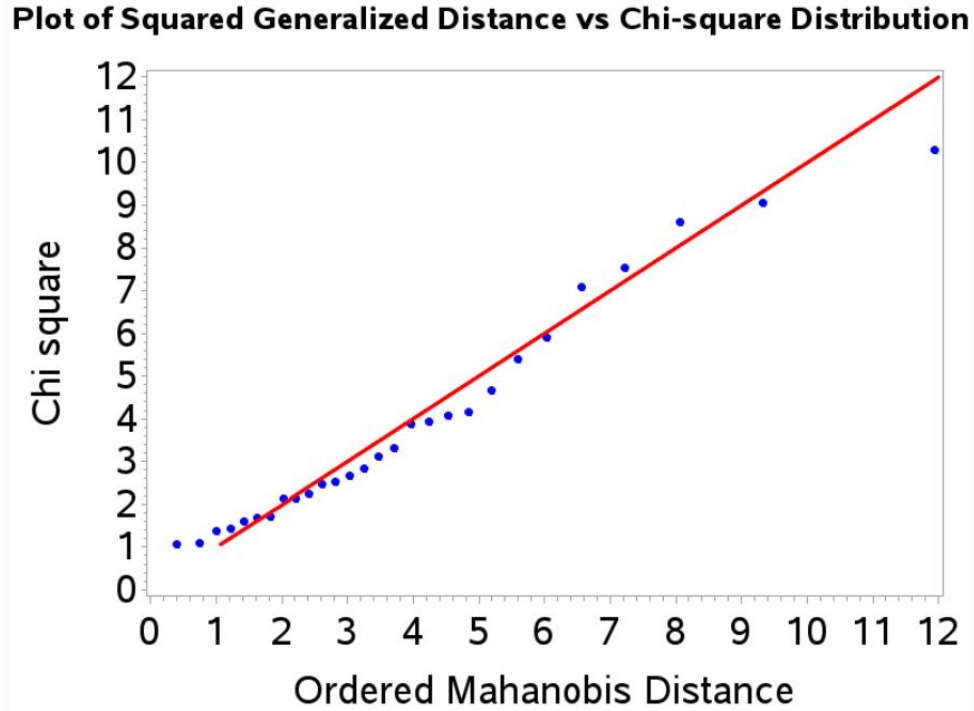


Figure 5: Chisq Plot

n1	mean1	S1				W1			
28	50.5357	290.4061	223.7526	288.4378	226.0093	7840.9643	6041.3214	7787.8214	6102.2500
	46.1786	223.7526	219.9299	229.0595	171.7315	6041.3214	5938.1071	6184.6071	4636.7500
	49.6786	288.4378	229.0595	350.0040	259.7130	7787.8214	6184.6071	9450.1071	7012.2500
	45.2500	226.0093	171.7315	259.7130	225.8241	6102.2500	4636.7500	7012.2500	6097.2500

tsq	cv	pval
20.1739	9.6916	0.0026

Figure 6: 1(b)

N	mean1	S				W1			
28	50.5357	290.4061	223.7526	288.4378	226.0093	7840.9643	6041.3214	7787.8214	6102.2500
	46.1786	223.7526	219.9299	229.0595	171.7315	6041.3214	5938.1071	6184.6071	4636.7500
	49.6786	288.4378	229.0595	350.0040	259.7130	7787.8214	6184.6071	9450.1071	7012.2500
	45.2500	226.0093	171.7315	259.7130	225.8241	6102.2500	4636.7500	7012.2500	6097.2500

tsq	cv	pval
0.4168	6.9972	0.8194

95% C.I		
	Lower Bound	Upper Bound
Contrast	4.3742	13.1972

Figure 7: 1(c)

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.886877	Pr < W	0.0236
Kolmogorov-Smirnov	D	0.187577	Pr > D	0.0647
Cramer-von Mises	W-Sq	0.149213	Pr > W-Sq	0.0225
Anderson-Darling	A-Sq	0.879058	Pr > A-Sq	0.0209

Figure 8: 2(a) Arcsin

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.910215	Pr < W	0.0643
Kolmogorov-Smirnov	D	0.167542	Pr > D	0.1450
Cramer-von Mises	W-Sq	0.115887	Pr > W-Sq	0.0664
Anderson-Darling	A-Sq	0.686159	Pr > A-Sq	0.0650

Figure 9: 2(a) Sqrt

The confidence interval of contrast is  $[4.37, 13.20]$ . So it is reasonable to say that weights of bark deposits is higher in N and S than E and W by about 8 in average.

### Question 2.

- (a) Square root should be chosen since it has larger p-value, even though both distributions are not very close to a normal.
- (b) The hypothesis is rejected at 5% significance level ( $p\text{-value} = 10^{-14}$ )

### Question 3.

tsq	cv	pval
565.2399	7.5041	4.063E-14

Figure 10: 2(b)

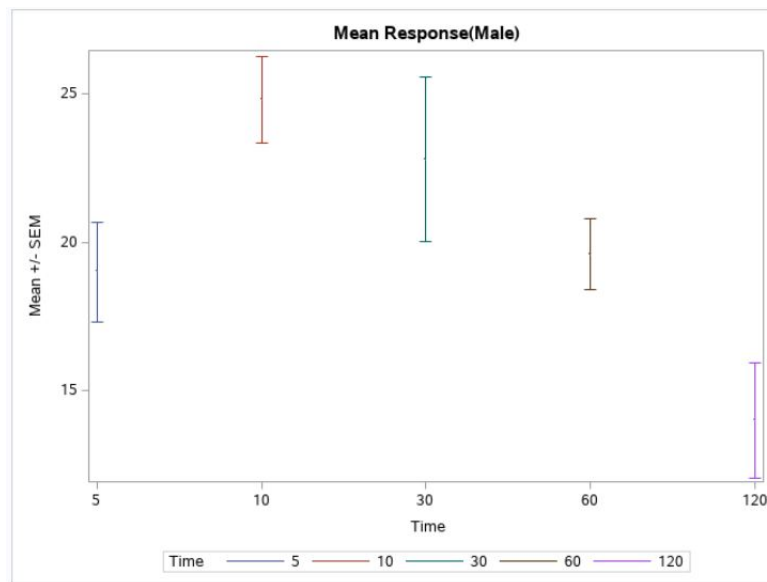


Figure 11: Male

- (a) See Figure 11 and 12.
- (b) **3.3)**  $H_0$  is not rejected at 5% significance level.
- 3.4)**  $H_0$  is rejected at 5% significance level.

#### 4. References

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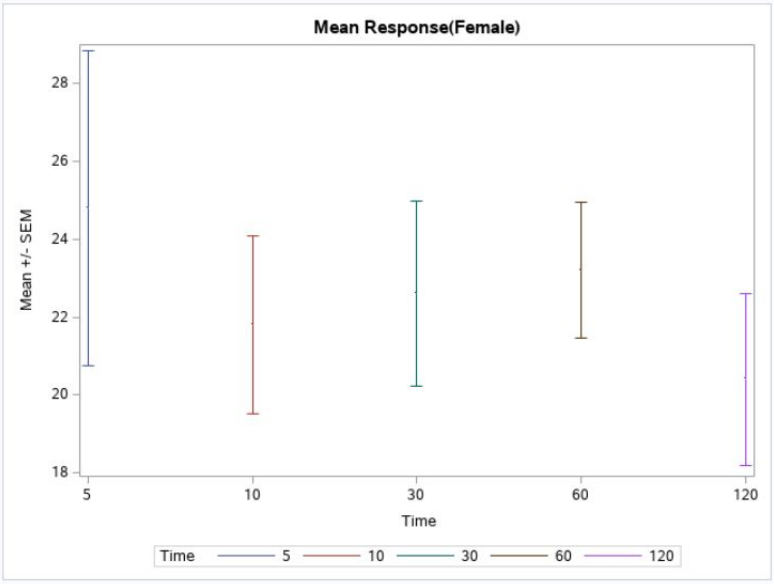


Figure 12: Female

tsq	cv	pval
59.3623	62.5606	0.0545433

Figure 13: 3(b)(i)

tsq	cv	pval
59.3414	33.2299	0.0155804

Figure 14: 3(b)(ii)