

PS4

Weimin Zhou

Due: 17/Oct/2018

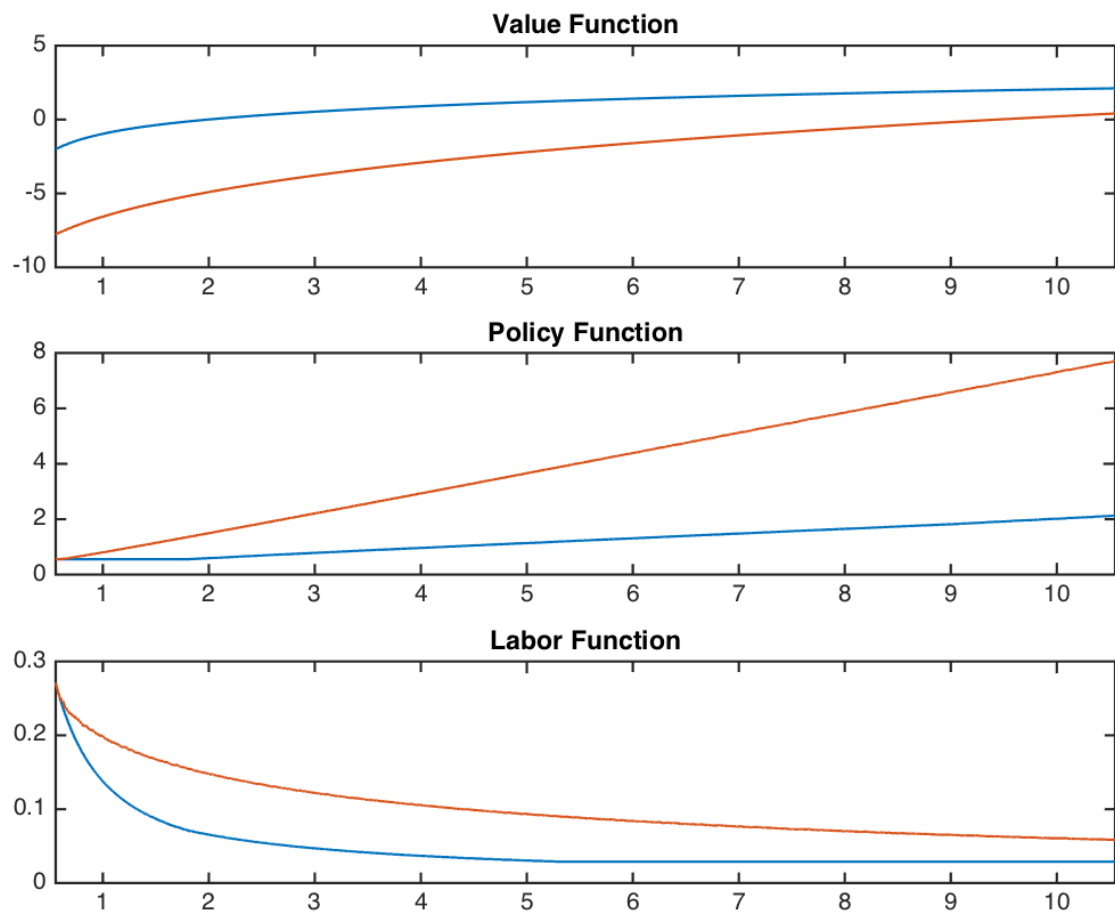
Question 2. Business Cycle Fluctuations [PS4Q2.m]: contains all codes of this part.

1. Add productivity shocks which follow a two-states Markov chain where the two values of the shock are 1.01 and $1/1.01$. Set the unconditional mean of z_t to one.

Value Function Iterations for the deterministic growth model are completed.

Elapsed time is 8.321668 seconds.

Number of iterations:



For plotting above figures, I combined Monotonicity, Concavity conditions and Howard's Improvements all together, expecting a higher speed.

I used the trick that setting transition function more diverse, and we could see the mean is still close to one, but the graph can give difference between two different shocks by above figures. A larger productivity shock achieved a high value function and higher policy function $g(k)$ and higher working hours.

logged variance of some variables in the model for good shock

output	capital	hours	consumption	investment
0.0549	0.1884	0.2518	0.5505	0.9281

logged variance of some variables in the model for bad shock

output	capital	hours	consumption	investment
0.0012	0.4551	0.1332	0.2703	0.7347

HP filter variance of some variables in the model for good shock

output	capital	hours	consumption	investment
1.0e-05 *				
0.0086	0.8036	0.0069	0.7780	0.8414

HP filter variance of some variables in the model for bad shock

output	capital	hours	consumption	investment
1.0e-04 *				
0.0096	0.2547	0.0035	0.1955	0.2639

ARIMA(1,0,0) Model for computing Persistence of Output

Conditional Probability Distribution: Gaussian

Parameter	Standard Value	t Error	Statistic
-----	-----	-----	-----
Constant	0.000565529	1.09595e-05	51.6018
AR{1}	0.982764	7.0642e-05	13911.9
Variance	5.14532e-08	2.55632e-08	2.01278

Persistence of some variables in the model for good shock

output	capital	hours	consumption	investment
[0.9834]	[1.0000]	[0.9828]	[1.0000]	[0.9998]

Persistence of some variables in the model for bad shock

output	capital	hours	consumption	investment
[0.9861]	[1.0000]	[0.9924]	[0.9996]	[0.9996]

Correlation Coefficients Table for Good Shocks

output	capital	hours	consumption	investment
1.0000	-0.4931	0.9887	-0.5484	0.5599
-0.4931	1.0000	-0.6075	0.9972	-0.9962
0.9887	-0.6075	1.0000	-0.6581	0.6684
-0.5484	0.9972	-0.6581	1.0000	-0.9999
0.5599	-0.9962	0.6684	-0.9999	1.0000

Correlation Coefficients Table for Bad Shocks

output	capital	hours	consumption	investment
1.0000	-0.9753	0.8453	-0.9726	0.9734
-0.9753	1.0000	-0.9002	0.9993	-0.9994
0.8453	-0.9002	1.0000	-0.9151	0.9144
-0.9726	0.9993	-0.9151	1.0000	-1.0000
0.9734	-0.9994	0.9144	-1.0000	1.0000

Variance Decomposition of output (Check Comovement) for Good Shocks

Var(capital)	0.0174
Var(labor-hours)	0.0004
Var(consumption)	0.4763
Var(investment)	0.5059

Variance Decomposition of output (Check Comovement) for Bad Shocks

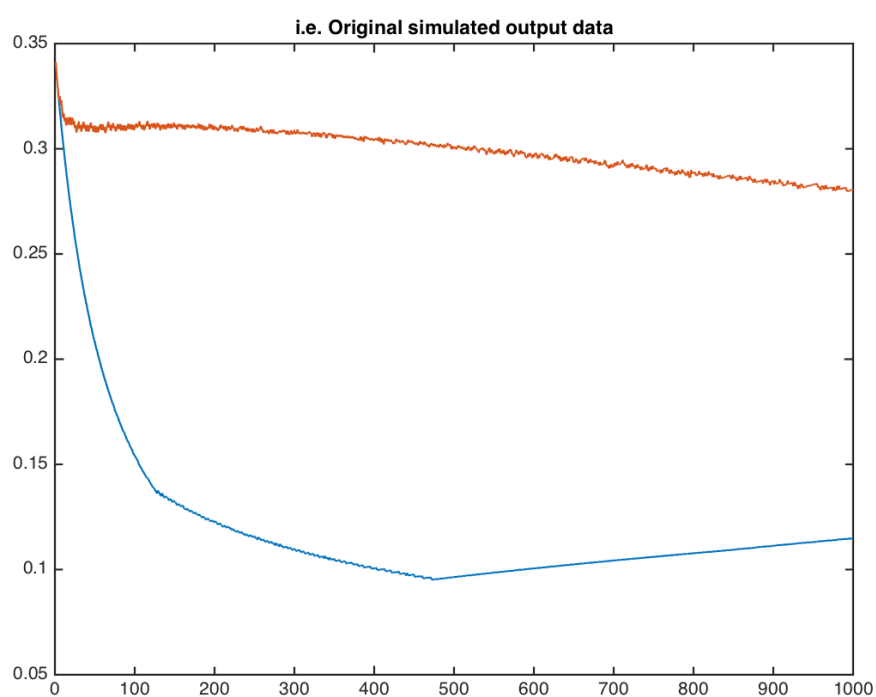
Var(capital)	0.8168
Var(labor-hours)	0.0003
Var(consumption)	0.0901

Var(investment) 0.0929

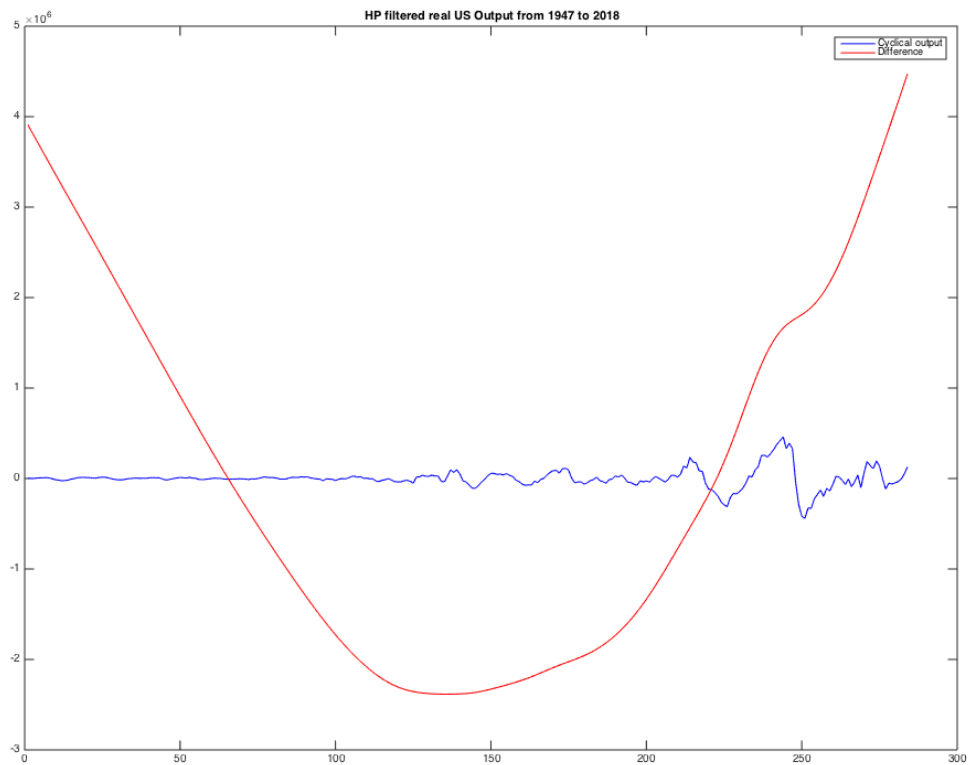
I downloaded the US.data and just for a rough hint due to time limit, I checked output and investment, consumption:

logged variance of some variables of US data

output	consumption	investment
1.9337	2.0406	2.0105



HP filtered output data of US.



HP filter variance of some variables in US data

output	consumption	investment
1.0e+10 *		
1.1355	0.3760	0.7477

Persistence of some variables in US data

output	consumption	investment
[1.0000]	[1.0000]	[1.0000]

Since I include the 1947 to 2018 quarterly data, persistence will be of course very large, since I didn't make any manipulation for such a long time-series data.

Correlation Coefficients Table of US data

<u>Output</u>	<u>Consumption</u>	<u>Investment</u>
1.0000	<u>0.9997</u>	<u>0.9915</u>
0.9997	1.0000	0.9899
0.9915	0.9899	1.0000

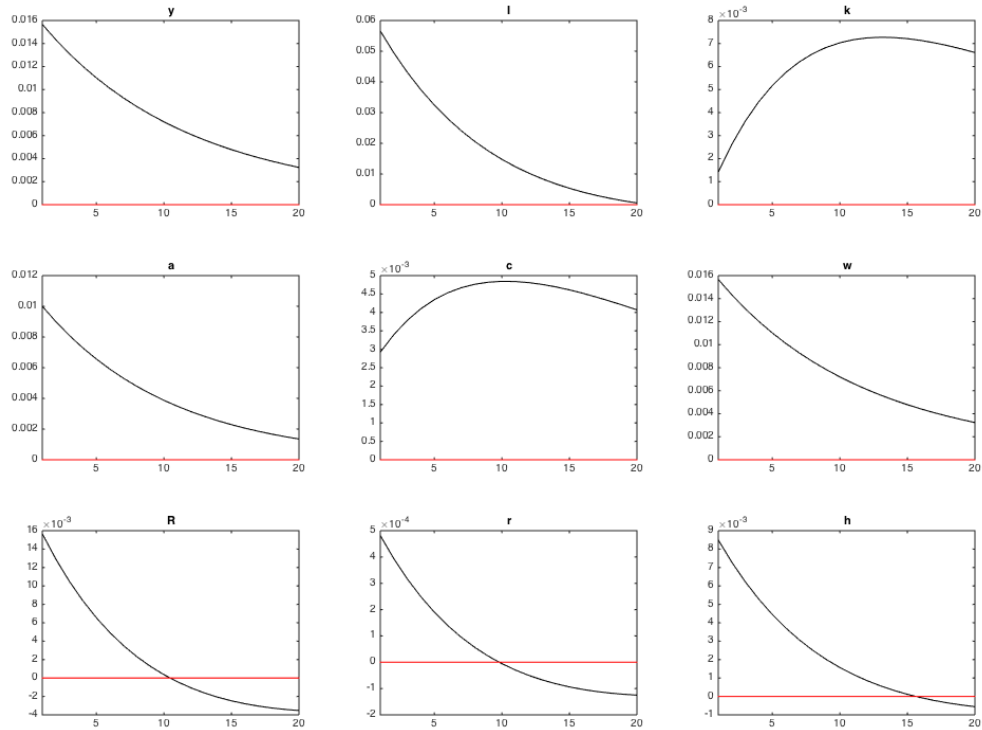
Variance Decomposition of output (Check Comovement) in US data

<u>Var(Consumption)</u>	<u>0.9409</u>
<u>Var(Investment)</u>	<u>0.0591</u>

Remarks:

The basic benchmark model of RBC cannot capture as many features in the US data. Since in the RBC basic model, agents are perfect forward-looking, and hence smooth their consumption and investment till a steady states, which could be proved there's a unique equilibrium for rational agents. However, in the US data, fluctuations are happened as always. Hence, only persistence matches since it's a long time series data.

3. Impulse Response Function of output, consumption, investment, capital, house to a productivity shock.



What we can tell from the IMF is just the results of benchmark RBC with endogenous labor supply (elastically), which denotes a sensitive behavior of investment and interest rate and hours of working, hence, the capital stock is increasing on the other side.