Macroeconomics Field Exam
August 2017
Department of Economics
UC Berkeley

(3 hours)

1 Housing Wealth and Consumption in Theory (35min)

Consider a household who lives for J periods (no bequest motive).[1] A household born at time t maximizes the expected utility function:

$$E\left[\sum_{j=1}^{J} \beta^j \frac{\left(C_{it+j}^{\alpha} H_{it+j}^{1-\alpha}\right)^{1-\sigma}}{1-\sigma}\right]$$

where C_{it} and H_{it} are non-durable and housing consumption of household i in period t.

The household can invest in two assets: a perfectly liquid, risk-free one-period bond A (with fixed interest rate r) and housing H. Houses do not depreciate, there is no rental market and there is no transaction cost in the housing market. House prices ($P_t = x_t P_{t-1}$) follow a geometric random walk process.

Households face a borrowing constraint. Housing can be used as a collateral and households can borrow up to θ fraction of the value of their house.

Log income $Y_{it} = e^{(x+z_{it})}$ is random and follows an $AR(1)$ process, such that $z_{it} = \rho z_{i,t-1} + \epsilon_{it}$.

1. Write the household maximization problem (i.e. Bellman equation). Be careful to list state variables and the choice variables, include the laws of motion, and list all constraints.

2. Derive the FOC and the ET.

3. Discuss **intuitively** why in this setting marginal propensity to nondurably-consume (MPC) out of housing wealth is linearly related to MPC out of a transitory income shock.

4. Discuss intuitively the relation between the size of the housing shock and the elasticity of non-durable consumption w.r.t house prices. Do households respond more to positive or negative house prices shocks? (Hint: Think about the relation between household distance to the borrowing constraint and their consumption response to wealth or income shocks).

5. Now assume there is a fixed cost associated with any housing transaction. How does the introduction of this fixed cost change the reaction of households' non-durable consumption to house price shocks? Does this fixed cost increase or decrease the elasticity of consumption with respect to house prices? **Again an intuitive discussion suffices**. (Hint: The answer may depend on the age of household)

---

[1]This problem is inspired by Berger et al. (2016).

2 Housing Wealth in Action (15min)

1. How would you empirically test for the prediction that the marginal propensity to consume out of housing wealth is similar to the marginal propensity to consume out of transitory transitory income shocks?

2. In the appendix, you will find figures and a table from Mian, Rao and Sufi (2013), who relate average household consumption expenditure to the shift in housing wealth. **Assume that their housing wealth shifts are exogenous.** The authors comment:

   - "The average MPC can be estimated by regressing the dollar change in total spending per capita on the dollar change in housing net worth. The left panel of Figure IV plots the county-level change in spending per household from 2006 to 2009 on the county-level change in home value per household over the same period. Given our goal of estimating an MPC, we keep units in terms of thousands of dollars. There is a strong positive relation between the change in home value and the change in spending. At the extreme, a county where households are experiencing a decline in home value of $150,000 sees a reduction in spending per household of almost $10,000. There is also some evidence of a nonlinear effect as the relationship is steeper for smaller declines in home value versus larger ones. Table IV presents coefficients from regressions corresponding to the left panel of Figure IV. **The estimated average MPC in column (1) is 5.4 cents per dollar.**"

   Would this county-level estimate be the right target for you calibrate parameters that affect your model's MPC out of housing wealth? List two concerns that you may have that detach an **individual** household's **micro** consumption sensitivity to its **own** housing wealth from a local economy's average-household consumption response to average housing wealth shifts.

3. Suppose you had micro-data on nondurable consumption and household-level housing wealth. Suppose you found that is housing wealth increased by $1, consumption increased by $0.05. Would this be sufficient for you to calibrate the aforementioned model's parameters? If not, then list a potential confounding factor and explain.

4. Suppose you had a household-level instrument for each household's property value. Would you expect to find larger or smaller consumption responses for those directly affected households, compared to an aggregate analysis? Discuss two potential factors.

5. Consider the following back of the envelope calculation of Mian, Rao and Sufi (2013), and discuss two potential concerns you may have with their calculation:

   - Another way of stating the magnitude is to examine aggregate data. Our estimate for the MPC varies between 0.054 for the OLS estimate to 0.072 for the IV estimate. Let us pick 0.06 within this range for convenience. What does this estimate imply about the aggregate spending effect of the collapse in home values? [...] The drop in value of housing between 2006 and 2009 is equal to $5.6 trillion [...] An MPC of 0.06 implies that the drop in consumption driven by a $5.6 trillion loss in home value is equal to $336 billion. The average nominal spending growth between 1992 and 2006 was 5.2%. Using this trend growth for nominal spending between 2006 and 2009,

we estimate a total nominal decline in spending of $870 billion from 2006 and 2009 relative to the linear preperiod trend. The total drop due to the housing net worth shock implied by our MPC is almost 40% ($336 billion/$870 billion) of the spending decline relative to trend."

3   New Keynesian Frontiers: Beyond Labor Supply (50min)

1. Write down the fundamental pricing equation of the New Keynesian model, which solves for each firm's optimal price. You can ignore price stickiness and focus on what the firm perceives to be a non-stochastic steady state. Stroebel and Vavra (2015) find that local house price shifts, in the spirit of Mian, Rao and Sufi (2013), go along with higher local retail prices.[2] Explain **three** channels through which such house price increases may lead New Keynesian firms to increase their product prices.

2. How are wages determined in the standard New Keynesian model with flexible wages? Do all firms pay the same wage, no matter whether they received the Calvo opportunity of price resetting?

3. What is the role of the Frisch elasticity of labor supply in the New Keynesian Phillips curve? Discuss from the perspective of a labor demand shift, for example due to a shift in consumption demand.

4. Suppose that in the data, inflation is not all that procyclical (or responsive to shocks) as an otherwise successful calibrated New Keynesian model would predict. Would lowering the Frisch elasticity help the model match empirical inflation patterns?

5. Consider the following series of quotes from David Romer's textbook:

   - "In a competitive labor market .., the equilibrium wage falls by the percentage fall in employment divided by the elasticity of labor supply. For a 3 percent fall in employment and a labor supply elasticity of 0.2, for example, the equilibrium wage falls by 15 percent. .. a 15 percent fall in wages translates directly into a 15 percent fall in costs. Firms therefore have an overwhelming incentive to cut wages and prices in this case."

   "...These incentives for price adjustment will almost surely swamp the effects of any complications in the goods and credit markets."

   "At a general level, real wages might not be highly procyclical for two reasons. First, short-run aggregate labor supply could be relatively elastic (as a result of intertemporal substitution, for example). But... this view of the labor market has had limited empirical success."

   Explain why David Romer is pessimistic about the high-supply-elasticity view of the labor market.

6. Suppose that the household is not on the labor supply curve. Which advantages does such a model bring from the perspective of the New Keynesian Phillips curve vis-a-vis a model in which the labor market clears?

7. Name one popular model of the labor market that deemphasizes the role of labor supply in employment and wage determination. [Do not list wage stickiness.] Explain why this view of the labor market overcomes David Romer's challenge. Zoom into the nexus of the joint determination of employment and wages, and the wage shifts that are consistent with employment shifts.

---

[2]There exist no comprehensive local price indices for non-retail sectors

8. Explain, abstractly, how wage stickiness would help the model smooth inflation.

9. Remind yourself of the Galí set-up of wage stickiness. Suppose labor demand increases employment as much as in the model without wage stickiness, but in the wage-stickiness model the real wage is smoother. Which trick does Galí use in order to leave the households willing to supply more labor without an increase in the real wage? [If you don't remember the particular model, try to come up with a reason.]

10. Remind yourself of Kudlyak (2014) and Basu and House (2016). Summarize the key empirical motivation of Basu and House (2016), and relate it to the New Keynesian puzzles above.

4 Measuring labor costs (20min)

1. Suppose you were interested in the allocative marginal cost of labor, and one would point to the countercyclical time series of BLS average real wages. Would you conclude that firms labor cost is countercyclical? Why not?

2. Suppose that you had seen the coefficient on a business cycle indicator from a panel regression of log wages residualized by a worker fixed effect. What type of confounding factors would this fixed effect eliminate on your measurement mission?

3. Suppose that jobs are long-lasting. What type of labor cost concept would you like to measure in the data to assess this question? Suppose that separations are exogenous.

4. Suppose that jobs are long-lasting, but both the worker and the firm are myopic, such that the discount factor is $\beta = 0$. Whose labor costs would be allocative – new hires' wages or incumbent workers' spot wages? Or their present value, or their user cost?[3]

5. **5x points** – open-ended question: Suppose that you were to measure new hires' wages in the data, as Martins et al. (2012) does in Portugal. Suppose that wages are considerably more procyclical for new hires. However, you note that there is tremendous heterogeneity in the cyclicality of hiring in the data. Specifically, the public sector, health care industries or McDonald's employment and hiring are very stable. By contrast, durable goods manufacturing, construction and luxury goods sector are very procyclical in their employment and particular their hiring. Would you worry that a simple empirical analysis of new hires' wages would capture the relevant labor cost? Whose wages would that new-hire time series represent during recessions, and whose during expansions? Would you overestimate or underestimate wage procyclicality?[4] Explain the compositional problems. How would you propose to overcome those problems, or how can you assess whether they introduce bias?

---

[3]Again, workers cannot quit, and firms cannot fire you unless the employment relationship exogenously dies.
[4]This may not be a well-defined concept with heterogeneity even!

Part 5.

Short questions (True/False/Uncertain + a brief explanation; explanation determines the grade; 15 minutes):

1. It makes sense to replace the Fed with a computer following a Taylor rule. (3 minutes)

2. Price-level targeting is an effective tool to minimize adverse effects of the zero lower bound on nominal interest rates. (3 minutes)

3. Identification of monetary policy shocks is better in VARs than in DSGE models. (3 minutes)

4. Upward-sloping labor supply curve may generate sun-spot equilibria in business cycle models. (3 minutes)

5. Imperfect information models rely on nominal rigidities to generate persistent responses of output, consumption, etc. to nominal shocks. (3 minutes)

Longer question (20 minutes)

Consider the standard intertemporal consumption problem with time varying rate of return except that the per-period utility function is

$$\frac{1}{1-\theta}(C_t v_t)^{1-\theta}$$

where C is consumption, θ is a parameter, and v is a disturbance to preferences. This disturbance is not directly observable by the econometrician.

1) Suppose that labor is inelastically supplied, output is stochastic but not storable, and production occurs without physical capital. What is the effect of a temporary taste shock at time t on the interest rate (from time t to $t+1$)? Explain.

2) Write the long-linearize Euler equation of this problem. What is the error term? Suppose you wanted to estimate θ by instrumental variables procedure. How is the standard procedure affected by the presence of the taste disturbance? What procedure would you use?

3) Does the presence of the taste disturbance make it easier or harder to explain the equity premium? Comment on whether this approach to explaining the equity premium is reasonable. (You can think of equity as a claim on a fixed share of aggregate output.)

APPENDIX: Mian, Rao and Sufi (2013)

TABLE IV

AVERAGE MARGINAL PROPENSITY TO CONSUME OUT OF HOUSING WEALTH

	(1)	(2)	(3)	(4) IV	(5) State FE	(6) Excluding AZ, CA, FL, NV
Change in home value, $000, 2006–9	0.054**	0.119**	0.051**	0.072**	0.051**	0.094**
	(0.009)	(0.015)	(0.011)	(0.021)	(0.013)	(0.017)
(Change in home value, $, 2006–9)^2		0.432**				
		(0.076)				
Construction employment share, 2006			−9.748	−2.915	−7.449	−2.305
			(5.479)	(7.800)	(5.379)	(5.818)
Tradable employment share, 2006			2.034	0.438	1.516	−0.795
			(2.235)	(3.783)	(2.190)	(2.496)
Other employment share, 2006			−1.568	−3.037	−2.186	−2.629
			(1.459)	(1.850)	(1.418)	(1.466)
Nontradable employment share, 2006			−1.797	−3.256	−3.341	−4.106
			(5.438)	(5.983)	(5.048)	(5.349)
Income per household, $000, 2006			−0.056*	−0.019	−0.043	−0.022
			(0.023)	(0.032)	(0.030)	(0.029)
Net worth per household, $000, 2006			0.003*	0.002	0.002	0.002
			(0.001)	(0.001)	(0.002)	(0.001)
Constant	−0.830	0.263	3.311**	3.211**	3.396**	3.415**
	(0.536)	(0.554)	(0.678)	(0.928)	(0.861)	(0.837)
N	944	944	944	540	944	833
R^2	0.362	0.423	0.421	0.347	0.573	0.336

Notes. Dependent variable: change in spending 2006–9 ($000). This table presents coefficients from regressions relating the change in household spending to the change in home value between 2006 and 2009. Both the change variables are in thousands of dollars. All regressions are at the county level. Standard errors are heteroskedasticity robust, clustered at the state level. All regressions are weighted by the number of households in the county. **, *, Coefficient statistically different than 0 at the 1% and 5% confidence levels, respectively.
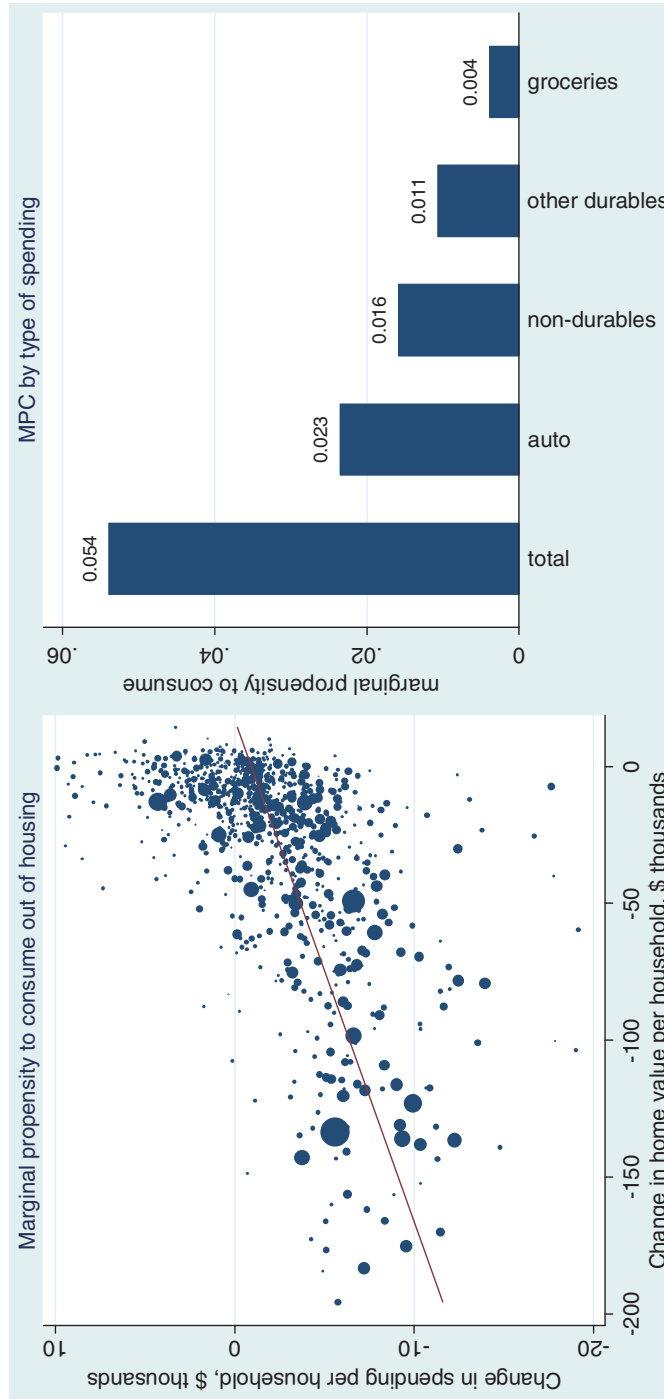
FIGURE IV

The Average Marginal Propensity to Consume

The left panel scatterplot relates the change in total spending per household in a county from 2006 to 2009 to the change in home values over the same time period. The scatterplot and regression line are weighted by the number of households in the county. The gradient of the line represents the average marginal propensity to consume. The right panel plots the marginal propensity to consume for various spending categories.