

# Homework 1

Eco 4306 Economic and Business Forecasting

Spring 2019

Due: Wednesday, February 6, before the class

### Problem 1 (50 points)

(a) (10 points) Figure below shows the time series plots for the two time series for the sample 1947Q2-2018Q3.

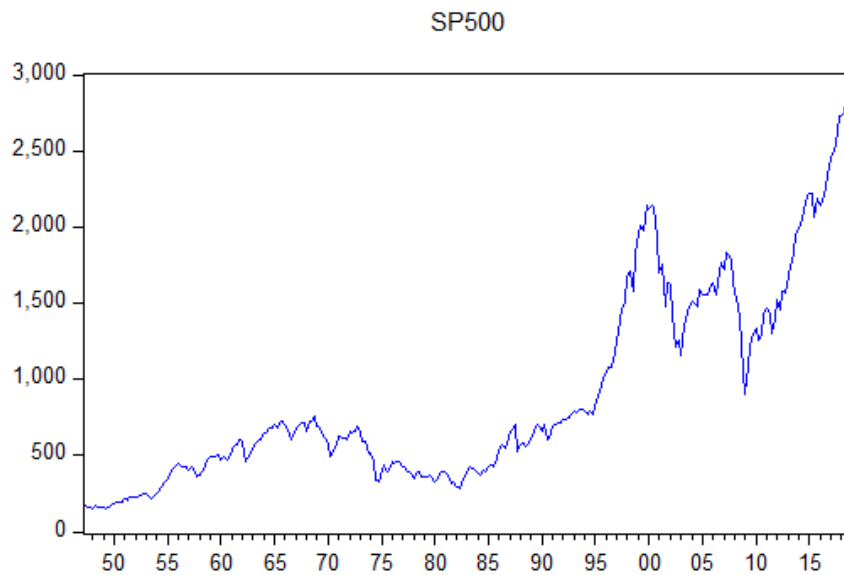
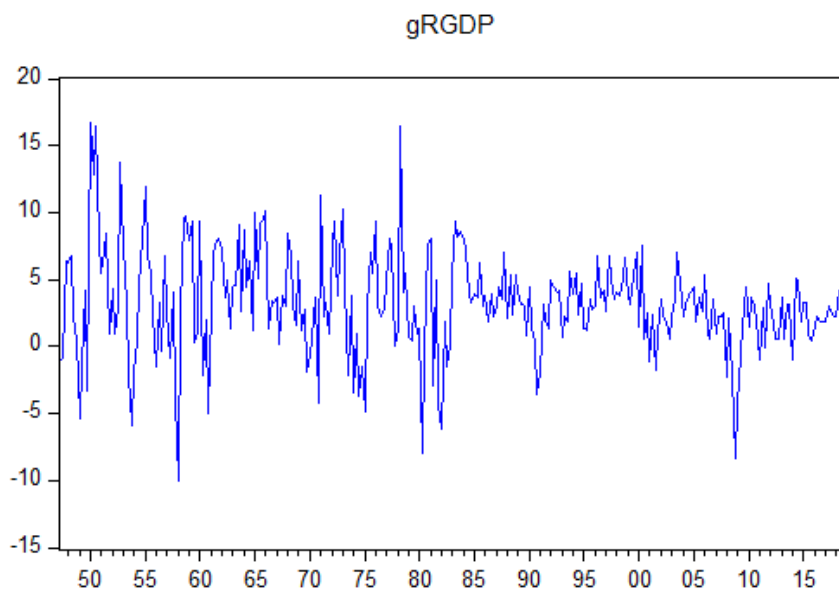
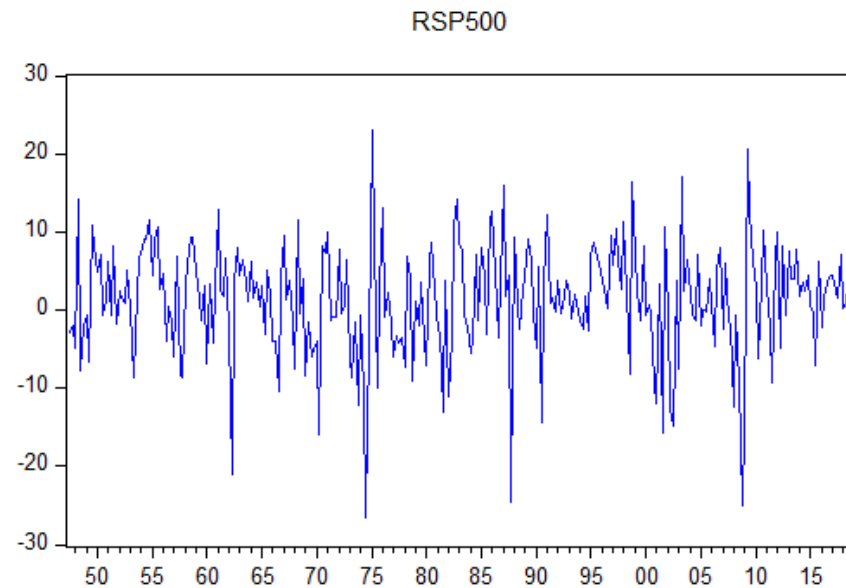
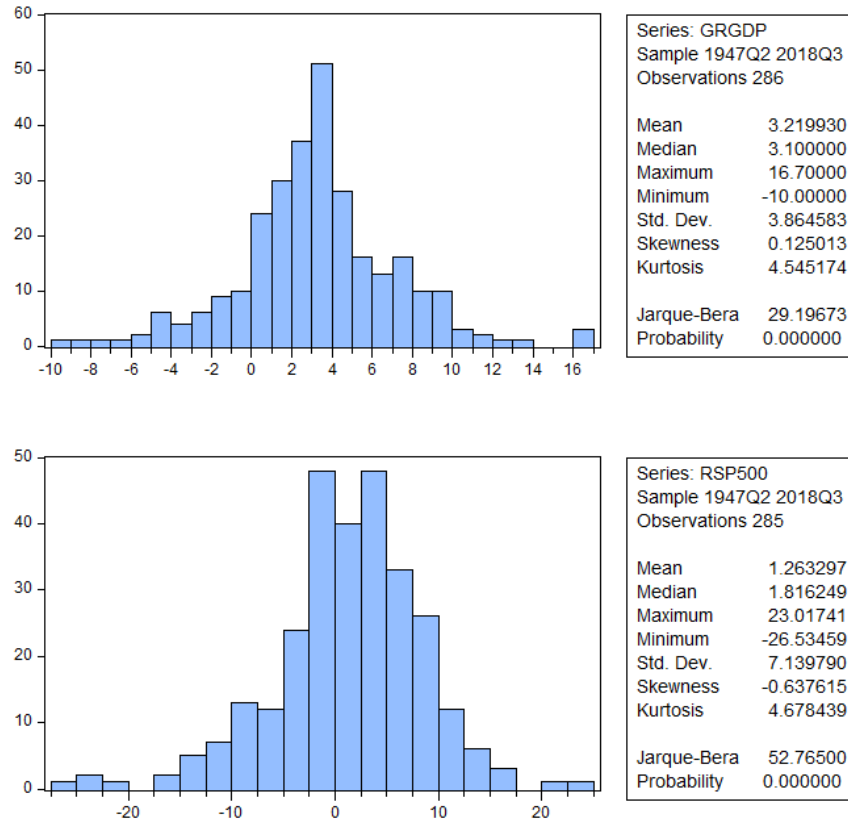


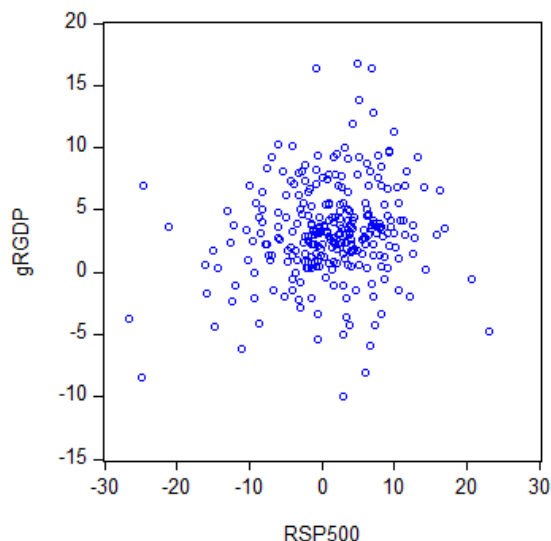
Figure below shows the time series plot for the constructed series for S&P500 return.



(b) (20 points) Figure below shows the descriptive statistics for the two time series for the sample 1947Q2-2018Q3.



- (c) (10 points) The high Jarque-Bera statistics and the associated p-value which are essentially zero imply that these two time series are not normally distributed.
- (d) (10 points) The scatter plot below suggests that there is only very weak contemporaneous correlation in the 1947Q2-2018Q3 sample, which is confirmed by calculating the correlation coefficient,  $\text{corr}(gRGDP_t, rSP500_t) = 0.150$ .



## Problem 2 (50 points)

Below are the results for the four models. Comparing their adjusted  $R^2$ , we can see that model contemporaneous correlation in (a) explains only a tiny fraction of the overall variation in the GDP growth rate, adjusted  $R^2$  is 0.022. Using lagged terms instead increases the adjusted  $R^2$  to 0.081, 0.196 and 0.239 in parts (b), (c), (d) respectively.

- (a) (12.5 points) contemporaneous correlation model:

$$gRGDP_t = 3.132 + 0.081rSP500_t + \varepsilon_t$$

Dependent Variable: GRGDP  
Method: Least Squares  
Date: 02/07/19 Time: 10:22  
Sample (adjusted): 1947Q3 2018Q3  
Included observations: 285 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.132028	0.230173	13.60728	0.0000
RSP500	0.081302	0.031799	2.556751	0.0111
R-squared	0.022577	Mean dependent var		3.234737
Adjusted R-squared	0.019124	S.D. dependent var		3.863246
S.E. of regression	3.826128	Akaike info criterion		5.528577
Sum squared resid	4142.910	Schwarz criterion		5.554208
Log likelihood	-785.8222	Hannan-Quinn criter.		5.538852
F-statistic	6.536975	Durbin-Watson stat		1.349254
Prob(F-statistic)	0.011088			

- (b) (12.5 points) one-quarter leading indicator model:

$$gRGDP_t = 3.058 + 0.153rSP500_{t-1} + \varepsilon_t$$

Dependent Variable: GRGDP  
Method: Least Squares  
Date: 02/07/19 Time: 10:22  
Sample (adjusted): 1947Q4 2018Q3  
Included observations: 284 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.057590	0.223504	13.68025	0.0000
RSP500(-1)	0.153405	0.030858	4.971288	0.0000

R-squared	0.080576	Mean dependent var	3.248944
Adjusted R-squared	0.077315	S.D. dependent var	3.862600
S.E. of regression	3.710278	Akaike info criterion	5.467108
Sum squared resid	3882.057	Schwarz criterion	5.492805
Log likelihood	-774.3293	Hannan-Quinn criter.	5.477410
F-statistic	24.71370	Durbin-Watson stat	1.473292
Prob(F-statistic)	0.000001		

- (c) (12.5 points) four-quarter leading indicator model:

$$gRGDP_t = 2.694 + 0.138rSP500_{t-1} + 0.148rSP500_{t-2} + 0.061rSP500_{t-3} + 0.062rSP500_{t-4} + \varepsilon_t$$

Dependent Variable: GRGDP  
Method: Least Squares  
Date: 02/07/19 Time: 10:22  
Sample (adjusted): 1948Q3 2018Q3  
Included observations: 281 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.693638	0.219145	12.29158	0.0000
RSP500(-1)	0.137764	0.029436	4.680179	0.0000
RSP500(-2)	0.147890	0.029703	4.978948	0.0000
RSP500(-3)	0.061105	0.029706	2.057018	0.0406
RSP500(-4)	0.062185	0.029412	2.114254	0.0354

R-squared	0.196094	Mean dependent var	3.214591
Adjusted R-squared	0.184443	S.D. dependent var	3.868688
S.E. of regression	3.493743	Akaike info criterion	5.357458
Sum squared resid	3368.923	Schwarz criterion	5.422197
Log likelihood	-747.7228	Hannan-Quinn criter.	5.383422
F-statistic	16.83088	Durbin-Watson stat	1.541076
Prob(F-statistic)	0.000000		

- (d) (12.5 points) four-quarter indicator model with GDP inertia:

$$gRGDP_t = 2.068 + 0.122rSP500_{t-1} + 0.119rSP500_{t-2} + 0.027rSP500_{t-3} + 0.046rSP500_{t-4} + 0.230gRGDP_{t-1} + \varepsilon_t$$

Dependent Variable: GRGDP  
Method: Least Squares  
Date: 02/07/19 Time: 10:22  
Sample (adjusted): 1948Q3 2018Q3  
Included observations: 281 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.068439	0.265904	7.778880	0.0000
RSP500(-1)	0.122069	0.028962	4.214811	0.0000
RSP500(-2)	0.118620	0.029883	3.969467	0.0001
RSP500(-3)	0.027009	0.030212	0.893985	0.3721
RSP500(-4)	0.046529	0.028938	1.607855	0.1090
GRGDP(-1)	0.230986	0.058522	3.947000	0.0001

R-squared	0.239193	Mean dependent var	3.214591
Adjusted R-squared	0.225361	S.D. dependent var	3.868688
S.E. of regression	3.404972	Akaike info criterion	5.309472
Sum squared resid	3188.305	Schwarz criterion	5.387159
Log likelihood	-739.9808	Hannan-Quinn criter.	5.340629
F-statistic	17.29170	Durbin-Watson stat	2.039267
Prob(F-statistic)	0.000000		