Applied Quantitative Method (II)

Department of Economics

National Taipei University

Spring Semester

Homework 1

(Due in Class on the Date Assigned)

Empirical Problem Set: This homework assignment is from *http://www.the-smooth-operators.com/*. Answer the following questions using *data_for_homework_1(1)* and *data_for_ homework_1(2)*.

Attention in the growth empirics literature has focused on the fact that the distribution of output, as measured by some form of GDP, has become increasingly bimodal as time has passed. Henderson, Parmeter and Russell (2008) tested this phenomena using data from the Penn World Table version 6.2 (available on the JAE data archive website). You will be using it to analyze the robustness of their results to a variety of features. Use only the 1970 and 2000 RGDPCH (rgdpch-70 and rgdpch-00 in the file) series from their paper. For your plots please print both the 1970 and 2000 plots on the same graph but make sure that you have no more than two plots per graph. Also, prior to estimating any densities convert the data my dividing by the mean output in each year. That is instead of plotting x plot $x/\overline{x}$.

1. Using the Silverman rule-of-thumb please plot the distributions of output using a Gaussian kernel. Is the bimodal feature apparent in either year?

2. Using Silverman's appropriate rule-of-thumb bandwidth plot out these two distributions using the Epanechnikov kernel. Is the bimodal feature still visually apparent?

3. Calculate the LSCV bandwidths for the 2000 density for a Gaussian kernel. Is the bimodal feature still apparent.

4. List the value of the bandwidth chosen via LSCV.

5. Instead of using the leave-one-out estimator, show that when you fail to use the leave-one-out estimator that the bandwidth tends towards zero. Essentially I am asking you to list the bandwidth chosen via LSCV when you do not use the leave-one-out estimator.

Theoretical Problem Set: Answer the following questions about the rule-of-thumb bandwidth.

1. Derive the second-order derivaitve of the probability density function from a normal distribution with mean μ and variance σ^2.

2. The roughness of the probability density function can be shown to be $0.212\sigma^{-5}$ with a trick and the roughness of the Gaussian kernel function is 0.282. Show that the rule-of-thumb bandwidth is $1.059\sigma n^{-\frac{1}{5}}$.