You are expected to answer all parts of all questions. If you cannot solve part of a question, *do not give up*. The exam is written so that you should be able to answer later parts even if you are stumped by earlier parts.

Write all answers on the exam itself; if you run out of room, use the back of the previous page.
Part I. Long Question.

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.

The 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.

1. 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 $\ell_0W_0$ 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.
a) 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 $H_{-1} \equiv N_0 / r$. 

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

\[ A_{-1} > -H_{-1} \equiv -N_0/r \]  \hspace{1cm} (1)

will have strictly positive consumption throughout their unemployed life.
c) 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.
d) Call the equivalent lump sum $\zeta \ell W$, 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 $h_{-1} = \zeta = \eta \Gamma / r$. 
e) 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).
f) Explain why an expansion of unemployment benefits corresponds to a relaxation of a ‘natural borrowing constraint.’
2. 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:

a) 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 $\bar{\bar{U}}$ will be lower forever. This period of optimism lasts for six years, and then suddenly reverses itself (unemployment expectations revert to their previous value).
b) 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).
c) 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 $\check{\eta} > \bar{\eta}$ 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 $\bar{\eta}$).
Part II. Short Question.

**Friedman (1957)’s Permanent Income Hypothesis With Noisy c.** Answer the following questions under the assumption that Friedman’s Permanent Income Hypothesis \( c_t = p_t \) is true. Koijen, van Nieuwerburgh, and Vestman (2013) present household spending data from two different sources (“survey” – designated below by an “s” superscript) and “imputed” (designated below by an “m” superscript) which can be assumed to have independent measurement errors \( \epsilon_s^i \perp \epsilon_m^i \):

\[
\begin{align*}
  c_s^i &= c_i + \epsilon_s^i \quad (2) \\
  c_m^i &= c_i + \epsilon_m^i \quad (3)
\end{align*}
\]

1. Suppose that the errors from the imputed measure of spending were \( \epsilon_m^i = 0 \ \forall \ i \). That is, the imputation manages to capture the true level of spending perfectly. On the other hand, the errors from the survey have variance \( \sigma_s^2 \). Explain what coefficients you would expect to get from the following two regressions:

\[
\begin{align*}
  c_s^i &= \alpha_0 + \alpha_1 c_m^i + u_i \quad (4) \\
  c_m^i &= \gamma_0 + \gamma_1 c_s^i + v_i \quad (5)
\end{align*}
\]

if \( \sigma_s^2 = \sigma_{\epsilon_s}^2 \).

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Koijen, van Nieuwerburgh, and Vestman (2013)
2. The authors compare their results to those from a similar Danish study that also has data from similar “survey” and “imputed” sources. They find that when they run a regression like (5) their $\gamma_1$ coefficient is lower than the corresponding coefficient estimated in Danish data. What hypothesis about the relative variances of $\epsilon_i^s$ might explain these results? What other hypothesis might explain these results even if the variances of the $\epsilon_i^s$ variables are the same across Denmark and Sweden? How would you expect the results
3. Separately, the authors present persuasive evidence that suggests that their estimate of $c_i^m$ is substantially better than the estimate of $c_i^m$ from the Danish data (that is, their value of $\sigma_i^{2_m}$ is smaller than the $\sigma_i^{2_m}$ in the Danish data). If this is true, what differences might you expect in the coefficient on $\alpha_1$ if the authors were to estimate that equation on their data?
References


