Stat 244 BU Hw 3 Answer sheet

7. a. $s^2 = \frac{\Sigma(x_i - \bar{x})^2}{n-1} = 57.7230$

$s = \sqrt{57.7230} = 7.60$

b. With 11 df, $\chi^2_{.025} = 21.920$ $\chi^2_{.975} = 3.816$

$$\frac{(12-1)(57.7230)}{21.920} \le \sigma^2 \le \frac{(12-1)(57.7230)}{3.816}$$

$28.9668 \le \sigma^2 \le 166.3923$

c. $5.38 \le \sigma \le 12.90$

9. H_0: $\sigma^2 \le .0004$

H_a: $\sigma^2 > .0004$

$$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2} = \frac{(30-1)(.0005)}{.0004} = 36.25$$

Degrees of freedom = n - 1 = 29

Using χ^2 table, p-value is greater than .10

Exact p-value using $\chi^2 = 36.25$ is .1664

p-value > .05, do not reject H_0. The product specification does not appear to be violated.

11. H_0: $\sigma^2 = .009216$

H_a: $\sigma^2 \neq .009216$

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(20-1)(.114)^2}{.009216} = 26.79$$

Degrees of freedom = n - 1 = 19

Using χ^2 table, area in upper tail is greater than .10

Two-tail p-value is greater than .20

Exact p-value corresponding to $\chi^2 = 26.79$ is .2193

p-value > .05, do not reject H_0. Cannot conclude the variance in interest rates has changed.

19. $H_0: \sigma_1^2 = \sigma_2^2$

$H_a: \sigma_1^2 \neq \sigma_2^2$

$s_1^2 = .0489$

$s_2^2 = .0059$

$$F = \frac{s_1^2}{s_2^2} = \frac{.0489}{.0059} = 8.28$$

Degrees of freedom 24 and 21

Using *F* table, area in tail is less than .01

Two-tail *p*-value is less than .02

Exact *p*-value $\approx$ 0

p-value $\leq$ .05, reject H_0. The process variances are significantly different. Machine 1 offers the best opportunity for process quality improvements.

Note that the sample means are similar with the mean bag weights of approximately 3.3 grams. However, the process variances are significantly different.

21. Consider the Small cap fund as population 1 and the large cap fund as population 2.

$H_0: \sigma_1^2 \leq \sigma_2^2$

$H_a: \sigma_1^2 > \sigma_2^2$

$$F = \frac{s_1^2}{s_2^2} = \frac{(13.03)^2}{(8.89)^2} = 2.15$$

Degrees of freedom 25 and 25

Upper-tail *p*-value is the area to the right of the test statistic.

From the *F* table, the *p*-value is between .025 and .05

Exact *p*-value corresponding to *F* = 2.15 is .0306

p-value $\leq$ .05, reject H_0. The population variance and standard deviation for the small cap growth fund are larger. Financial analysts would say the small cap growth fund is riskier.