Homework 3

1. At the end of 2008, the variance in the semiannual yields of overseas government bond was $\sigma^2 = .70$. A group of bond investors met at that time to discuss future trends in overseas bond yields. Some expected the variability in overseas bond yields to increase and others took the opposite view. The following table shows the semiannual yields for 12 overseas countries as of March 6, 2009.

Country	Yield (%)	Country	Yield (%)
Australia	3.98	Italy	4.51
Belgium	3.78	Japan	1.32
Canada	2.95	Netherlands	3.53
Denmark	3.55	Spain	3.90
France	3.44	Sweden	2.48
Germany	3.08	United Kingdom	3.76

(a). Compute the mean, variance, and standard deviation of the overseas bond yields as of March 6, 2009.
(b). Develop hypotheses to test whether the sample data indicate that the variance in bond yields has changed from that at the end of 2008.
(c). Use $\alpha = .05$ to conduct the hypothesis test formulated in part (b). What is your conclusion?

2. Data were collected on the top 1000 financial advisers by Barrons. Merrill Lynch had 239 people on the list and Morgan Stanley had 121 people on the list. A sample of 16 of the Merrill Lynch advisers and 10 of the Morgan Stanley advisers showed that the advisers managed many very large accounts with a large variance in the total amount of funds managed. The standard deviation of the amount managed by the Merrill Lynch advisers was $s_1 = \$587$ million. The standard deviation of the amount managed by the Morgan Stanley advisers was $s_2 = \$489$ million. Conduct

a hypothesis test at $\alpha = .10$ to determine if there is a significant difference in the population variances for the amounts managed by the two companies. What is your conclusion about the variability in the amount of funds managed by advisers from the two firms?

3. Benson Manufacturing is considering ordering electronic components from three d-ifferent suppliers. The suppliers may differ in terms of quality in that the proportion or percentage of defective components may differ among the suppliers. To evaluate the proportion of defective components for the suppliers, Benson has requested a sample shipment of 500 components from each supplier. The number of defective components and the number of good components found in each shipment are as follows.

	Supplier		
Component	A	B	C
Defective	15	20	40
Good	485	480	460

(a). Formulate the hypotheses that can be used to test for equal proportions of defective components provided by the three suppliers.

(b). Using α .05 level of significance, conduct the hypothesis test. What is the p-value and what is your conclusion?

(c). Conduct a multiple comparison test to determine if there is an overall best supplier or if one supplier can be eliminated because of poor quality.

4. On a syndicated television show the two hosts often create the impression that they strongly disagree about which movies are best. Each movie review is categorized as Pro (thumbs up), Con (thumbs down), or Mixed. The results of 160 movie ratings by the two hosts are shown here.

	Host B		
Host A	Con	Mixed	Pro
Con	24	8	13
Mixed	8	13	11
Pro	10	9	64

Use a test of independence with a .01 level of significance to analyze the data. What is your conclusion?

5. The weekly demand for a product is believed to be normally distributed. Use a goodness of fit test and the following data to test this assumption. Use $\alpha = .10$. The sample mean is 24.5 and the sample standard deviation is 3.

18	20	22	27	22
25	22	27	25	24
26	23	20	24	26
27	25	19	21	25
26	25	31	29	25
25	28	26	28	24

6. (**Optional**) Consider the two-tailed F-test for two population variances. Denote n_A, s_A^2 to be the sample size and sample variance for a sample from population A, and n_B, s_B^2 the sample size and sample variance for a sample from population B. In our lecture note, we always put the sample variance with larger observed value on the numerator of the test statistics. In another word, we let

$$F = \frac{s_1^2}{s_2^2},$$

where $s_1^2 = \max\{s_A^2, s_B^2\}, s_2^2 = \min\{s_A^2, s_B^2\}$. Then we reject H_0 if $F \geq F_{\alpha/2}(n_1 - 1, n_2 - 1)$, where n_1 and n_2 are defined accordingly.

(a). Alternatively, consider the conventional test statistics

$$\tilde{F} = \frac{s_A^2}{s_B^2}.$$

Then the rejection region for the critical value approach is the union of two intervals $(0, c_1] \cup [c_2, \infty)$. Determine the critical values c_1 and c_2.

(b) Show that the rejection rules based on F and $\tilde{F}$ are equivalent.