Exercise 2
Reading in data to GRETL and Unit Root tests

Name:

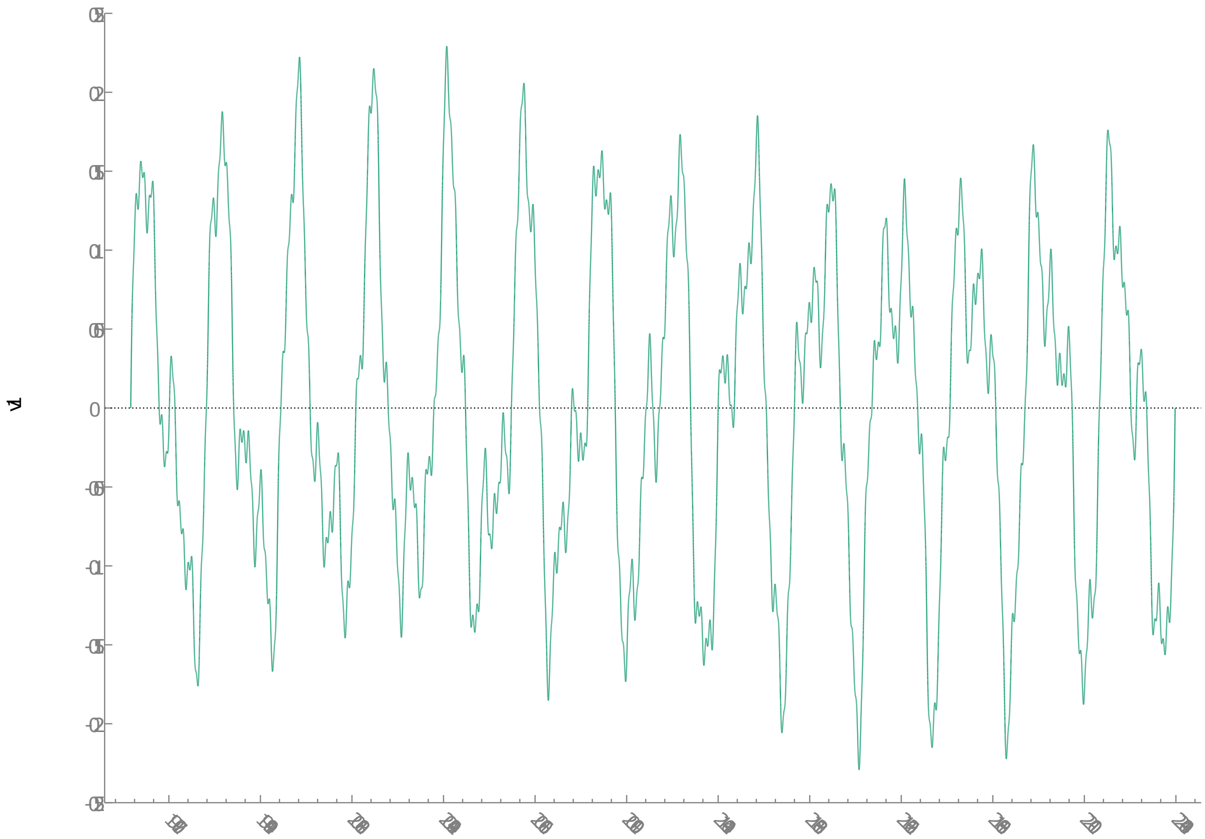
This exercise will give you the opportunity to find an appropriate time series data set and read it in to GRETL. Once read into GRETL, you can then plot and proceed to apply some unit root tests to the data to see whether or not there is a constant mean across time. There is also an extra credit challenge portion that is worth 7 points if you want to attempt it.

1. Find yourself a nice happy time series data set online. The good news is that unlike market research data sets, free time series data sets are easy to find and download. Here is a starting place for you:

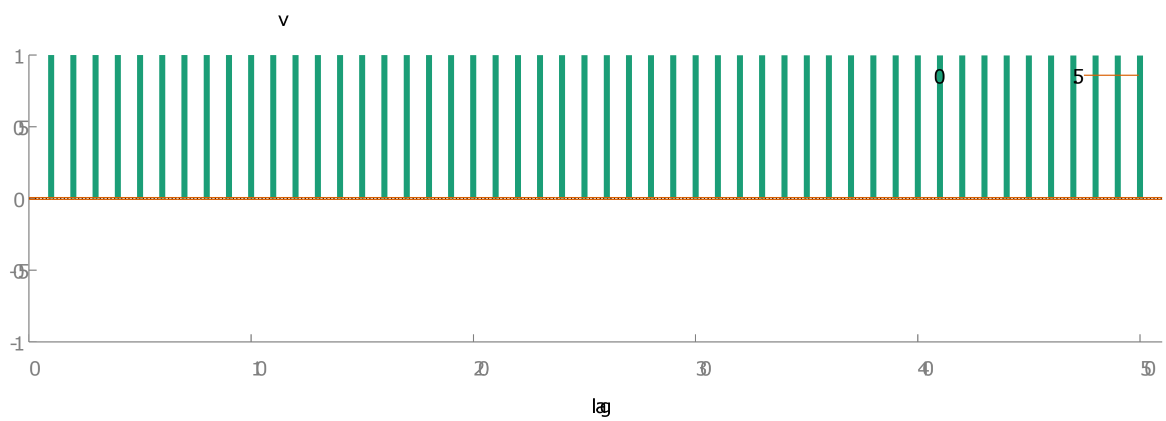
https://archive.ics.uci.edu/ml/datasets.php?format=&task=&att=&area=&numAtt=10to100&numIns=&type=ts&sort=nameUp&view=table

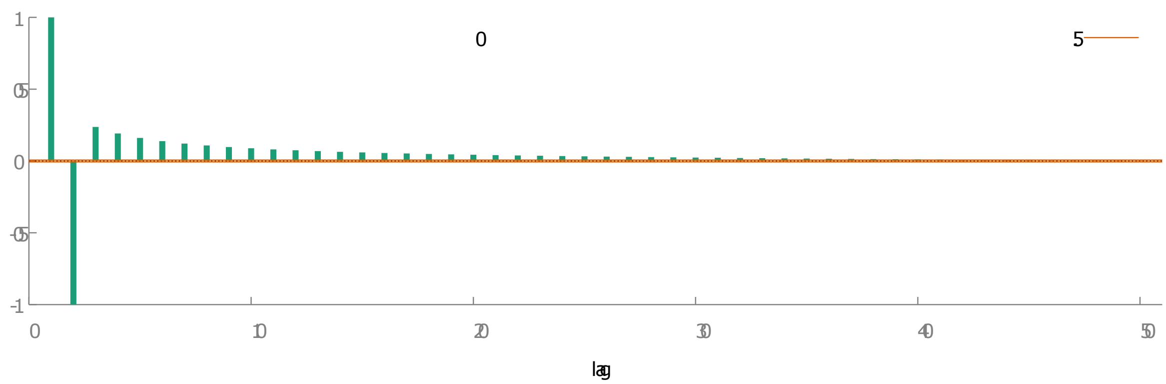
Pseudo Periodic Synthetic Time Series from the link above.

2. Once you have found your time series data set then plot the data set (be sure to include the plot in your exercise). Use your Mark I eyeball and tell me if you think the mean is constant across time or not.
   Yes



3. Run an ACF plot for the data set (be sure to include that plot in your exercise). First, tell me what prominent feature is usually there in an ACF plot if there is a trend or non-constant mean across time? Does your plot look like there is a non-constant mean?
   Theres a trend the mean is non-constant





4. Next apply the two unit root tests that test for constant mean across time.

    a. What is the null and alternative hypothesis for the KPSS test?
    Null=Theres a constant mean
    Alternative=Theres nonconstant mean
    b. What do you conclude from the KPSS test on your data? Be sure to include the test in your exercise.
    P-value<0.01 Theres a constant trend
    c. What is the null and alternative hypothesis for the Augmented Dickey Fuller test?
    Null=Theres a nonconstant mean
    Alternative=Theres is a constant mean
    d. What do you conclude from the Augmented Dickey Fuller test on your data?
    asymptotic p-value 3.523e-52 There is a constant mean

KPSS test for v1
T = 100001
Lag truncation parameter = 22
Test statistic = 1.96845

	10%	5%	1%
Critical values:	0.347	0.462	0.744

P-value < .01

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Augmented Dickey-Fuller test for v1
testing down from 67 lags, criterion AIC
sample size 99933
unit-root null hypothesis: a = 1

  test with constant
  including 67 lags of (1-L)v1
  model: (1-L)y = b0 + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -2.10201e-009
  test statistic: tau_c(1) = -24.5988
  asymptotic p-value 3.523e-52
  1st-order autocorrelation coeff. for e: -0.005
  lagged differences: F(67, 99864) = 7538188100077.186 [0.0000]

  with constant and trend
  including 67 lags of (1-L)v1
  model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
  estimated value of (a - 1): -2.10204e-009
  test statistic: tau_ct(1) = -24.5583
  asymptotic p-value 7.921e-93
  1st-order autocorrelation coeff. for e: -0.005
  lagged differences: F(67, 99863) = 7538568278984.503 [0.0000]
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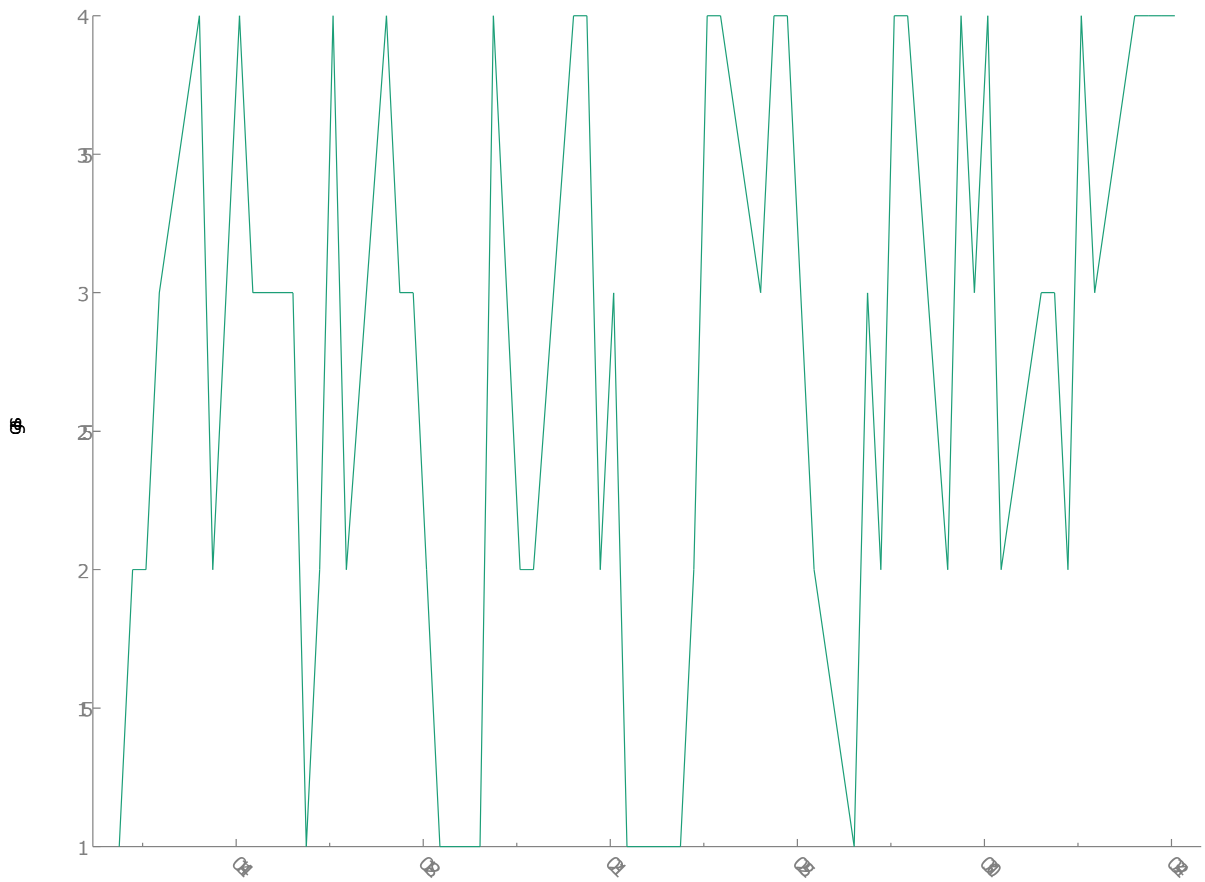
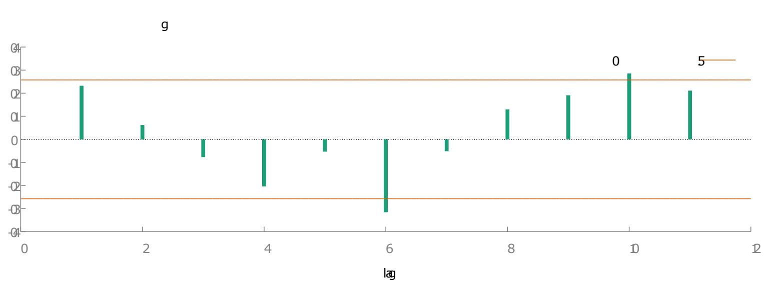
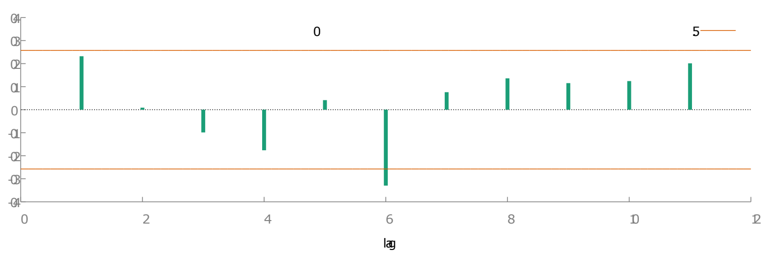
5. Select another raw time series data set and repeat steps 2 through 4d.

Dataset from the same website, Gas sensor array under flow modulation.
Eye test: no constant mean.



There is no trend, constant mean.





a. What is the null and alternative hypothesis for the KPSS test?

Null=Theres a constant mean
Alternative=Theres nonconstant mean

b. What do you conclude from the KPSS test on your data? Be sure to include the test in your exercise.
P-value>0.1 Theres a nonconstant trend
c. What is the null and alternative hypothesis for the Augmented Dickey Fuller test?
Null=Theres a nonconstant mean
Alternative=Theres is a constant mean
d. What do you conclude from the Augmented Dickey Fuller test on your data?
asymptotic p-value 1.937e-07 There is a constant mean

Augmented Dickey-Fuller test for gas
testing down from 10 lags, criterion AIC
sample size 57
unit-root null hypothesis: a = 1

test with constant
including 0 lags of (1-L)gas
model: (1-L)y = b0 + (a-1)*y(-1) + e
estimated value of (a - 1): -0.762023
test statistic: tau_c(1) = -5.91278
asymptotic p-value 1.937e-07
1st-order autocorrelation coeff. for e: -0.017

with constant and trend
including 5 lags of (1-L)gas
model: (1-L)y = b0 + b1*t + (a-1)*y(-1) + ... + e
estimated value of (a - 1): -1.73792
test statistic: tau_ct(1) = -5.11176
asymptotic p-value 0.0001
1st-order autocorrelation coeff. for e: -0.024
lagged differences: F(5, 44) = 2.681 [0.0336]

KPSS test for gas

T = 58
Lag truncation parameter = 3
Test statistic = 0.348277

	10%	5%	1%
Critical values:	0.351	0.462	0.727

P-value > .10

Extra credit 7 points

1. Identify a third time series data set. Read that data set into R, Python, SAS, Stata or name your poison.
2. What are the null and alternative hypotheses for the Phillips-Perron test?
3. Apply the Phillips-Perron test to the data set you found in step 1 above. What do you conclude? Be sure to cut and paste a legible copy of the results table that shows the Phillips-Perron test into your exercise.