Spring 2017
Problem Set #3
Due Tuesday Feb 7, 2:30pm

1. Let $y_t$ be a time series with a constant mean $E(y_t) = \mu$. Show that the sample mean $\bar{y}_T = \frac{1}{T} \sum_{t=1}^{T} y_t$ is an unbiased estimator for $\mu$.

   Hint: When $y_t$ is iid, the unbiasedness of the sample mean is shown in Wooldridge Appendix C. Does the proof change in the time-series case?

2. Let $y_t$ be a time series with a constant mean $E(y_t) = \mu$, constant variance $\text{var}(y_t) = \sigma^2$, and $\text{cov}(\,y_t, y_j) = 0$ for $t \neq j$. Show that the variance of the sample mean $\bar{y}_T$ is $\sigma^2/T$.

   Hint: When $y_t$ is iid, this result is shown in Wooldridge, Appendix C (see also Property VAR.3, VAR.4 in Appendix B). Does the proof change in the time-series case?

3. The Census Bureau (www.census.gov) released data on Housing Starts (look for the report on "New Residential Construction" under Topics/Economy/Economic Indicators) for December 2016 on Jan 19.

   (a) What was the number of units of "New Privately-Owned Housing Units Authorized in Permit-Issuing Places" in December 2016 for the U.S.?

   (b) What was the estimated percentage change for Dec 2016 from Dec 2015 for the U.S.?

   (c) What was the estimated percentage change for the Midwest region?

   (d) Notice that the Census Bureau gives confidence intervals for these percentages. Why do you think they do this? What was the confidence interval for the Midwest region? How does this change your interpretation of the estimate?

4. The Census Bureau released data on Home Ownership Rates on Jan 31. (You can find the release using the same steps as above.)

   (a) What was the rental vacancy rate in the fourth quarter of 2016?

   (b) Using Table 2 from this release, what is the "margin of error" for this estimate? What is the meaning of the "margin of error"?

   (c) Calculate a 90% confidence interval for the vacancy rate.

5. The Stata file "realgdpgrowth.dta" is posted on the course website. It contains quarterly series of U.S. national accounts data, from 1947q2 through 2016q4. All are real percent changes from the previous period, seasonally adjusted. The time index is "time".

   (a) The series "pce_nondurables" is personal consumption expenditures on nondurable goods. Estimate the mean of the series, and plot the series along with the fitted mean.

   (b) Using the constant mean model, generate point and interval forecasts for nondurables for the next 4 quarters. Plot your forecasts.