# Econ 302 Intermediate Macro Handout 2

April 21, 2016

## Chapter 16 - Consumer Behavior

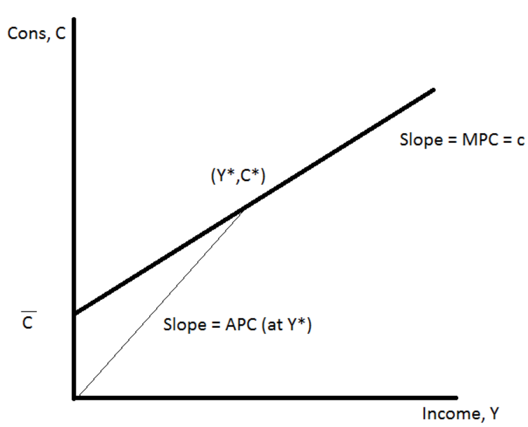
Previously, we have talked about the role consumer spending, $C(Y-T)$, plays in determining aggregate demand ($Y = C(Y-T) + I(r) + G + NX$). As consumer spending is two-thirds of GDP, we ought to consider more carefully the microeconomics of consumer spending.

### Keynesian Consumption Function

Thus far, the particular functional form we have given the consumption function is linear:

$$C = \overline{C} + cY$$

where $\overline{C}$ is *autonomous spending* and $c$ is the *marginal propensity to consume*. Note that here we write $Y$ for disposable income (instead of $Y-T$) for notational convenience. Graphically, this looks like:




Two important features of this consumption function are that MPC is constant and *average propensity to consume*, APC, is decreasing in $Y$.

$$MPC = \frac{\partial C}{\partial Y} = c$$
$$APC = \frac{C}{Y} = \frac{\overline{C}}{Y} + c$$

This matches Keynes's observation that the rich (high $Y$) consume a lower percentage of their income ($APC$) than the poor.

## Intertemporal Choice (Fisher)

### Intertemporal Budget Constraint

Keynes's model is elegant and matches some facts, but we also think that people are *forward-looking*. When deciding how much to consume today, you consider your future income. Further, people *smooth consumption across time*. Thus, in modeling a consumer's behavior, we need to take into account their income today and their income tomorrow (here we consider a two-period model). This gives rise to the *intertemporal budget constraint*:

$$C_1 + \frac{C_2}{1+r} = Y_1 + \frac{Y_2}{1+r}$$

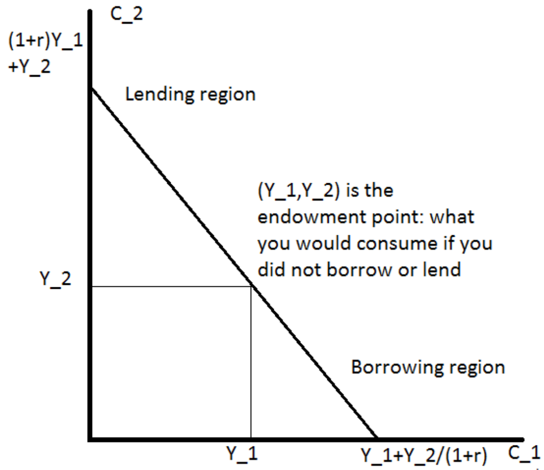
The left-hand side is the present value of consumption, and the right-hand side is the present value of income. $r$ is the interest rate.

To motivate the idea of present value, consider the quantity $\frac{Y_2}{1+r}$. $Y_2$ is the amount of income the agent will make tomorrow. What if the agent wanted to consume it all today? He would ask a lender to give him money now and promise to pay the lender $Y_2$ tomorrow. The question is: how much will the lender give him to get $Y_2$ tomorrow? Call this quantity $X$. The lender gives up $X$ today to get $Y_2$ tomorrow. But what is the opportunity cost of giving up $X$? If the interest rate is $r$, the lender could put $X$ in the bank and get $(1+r)X$ tomorrow. Thus in equilibrium, the lender will be indifferent between putting $X$ in the bank and giving our agent $X$ in anticipation of $Y_2$ tomorrow. So it must be that

$$(1+r)X = Y_2 \Longleftrightarrow X = \frac{Y_2}{1+r}$$

Since the agent can transform his $Y_2$ tomorrow into $X = \frac{Y_2}{1+r}$ today, $\frac{Y_2}{1+r}$ is the *present value* of $Y_2$ tomorrow.

Given that income can be moved across periods at the rate $1+r$, we can simply think of consumption today $C_1$ and consumption tomorrow $C_2$ as *two different goods with the price* $1+r$. We can depict the intertemporal budget constraint as the set of all possible consumption points given an interest rate $r$:

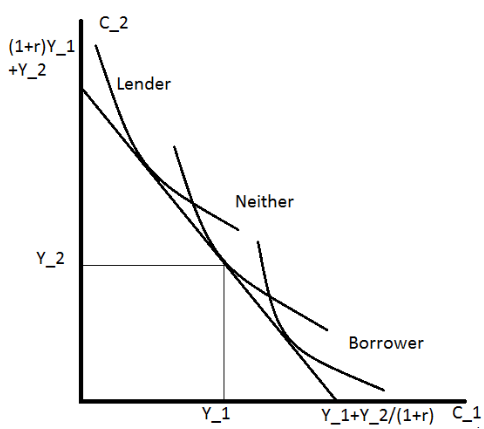



### Optimization

Whether an agent ends up being a borrower, lender, or neither depends on *preferences*. We depict preferences as *indifference curves*. An indifference curve is the set of points that yield the same utility. If our utility function is $U(C_1, C_2)$, then an indifference curve for the level of utility $\overline{u}$ is:

$$\{(C_1, C_2) \colon U(C_1, C_2) = \overline{u}\}$$

In this case, consumption points to the northeast are preferable: northeast means more $C_1$ *and* more $C_2$. So an agent will choose a point on the budget line that just barely touches (is tangent to) the furthest indifference curve to the northeast. Below we see three examples of three consumers optimizing:




We see that whether they borrow or lend (or neither) depends on the optimization given their preferences.

**Exercise**

1. How does an increase in first period income ($Y_1$ increases) affect the choices of a borrower versus a lender?
2. How does an increase in the interest rate affect the choices of a borrower versus a lender?

**Life-Cycle Hypothesis (Modigliani)**

In addition to the insight that consumers are forward-looking and smooth consumption over time, we think that people plan their consumption such that they will have resources in retirement.

Consider an agent with wealth $W$ and yearly earnings of $Y$ who lives for $T$ periods and will retire in $R$ years. Then his total lifetime income is $R \times Y$ and thus total lifetime resources are $W + R \times Y$. If the agent wants to perfectly smooth consumption, then yearly consumption will be:

$$C = (W + R \times Y)/T$$

**Permanent Income Hypothesis (Friedman)**

We can decompose income into two components: *permanent income* and *transitory income*:

$$Y = Y^P + Y^T$$

Milton Friedman thought that consumption mostly depended on the permanent component. Thus a consumption function might look like

$$C = \alpha Y^P$$

This gives an APC of

$$APC = C/Y = \alpha Y^P/Y$$

So in the data, it might look like higher income households have a lower $APC$, but this could be driven by the fact that, in a good year $Y^T$ goes up and thus the household is richer, but since $Y^P$ did not change, the household did not spend any more than before the increase in transitory income.

## Exercises

**Mankiw 16.4** Explain whether borrowing constraints increase or decrease the potency of fiscal policy to influence aggregate demand in each of the following cases:

1. A temporary tax cut
2. An announced future tax cut

**Mankiw 16.8** This problem uses calculus to compare two scenarios of consumer optimization:

1. Nina has the following utility function

   $$U = \ln(C_1) + \ln(C_2) + \ln(C_3)$$

   She starts with wealth of $120,000$, earns no additional income, and faces a zero interest rate. How much does she consume in each period? (Hint: the marginal rate of substitution between consumption in any two periods is the ratio of marginal utilities.)

2. David is just like Nina, except he always gets extra utility from present consumption. From teh perspective of period one, his utility function is

   $$U = 2\ln(C_1) + \ln(C_2) + \ln(C_3)$$

   In period one, how much does David decide to consume in each of the three periods? How much wealth does he have left after period one?

3. When David enters period two, his utility function is

   $$U = \ln(C_1) + 2\ln(C_2) + \ln(C_3)$$

   How much does he consume in periods two and three? How does your answer here compare to David's decision in part (b)?

4. If, in period one, David were able to constrain the choices he can make in period two, what would he do? Related this example to one of the theories of consumption discussed in the chapter.