Purdue University

Computational Finance Program

MGMT 616 “Asset pricing”

HW1

Implementing a consumption-based asset pricing model

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Problem statement

The purpose of this homework is to take the first few steps in the implementation of the consumption-based asset pricing model described in the paper of Campbell and Cochrane [1]. The formula numeration and page references below refer to that paper. For this homework, it is only required to get the stationary distribution of the Surplus Consumption Ratio, i.e., to reproduce Fig2 on p 219 of the paper.

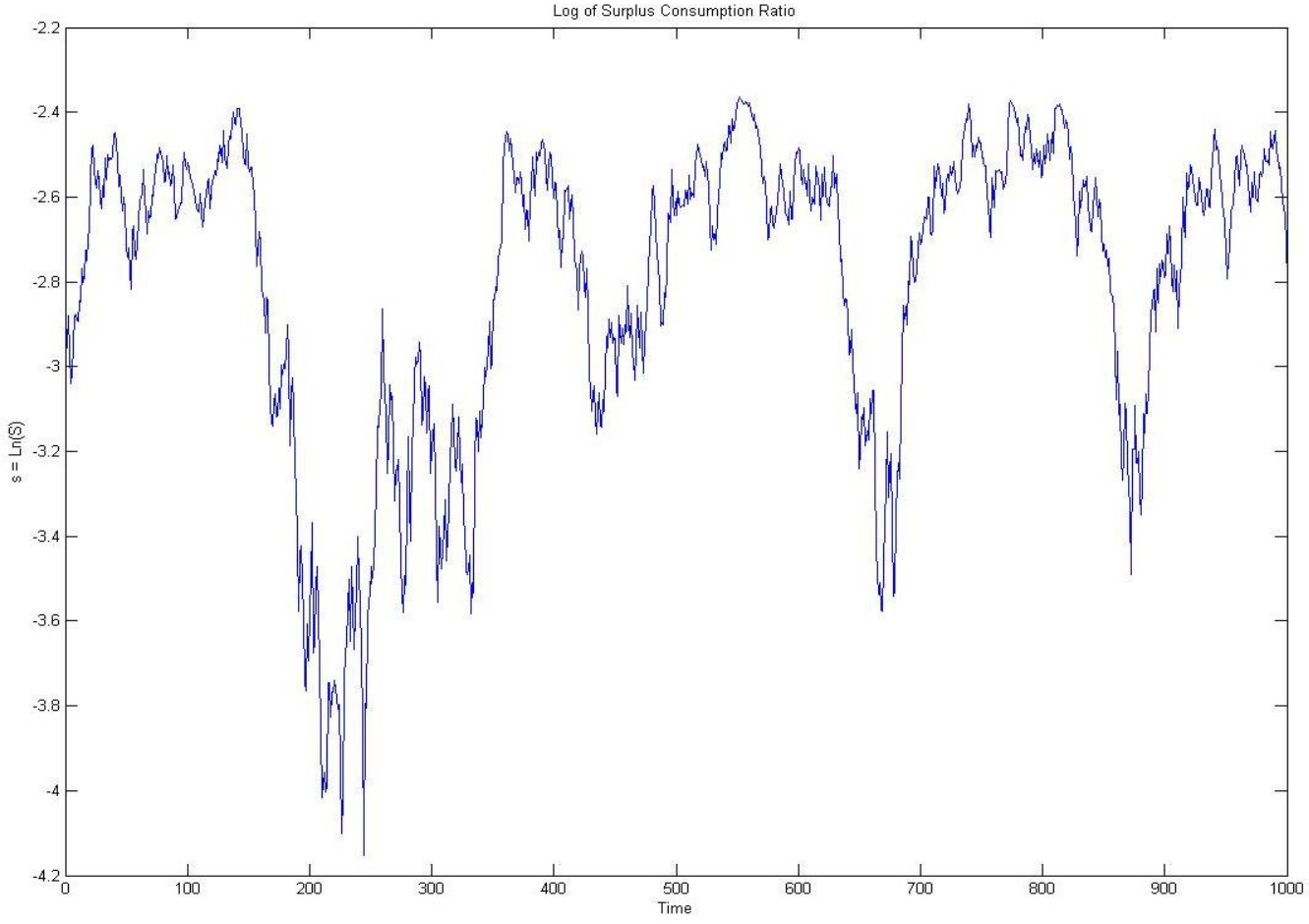
Solution

First we have to construct the process for the log of surplus consumption ratio:

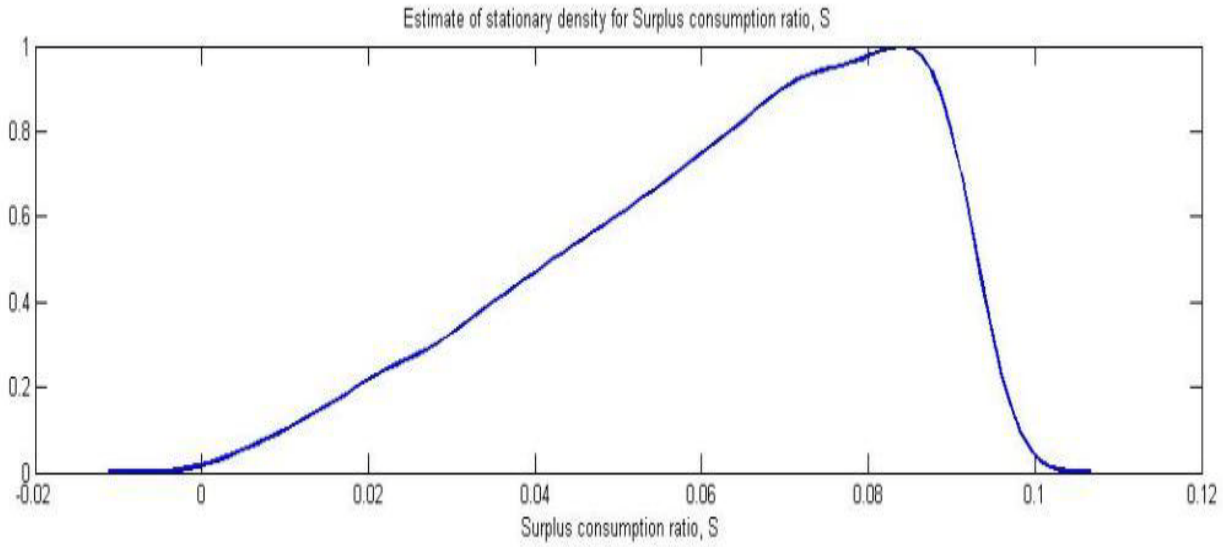
$$s_{t+1}^{a} = (1-\phi)\,\bar{s} \;+\; \phi\, s_t + \lambda(\bar{s})\, v_{t+1} \qquad \textbf{(3)}$$

where the technology shock $v_{t+1} \sim i.i.d.\ \mathrm{N}(0,\sigma^2)$

Parameters $\phi,\ \bar{s},\ g$ in the equation (3) are taken from the Table1 on p 218. They were chosen by the authors to match certain moments of postwar data. Here's an example of a single simulated path for s_t:



To get the stationary density, I simulate 5000 paths of length 1000. The kernel density estimate based on 5000 terminal values is as follows:



As we see, this density is very similar to what we wanted to get (see Figure 2, p 219). The attached Matlab GUI file, consumption_gui.m, allows the user to vary the number of simulated paths, the path length, and the size of smoothing window for the kernel density estimator.

References

[1] Campbell, Cochrane, 1999, “By force of habit: a consumption-based explanation of aggregate stock market behavior”, The Journal of Political Economy, Apr., 1999