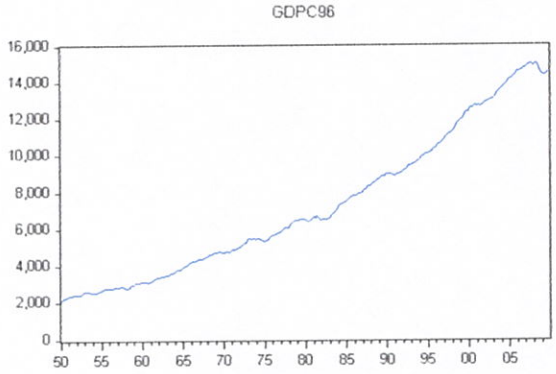
Ian Woodruff 100/100

29 March, 2017

Homework 6

Problem 1:

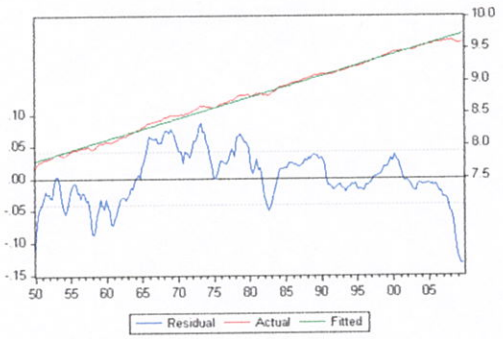


Dependent Variable: LOG(GDPC96)
Method: Least Squares
Date: 03/29/17 Time: 16:41
Sample: 1950Q1 2009Q4
Included observations: 240

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.652593	0.005778	1324.332	0.0000
@TREND	0.008226	3.89E-05	211.5913	0.0000

R-squared	0.994712	Mean dependent var	8.734316
Adjusted R-squared	0.994690	S.D. dependent var	0.572618
S.E. of regression	0.041727	Akaike info criterion	-3.507048
Sum squared resid	0.414388	Schwarz criterion	-3.478042
Log likelihood	422.8457	Hannan-Quinn criter.	-3.495360
F-statistic	44770.87	Durbin-Watson stat	0.053231
Prob(F-statistic)	0.000000		

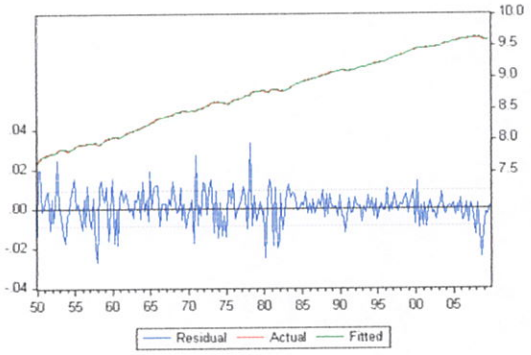
A. We can see here that the real GDP is steadily increasing from 1950 to about 2009, with a slight decrease around 2007. We can also see that **log(rGDP) = 7.65 + 0.0082t + e.**



Date: 03/29/17 Time: 16:33
Sample: 1950Q1 2009Q4
Included observations: 240

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.938	0.938	213.75	0.000
		2	0.860	-0.160	394.34	0.000
		3	0.781	-0.039	543.98	0.000
		4	0.706	-0.014	666.43	0.000
		5	0.640	0.033	767.61	0.000
		6	0.591	0.088	854.49	0.000
		7	0.552	0.011	930.24	0.000
		8	0.513	-0.032	996.10	0.000
		9	0.482	0.046	1054.5	0.000
		10	0.447	-0.053	1105.1	0.000
		11	0.409	-0.028	1147.6	0.000
		12	0.378	0.051	1184.8	0.000
		13	0.359	0.072	1216.9	0.000
		14	0.346	0.029	1247.7	0.000
		15	0.336	-0.011	1276.8	0.000
		16	0.323	-0.031	1303.8	0.000
		17	0.302	-0.051	1327.8	0.000
		18	0.277	-0.010	1347.8	0.000
		19	0.251	-0.006	1364.4	0.000
		20	0.229	0.029	1378.2	0.000
		21	0.211	0.010	1390.0	0.000
		22	0.199	0.019	1400.8	0.000
		23	0.191	-0.000	1410.3	0.000
		24	0.185	0.014	1419.4	0.000
		25	0.175	-0.024	1427.7	0.000
		26	0.163	-0.004	1435.0	0.000
		27	0.145	-0.044	1440.7	0.000
		28	0.128	0.013	1445.2	0.000
		29	0.108	-0.044	1448.4	0.000
		30	0.095	-0.043	1450.4	0.000
		31	0.073	0.056	1451.9	0.000
		32	0.056	-0.053	1452.8	0.000
		33	0.032	-0.074	1453.1	0.000
		34	0.010	0.017	1453.1	0.000
		35	-0.006	0.012	1453.1	0.000
		36	-0.016	0.031	1453.2	0.000

B. We can identify that the residuals are **not** white noise. When looking at the residual graph, we can see that it fluctuates, but less than it should be. It is also confirmed by the correlogram, as the first two PAC values are significantly large.



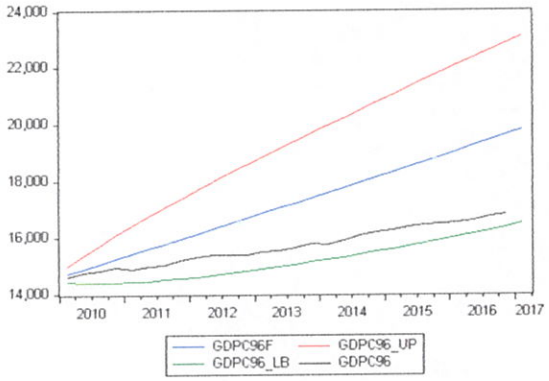
Date: 03/29/17 Time: 16:53
Sample: 1950Q1 2009Q4
Included observations: 240
Q-statistic probabilities adjusted for 2 ARMA terms

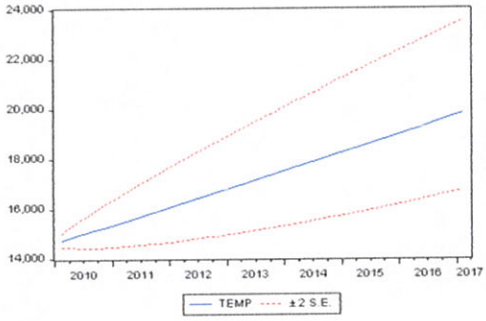
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.061	-0.061	0.9058	
		2	0.065	0.062	1.9504	
		3	-0.006	0.002	1.9589	0.162
		4	0.005	0.001	1.9654	0.374
		5	-0.107	-0.108	4.8137	0.186
		6	0.031	0.019	5.0515	0.282
		7	0.011	0.028	5.0844	0.406
		8	-0.075	-0.077	6.4747	0.372
		9	0.089	0.080	8.4564	0.294
		10	0.066	0.076	9.5573	0.297
		11	0.011	0.012	9.5856	0.385
		12	-0.102	-0.111	12.228	0.270
		13	-0.070	-0.105	13.492	0.262
		14	0.017	0.047	13.567	0.329
		15	-0.055	-0.027	14.337	0.351
		16	0.092	0.077	16.526	0.282
		17	0.026	0.033	16.703	0.337
		18	0.022	0.006	16.826	0.397
		19	-0.031	-0.035	17.085	0.449
		20	0.047	0.006	17.680	0.477
		21	-0.106	-0.080	20.649	0.357
		22	0.023	0.049	20.790	0.410
		23	-0.055	-0.036	21.614	0.422
		24	0.040	0.036	22.053	0.457
		25	0.021	0.018	22.178	0.510
		26	0.016	-0.024	22.248	0.564
		27	-0.026	-0.040	22.433	0.611
		28	0.052	0.058	23.174	0.623
		29	0.105	0.146	26.227	0.506
		30	-0.198	-0.189	37.093	0.117
		31	0.062	0.027	38.166	0.119
		32	-0.008	0.028	38.185	0.145
		33	-0.025	-0.035	38.360	0.170
		34	0.023	0.017	38.513	0.199
		35	-0.021	-0.068	38.636	0.230
		36	-0.011	0.014	38.669	0.267

*Probabilities may not be valid for this equation specification.

C. The residuals are now white noise because, looking at the correlogram, each of the PAC values are within the bounds; while simultaneously the residual graph fluctuates much more often.

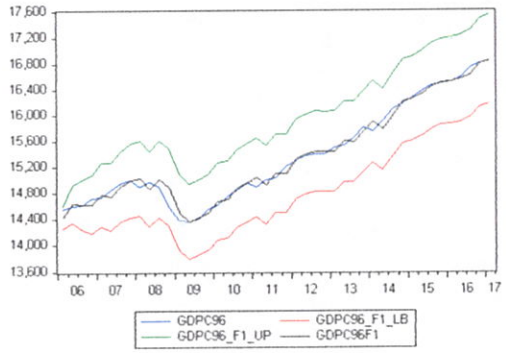
D.

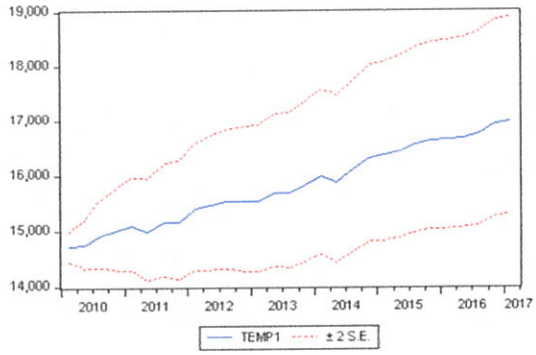




Forecast: TEMP	
Actual: GDPC96	
Forecast sample: 2010Q1 2017Q1	
Included observations: 29	
Root Mean Squared Error	1649.628
Mean Absolute Error	1434.147
Mean Abs. Percent Error	8.944279
Theil Inequality Coefficient	0.050164
Bias Proportion	0.755814
Variance Proportion	0.240839
Covariance Proportion	0.003347
Theil U2 Coefficient	15.96608
Symmetric MAPE	8.458172

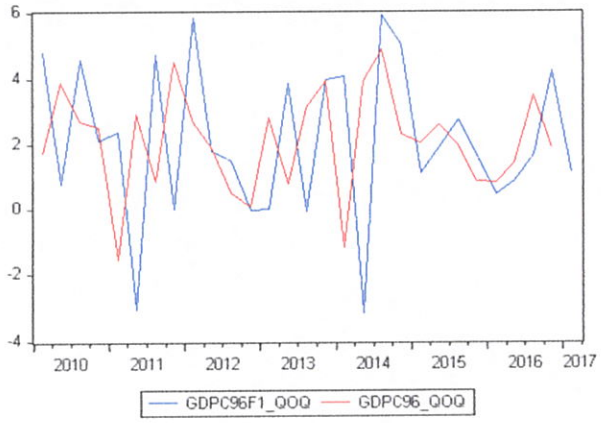
E. The **RMSE** for a multistep forecast is very large, at almost **1650**; while the forecast gets further away from the actual data.



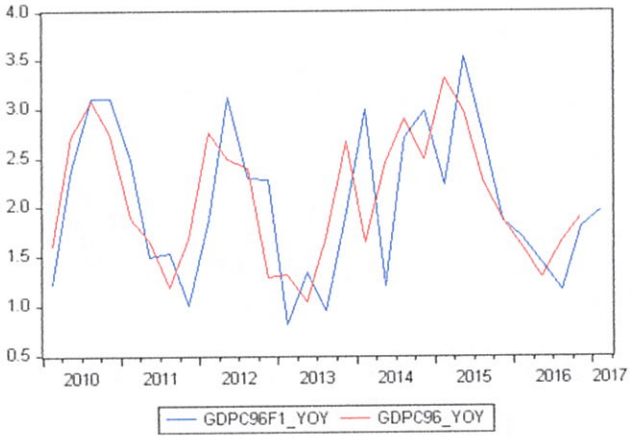


F. The **RMSE** is much smaller here, only **103.85**; while the forecast is very close to the actual data. The one step ahead forecast is more accurate.

G. In **Part e**, the forecast was an over-prediction as the forecasted data is greater than the actual data throughout the entire time period. The difference between the Upper bound and Lower bound is large, creating more room for error. **Part f** has more fluctuations in the data while the difference between the upper and lower bounds stays pretty consistent. Here the forecast is very close to the actual data so it is a more accurate forecast.



H. The forecast is reasonably accurate here when using the quarter over quarter growth rate. The prediction of the growth rate in 2017 Q1 is 1.11%.



I. The predicted growth rate in 2017 Q1 will be 1.97% when using the year over year growth rate method. The forecast is reasonably accurate to the actual data here as well.

J. My prediction for 2017 Q1 is a 1.1% growth rate while the survey suggests that the average forecasted growth rate in 2017 Q1 is 1.8%, the maximum forecasted growth rate for 2017 Q1 is 3.6% which is very optimistic, and the minimum forecasted growth rate for 2017 Q1 is 0.5% which is very pessimistic.