1. **Buffer Stock Saving and Balance Sheets.**

The Great Recession was particularly severe in economies that experienced a larger run-up in household debt prior to the crisis.

International Monetary Fund (2012), Mian, Rao, and Sufi (2011), and Dynan (2012) have pointed out, respectively for countries, states within the U.S., and for individual households, that those who ran up bigger debts in the period leading up to the Great Recession experienced bigger consumption drops when the Recession hit. (The figure above shows some of the IMF’s evidence). This question asks you to interpret this pattern using a modified version of the tractable buffer stock model of saving, TractableBufferStock.

a) In the modified model, rather than having their income go to zero when they become unemployed (call the period in which they become unemployed period 0), jobless persons instead receive an unemployment benefit proportional to
the labor income \( \ell_0 W_0 \) they would have earned if they had remained employed in period 0. Assume that these benefits are financed by some new source of revenues that does not affect the employed consumer’s budget constraint; foreigners, for example.

i. Call the benefit \( N_0 = \eta \ell_0 W_0 \), where \( 0 < \eta < 1 \) means that the consumer’s unemployment/retirement benefit is positive but less than the income they earned when employed. If in any period \( t \) the consumer ends the period ‘in debt’ \( A_t < 0 \) assume that a lender who does not receive interest payments of at least \(-rA_t\) in period \( t + 1 \) can seize any amount of the consumer’s income less than or equal to jobless benefits \( N_0 \) (whether the consumer is employed or unemployed). Explain why even an infinitely risk-averse private lender will be willing to lend an employed consumer any amount less than \( H_{-1} \equiv N_0 / r \).

ii. Explain the role of the ‘return impatience’ condition \((R\beta)^{1/\rho}/R < 1\) in guaranteeing that the solution to the unemployed consumer’s problem makes sense, in that a consumer who has ended employment with

\[
A_{-1} > -\frac{H_{-1}}{} \equiv -\frac{N_0}{r}
\]

will have strictly positive consumption throughout their unemployed life.

iii. Explain why the existence of this unemployment insurance system is equivalent (in its implications for the path of consumption) to a system in which newly unemployed consumers receive a lump sum payment of \( N_0(R/r) \) upon entering their first period of unemployment.

iv. Call the equivalent lump sum \( \varsigma \ell W \), and suppose that for an employed consumer, labor income grows by factor \( \Gamma \) from year to year. Defining lower-case variables as the upper-case versions divided by \( \ell W \), explain why \( h_{-1} = \varsigma = \eta \Gamma / r \).

v. Explain why the effect of the introduction of such a system is simply to shift the consumption function in the phase diagram to the left by the amount \( h = \eta / r \). Draw an example of such a leftward shift that is large enough so that the target ratio of bank balances \( b \) is negative (so that in steady state the consumer will be in debt).

vi. Explain why an expansion of unemployment benefits corresponds to a relaxation of a ‘natural borrowing constraint.’

b) Using the model, for each of the experiments below, show how the phase diagram changes, and show the path of the personal saving rate of debtors leading up to, during, and after the experiment.

Experiments:

i. Suddenly and without warning, consumers become more optimistic about the probability becoming unemployed: They believe there has been a permanent improvement in the functioning of the labor market so that
the probability of unemployment $\bar{U}$ will be lower forever. This period of optimism lasts for six years, and then suddenly reverses itself (unemployment expectations revert to their previous value).

ii. Suddenly and without warning, consumers become more optimistic about future income growth: They believe there has been a permanent improvement in $\Gamma$. This period of optimism lasts for six years, and then suddenly reverses itself (growth expectations revert to their previous value).

iii. Suddenly and without warning, the government announces a permanent increase in the generosity of the unemployment insurance system (specifically: $\eta$ goes from $\bar{\eta}$ before period $t$ to $\bar{\eta} > \bar{\eta}$ in period $t$). Everyone believes this change is permanent. For six years, the change in the program persists. Then, without warning, the government reduces the generosity of the unemployment system back to its original level ($\eta$ goes back down to $\bar{\eta}$).

2. Asset Pricing In A Financial Crisis.

In August 2007 global financial markets underwent a period of turmoil triggered by a reassessment of the market for U.S. subprime mortgage debt securities. Inspired by these events, this question requires you to consider several possible interpretations of asset price movements, using the Lucas (1978)/C-CAPM model (Hint: The Gordon model of asset pricing is useful but can also be misleading because it neglects general equilibrium effects).

The Lucas economy has two risky assets, which we will call ‘subprime debt’ ($S$) and ‘other risky assets’ ($O$). The distinction between $S$ and $O$ is that $S$ is subject to larger shocks than $O$ and therefore, for any given quantity of holdings of the two securities, the covariance between consumption and movements in $S$ will be greater. (Both covariances are positive because in a Lucas economy all production is consumed).

Leading up to period $t$ the two assets were priced according to a belief that the variance of the payoff from a unit holding (a share) of $S$ was $x > 1$ times the size of the variance of the payoff from a share of $O$. Using the Lucas model, describe the patterns you would expect to observe at time $t$ in response to each of the following three possible scenarios. (Assume that, aside from the change described, nothing else about the economy changes). For each case, describe what happens to the level of the two prices $P_S$ and $P_O$ and to the two price/dividend ratios $P_S/D_S$ and $P_O/D_O$ (you can assume that the subprime market is small relative to the size of the other market).

a) There is a one-time, permanent drop in the level of dividends per share of $S$ to half the original level. The expected future relative variance of dividends per share for $S$ is unchanged (around this new lower level) in the future.

b) The variance of dividends associated with holding a share of $S$ will be permanently higher, but the mean expected level of dividends remains unchanged.
c) There is an increase in the level of ‘risk aversion’ (the coefficient of relative risk aversion of the representative agent) in the market. (You can assume that there is a riskless asset in the market as well).
References


