**Exam No. 1 on Topics from Chapters 2 through 7 (1 hour)**

Using cross-section data for the 58 counties in California, data on the following variables were obtained from both the 1980 and the 1990 Censuses (this makes the total number of observations 116). The model relates median family income to its determinants listed below.

| | | |
|---|---|---|
| medinc | = | median family income in thousands of dollars (this is the dependent variable) |
| famsize | = | persons per household |
| highschl | = | percentage of the population (25 years and over) that had only high school education |
| college | = | percentage of the population (25 years and over) that completed four years of college or higher |
| urb | = | percentage of urban population |
| D90 | = | 1 for the 1990 Census and 0 for the 1980 Census |

The attached table has the coefficients, *p*-values, ESS, and the model selection statistics for four different models. Model B is the basic model and Model A is the most general model that incorporates structural change between the two periods. Note that you are not given the standard errors or *t*-statistics and they cannot be calculated from the information given. Values in parentheses are *p*-values.

| Variable | MODEL A<br>Coeff<br>(pvalue) | MODEL B<br>Coeff<br>(pvalue) | MODEL C<br>Coeff<br>(pvalue) | MODEL D<br>Coeff<br>(pvalue) |
|---|---|---|---|---|
| $b_1$)constant | -16.909<br>(0.220) | 98.434<br>(< 0.01) | -17.040<br>(0.210) | -40.216<br>(<0.01) |
| $b_2$)famsize | 4.893<br>(0.117) | -20.215<br>(< 0.01) | 4.944<br>(0.103) | 10.029<br>(<0.01) |
| $b_3$)highschl | 0.224<br>(0.016) | -0.400<br>(0.004) | 0.223<br>(0.015) | 0.342<br>(<0.01) |
| $b_4$)college | 0.337<br>(< 0.01 | 0.549<br>(< 0.01) | 0.339<br>(< 0.01) | 0.381<br>(<0.01) |
| $b_5$)urb | 0.045<br>(0.003) | 0.017<br>(0.532) | 0.044<br>(< 0.01) | 0.041<br>(<0.01) |
| $b_6$) D90 | -36.175<br>(0.046) | -35.767<br>(0.037) | | |

| Variable | MODEL A<br>Coeff<br>(pvalue) | MODEL B<br>Coeff<br>(pvalue) | MODEL C<br>Coeff<br>(pvalue) | MODEL D<br>Coeff<br>(pvalue) |
|---|---|---|---|---|
| $b_7$)D90×famsize | 9.881<br>(0.013) | | 9.760<br>(0.007) | 2.151<br>(<0.01) |
| $b_8$)D90×highschl | 0.201<br>(0.124) | | 0.199<br>(0.118) | |
| $b_9$)D90×college | 0.872<br>(< 0.01) | | 0.871<br>(< 0.01) | 0.772<br>(<0.01) |
| $b_{10}$)D90×urb | -0.002<br>(0.941) | | | |
| ESS | 763.029 | 5172.560 | 763.069 | 796.560 |
| SGMASQ | 7.198 | 46.600 | 7.131 | 7.308 |
| HQ | 8.606 | 51.005 | 8.378 | 8.288 |
| GCV | 7.877 | 48.699 | 7.731 | 7.777 |
| AIC | 7.816 | 48.606 | 7.682 | 7.748 |
| SCHWARZ | 9.910 | 54.731 | 9.512 | 9.148 |
| RICE | 7.948 | 48.798 | 7.786 | 7.809 |
| FPE | 7.819 | 48.608 | 7.685 | 7.749 |
| SHIBATA | 7.712 | 48.435 | 7.599 | 7.696 |

1. (3 points)
To carry out a Wald test for structural change using Model B as the restricted model and Model A as the unrestricted model, state the null hypothesis.

2. (10 points)
Compute the test statistic and state its distribution and d.f.

3. (10 points)
Actually carry out the test at the 1 percent level and state your conclusion as to whether or not there has been a significant change in the structure.

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4. (10 points)
Considering omitted variable bias, significance of coefficients, and other measures, which model would you choose as the best? Explain why.

5. (12 points)
*In Model C*, compute the marginal effect on medium income with respect to family size, highschl, and college, separately for 1980 and 1990 data and enter in the following table.

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| | 1980 data | 1990 data |
|---|---|---|
| . | | |
| Famsize | | |
| Highschl | | |
| College | | |

6. (5 points)
What do the above numbers indicate about change in behavior between 1980 and 1990? Explain as you would to a senator or a congressman.