HW8

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14.1

a) Between 1955:1 and 2009:4, the mean is 0.0072

```
. import excel "E:\Master 2\ECONOMETRICS\Problem Set8\UsMacro_Quarterly.xlsx", sheet("Sheet1") firstrow

. gen time=_n-53

. tsset time, quarterly
        time variable:  time, 1947q1 to 2009q4
                delta:  1 quarter

. gen lnRealGDP=ln( RealGDP )

. gen dlnRealGDP=D.lnRealGDP
(1 missing value generated)

. mean dlnRealGDP if tin(1955q1,2009q4)

Mean estimation                   Number of obs    =       220
```

	Mean	Std. Err.	[95% Conf.	Interval]
dlnRealGDP	.0077219	.0006258	.0064886	.0089553

b) Mean growth rate in percentage points is 3.08876
c) The standard deviation is 0.250

d) The first 4 autocorrelations are 0.3445, 0.2163, 0.0495 and -0.0154

```
. corr dlnRealGDP L.dlnRealGDP if tin(1955q1,2009q4)
(obs=220)

             |                 L.
             | dlnRea~P dlnRea~P
-------------+------------------
  dlnRealGDP |
         --. |   1.0000
          L1 |   0.3445   1.0000


. corr dlnRealGDP L2.dlnRealGDP if tin(1955q1,2009q4)
(obs=220)

             |                L2.
             | dlnRea~P dlnRea~P
-------------+------------------
  dlnRealGDP |
         --. |   1.0000
          L2 |   0.2163   1.0000


. corr dlnRealGDP L3.dlnRealGDP if tin(1955q1,2009q4)
(obs=220)

             |                L3.
             | dlnRea~P dlnRea~P
-------------+------------------
  dlnRealGDP |
         --. |   1.0000
          L3 |   0.0495   1.0000


. corr dlnRealGDP L4.dlnRealGDP if tin(1955q1,2009q4)
(obs=220)

             |                L4.
             | dlnRea~P dlnRea~P
-------------+------------------
  dlnRealGDP |
         --. |   1.0000
          L4 |  -0.0154   1.0000
```

14.2

a) The estimated AR(1) coefficient is 0.34337 [0.1982098, 0.4885306] and is statistically significant.

```
. regress dlnRealGDP L.dlnRealGDP if tin(1955q1,2009q4), vce(robust)

Linear regression                               Number of obs     =        220
                                                F(1, 218)         =      21.74
                                                Prob > F          =     0.0000
                                                R-squared         =     0.1187
                                                Root MSE          =     .00873

------------------------------------------------------------------------------
             |               Robust
  dlnRealGDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  dlnRealGDP |
         L1. |   .3433702   .0736516     4.66   0.000     .1982098    .4885306
             |
       _cons |   .0050586   .0008846     5.72   0.000      .003315    .0068021
------------------------------------------------------------------------------

. scalar BIC1=ln(e(rss)/e(N))+2*ln(e(N))/e(N)

. scalar AIC1=ln(e(rss)/e(N))+2*2/e(N)
```

b) The coefficient of the first lag is statistically significant, whereas the coefficient of the second lag is not. BIC(1) being smaller then BIC(2), AR(1) is preferable.

```
. regress dlnRealGDP L.dlnRealGDP L2.dlnRealGDP if tin(1955q1,2009q4), vce(robust)

Linear regression                               Number of obs     =        220
                                                F(2, 217)         =      11.94
                                                Prob > F          =     0.0000
                                                R-squared         =     0.1294
                                                Root MSE          =      .0087

------------------------------------------------------------------------------
             |               Robust
  dlnRealGDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  dlnRealGDP |
         L1. |   .3053322   .0796661     3.83   0.000     .1483138    .4623506
         L2. |   .1097903   .0826838     1.33   0.186    -.0531759    .2727565
             |
       _cons |   .0044984   .0010324     4.36   0.000     .0024636    .0065332
------------------------------------------------------------------------------

. scalar BIC2=ln(e(rss)/e(N))+3*ln(e(N))/e(N)

. scalar AIC2=ln(e(rss)/e(N))+3*2/e(N)
```

c) Based on BIC, we would be better off chasing one lag, whereas AIC would recommend having two lags. i.e. AR(2) is the better model.

```
. regress dlnRealGDP L(1/3).dlnRealGDP if tin(1955q1,2009q4), vce(robust)

Linear regression                               Number of obs     =        220
                                                F(3, 216)         =       7.89
                                                Prob > F          =     0.0001
                                                R-squared         =     0.1327
                                                Root MSE          =      .0087

------------------------------------------------------------------------------
             |               Robust
  dlnRealGDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  dlnRealGDP |
         L1. |   .3119704   .0802763     3.89   0.000     .1537453    .4701956
         L2. |   .1286768   .0898773     1.43   0.154     -.048472    .3058256
         L3. |  -.0616961   .0759268    -0.81   0.417    -.2113485    .0879562
             |
       _cons |   .0047812   .0010618     4.50   0.000     .0026884    .0068741
------------------------------------------------------------------------------

. scalar BIC3=ln(e(rss)/e(N))+4*ln(e(N))/e(N)

. scalar AIC3=ln(e(rss)/e(N))+4*2/e(N)
```

```
. regress dlnRealGDP L(1/4).dlnRealGDP if tin(1955q1,2009q4), vce(robust)

Linear regression                               Number of obs     =        220
                                                F(4, 215)         =       5.99
                                                Prob > F          =     0.0001
                                                R-squared         =     0.1342
                                                Root MSE          =     .00872

------------------------------------------------------------------------------
             |               Robust
  dlnRealGDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  dlnRealGDP |
         L1. |   .3093836    .079642     3.88   0.000     .1524045    .4663627
         L2. |   .1337497   .0923868     1.45   0.149      -.04835    .3158495
         L3. |  -.0488982   .0766608    -0.64   0.524    -.2000011    .1022048
         L4. |  -.0413429   .0815097    -0.51   0.613    -.2020033    .1193175
             |
       _cons |    .004986   .0011237     4.44   0.000      .002771    .0072009
------------------------------------------------------------------------------

. scalar BIC4=ln(e(rss)/e(N))+5*ln(e(N))/e(N)

. scalar AIC4=ln(e(rss)/e(N))+5*2/e(N)
```

```
. scalar dir
       AIC2 = -9.4751907
       AIC3 = -9.4699327
       AIC4 = -9.4625434
       AIC1 = -9.4720938
       BIC4 = -9.3854155
       BIC3 = -9.4082304
       BIC1 = -9.4412426
       BIC2 =  -9.428914
```

14.5

a) AR(1) has an r-squared of 0.1187 whereas ADL(1,4) has an r-squared of 0.1921. The R squared increases by 0.0734.

```
. gen dTBillRate=D.TBillRate
(1 missing value generated)

. regress dlnRealGDP L.dlnRealGDP L(1/4).dTBillRate if tin(1955q1,2009q4), vce(robust)

Linear regression                               Number of obs     =        220
                                                F(5, 214)         =       8.05
                                                Prob > F          =     0.0000
                                                R-squared         =     0.1921
                                                Root MSE          =     .00844

------------------------------------------------------------------------------
             |               Robust
  dlnRealGDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  dlnRealGDP |
         L1. |   .3304833   .0810072     4.08   0.000      .170809    .4901575
             |
  dTBillRate |
         L1. |   .0018182   .0008844     2.06   0.041     .0000749    .0035614
         L2. |  -.0033377   .0009575    -3.49   0.001    -.0052251   -.0014503
         L3. |   .0012095   .0007504     1.61   0.108    -.0002697    .0026887
         L4. |  -.0024893   .0008687    -2.87   0.005    -.0042017    -.000777
             |
       _cons |   .0051465   .0009455     5.44   0.000     .0032829    .0070102
------------------------------------------------------------------------------
```

b) The granger causality f-statistic is 5.11. As it is greater than 3.32 it is significant at the 1% level.

```
. test L1.dTBillRate L2.dTBillRate L3.dTBillRate L4.dTBillRate

 ( 1)  L.dTBillRate = 0
 ( 2)  L2.dTBillRate = 0
 ( 3)  L3.dTBillRate = 0
 ( 4)  L4.dTBillRate = 0

       F(  4,   214) =    5.11
            Prob > F =    0.0006
```