

Name \_\_\_\_\_ last 4 PSU ID \_\_\_\_\_

Section 001 - MWF 11:15 am - 12:05 pm : 10 Sparks Building

Section 007 - MWF 9:05 - 9:55 am : 112 Kern Building

Spring 2012 Chuderewicz

YOU MUST USE THIS AS A TEMPLATE – **NOTEBOOK PAPER IS NO LONGER ACCEPTED - MAKE SPACE FOR YOUR ANSWERS BY HITTING ENTER** (you certainly don't need to type this assignment)– LEAVE THE QUESTIONS AS THEY ARE – AND **PLEASE STAPLE!** ALSO, PLEASE **PUT THE FIRST TWO LETTERS OF YOUR LAST NAME IN THE TOP RIGHT HAND CORNER** OF THIS PAGE SO THAT WE CAN ALPHABETIZE THESE EASILY. THANKS IN ADVANCE!

Economics 304

Homework #3 – Dagwood and Homer and the Savings Function

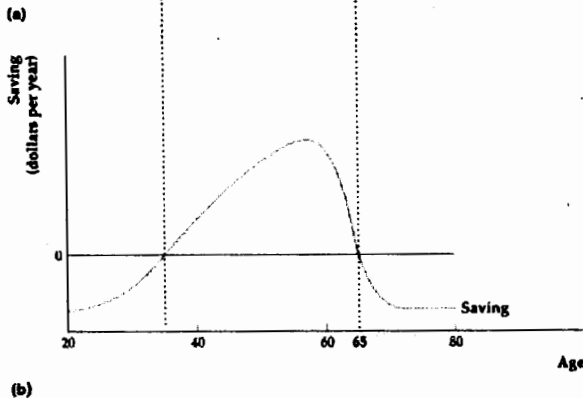
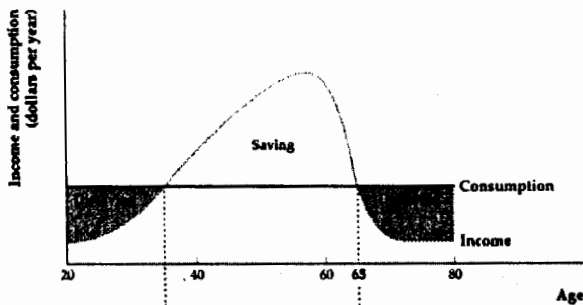
**Due Wednesday, 2/8 at the beginning of class – you must hand in homework in the section you are registered in - no late papers accepted!**

**Instructions: Please show all work or points will be taken off. Good luck!**

This HW assignment is very relevant to the Great Recession experienced in the US from December 1997 - June 1999. In particular, we experience a significant and negative wealth shock and map out how this effects the consumption decisions of households. We let the Fed 'come to the rescue' and lower real rates of interest to extremely low (and negative) levels, much like they did during the Great Recession! It is here that we can really see how and why consumers react differently to a change in real interest rates based on whether they are a saver or a borrower. The intuition is hopefully clear: the saver, Dagwood in what follows, is **worse off** due to the fall in real rates and Homer, our borrower, is **better off** due to the lower real rates. This homework also addresses the net (aggregate) effect on consumption in an economy that consists of both savers and borrowers (like economies do), and also considers the outcome if the borrowers become credit constrained, like many are given that so many mortgages are under water, much in line from the excerpt below (Click [Here](#) for entire article). We conclude by considering the idea that the Fed may be making matters worse with their zero interest rate policy.

*Edward Harrison at Credit Writedowns describes the Fed's zero interest rate policy as "toxic," noting that it is a transfer from savers and fixed-income investors to borrowers. On net, this is stimulative if the spending propensities of the latter exceeds that of the former, but the willingness of the borrowers to spend is constrained by weak household balance sheets. The Fed is thus pushing on a string, and possibly even making matters worse by reducing the income flow to households.*

1. (30 points total). Suppose we have Dagwood, who has a current income of \$300K and expected future income of \$100K. He has \$100K in current wealth (i.e., 'a' = \$100K), but this is before he opens that #@\$% envelope. He has zero expected future wealth.



Dagwood's behavior is consistent with the life-cycle theory of consumption. For one, he perfectly smoothes consumption and two, since he is in his peak earning years, he is saving now so that he can maintain his current level of consumption in the future. Given that Dagwood faces a real interest rate of 0.05, answer the following questions.

a) (5 points) Calculate Dagwood's optimal consumption bundle showing all work. Then draw a **completely labeled** graph (the two period consumption model) depicting this initial optimal consumption bundle as point  $C^*_A$  (please use the space below). Note, for all  $C^*$  calculations, round down to one decimal point.

(10 points for a completely labeled graph – be sure to label the no

lending / no borrowing point = NL/NB)

$$Y = 300k, Y^f = 100k, a = 100k, a^f = 0$$

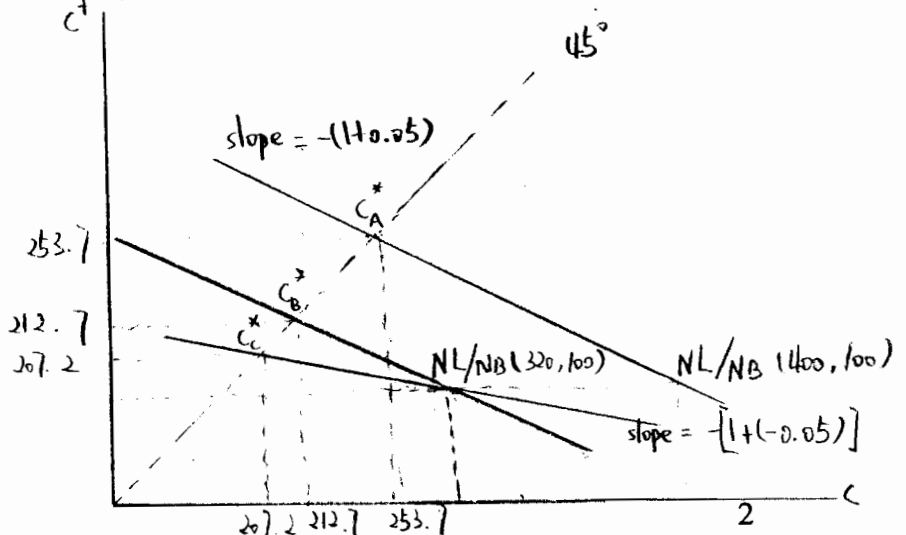
$$r = 0.05$$

$$PVLC = PVLR$$

$$C^* = \frac{[(1+r)(Y+a) + Y^f + a^f]}{2+r}$$

$$C^*_A = \frac{[(1+0.05)(300+100) + 100 + 0]}{2+0.05}$$

$$= 253.7k$$



b) (5 points) Now Dagwood can't help himself and opens up that envelope and "ouch" he says, his "a" or current wealth has lost eighty percent (80%) of its value and thus falls from \$100K to \$20K. Recalculate Dagwood's 'new' optimal consumption point and label on your graph as point C\*B. Is Dagwood worse off or better off? Explain (hint, what has happened to his budget constraint (aka opportunity set)).

$$a = 20k$$

$$C_B^* = \frac{[(1+0.05)(300+20) + 100 + 0]}{2+0.05}$$

$$= 212.1k$$

Dagwood is worse off. When his wealth falls from 100k to 20k, his current and future spending equilibrium point shifts to the left, which decreases the budget constraint.

### THE FED TO THE RESCUE!



c) (5 points) In steps Ben Bernanke and the Fed and they conduct massive amounts of open market purchases and get the real rate of interest all the way down to  $-0.05$  (negative 5% =  $-0.05$ ). Recalculate the optimal bundle for Dagwood and add this point to your graph and label as point C\*C. (Note, point C\*C incorporates the shock to wealth in part b))

$$r = -0.05$$

$$C_C^* = \frac{[(1-0.05)(300+20) + 100 + 0]}{2-0.05}$$

$$= 207.2k$$

d) (5 points) Is Dagwood better or worse off due to the fall in the real rate of interest? Explain being sure to discuss exactly how the substitution and income effects play a role here. Be sure to **define** what the income and substitution effects are and how they play a role in Dagwood's decision to alter his previously optimal bundle (we are comparing part b) to part c)). Also, comment on whether these income and substitution effects work in the same or opposite direction (i.e., is it a tug of war or do they work in the same direction?) in this particular case.

Dagwood is worse off due to the fall in the real rate of interest. The substitution effect of real interest rates on savings reflects the

tendency to reduce current consumption and increase future consumption  
 The income effect shows the change in current consumption when a higher real interest rate makes consumers rich or poor. On the saver side, the income and substitution effects work in opposite directions. Income effect reduces consumption and substitution effect raises consumption. In this case, the income effect dominates as he reduces consumption and raises savings, and becomes poorer.



2. (NEW GRADER) (30 points total) Dagwood's neighbor, Homer Simpson, does not abide by the life cycle theory of consumption. Homer has a "let's live life like it's our last day" mentality and thus, he prefers to consume more today, relative to the future. In particular, Homer prefers to consume exactly twice as much today (c), relative to consumption next



period ( $c^f$ ). Homer's current income equals \$200K and his future expected income = \$200K. He has no wealth (neither current nor expected) since he lives like today is his last! Homer faces a real interest rate of 0.05. Please answer the following questions.

a) (5 points) Solve for Homer's optimal consumption basket today ( $C^*$ ) and his optimal consumption basket next period ( $C^{f*}$ ). Please provide a completely labeled graph depicting these results and label this point as  $C^*_A$ .

(10 points for a completely labeled graph – be sure to label the no lending / no borrowing point = NL/NB)

$$Y = 200k, Y^f = 200k, a = 0, a^f = 0, r = 0.05$$

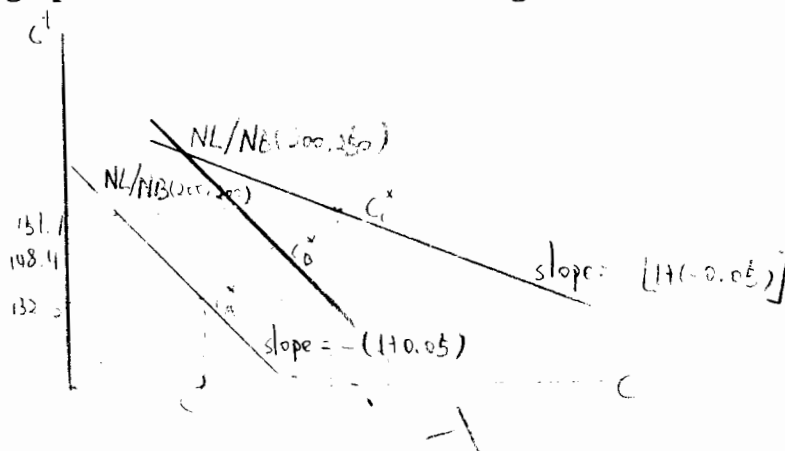
$$C = 2C^f, C^f = C^x$$

$$PVLC = PVLR$$

$$C^x = \frac{[(1+r)(Y+a) + Y^f + a^f]}{3+2r}$$

$$= 132.3k = C^f$$

$$C = 2C^x = 264.6k$$



Now Homer, of course, is not affected by the crashing market since he has no envelope to open!

b) (5 points) Homer goes to work and the rumor being spread around the work place is that future demand is increasing as Homer works in the 'green energy' field and business (grants, etc) has never been better. As a result, Homer revises his estimate of future income ( $y^f$ ) up to \$250K (his current income is not effected). Recalculate the optimal bundle for Homer and add this point to your graph and label as point  $C^*_B$ . Is Homer

worse off or better off? Explain (hint, what has happened to his budget constraint (aka opportunity set)).

$$y^f = 250k$$

$$C_B^* = \frac{[(1+0.05)(200+0) + 250+0]}{3 + 2(0.05)}$$

$$= 148.4k = c^f$$

$$C = 2C_B^* = 296.8k$$

Homer is better off. When his expected future income rises from 200k to 250k, his future consumption increases, so the budget constraint shifts to the right.

### THE FED TO THE RESCUE!



c) (5 points) In steps Ben Bernanke and the Fed and they conduct massive amounts of open market purchases and get the real rate of interest all the way down to  $-0.05$  (negative 5% =  $-0.05$ ). Recalculate the optimal bundle for Homer and add this point to your graph and label as point  $C^*c$ . (Note, point  $C^*c$  incorporates the shock to Homer's future income in part b)).

$$r = -0.05$$

$$C_c^* = \frac{[(1-0.05)(200+0) + 250+0]}{3 + 2(-0.05)}$$

$$= 151.7k = c^f$$

$$C = 2C_c^* = 303.4k$$

d) (5 points) Is Homer better or worse off due to the fall in the real rate of interest? Explain being sure to discuss exactly how the substitution and income effects play a role in Homer's consumption decisions.

Homer is better off due to the fall in the real rate of interest. According to the definition, substitution effect reflects the tendency of consumer to reduce current consumption and save for future, while income effect reflects the change in consumption depending on consumer's becoming rich or poor. On the borrower side, the income and substitution effects work in the same direction. In this case, as the real interest rate falls, current consumption increases. And he feels richer and the future cost of consumption falls.

NEW GRADER

3. a) (30 points total) What is the net effect of this expansionary monetary policy (i.e., negative real rates of interest) on consumption, all else constant? To answer this question, assume we have an equal amount of "Dagwoods" and "Homers" so we can simply add the change in Dagwood's consumption to the change in Homer's consumption. Please give the actual change in consumption, given this expansionary policy.

$$\Delta C_D = 207.2 - 212.7 = -5.5k$$

$$\Delta C_H = 303.4 - 296.8 = 6.6k$$

$$\Delta C_D + \Delta C_H = 1.1k$$

The net effect of this expansionary monetary policy is that both Dagwoods and Homers became better off and they increase their consumption by 1.1k

b) (10 points) Now consider the case where Homer is credit constrained and thus, cannot qualify for cheap loans since his balance sheet is a wreck. As such, the real rate of interest that Homer faces is 10% ( $r = 0.10$ ), and not the ultra low negative real rate =  $-.05$  that Dagwood (who has a solid balance sheet) faces. Please re-answer part a) above, assuming that Homer faces a real rate of 0.10 and Dagwood faces a real rate of  $(-.05)$ . Use the actual numbers, that is, add the change in Dagwood's consumption (you already did this in 3a)) to the change in Homer's consumption, given that he faces a real rate of 0.10, all else constant (i.e., after his  $y^f$  rose). Are your results consistent with this pic (click [Here](#))? Why or why not?

We are now going to derive and draw (depict) two desired savings functions for Homer and Dagwood respectively. Note importantly that **savings** in the present context is **defined simply as  $y - c$ , that is, current income minus current consumption**. Note also that savings can be positive or negative, it depends on whether you are a saver or borrower. In this assignment, Homer is the borrower so his savings is negative where Dagwood is the saver, and thus, his savings are positive. To derive a savings function we let real interest rates vary and map out the corresponding change in desired savings, all else constant.

$$\Delta C_D = -5.5k$$

$$C_D^* = \frac{((1+0.1)(200+0) + 50+0)}{3+2(0.1)}$$

$$= 146.9k$$

$$c = 2C_D^* = 293.8k$$

$$\Delta C_H = 293.8 - 296.8 = -3k$$

$$\Delta C_D + \Delta C_H = -8.5k$$

The results are consistent with the pic. Since Homer is credit constrained and he is a borrower, when the real interest rate increases, he becomes poorer, so he will decrease current consumption, which is consistent with the fall of personal consumption expenditure during the recession

c) Using the results from 1 b) and 1 c), where  $a = \$20K$ , derive the desired savings function (for Dagwood) labeling the point from 1b) as point A and the results from 1c) as point B. Connect the points and we have the savings function for Dagwood. **Make sure you put in parentheses next to the savings function what we are holding constant and show your work.**

(5 points for a completely labeled graph – be sure put all the relevant shift variables in brackets next to the  $S^d$  as we did in class)

We now move on to the results for Homer. We are going to do the exact same exercise that we did for Dagwood. Note that since Homer is a borrower, his savings is negative and thus, all points in the diagram will be left of the origin.

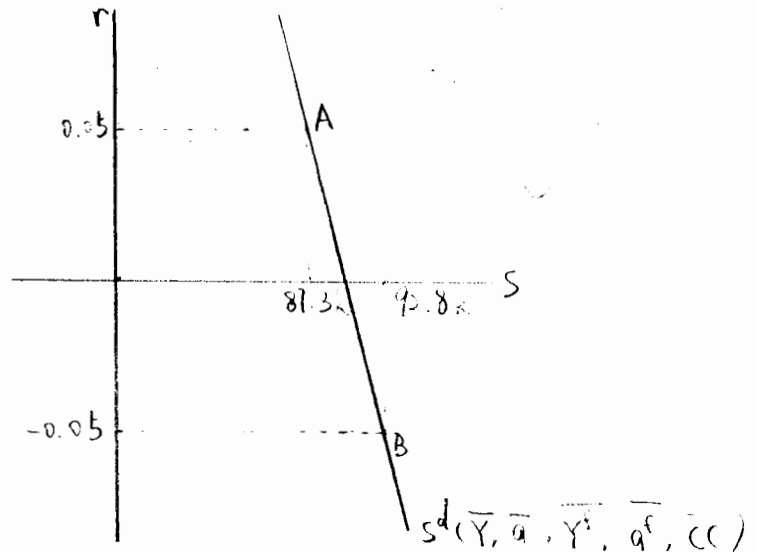
$$S = Y - C$$

$$1b). Y = 300k, C = 212.7k, r = 0.05$$

$$S_A = 87.3k$$

$$1c). Y = 300k, C = 207.2k, r = -0.05$$

$$S_B = 92.8k$$



d) Using only the results from 2b) and 2c), where  $y^f = \$250K$ , derive the desired savings function (for Homer) labeling the point from 2 b) as point A and the point from 2c) as point B. Connect the points and we have the savings function for Homer. **Make sure you put in parentheses next to the savings function what we are holding constant.**

5 points for a completely labeled graph – be sure put all the relevant shift variables in brackets next to the  $S^d$  as we did in class and please show your work.

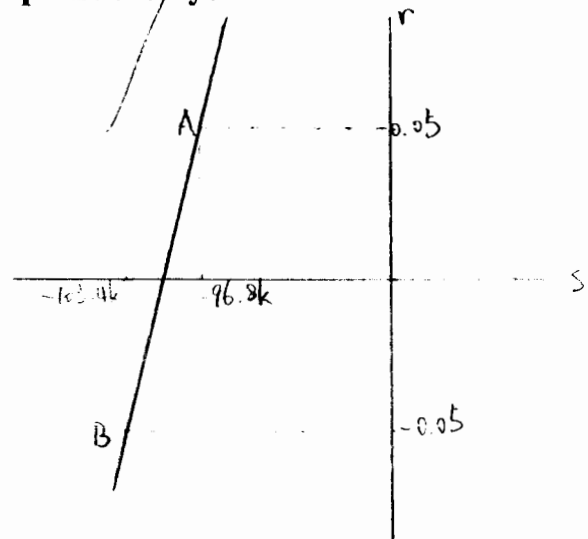
$$S = Y - C$$

$$2b). Y = 200k, C = 296.8k, r = 0.05$$

$$S_A = -96.8k$$

$$2c). Y = 200k, C = 303.4k, r = -0.05$$

$$S_B = -103.4k$$



e) (5 points) . Suppose you were Ben Bernanke's cousin and was head of the central bank in an economy filled with Dagwoods (savers). Suppose also that your economy was in a recession and you wanted to stimulate consumption today as part of your dual mandate (try to get the economy to grow at potential). Suppose the current real rate of interest is zero. Would you raise or lower real interest rates to stimulate consumption? Explain in detail using the substitution and income effects.

Since Dagwood is a saver, the interest rate should be raised to stimulate consumption. When interest rate rises, saver becomes richer and will increase consumption. The income effect shows that savers consume more and save less in response to an increase in interest rate. Substitution effect shows the tendency of consumers to save more and substitute towards future consumption from current consumption. In this case, the income effect dominates and income and substitution effects work in opposite directions

1) -0  
2) -1  
3) -0  
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39