

**Economics Comprehensive Exam
January, 2015**

Your ID number _____

Point values are given in parentheses. Partial credit will be awarded. You can put answers on paper and in this file—you'll need to turn in both plus the Excel file from Question 6 and your Stata log from the Econometrics section. Save these files to your Caleb:Courses Eco 401 folder as CompsID.docx, e.g. if your ID number is 6, save it as Comps06.docx (and .xlsx and .log). In the .docx file indicate if your answer is on the paper copy instead of the electronic file.

MICROECONOMICS

1. (10 pts.) Ann chooses between leisure (L) and consumption (C). She has the utility function

$$U = C(L-100)$$

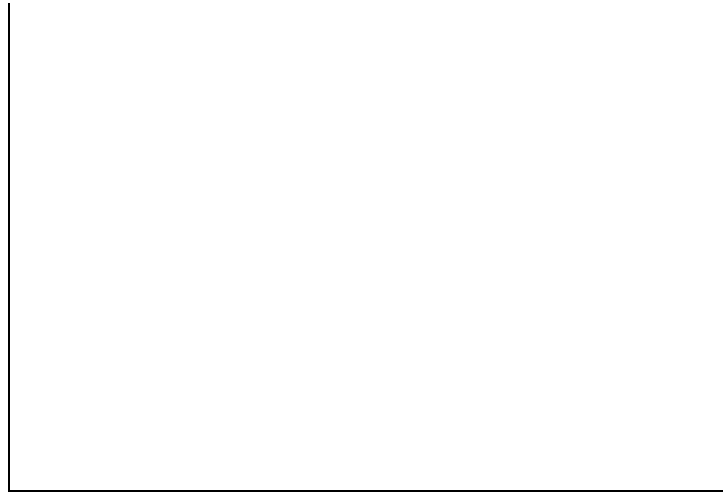
Ann has a total for 168 hours per week available, and can work at a wage of \$8 per hour. She has non-labor income of \$32 per week.

a. Write the Lagrangian for Ann's maximization problem.

b. Find Ann's optimal bundle of L and C.

2. Bob has the utility function $U(X, Y) = XY^2$. The price of X is \$2 and the price of Y is \$3. Bob's income is \$180.

a. (5 pts.) Graph Bob's budget line and any one of his indifference curves. Label at least two specific points on each.



b. (3 pts.) Find Bob's Marginal Rate of Substitution.

c. (5 pts.) Find Bob's optimal bundle of X and Y.

d. (9 pts.) Suppose the price of X rises to \$3. Show graphically the effect of this increase in the price of X. Decompose the change in the quantity of X into the income and substitution effects. Clearly label the old and new quantities of X and the income and substitution effects.



e. (4 pts.) Find the equation for Bob's demand for X as a function of P_x .

f. (3 pts.) Graph Bob's demand curve.



3. (9 pts.) Cindy can work at a wage of \$8 per hour, and she has no non-labor income. However, she is eligible for a welfare program which will pay \$300 per month if she has no earned income. If Cindy works her welfare check is reduced by 50 cents for every dollar she earns.

a. Draw Cindy's budget constraint for leisure and consumption with and without the welfare program.



b. Will the income effect of the welfare program increase or decrease Cindy's hours of work? Explain why.

c. Will the substitution effect of the welfare program increase or decrease Cindy's hours of work? Explain why.

d. What overall effect do we expect the welfare program to have on her hours of work? Explain why.

4. (8 pts.) Suppose the demand for gasoline is given by the equation:

$$Q^d = 5.4 - 0.65 \text{ Price} + 0.18 \text{ Median Income}$$

where Q^d is gallons purchased per week per household, the price is measured in dollars, and median income is measured in thousands of dollars. Currently the price of gasoline is \$2.80 and the median income is 48 thousand dollars. Find the price elasticity of demand and the income elasticity of demand.

5. A monopolist faces the demand curve $P = 80 - 0.2Q^d$. The monopolist's costs are $C(Q) = 20Q$.

a. (6 pts.) What price maximizes the monopolist's revenue?

b. (6 pts.) What price maximizes the monopolist's profits?

c. (6 pts.) Find the deadweight loss associated with the monopoly price.

6. (6 pts.) Dave also chooses between consumption and leisure. His utility function is

$$U = \frac{CL}{C+L}$$

Dave also has to satisfy two constraints. His Consumption cannot be more than his income. Dave has no non-labor income, and can work at a wage of \$12 per hour. Dave can choose how many hours he would like to work, he only has 168 hours available in a week, so his hours of leisure plus hours of work cannot exceed 168.

Solve this problem using Excel. Open a blank Excel file and set up the problem. Run Solver. Save the solutions in your eco401 folder and title the file CompsXX.xlsx where XX is your number (for example, if your number is 6 title the file Comps06.xlsx).

MACROECONOMICS

1. Consider the following model of the economy:

$$C = 200 + 0.75Y^D$$

$$Y^D = Y - tY$$

$$\text{tax rate } t = 10\%$$

$$G = 300$$

$$I = 250 - 25r$$

$$M^D/P = Y - 45r$$

$$M^S = 1000$$

$$P = 2$$

a) (5) Draw a graph of the Keynesian cross and write down the value of the multiplier. Show all your work. What happens to your graph if the government spending G is increased? Show it on your graph and give a brief explanation.

b) (5) Derive the IS equation.

c) (5) Derive the LM equation.

d) (5) A monetary expansion increases the M^S . Draw a graph of the IS/LM model and show what happens due to this monetary expansion. Explain what happens to equilibrium Y and r after the expansion (you don't have to calculate it).

e) (10) "Although the global crisis of confidence had come to an end, policy action continued on an international scale as governments sought to support market functioning and to cushion the blow of rapid economic contraction." –Bank for International Settlements, *79th Annual Report*, 2009.

The above statement describes policy actions taken by governments to address the financial crisis of 2007. But some economists don't think monetary policy is effective in the long run. Use a graph of the AD/AS model to show the short run effects of an expansionary monetary policy via open market purchase of bonds by the Federal Reserve. Then show what happens to the graph in the long run. Give a brief explanation as to what is going on. Also describe what happens to real GDP in the long run based on the monetary expansion.

2. (10) "I estimated a simple housing starts equation with the federal funds rate as the explanatory variable. The equation was estimated with quarterly data over the nearly 50-year period from the second quarter of 1959 to the second quarter of 2007. The model shows a strong, statistically significant effect of the federal funds rate on housing starts, which occurs with a lag."

–"Housing and Monetary Policy" by John B. Taylor. Housing, Housing Finance, and Monetary Policy: A Symposium Sponsored by the Federal Reserve Bank of Kansas City, 2007

Use the above statement to interpret the graph below from Taylor's paper. What conclusion can you draw about the relationship between monetary policy and the impact on the housing market?

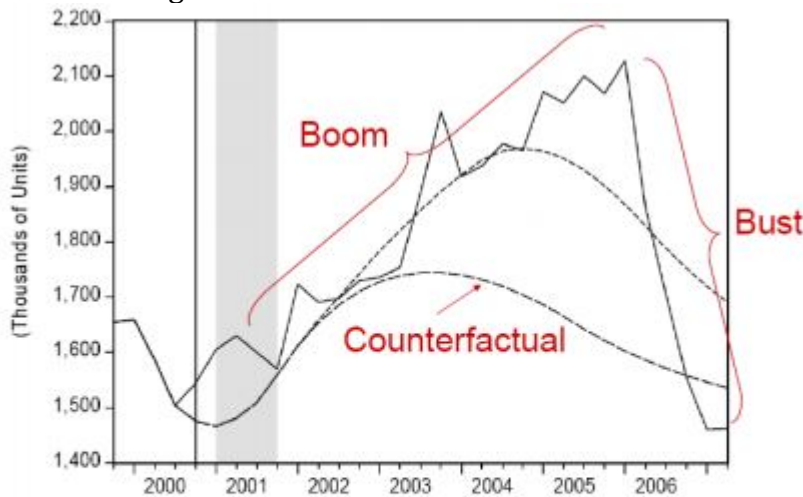
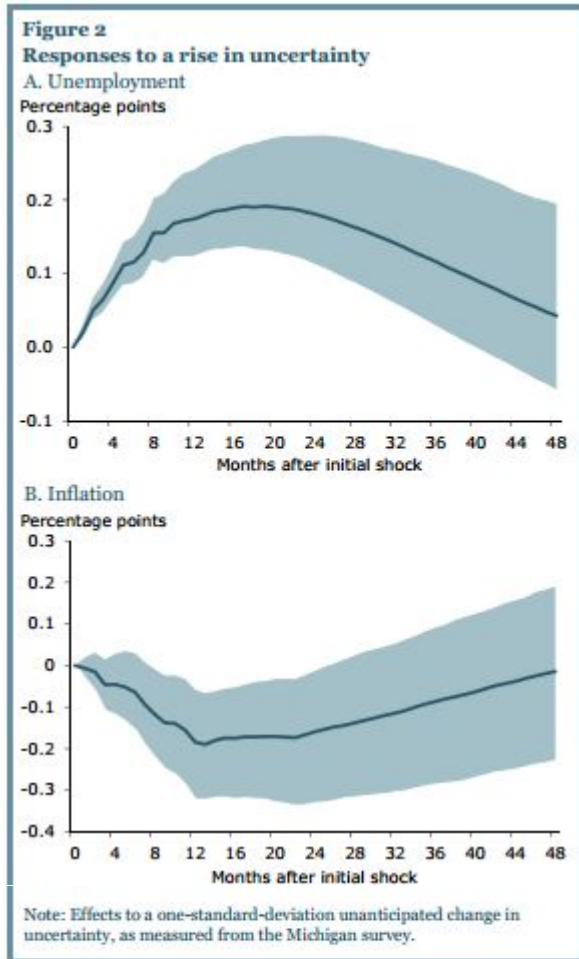


Figure 2. The Boom-Bust in Housing Starts Compared With the Counterfactual. (The line with shorter dashes shows *model* simulations with the actual interest rate.)

3a) (10) Using survey data from the University of Michigan survey of consumers, Leduc and Liu (2012)¹ estimated a model that includes consumers' perceived uncertainty (about the future of the economy), the unemployment rate, the inflation rate, and the three month Treasury bill rate. The model allows them to measure how an unexpected increase in uncertainty would affect unemployment and inflation. Below are two impulse response functions from their paper. Give an interpretation of these figures. What effect does an unexpected rise in uncertainty have on unemployment and inflation? How this effect similar to a shock to aggregate demand?



¹ "Uncertainty, Unemployment, and Inflation" by Sylvain Leduc and Zheng Liu, FRBSF Economic Letter, 2012

b) (5) "Policymakers typically try to counter uncertainty's economic effects by easing the stance of monetary policy." --"Uncertainty, Unemployment, and Inflation" by Sylvain Leduc and Zheng Liu, FRBSF Economic Letter, 2012

Discuss the role of monetary policy in addressing the uncertainty if the Federal Reserve is limited by the zero lower bound. How effective is monetary policy if the Fed is facing that limitation and what implications does it have for Leduc and Liu's model from part a)?

c) (5) What is the role of Quantitative Easing? Begin by defining what it is, and explain what effect it may have on interest rates. Be specific, and include an explanation of what impact it may have on the yield curve.

4. This question is about the Solow model for growth using a standard Cobb-Douglas production function, $Y = K^\alpha L^{(1-\alpha)}$.

a) (10) In the space below draw this economy's investment function if we assume that people save a fraction s of their income. Label it clearly. If a fraction δ of capital stock depreciates each year, draw this depreciation on your graph and show the steady state level of capital per effective worker in the graph.



b) (5) Say the government enacts a policy to set the savings rate such that the economy reaches the Golden Rule level of capital. Label the Golden Rule level of capital on your graph and define it.

c) (5) What is the growth rate of capital per worker in the steady state? Explain.

ECONOMETRICS

A great deal of research in empirical labor economics has focused on the effects of investment in human capital (especially education) and on-the-job training on wage rates. The theory of human capital asserts that people who possess greater human capital will have higher marginal products and therefore will earn a higher wage, *ceteris paribus*. Economists typically test this theory by acquiring data on individuals and then regressing wages on years of education and a host of control variables. They almost always find that education has a statistically significant and practically important positive effect on the wage rate.

However, there is a big problem with these analyses. As R.J. Willis writes, “a large literature addresses the issue of the extent to which the estimated rate of return [to education] is upward biased because ability is unobserved and ‘high ability’ individuals, on average, have higher schooling attainment than ‘low ability’ individuals.”² If this is the case, then regressions which include education as an independent variable but leave out ability may suffer from omitted variable bias, which is often called “ability bias” in this context. In this view, both ability and education and training increase marginal productivity. There are relatively few data sets which measure ability directly, but one is the National Longitudinal Survey of Youth, 1997 edition (NLSY97). In this exam, we’ll work data from the NLSY97 to estimate the return to schooling and job experience, with and without a measure of ability as a control variable.

The Data:

The NLSY97 has followed a sample of 8,984 people living in the United States from 1997 when they were initially interviewed to 2011-12 when they were most recently interviewed. The NLSY97 asks respondents about a very wide range of topics, including education, income, wealth, marital history, health, crime, and other topics. All the people in the sample were born between 1980 and 1984.³ We will work with data from the initial round and from the 2011 round. In the initial round of interviews, most respondents, who were then aged 12 to 18, took the ASVAB test which supposedly measures intelligence or ability. The ASVAB scores have been adjusted for the age of the test taker. We have restricted the sample to people who reported a wage in 2011 for whom we had data on their wage, their work experience, education, test scores, region of residence, whether there were kids in the household, and marital status. We also dropped people who reported wages under \$1 per hour and above \$255 per hour. Taken together, all this reduces the sample to only 3,904 persons.

² Willis, R.J. “Wage Determinants” Ch. 10 in Ashenfelter, Orley and Layard, Richard, (1986) *Handbook of Labor Economics*, Vol. 1, p. 534.

³ The sample is actually two samples combined into one, the first “a cross-sectional sample of 6,748 respondents designed to be representative of people living in the United States during the initial survey round and born between January 1, 1980, and December 31, 1984”, the second “a supplemental sample of 2,236 respondents designed to oversample Hispanic or Latino and black people living in the United States during the initial survey round and born during the same period as the cross-sectional sample.” See <https://www.nlsinfo.org/content/cohorts/nlsy97/intro-to-the-sample/nlsy97-sample-introduction-0>. We won’t worry about the fact that blacks and Hispanics are oversampled.

Here is a list of the variables we've included:

Name	Definition
hrlypay2011	the respondent's wage in \$/hr. as of the 2011 interview in his/her job #1 (some respondents have more than one job)
lnhrlypay	=ln(hrlypay2011)
expyrsteen	the number of years respondent worked as a teen (age <20) , measured as the number of weeks worked divided by 50
expyrsadult	the number of years the respondent has worked as an adult (age 20 or over) as of the 2011 interview , measured as the number of weeks worked divided by 50
educ	the respondent's years of education as of 2011
asvab	the respondent's score in percentile rank on the ASVAB test, a measure of ability which includes components covering Mathematical Knowledge (MK), Arithmetic Reasoning (AR), Word Knowledge (WK), and Paragraph Comprehension (PC)
black	=1 if respondent is black; 0 otherwise
hispanic	=1 if respondent is hispanic; 0 otherwise
married	=1 if respondent is married in 2011; 0 otherwise
urban	=1 if respondent lives in an urban area in 2011; 0 otherwise
east	=1 if respondent lives in the East region in 2011; 0 otherwise
northcentral	=1 if respondent lives in the North Central region in 2011; 0 otherwise
south	=1 if respondent lives in the South region in 2011; 0 otherwise
west	=1 if respondent lives in the West region in 2011; 0 otherwise
collegegrad	=1 if respondent has educ>15; 0 otherwise.

Note that respondents who are neither black nor Hispanic are overwhelmingly white. Below are summary statistics for the variables:

Variable	Obs	Mean	Std. Dev.	Min	Max
hrlypay2011	3904	18.29083	14.6083	1.04	254.55
lnhrlypay	3904	2.73041	.5661896	.0392207	5.539497
expyrsteen	3904	2.50521	1.452649	0	6.28
expyrsadult	3904	7.492111	2.484795	0	12.5
educ	3904	14.125	2.800708	6	20
asvab	3904	49.28703	29.10264	.108	100
black	3904	.2279713	.4195777	0	1
hispanic	3904	.1959529	.3969833	0	1
married	3904	.3852459	.4867157	0	1
urban	3904	.7879098	.4088407	0	1
east	3904	.15625	.3631387	0	1
northcentral	3904	.2220799	.4156978	0	1
south	3904	.392418	.4883515	0	1
west	3904	.229252	.4204055	0	1
collegegrad	3904	.3773053	.4847744	0	1

Open the file comps2015.dta. You will see these variables as well as others which we used to construct these variables. Execute this command:

Model 1: `reg lnhrlypay educ, robust`

{In Stata, just type the “`reg lnhrlypay educ, robust`” part}

1. (5 pts.) Interpret the coefficient estimate for the coefficient on educ of the ordinary least squares regression you just ran.

Recall that robust means that the estimated standard error adjusts for the possible presence of heteroskedasticity. We’ll use robust standard errors throughout this exam. Now let’s get to the central issue. Run the following regressions:

Model 2: `reg lnhrlypay educ asvab, robust`

Model 3: `reg asvab educ, robust`

2. (12 pts. total) Compare the results from Model 1 to those from Model 2.

(a) (8 pts) Explain as carefully as you can why the coefficient estimate on educ has changed in the direction that it did between Model 1 and Model 2. [Hint: you will want to use the result from Model 3 in your explanation—at least the qualitative result if not the quantitative.]

(b) (4 pts.) Policy makers want to know: What would happen to people’s wages if their educational attainment could be increased? If you were asked to choose between Model 1 and Model 2, which one would give a better (not necessarily a perfect) answer to this question? Explain.

Now let's introduce some other control variables. Run the following regression (which is for men only):

Model 4: reg lnhrlypay expyrsteen expyrsadult educ asvab black hispanic married urban northcentral south west if male==1, robust

3. (4 pts.) Interpret (i.e., explain what the numerical values tell us) the coefficient estimates from Model 4 for:

(a) expyrsadult:

(b) married:

4. (4 pts.) Someone looking at the coefficient estimate for married in Model 4 argues that "men who are married have extra motivation to get a good-paying job". What is another plausible explanation?

Now run the same regression, but this time for women only:

Model 5: reg lnhrlypay expyrsteen expyrsadult educ asvab black hispanic married urban northcentral south west if male==0, robust

You should discover that there are some interesting differences between the results of Models 4 and 5. To investigate matters further, we created the following interaction variables:

maleeduc=male \times educ
malepyrs=male \times expyrsadult
maleasvab=male \times asvab
malemarried=male \times married
maleblack=male \times black
malehispanic=male \times hispanic

Now run the following regression using these interaction variables:

Model 6: reg lnhrlypay expyrsteen expyrsadult educ asvab black hispanic married urban northcentral south west male maleeduc malepyrsadult maleasvab malemarried maleblack malehispanic, robust

There's a lot going on in Model 6, but we'll focus on education, ability, and job experience.

5. (6 pts.) What do the coefficient estimates and associated standard error estimates for `maleeduc`, `maleyrsadult` and `maleasvab` tell us? Consider each in turn.

Run the following probit regression (be sure to use `dprobit`):

Model 7: `dprobit collegegrad male black hispanic asvab, robust`

6. (4 pts.) Interpret the coefficient estimate and standard error for `male` in Model 7.

7. (5 pts.) Interpret the coefficient estimate and standard error for `asvab` in Model 7. In your opinion, is this coefficient estimate practically important? Explain your answer.