Sample – Macro Economics

1. Transform the series in logarithms (lry_ca, lry_us) and verify if the series are stationary using augmented Dickey-Fuller unit root tests. Explain in detail what you are doing and (always) put all estimation outputs in the Appendix. Refer to the table number when you explain your results. What do you conclude?

Canada

Dickey-Fuller test for unit root   Number of obs = 205

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-5.173	-3.475	-2.883	-2.573

MacKinnon approximate p-value for Z(t) = 0.0000

D.lry_ca	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lry_ca L1.	-.0063578	.001229	-5.17	0.000	-.0087811	-.0039345
_cons	.049842	.0080644	6.18	0.000	.0339412	.0657427

United States

Dickey-Fuller test for unit root   Number of obs = 280

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.944	-3.458	-2.879	-2.570

MacKinnon approximate p-value for Z(t) = 0.0404

D.lry_us	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lry_us L1.	-.0025349	.0008609	-2.94	0.004	-.0042297	-.0008401
_cons	.0299843	.0075778	3.96	0.000	.0150671	.0449015

2. Take the first difference of lry_ca, lry_us, and verify if the transformed series are stationary. What do you conclude? xtract the cyclical component of both lry_ca, lry_us, using the Hodrick and Prescott Filter (HP) and present both cyclical components in the same graph (with a zero line). Are the cyclical components of the series stationary? Comment.

Canada

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Dickey-Fuller test for unit root                   Number of obs   =       204

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)             -9.788            -3.475            -2.883            -2.573
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D.First_Diff |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  First_Diff |
         L1. |  -.6329996   .0646707    -9.79   0.000    -.7605157   -.5054834
             |
       _cons |   .0051139   .0007743     6.60   0.000     .0035871    .0066408
------------------------------------------------------------------------------
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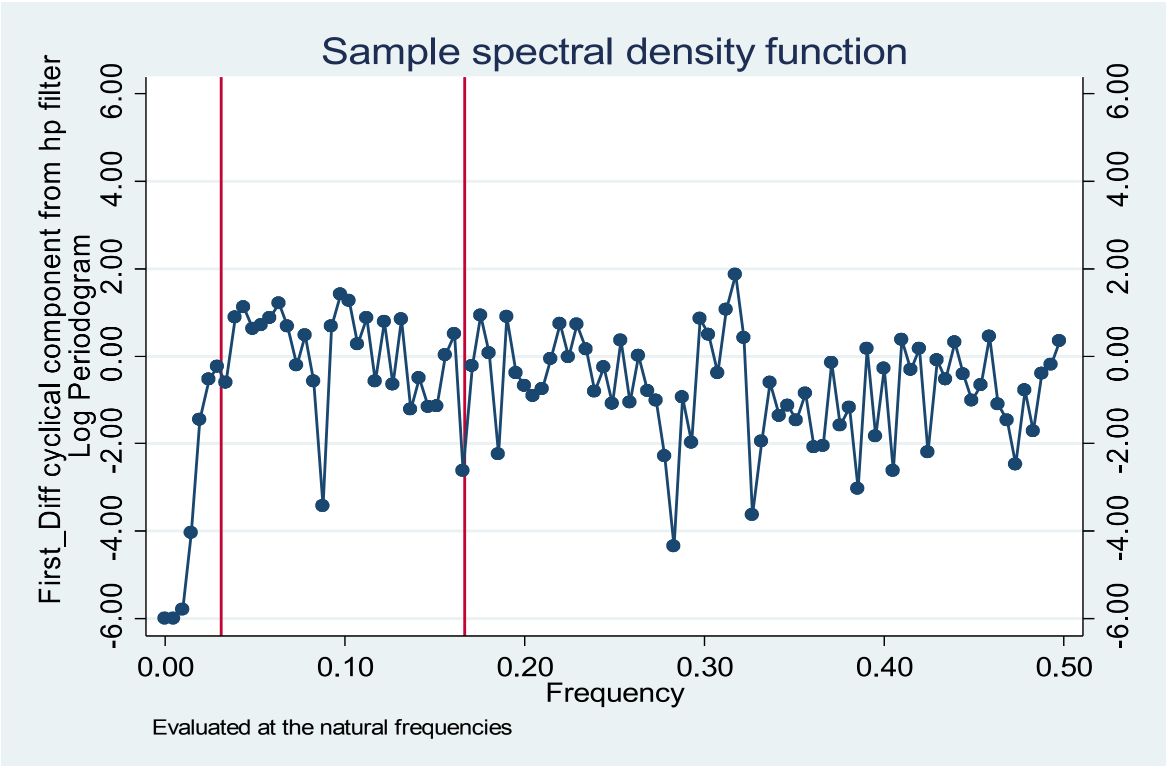


Dickey-Fuller test for unit root   Number of obs = 204

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-11.720	-3.475	-2.883	-2.573

MacKinnon approximate p-value for Z(t) = 0.0000

D. First_Diff_hp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
First_Diff_hp L1.	-.8071901	.0688713	-11.72	0.000	-.942989	-.6713913
_cons	-.0000377	.000525	-0.07	0.943	-.0010728	.0009974

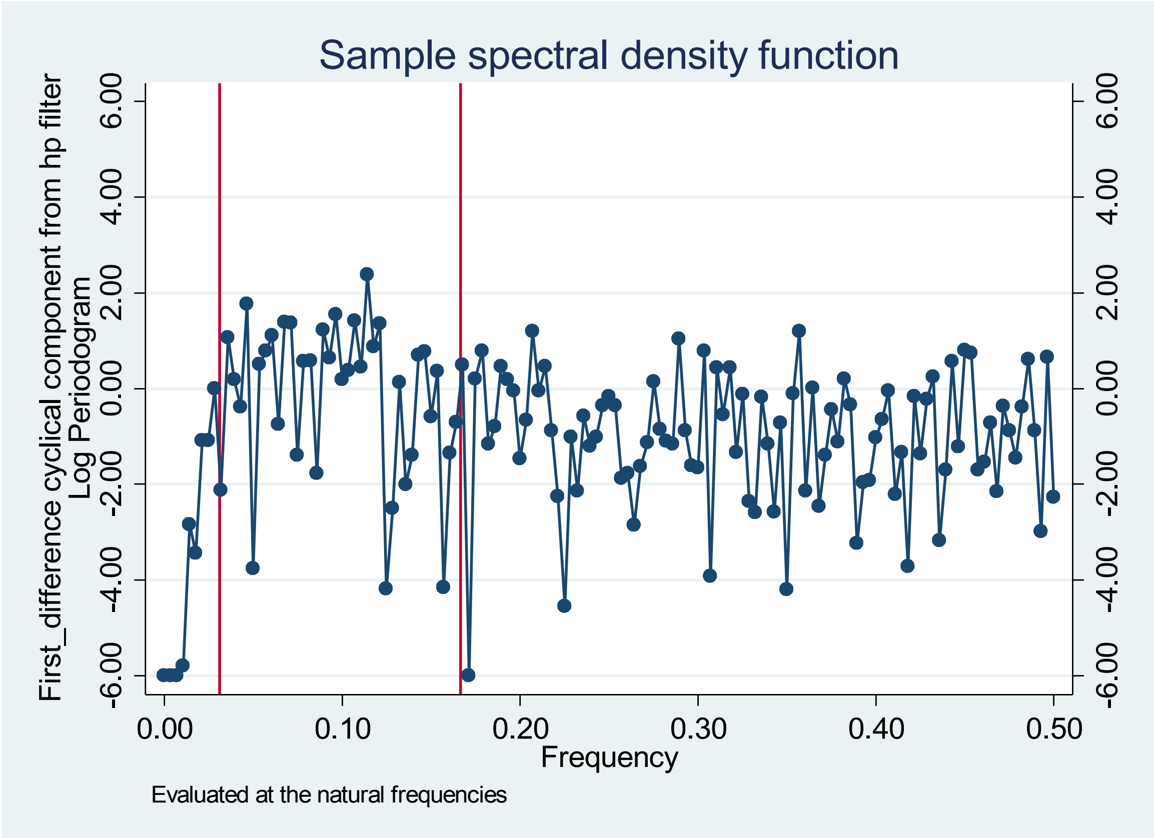
United States

Dickey-Fuller test for unit root   Number of obs = 279

	Test Statistic	Interpolated Dickey-Fuller 1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-11.269	-3.458	-2.879	-2.570

MacKinnon approximate p-value for Z(t) = 0.0000

D. First_difference	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
First_difference L1.	-.6275573	.0556897	-11.27	0.000	-.7371861	-.5179286
_cons	.0048781	.0006807	7.17	0.000	.0035381	.0062181

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Dickey-Fuller test for unit root                   Number of obs   =       279

                               ---------- Interpolated Dickey-Fuller ---------
                  Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value             Value
------------------------------------------------------------------------------
 Z(t)            -12.536            -3.458            -2.879            -2.570
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------------
D.                   |
First_difference_hp  |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+--------------------------------------------------------------
First_difference_hp  |
                 L1. |  -.7231196   .0576817   -12.54   0.000    -.8366699   -.6095694
                     |
               _cons |   .0000209   .0005068     0.04   0.967    -.0009768    .0010186
------------------------------------------------------------------------------------
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3. Perform granger causality tests between 1) the first differences of lry_ca and lry_us using 1, 2, and 3 lags. What do you conclude? How could you explain these results using macroeconomic theory? Explain in detail.

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. tsset Period, quarterly
        time variable:  Period, 1960q2 to 2011q3
                delta:  1 quarter

. regress First_difference_US L(1/3). First_difference_US L(1/3). First_Diff_CAN

      Source |       SS       df       MS              Number of obs =     202
-------------+------------------------------           F(  6,   195) =    6.29
       Model |  .002300258     6  .000383376           Prob > F      =  0.0000
    Residual |  .011883292   195   .00006094           R-squared     =  0.1622
-------------+------------------------------           Adj R-squared =  0.1364
       Total |  .014183549   201  .000070565           Root MSE      =  .00781

------------------------------------------------------------------------------------
First_difference_US |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------------+---------------------------------------------------------------
First_difference_US |
                L1. |   .2803543   .0717182     3.91   0.000     .1389113    .4217973
                L2. |   .1909054   .0734375     2.60   0.010     .0460717     .335739
                L3. |  -.0122186   .0788708    -0.15   0.877     -.167768    .1433307
                    |
     First_Diff_CAN |
                L1. |     .07664   .0767098     1.00   0.319    -.0746474    .2279274
                L2. |  -.1258298   .0728247    -1.73   0.086     -.269455    .0177954
                L3. |  -.0211031   .0691053    -0.31   0.760    -.1573928    .1151866
                    |
              _cons |   .0046105   .0010124     4.55   0.000     .0026139    .0066071
------------------------------------------------------------------------------------


 test L1.First_Diff_CAN L2.First_Diff_CAN L3.First_Diff_CAN

 ( 1)  L.First_Diff_CAN = 0
 ( 2)  L2.First_Diff_CAN = 0
 ( 3)  L3.First_Diff_CAN = 0

       F(  3,   195) =    1.35
            Prob > F =    0.2585
```

4. For both Canada and the United States, compute two tables analogue to Table 5.1 in Romer (2012) based on the first differences of lry_ca, lry_us. For this, assume that a recession is defined as two consecutive quarters with negative real GDP growth. Analyzed and discuss (1 page).

Canada

Table 4.1

Year and quarter of peak in real GDP	Number of quarters until trough in real GDP	Change in real GDP,peak to trough
Q4 FY 1970	1	0.57%
Q2 FY 1981	6	4.88%
Q3 FY 1986	1	0.56%
Q2 FY 1990	3	2.97%
Q3 FY 2008	3	3.86%

Figure 4.1

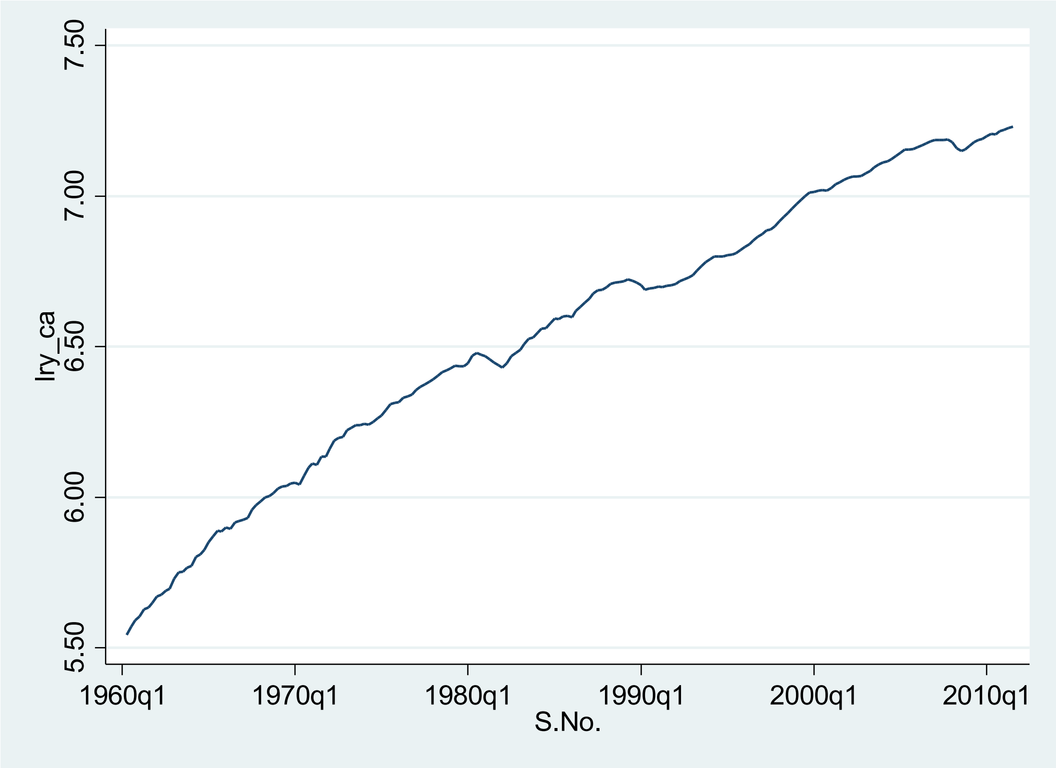
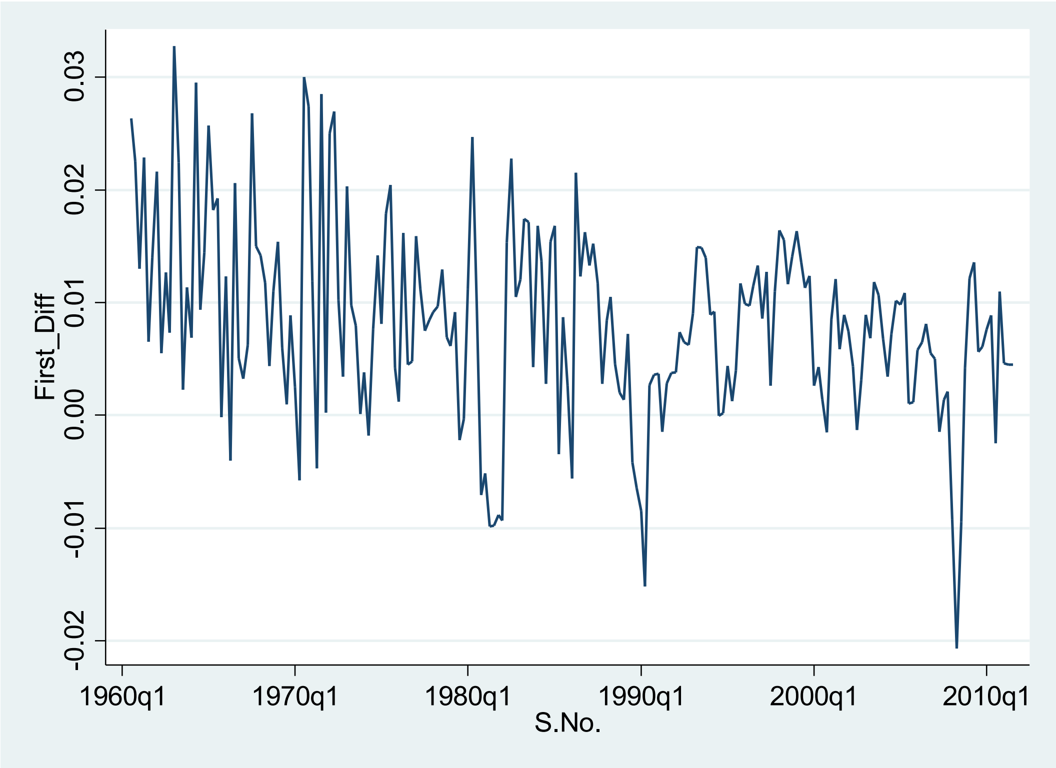


Figure 4.2



United States

Table 4.2

Year and quarter of peak in real GDP	Number of quarters until trough in real GDP	Change in real GDP,peak to trough
Q2 1973	1	0.54%
Q4 1973	1	0.83%
Q2 1974	3	2.56%
Q1 1980	2	2.18%
Q1 1981	1	0.73%
Q3 1981	2	2.82%
Q2 1982	1	0.36%
Q3 1990	2	1.32%
Q4 2000	1	0.28%
Q2 2000	1	0.32%
Q4 2007	6	4.24%
Q4 2010	1	0.39%
Q4 2013	1	0.29%

Figure 4.3

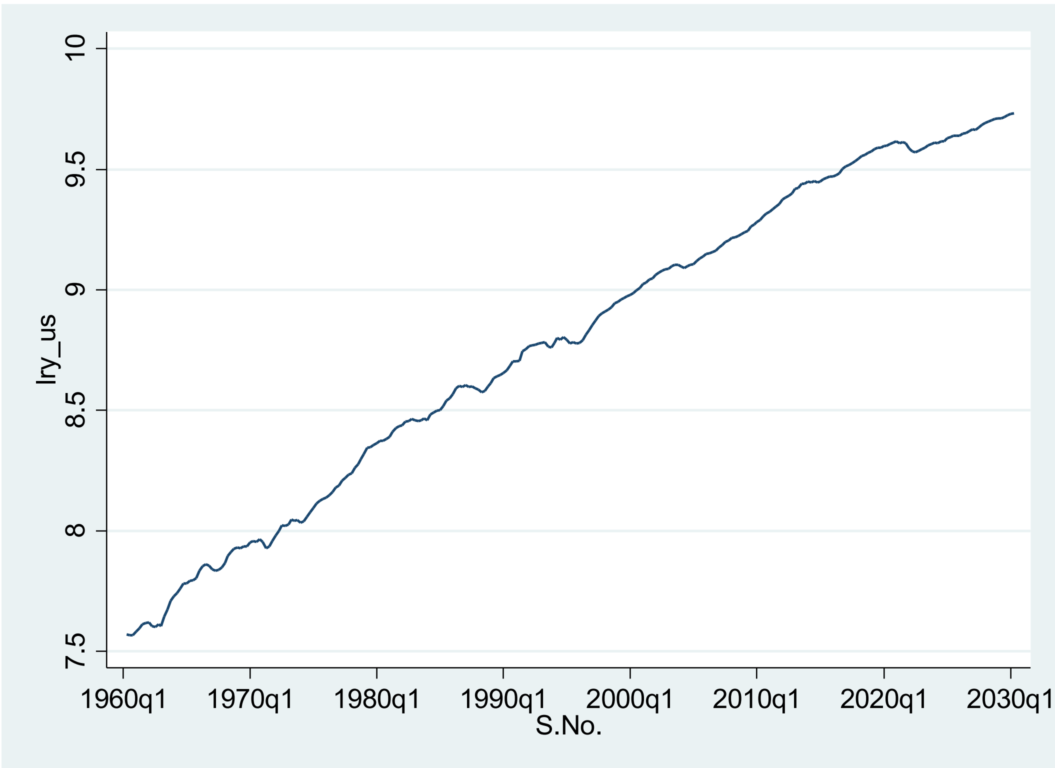
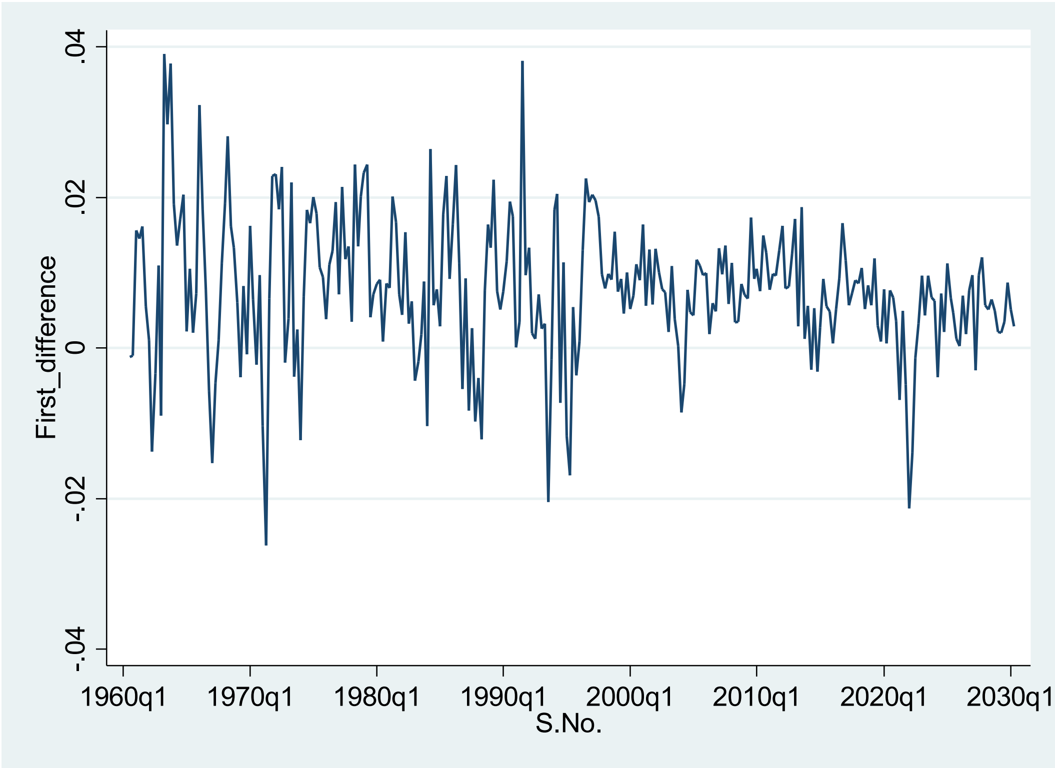


Figure 4.4


First_difference
.04
.02
0
-.02
-.04
1960q1
1970q1
1980q1
1990q1
2000q1
2010q1
2020q1
2030q1
S.No.