Economics Comprehensive Exam   **Your ID number _____**
January, 2014

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 5.e. and your Stata log from the Econometrics section. Save these files to your Caleb:Courses Eco 401 folder as CompsIDNumber.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. Ann works at an hourly wage of $12 per hour and has non-labor income of $50 per week. She has a time endowment of 168 hours per week. Consider two kinds of taxes, a 25% income tax and a lump-sum tax of $40.

   a.   (3 pts.) Graph Ann's budget constraint with no taxes.

   b. (3 pts.) Suppose we tax Ann's labor income at a rate of 25%. Graph Ann's new budget constraint.

c. (7 pts.) Show the income and substitution effects of the 25% tax on labor income on the graph.

d. (3 pts.) Suppose we impose a lump-sum tax of $40 per week. Graph Ann's new budget constraint.

e. (7 pts.) Show the income and substitution effects of the lump-sum tax on the graph.

f. (6 pts.) Which tax is likely to decrease hours of work more? Explain why.

2. A firm's capital stock is fixed in the short-run, and its short-run production function is

$$Q(L) = 60 \ln(L)$$

The firm is also a price-taker, and the price of its product is $100.

  a. (8 pts.) Suppose the firm operates in a perfectly competitive labor market and the wage is $12. What quantity of labor should the firm hire to maximize profits? Show your work.

  b. (8 pts.) Find the firm's labor demand curve as a function of wage.

3. Does the labor supply curve have a positive or negative slope?

  a. (8 pts.) Discuss this question theoretically: What does economy theory tell us we should expect, and why?

b. (8 pts.) Discuss this equation empirically: What have empirical studies of the labor market found about the response of labor supply to the wage?

4. Gronau, in the paper we discussed in class, assumed that individuals divide their time between work at home (H), market work (N), and consumption time (L). The consumer maximizes Z(X,L) where X is the sum of market goods (X_M) and home-produced goods (X_H). Both X_M and X_H are measured in terms of dollars. Suppose that Bob's household production function is:

$$X_H = 72 \ H^{1/2}$$

Bob can work at a wage of $12 per hour, and has non-labor income of $72. Bob's utility function is $Z = X^{1/2} \ L^{1/2}$. Bob has a total of 24 hours available.

a. (6 pts.) Assuming that his optimal bundle includes market work, how many hours should he work in household production? Show your work.

b. (10 pts.) Solve for Bob's optimal bundle (H, N, L, X_M, and X_H). Show your work.

5. Suppose that consumers value three things, the consumption good (X), leisure (L), and health (H). The consumer's utility function is U(X, L, H). Health is itself a function of both the health-promoting good (Y) and time spent promoting health (Z); H = H(Y, Z). The consumer has two constraints, a time constraint and an income constraint. The consumer has 168 hours in a week, and spends that time on three things: leisure (L), time spent promoting health (Z), and work hours (N). The consumer can work at a constant wage of $w per hour, and has non-labor income of $A. The consumer spends his money on X and Y. The price of X is $1 (i.e., X is the numeraire), and the price of each unit of Y is $p.

a. (4 pts.) Write out the Lagrangian for the consumer's maximization problem. Substitute the health function for H. Your Lagrangian should contain the variables X, L, Y, Z, and N.

b. (6 pts.) Write out all the first order conditions for this problem. (You don't have the specific functional forms, so use general notation for the derivatives, such as dU/dX.)

c. (3 pts.) Suppose that the consumer learns that the health-promoting good Y has a larger effect on health than he previously thought. What effect will this new knowledge (an increase in dH/dY) have on the quantity of X that he consumes? Explain why you reach this conclusion.

e. (10 pts.) Given the functional forms and parameters below, use Solver to find the optimal solution. Create your own Excel sheet to set up the problem. Run Solver, and save your solution in your Eco401 folder. Identify your file only with your number, e.g. Comps06.xlsx for ID Number 6; Ms. Sacco will move these files to a folder with your number on it.

HINT: Produce a clear, organized, worksheet. If Solver doesn't converge to a plausible answer, make sure you are using positive starting values and that you have correctly specified the constraint(s).

$U(X, L, H) = X(L-75)H$ and $H(Y,Z) = Y^{0.5} Z^{0.5}$

so $U(X, L, Y, Z) = X(L-75) Y^{0.5} Z^{0.5}$

Parameter values:
$w = 10$
$A = 100$
$p = 2$

MACROECONOMICS

6. A paper by Sahm, Shapiro, and Slemrod (2012) discussed a variety of fiscal policy changes to address economic downturns. Here is an excerpt.

> "Fiscal stimulus during economic downturns has been a prominent feature of economic policy in the first decade of the new millennium. Payments to households by different mechanisms have been central to these stimulus policies. In 2001, households received a tax rebate paid by paper check. In 2008, households received economic stimulus payments in the form of a paper check or electronic funds transfer. In 2009, working households had a reduction in income tax withholding corresponding to a tax credit…"

> > --"Check in the Mail or More in the Paycheck: Does the Effectiveness of Fiscal Stimulus Depend on How it is Delivered?" by Claudia R. Sahm, Matthew D. Shapiro, and Joel Slemrod, *American Economic Journal*, 2012.

Note that the 2001 rebate was part of a legislation to cut taxes permanently and "indeed it has been extended at least through 2012" (Sahm, Shapiro, and Slemrod, pp. 217-218).

a. (12 pts.) Draw a graph of the Keynesian cross to show the effect of the 2001 tax cut on the model. Explain briefly what happens after the tax cut and clearly label your graph (all intersections and critical points).

b. (12 pts.) Write a definition of the multiplier (including a general equation for it). Give a brief explanation for what role the multiplier plays in your analysis in part a).

c. (12 pts.) Use the AD/AS model to depict the impact of the stimulus payment in the short run and give an explanation. Briefly explain the effect of the stimulus payment on a household's consumption, the price level, and the real GDP.

d. (10 pts.) The 2001 legislation for a tax cut was intended to be permanent, and "it has been extended at least through 2012" (pp. 217-218. Sahm, Shapiro, and Slemrod).

Milton Friedman's permanent income hypothesis (PIH) suggests that current income is a sum of permanent income (the income that people expect to receive regularly in the future) and transitory income (income that people get randomly and do not expect to receive regularly).

What would the PIH say about the effectiveness of the 2001 tax cut legislation (if it were permanent as originally intended) versus the 2008 one-time stimulus rebate? Give a brief explanation of the impact of each on a household's consumption over its lifetime. Be sure to explain the role of time in the permanent income hypothesis.

e. (10 pts.) Define Ricardian Equivalence. Give a brief explanation on the effectiveness of the 2009 two-year tax credit if you apply Ricardian Equivalence to the issue.

7. Now let's move on to monetary policy. The authors state "the 2008 stimulus payment was designed to provide rapid stimulus in tandem with the sharp cuts in interest rates by the Federal Open Market Committee in order to head off a recession." (Sahm, Shapiro, and Slemrod, p. 218).

a. (12 pts.) What effect will an expansionary monetary policy have on the IS/LM model? Draw a graph and use it in your explanation.

b. (10 pts.) If the Federal Reserve is at the zero lower bound, what implications does this have for the effectiveness of monetary policy? Draw a graph of the IS/LM model and use it in your explanation.

c. (10 pts.) Discuss the role of the Taylor Rule in formulating monetary policy. Write down the equation for the Taylor rule and explain the relevance of each part of the equation.

d. (12 pts.) Here is an excerpt from a paper by Gagnon et al (2011), "Large Scale Asset Purchases by the Federal Reserve: Did They Work?"

> "In December 2008, the Federal Open Market Committee (FOMC) lowered the target for the federal funds rate to a range of 0 to 25 basis points. With its traditional policy instrument set as low as possible, the Federal Reserve faced the challenge of how to further ease the stance of monetary policy as the economic outlook deteriorated. The Federal Reserve responded in part by purchasing substantial quantities of assets with medium and long maturities in an effort to drive down private borrowing rates, particularly at longer maturities."

The authors hypothesize that the Large Scale Asset Purchase (LSAP) program helped to reduce market interest rates by reducing the supply to the private sector of assets with longer-term maturities. They estimate the following OLS regression model.

$tp_t^{10} = X_t \beta + \varepsilon_t$ where tp_t^{10} is the ten year Treasury yield, and X_t is a set of regressors including the following:

- Rate Expectations: Two variables that represent the expectation of future policy rates, including the Target Federal Funds Rate and the slope of the near-term Eurodollar futures.
- Cyclical Factors: Two variables that represent cyclical macroeconomic factors, including the unemployment gap and the core CPI.
- Uncertainty: Two variables representing uncertainty, including long run inflation disagreement and six month realized daily volatility of the 10-year treasury yield.
- Supply: Two variables representing the change in net public sector supply of longer term debt securities, as a percentage of nominal GDP.

(question continues on the next page)

Here is a table of regression output from their paper:

TABLE 4

Ordinary-Least-Squares Regression of Ten-Year Treasury Yield, December 1986 to June 2008

	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Constant	0.297	0.432	0.103	0.443	-0.013	0.513
Rate expectations						
Target fed funds	0.403***	0.114	0.424***	0.118	0.742***	0.114
Eurodollar slope	0.477*	0.214	0.478*	0.225	0.602*	0.273
Cyclical factors						
Unemployment gap	0.127	0.208	0.172	0.210	0.784***	0.198
Core CPI	0.378**	0.125	0.342**	0.131	0.163	0.157
Uncertainty						
Inflation disagreement	0.210	0.165	0.215	0.170	0.111	0.187
Realized volatility	1.057***	0.25	1.145***	0.27	1.340***	0.31
Supply						
Unadjusted	0.069***	0.014	—	—	—	—
Duration-adjusted	—	—	0.098***	0.023	—	—
Adjusted R^2	0.92		0.91		0.88	
Standard error of regression	0.45		0.46		0.53	
Number of observations	259		259		259	

Source: Authors' calculations.

Note: Newey-West standard errors with twelve lags.

***Statistically significant at the 1 percent level.
**Statistically significant at the 5 percent level.
*Statistically significant at the 10 percent level.

Look at the first column in the table above. If the LSAP (the change in net public sector supply of longer term debt securities as a percentage of nominal GDP) by the Federal Reserve was 12%, what was the estimated impact on the 10-year treasury yield? Calculate it in the space below. Give a brief explanation of whether the authors' hypothesis is supported or not.

ECONOMETRICS

The following questions are based on a paper entitled "Check in the Mail or More in the Paycheck: Does the Effectiveness of Fiscal Stimulus Depend on How It Is Delivered?" (2012) by Claudia R. Sahm, Matthew D. Shapiro, and Joel Slemrod (*American Economic Journal: Economic Policy*, (2012), 4(3): 216–250). Here is the abstract for the paper:

Recent fiscal policies, including the 2008 stimulus payments and the 2009 Making Work Pay Tax Credit, aimed to increase household spending. This paper quantifies the spending response to these policies and examines differences in spending by whether the stimulus was delivered as a one-time payment or as a flow of payments from reduced withholding. Based on responses from a representative sample of households in the Thomson Reuters/University of Michigan Surveys of Consumers, the paper finds that the reduction in withholding in 2009 boosted spending at roughly half the rate (13 percent) as the one-time payments (25 percent) in 2008.

Here is the background: At least three times between 2001 and 2009 Congress attempted to stimulate the economy by sending money to tax payers. Standard theory says that the more individuals spend out of a tax cut, the greater the boost to the economy. However, the delivery mechanism may make a difference. "In 2008, households received economic stimulus payments in the form of a [one-time] paper check or electronic funds transfer [usually $600 for individuals and $1,200 for married couples]. In 2009, working households had a reduction in income tax withholding corresponding to a tax credit [of $400 for singles and $800 for married couples], while retiree households received a one-time payment [of $250]" (p. 216). The fact that the stimulus money for working households went through withholding meant that instead of receiving the $400 or $800 in one lump sum, taxpayers saw their income tax withholding decline by $44 per month for singles and $67 per month for married couples for nine to twelve months. Sahm et al. are interested in whether the manner in which the federal government pays individuals makes a difference in terms of how much of the payment they decide to spend.

The data in the paper come from three waves of the Thomson Reuters/University of Michigan Surveys of Consumers. In the two 2008 waves (May/June and November/December) consumers were asked about the 2008 one-time payments; in the May/July survey consumers were once again asked about the 2008 stimulus payments but also about the 2009 reduction in withholding for working taxpayers, the 2009 one-time payment of $250 to retirees, and finally about their reaction to a hypothetical one-time payment of $250.

The survey questions were all very similar to this one, for 2009:

Under this year's economic stimulus program, most workers will receive an income tax credit. The tax credit will, in most cases, be four hundred dollars to eight hundred dollars per household this year and next. The tax credit will reduce the amount of taxes withheld from paychecks. As a result, take-home pay may increase as much as sixty-seven dollars per month for married workers or forty-four dollars per month for single workers. Thinking about your (family's) financial situation this year, will this income tax credit lead you **mostly to increase spending, mostly to increase saving, or mostly to pay off debt***?*

The authors cite research which shows that answers to survey questions on what people claim they actually did with stimulus payments correspond to their actual behavior: if people say they spent most of the stimulus payment, they probably did so.

Table 1 from the paper summarizes how people who were surveyed said they responded to the real and hypothetical stimulus payments:

TABLE 1—DISTRIBUTION OF RESPONSES TO STIMULUS

| | 2008 Tax rebate | | | 2009 Policies | | |
| | | | | Lower withholding | Hypothetical payment | Retiree payment |
Survey date	May/June 2008	Nov./Dec. 2008	May/July 2009	May/July 2009		
Percent of stimulus recipients						
Mostly spend	19	22	25	13	23	30
Mostly save	27	23	25	33	31	29
Mostly pay debt	53	55	50	54	46	41
Percent of all respondents						
Did not receive	9	19	20	34	34	66
Did not know use/receipt	2	3	3	3	1	1

Notes: Authors' weighted tabulations of the Thomson Reuters/University of Michigan Surveys of Consumers. All tabulations and regressions in the paper use the household head weight, which is nonzero for household heads or their spouses. This is the same weight used in the Index of Consumer Sentiment that is published monthly from the survey results. There were 982 adult-household heads or spouses who participated in the May/July 2009 surveys, 990 in the November/December 2008 surveys, and 980 in the May/June 2008. Tabulations of stimulus recipients in the top panel exclude individuals who did not report a planned use for the stimulus payment.

Notice that the percentages quoted in the abstract are circled in this table. Most of the rest of the paper is devoted to this question: ***why did people react differently to the two types of stimulus payments***? In particular, was it the worsening in economic conditions between 2008 and 2009 which caused people to spend less? Was it instead the difference in the way the payments were made? Or was it something else?

In their analysis, the authors lump together two of the answers to the basic survey question. They treat mostly save and mostly pay debt as being essentially equivalent. This allows them to create a dummy variable called **spend** which equals one if the tax payer replied that he or she had used the stimulus payment "mostly to increase spending" and zero if he or she said either "mostly to increase saving" or "mostly to pay off debt." Note that paying off debt and saving are essentially equivalent because both increase a person's net worth.

The authors note that the recipients of the 2008 tax rebate were somewhat different from those who received the 2009 reduction in withholding. This table describes some of the differences:

TABLE 4—DEMOGRAPHICS OF STIMULUS RECIPIENTS IN 2009 SURVEYS

	Percent of stimulus recipients	
Percent of stimulus recipients	2009 tax credit: lower withholding	2008 tax rebate
Age of respondent		
Under 40	31	24
40–64	62	50
65 and over	8	26
Household income		
Under $35,000	21	32
$35,001 to $75,000	35	35
More than $75,000	44	33
Personal finances compared to a year ago		
Better	24	20
Same	21	25
Worse	55	54

Note: Authors' weighted tabulations of the May and July 2009 Surveys of Consumers.

8. (5 pts.) Give a quick one sentence description, based on the table above, of how the recipients of the two stimulus schemes differed from each other, using adjectives but no numbers.

Definitions of Variables

withd: a dummy variable equal to 1 if the tax payer received the stimulus payment via a reduction in withholding and 0 if the tax payer received the stimulus payment in a one-time payment. **withd equals 0 for the 2008 tax rebate and equals 1 for the 2009 tax credit.**

agegt64: a dummy variable equal to 1 if the tax payer is older than 64 and 0 if the tax payer is younger than 65.

hypo: a dummy variable equal to 1 if the tax payer was responding to a question about a hypothetical payment and 0 if the tax payer if the tax payer was responding to a question about an actual payment

ylt20: a dummy variable equal to 1 if the tax payer's household income was $20,000 or less, 0 otherwise.

y20to35: a dummy variable equal to 1 if the tax payer's household income was between $20,001 and $35,000, 0 otherwise.

y35to50: a dummy variable equal to 1 if the tax payer's household income was between $35,001 and $50,000, 0 otherwise.

y50to75: a dummy variable equal to 1 if the tax payer's household income was between $50,001 and $75,000, 0 otherwise.

y75andup: a dummy variable equal to 1 if the tax payer's household income was more than $75,000, 0 otherwise.

worse: a dummy variable equal to 1 if the tax payer reported being worse off financially this year than last year.

Regression Analysis

Open the file comps2014.dta. We'll run some regressions, much simpler ones than those in the paper. Create a log file:
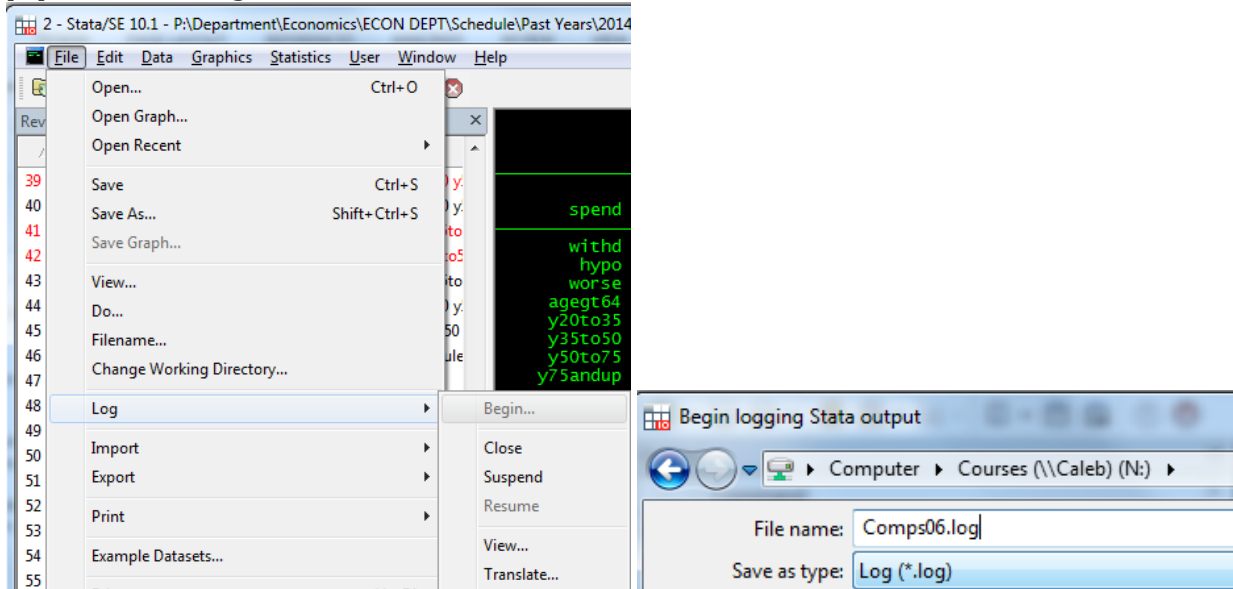
Execute this command:

     Model 1: reg spend withd, robust   {In Stata, just type the "reg spend withd, robust" part}

The paper says "All coefficients in the table are multiplied by 100, so the estimates are expressed in percentage points." Thus a value of -20 for the coefficient on withd would indicate that the value of the dependent variable spend is 20 percentage points lower (or 0.2 lower in decimal terms) when withd equals 1 than when withd equals 0.

9. (5 pts.) Interpret the coefficient estimates of the ordinary least squares regression you just ran.

Now run the following regression:

Model 2: reg spend withd agegt64, robust

10. (5 pts.) Interpret the coefficient estimate for agegt64 in Model 2.

11. (10 pts.) Give an explanation for why the coefficient estimate for withd is smaller in absolute value in Model 2 than in Model 1. [HINT: Use Table 4 on the previous page in your answer.]

Run the following regression:

 Model 3: reg spend withd hypo worse agegt64 y20to35 y35to50 y50to75 y75andup worse, robust

12. (10 pts.) Explain why Model 3 is preferable to Model 1 when the research question is, Why did people react differently to the two types of stimulus payments?

Finally, run the following probit regression:

Model 4: dprobit spend withd hypo worse agegt64 y20to35 y35to50 y50to75 y75andup worse, robust

13. (5 pts.) How does dprobit make it possible to compare probit to OLS results in dummy dependent variable models?

14. (10 pts.) Why are probit models often preferred to OLS models when dealing with dummy dependent variables?

15. (10 pts.) Do the regressions you have run make a strong case that the method of delivery affects the spending response to stimulus payments? Explain your answer.