

Name _____

Midterm Exam
Intertemporal Choice
Fall, 2024

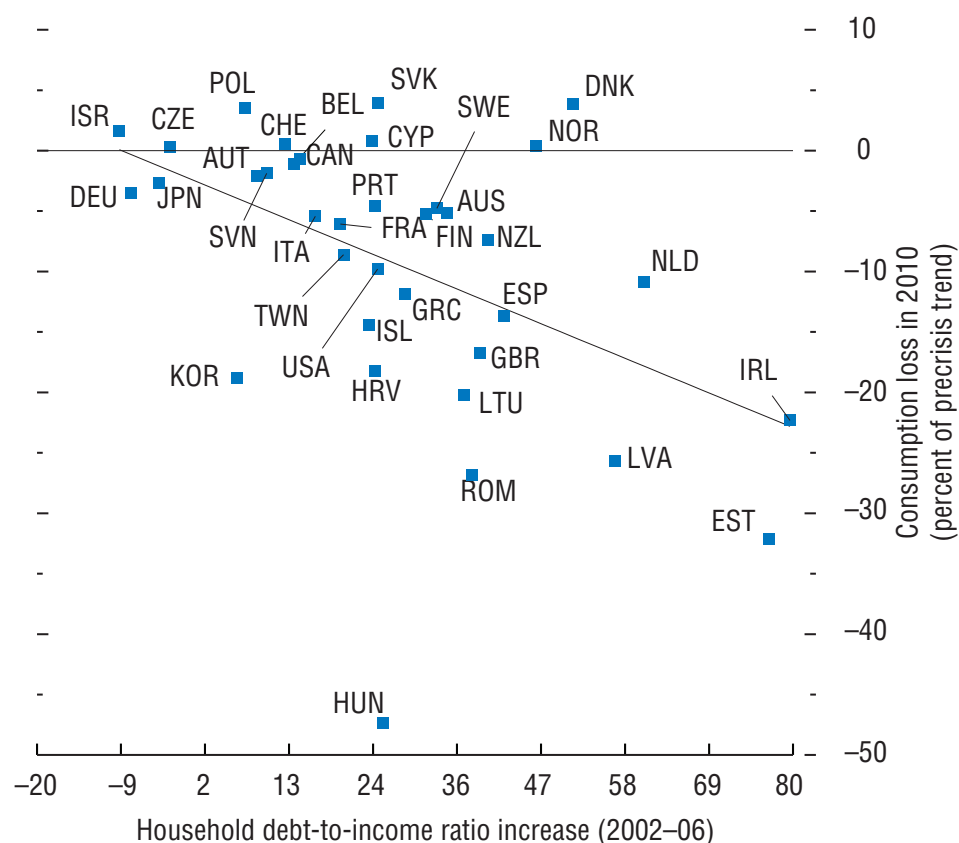
You are expected to answer all parts of all questions. If you cannot solve part of a question, *do not give up*. The exam is written so that you should be able to answer later parts even if you are stumped by earlier parts.

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

Part I: Long Question

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.



Source: IMF World Economic Outlook 2012, Chapter 3

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**.

- 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 will instead (forever) 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 (maybe Mexico will pay for it ...)

- 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_{t+1} (whether the consumer is employed or unemployed). Explain why even an infinitely risk-averse private lender would, in period -1, have been willing to lend a consumer who was employed in period -1 any amount less than $\underline{H}_{-1} \equiv N_0/r$.

- 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

$$A_{-1} > -\underline{H}_{-1} \equiv -N_0/r \tag{1}$$

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.

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

- 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 $\underline{h} = \eta/r$. 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 \mathcal{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 Γ . 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: η goes from $\underline{\eta}$ before period t to $\bar{\eta} > \underline{\eta}$ 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 (η goes back down to $\underline{\eta}$).

- c) For each of your answers to the prior question, provide an interpretation of the pattern described above: “those who ran up bigger debts in the period leading up to the Great Recession experienced bigger consumption drops when the Recession hit”

Part II: Short Question

1. **Small Open Economy Models of A Shock to Capital.** In the spring of 2011, Japan was hit by a terrible earthquake, tsunami, and resulting nuclear accident that destroyed a substantial amount of capital. This question asks what effect different models might lead you to expect for consumption spending in response to this disaster. Assume that before the shock, Japan was at its steady-state level of the capital/output ratio, and that the shock is perceived as a one-time destruction of a fixed amount of aggregate capital. Describe the dynamics of consumption per capita under the following models:

- a) A Diamond 2-Period OLG model

b) A Hall Random Walk model

c) A model with habit formation in aggregate consumption

- d) A model where the reason aggregate consumption is normally sluggish is ‘sticky information’ (hint: you do not need to assume that information is *always* equally sticky in every period)

References

- DYNAN, KAREN E. (2012): “Is Household Debt Overhang Holding Back Consumption?,” *Brookings Papers on Economic Activity*.
- INTERNATIONAL MONETARY FUND (2012): *World Economic Outlook, 2012* chap. 3. International Monetary Fund, Available at <http://www.imf.org/external/pubs/ft/weo/2012/01/pdf/text.pdf>.
- MIAN, ATIF, KAMALESH RAO, AND AMIR SUFI (2011): “Household Balance Sheets, Consumption, and the Economic Slump,” *Manuscript, University of California at Berkeley*.