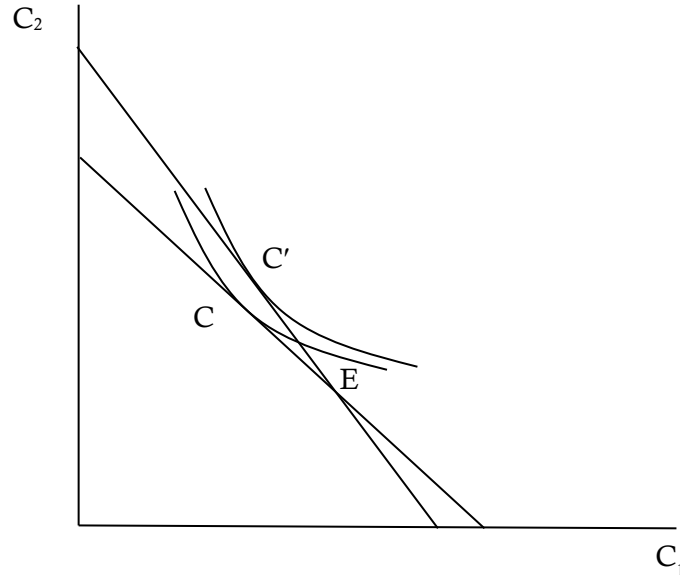


Practice problems covering Chapters 6 & 7

1. Draw a budget-constraint/indifference-curve diagram to illustrate each of the following situations with current consumption (C_1) on the horizontal axis and future consumption (C_2) on the vertical axis. You should assume that the person is approximately a consumption smoother, so that whether she is initially a saver or dissaver (borrower) is determined mainly by her endowment point. Be sure to identify clearly the endowment point, the budget constraints before and after the change, and the amounts saved or dissaved before and after the change.

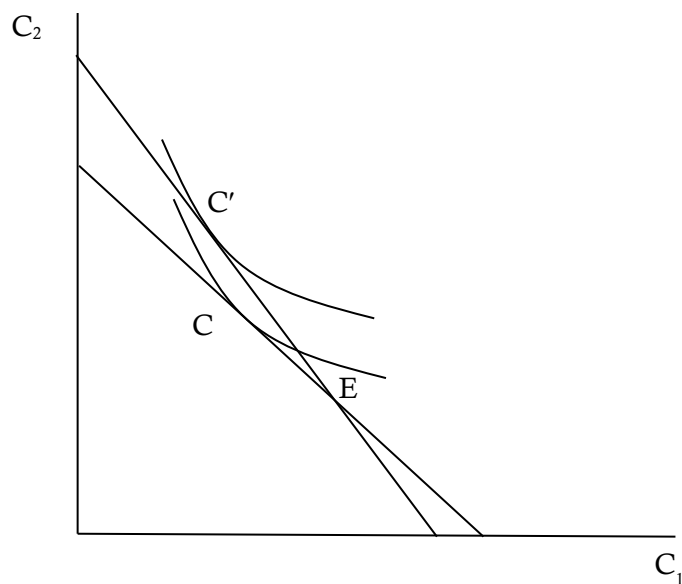
- a. A person who is initially a saver in period 1 and who responds to an increase in the real interest rate by decreasing saving.

Graph should look something like this. The key points are that the endowment point E lies below the consumption points and that the new consumption point C' lies to the right of the original consumption point C . The horizontal distance from E to C is saving at the lower interest rate. The (smaller) horizontal distance from E to C' is saving at the higher interest rate.



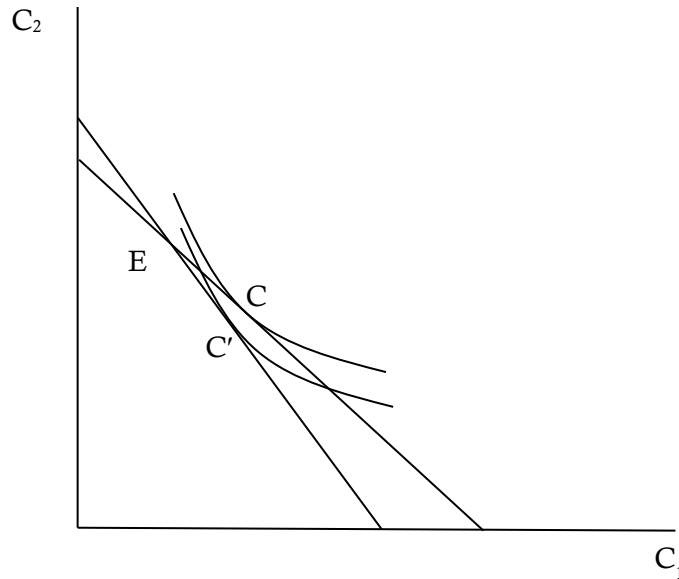
- b. A person who is initially a saver in period 1 and who responds to an increase in the real interest rate by increasing saving.

The only difference here is that C' lies to the left of C , showing an increase in saving (decrease in period one consumption) rather than a decrease.



- c. A person who is initially a dissaver (borrower) in period 1 and who responds to an increase in the real interest rate by increasing saving (reducing dissaving).

Here the endowment point E lies above and to the left of the consumption points, making the agent a borrower rather than a lender. Consumption changes from C to C' , which must lie below and to the left of C , showing a decrease in borrowing due to the rise in the interest rate.



- d. Explain (based on substitution and income effects) why the fourth case (dissaver who increases dissaving when the real interest rate rises) is impossible.

For this to occur, point C' in part c would have to lie to the right of point C , which cannot happen if consumption in both periods is a normal good. Both the income and substitution effects cause the borrower to borrow less when the interest rate rises. The substitution effect because present consumption is more expensive in terms of future consumption and the income effect because the borrower is poorer, so she consumes less in both periods (and, in particular, in period one, which means borrowing less).

2. Explain why the real interest rate rather than the nominal interest rate is used in the budget constraint for consumers. Explain why the real interest rate rather than the nominal interest rate is relevant for firms deciding whether to invest in real capital.

People care about purchasing power, not money *per se*. The real interest rate measures the rate of return on borrowing in terms of purchasing power.

3. Consider a model in which individuals live for three periods, earning income of Y_1 , Y_2 , and Y_3 and consuming C_1 , C_2 , and C_3 . You may assume that they receive and leave no bequests.
- a. Show the equation for the individual's lifetime budget constraint.

$$C_1 + \frac{C_2}{1+r} + \frac{C_3}{(1+r)^2} = Y_1 + \frac{Y_2}{1+r} + \frac{Y_3}{(1+r)^2}$$

- b. Solve for permanent income using an extension of equation (8.2) in the textbook.

$$Y^P + \frac{Y^P}{1+r} + \frac{Y^P}{(1+r)^2} = Y_1 + \frac{Y_2}{1+r} + \frac{Y_3}{(1+r)^2}$$

$$Y^P \left[1 + \frac{1}{1+r} + \frac{1}{(1+r)^2} \right] = Y_1 + \frac{Y_2}{1+r} + \frac{Y_3}{(1+r)^2}$$

$$Y^P = \frac{Y_1 + \frac{Y_2}{1+r} + \frac{Y_3}{(1+r)^2}}{1 + \frac{1}{1+r} + \frac{1}{(1+r)^2}}.$$

- c. Assuming for simplicity that the real interest rate is zero and that the consumer chooses perfectly smooth consumption, what consumption level will she choose in each year if $Y_1 = \$20,000$, $Y_2 = \$100,000$, and $Y_3 = \$0$ and she has access to perfect capital markets? In an economy comprising many such consumers, what pattern of borrowing and lending will emerge among individuals of various ages?

$C = \$40,000$ in each period. She borrows \$20,000 when young, repays it and saves an additional \$40,000 in middle age, and consumes the \$40,000 saved in middle age when old.

4. Some stocks promise high dividend payments and others promise none.

- a. Why do firms choose not to pay dividends?

If the assumptions on the Modigliani-Miller Theorem are not fully satisfied, then it may be cheaper for firms to finance their capital investment internally through retained earnings than by borrowing from markets. Thus, they may use any earnings for internal investment rather than paying them out in dividends.

- b. What kind of firms are likely to make that choice?

Small and new firms are more likely to have trouble raising capital on markets, so they are more likely to retain earnings. Firms that are making little profit (or earning losses) are also likely not to pay dividends.

- c. Why are people willing to hold stocks that do not pay dividends?

They must be anticipating that the share price will rise sufficiently to give them a competitive return through capital gains rather than dividends. If the firm invests its earnings wisely in projects that raise the firm's value, this expectation should be justified.

d. Is it plausible that these stocks will never, ever pay dividends to shareholders?

No. Equation (14.3) shows that the firm's share value should equal the present value of the infinite stream of future dividends. If a firm was *never* expected to pay out any money to shareholders, its shares would be worthless.

5. The “price/earnings ratio” or P/E is a common metric for evaluating stocks. It is the ratio of the current share price to current annual earnings.

a. What economic forces that would tend to equalize P/E ratios across firms in an efficient market?

Other things held equal (and there are many other relevant things!), investors can earn a higher return on their investment by buying shares with a lower P/E ratio. If two firms both earn \$1 per share and you can buy one share of A for \$10 and shares of B cost \$20, then you earn twice as high a rate of return on A as on B, since you only pay half as much in order to get the same return.

b. Why wouldn't you expect all P/E ratios to be exactly the same?

Share price should reflect the present value of current *and expected future* earnings. If earnings are expected to be higher in the future than they are now, then these high expected future earnings will increase the numerator (the price investors are willing to pay) relative to the denominator (current earnings).

c. What kinds of firms would you expect to have high or low P/E ratios at any moment in time?

Firms whose current earnings are below their expected “average” earnings in the future should have high P/E ratios. Correspondingly, firms whose current earnings are above their expected average will have low P/E ratios. Young, promising firms are likely to have high P/E ratios for this reason. Indeed, when current earnings are zero or negative, the concept of a P/E ratio is not well defined.

6. If you believe that interest rates are likely to rise in the future, what do you expect will happen to the prices of existing long-term bonds? Does this make bonds an attractive or unattractive investment choice? If everyone shares this opinion, will they tend to move their money into or out of bonds? How will this affect bond prices and the expected rate of return on bonds? How will this affect the prices of alternative assets such as stocks? Given this change in the value of stocks (assuming there is no change in the expected future profits of the firms), how will this affect the rate of return on stocks? How will equilibrium between the returns on stocks and bonds be restored?

The prices of existing long-term bonds would fall if market interest rates rise. This means that bonds would be unattractive if you expected rates to rise in the future. But if everyone thinks like this, then everyone will sell bonds, which will push down bond prices and push up the interest rate (and the expected rate of return on bonds) now. If people buy stocks with the money they pull out of bonds, stock prices will rise. That means that it costs more to get the same flow of corporate earnings, so the rate of return on stocks must be lower. This restores the equilibrium between the expected rate of return on bonds (initially too low) and on stocks (higher).