Midterm #2  
ECON 3510, Prof. DeBacker  
November 12, 2015

INSTRUCTIONS:

• Please read each question below carefully and respond to the questions on a separate sheet of paper. You must show your work.

• Please write clearly and indicate your answers

• When finished with the test, staple your scratch paper with your answers and your work to this test and turn it in.

• You may use a calculator, but not the calculator on a phone or a graphing calculator.

• This midterm consists of the following two sections that total 100 points possible:
  – Part 1: Short answer, 60 points possible
  – Part 2: Analytical problems, 40 points possible

• Good luck.

Part 1: Short Answer  
(60 points possible, 3 points each)

1. How do economists define a recession?

   • Not very precisely. Usually 2-3 consecutive quarters of declining economic activity such as declines in GDP and increases in unemployment. Recessions are measured from peak to trough. So the high point of economic activity starts the recession and it ends after the economy starts recovering from the low point.

2. What’s the primary difference between the long run and short run economic models we’ve studied?

   • In the short run, prices are fixed (or less flexible). The means that changes in nominal variables can have impacts on real variables - breaking the classical dichotomy.

3. Draw the aggregate supply and demand model. Note the equilibrium. What does this equilibrium represent?

   • Downward sloping AD, horizontal SRAS and/or vertical LRAS curves. Note intersection of AS and AD curves represent prices and output levels in the short/long run. The equilibrium represents equilibrium points in the goods and money market simultaneously.
4. With words, equations, or a picture, describe the government spending multiplier.

- The government spending multiplier is the end result of how initial government spending effects consumption, which further affects spending and consumption. The result is that a dollar worth of government spending increases GDP by more than that $1. With a picture, one might draw the Aggregate Expenditure Model (Keynesian Cross) and show the shift in the planned expenditure curve and the subsequent increase in income being larger than the change in government spending. With an equation you might write that the multiplier = $\frac{1}{1-MPC}$ and that this number exceeds one if the $MPC > 0$.

5. With a picture or words, explain what a increase in income does in the market for real money balances?

- The high income would shift the money demand function out. This would result in a higher equilibrium real interest rate.

6. With words, equations, or a picture, describe the equilibrium in the IS-LM model.

- Downward sloping IS, upward sloping LM. Equilibrium is where these two curves intersect. This point represents the $r$ and $Y$ that ensure supply equals demand in the goods market and the money market. Recall that each point along the IS curve is an equilibrium point in the goods market and each point along the LM curve is an equilibrium in the money market.

7. We discussed three reason why the AD curve is downward sloping. Give two of these, explaining why each results in a negative relation between prices and output.

- The three are the reasons: the Pigou Wealth Effect (higher prices mean lower real wealth and so less consumption spending), the Keynes Interest Rate Effect (higher prices mean a lower supply of real money balances, which mean higher interest rates and thus less investment spending), and the Mundell-Fleming Exchange Rate Effect (higher prices mean a lower supply of real money balances, which puts upward pressure on the interest rate, causing net capital outflows, which affect the currency market, pushing exchange rates up and so decreasing spending on net exports).

8. Give an example of a fiscal policy’s effects in the closed economy IS-LM model.
• Could use words or an equation or a picture. Just have to show the IS curve shifting somewhere and not the direction of the change on $r$ and $Y$.

9. Show what happens, in the case of the fiscal policy example you used for the previous question, if the central bank responds to the fiscal policy by holding interest rates constant.

• Depends on the example, but for expansionary fiscal policy, this will make the positive effect on $Y$ larger. For contractionary fiscal policy, this will make the negative effect on $Y$ larger. In either case, interest rates won’t change.

10. With words, equations, or a picture, describe the equilibrium in the Mundell-Fleming model.

• Downward sloping IS, a vertical LM, the nominal exchange rate on the vertical axis. Equilibrium is where these two curves intersect. This point represents the $e$ and $Y$ that ensure supply equals demand in the goods market and the money market. Recall that each point along the IS curve is an equilibrium point in the goods market and each point along the LM curve is an equilibrium in the money market.

11. Suppose that you are the Finance Minister of Panama. Make the case to your Prime Minister for having a fixed exchange rate (Panama pegs the value of its currency to the U.S. dollar).

• You might say how important trade with the U.S. is (e.g. because of your sweet canal) and that this trade is aided by having a stable exchange rate with the U.S. You might also point out that the central bank is not very capable and so it makes sense to outsource monetary policy to the U.S.

12. Explain how a country maintains a fixed exchange rate.

• The central bank promises to exchange currencies at this fixed rate. Thus if the market is pushing the exchange rate higher (lower) than the pegged value, the central bank will increase (decrease) the amount of domestic currency in the economy by exchanging foreign (domestic) currency for domestic (foreign) currency.

13. Describe (with words, pictures, or equations) the difference between expansionary fiscal policy (e.g. and increase in $G$) in a small, open economy with a floating exchange rate as compared to an economy with a fixed exchange rate.
In both cases the IS curve shifts out. In the floating exchange rate case, the exchange rate increases just enough to offset the effects of the otherwise stimulative fiscal policy. In the fixed exchange rate case, the central bank expands the money supply to keep the exchange rate fixed and we do see an impact of the government spending on GDP.

14. What happens if a small, open economy with a floating exchange rate imposes a tariff on imported goods?

- The exchange rate increases, with no change in GDP. Trade falls - imports and exports both falling so that net exports are unchanged.

15. What is the average propensity to consume? The marginal propensity to consume?

- \[ APC = \frac{C}{Y}, \quad MPC \] is the amount of each additional dollar of income spent on consumption.

16. Explain the idea of consumption smoothing and what this has to do with how individuals’ savings rates change over their lifetimes.

- Consumption smoothing is the idea that individuals like to spread their consumption out over different periods of their life, rather than consuming a lot at once and little at other times. The preference to consumption smooth means that individuals savings rates will change over their lifetimes - being low in the early and later part of their careers when earnings are lower, and higher in those peak earning years in the middle of life.

17. Explain the Permanent Income Hypothesis.

- This is the idea that people have permanent and transitory components to their income. If people know this, they will consume more out of permanent changes income and less out of those temporary changes in income.

18. Give an example of a tax policy that affects residential investment.

- Several, including the mortgage interest deduction, exemptions of capital gains, and exemption of imputed rents will do.

19. Explain how interest rates affect investment spending for two of the three types of investment spending.

- Business fixed invest: cost of capital, Residential invest: demand and thus price of housing, Inventories: opportunity cost of holding inventories.
20. What are the components of the user cost of capital?

- The price of capital, the real interest rate, and the depreciation rate.
Part 2: Analytical Problems
(40 points possible)

21. Microfoundations of consumption problem (20 points): Assume that an individual is born with initial wealth $W_1 = 10$, lives for three periods, and then dies. The individual will earn income in the first period of $Y_1 = 20$ and income in the second period of $Y_2 = 30$. The individual retires in the third (last) period of life and earns no income $Y_3 = 0$. Further, suppose that the individual can save her income at a zero interest rate. That is, the stock of wealth at the start of periods 2 and 3 are given by: $W_2 = Y_1 + W_1 - C_1$ and $W_3 = Y_2 + W_2 - C_2$.

(a) Assume this individual wants to smooth lifetime consumption such that consumption is equal in all periods: $C_1 = C_2 = C_3 = \bar{C}$, as in Modigliani’s life cycle hypothesis. What is the optimal consumption level in each period?

- Since we are assuming that the interest rate is zero and that the individual perfectly smooths consumption (i.e., has equal consumption in each period), we can find each period’s consumption as: $C = \frac{W_1 + Y_1 + Y_2 + Y_3}{3} = \frac{10 + 20 + 30 + 0}{3} = \frac{60}{3} = 20$.

(b) Demonstrate whether or not the consumption function from part (a) is in agreement with Keynes’ second conjecture about consumption, regarding the average propensity to consume?

- The APC = $\frac{C}{Y}$. In period 1, when income is 20, the APC is $\frac{20}{20} = 1$. In period 2, when income is 30, the APC is $\frac{20}{30} = 0.67$. In period 3, when income is 0, the APC is $\frac{10}{0} = \infty$. Thus we see evidence that is consistent with Keynes’ conjecture that the APC declines as income rises, and increases as income falls.

(c) How would the constant consumption level $\bar{C}$ change if the individual experienced transitory income shocks that increased first period income to $Y = 22$ but decreased second period income to $Y = 28$?

- Since we are assuming that the interest rate is zero and that the individual perfectly smooths consumption (i.e., has equal consumption in each period), we can find each period’s consumption as: $C = \frac{W_1 + Y_1 + Y_2 + Y_3}{3} = \frac{10 + 22 + 28 + 0}{3} = \frac{60}{3} = 20$. Consumption did not change. This is consistent with Friedman’s Permanent Income Hypothesis - individuals consumption is determined primarily by their permanent (or lifetime) income and does not respond strongly to the transitory income shocks (in this case, with the ability to borrow and lend at a zero interest rate and a strong preference to smooth consumption, there is not response to transitory shocks).
(d) Using the original income values of $Y_1 = 20$, $Y_2 = 30$, and $Y_3 = 0$, how would the constant consumption level $\bar{C}$ change if the individual experienced a permanent income shock that increased first period income to $Y = 23$ and increased second period income to $Y = 33$?

- Since we are assuming that the interest rate is zero and that the individual perfectly smooths consumption (i.e., has equal consumption in each period), we can find each period’s consumption as:

$C = \frac{W_1 + Y_1 + Y_2 + Y_3}{3} = \frac{10 + 23 + 33 + 0}{3} = \frac{66}{3} = 22$. Consumption in each period increases. This is again consistent with Friedman’s Permanent Income Hypothesis - individuals consumption is determined primarily by their permanent (or lifetime) income. Here, permanent income went up and thus consumption did as well.
22. *IS – LM* (20 points): Assume the consumption function, $C(\cdot)$, investment function, $I(\cdot)$, and money demand, $(\frac{M}{P})^d$, are given by the following equations:

\[ C(Y - T) = 1000 + 0.5(Y - T) \]  
(0.1)

\[ I(r) = 200 - 20r \]  
(0.2)

\[ (\frac{M}{P})^d = 2Y - 20r \]  
(0.3)

Further assume that $G = 400$ and $T = 400$. Also, $M = 5000$ and $P = 1$.

(a) What is the equation for the *IS* curve?
- The *IS* curve is given by: $Y = C(Y - T) + I(r) + G \implies Y = 1000 + 0.5(Y - 400) + 200 - 20r + 400 \implies Y = 2800 - 40r$.

(b) What is the equation for the *LM* curve?
- The *LM* curve is given by: $\frac{M}{P} = L(r, Y) \implies \frac{M}{P} = 2Y - 20r \implies \frac{5000}{1} = 2Y - 20r \implies 5000 = 2Y - 20r \implies Y = 2500 + 10r$.

(c) What is the *IS – LM* equilibrium?
- The equilibrium is $r = 6$ and $Y = 2560$.

(d) If the Fed increases the supply of money by 200, what is the new equilibrium?
- The new equation for the LM curve is: $\frac{5200}{1} = 2Y - 20r \implies 2600 = Y - 10r \implies Y = 2600 + 10r$. The new equilibrium is $r = 4$ and $Y = 2640$. 
Bonus: Microfoundations of investment problem
(20 points possible)

- Assume an economy populated by two types of firms: production firms and rental firms. Production firms rent capital $K$ from rental firms at a nominal rental rate $R$. Production firms also hire labor $L$ at a nominal wage $W$ in order to produce output $Y$ sold at a nominal price $P$. The production function of production firms takes the following Cobb-Douglas form:

$$Y = 0.5K^{0.5}L^{0.5} \tag{0.4}$$

The key decision for production firms is how much capital $K$ to rent from rental firms. On the other hand, rental firms rent capital $K$ to production firms at the nominal rental rate $R$. Their nominal costs are given by $P_K K(r + \delta)$, where $r$ is the real interest rate and $\delta$ is the rate of depreciation. The key decision for rental firms is how much capital to buy at market price $P_K$.

1. Derive the demand function for capital $K^D$ on the part of production firms that maximizes their profits. This will be a function of the real rental rate of capital. Show that $K^D$ is a negative function of the interest rate.

- Production firms choose how much capital to rent $K^D$ by maximizing profits:

$$\max_K PF(K, L) - RK - WL$$

The first order condition states that at the optimal choice of $K$:

$$\frac{\partial \Pi}{\partial K} = P \ast \frac{\partial F}{\partial K} - R = 0$$

Recall that $\frac{\partial F}{\partial K}$ is the marginal product of capital ($MPK$). Thus, the choice of $K$ must satisfy: $MPK = \frac{R}{P}$. Here, the marginal product of capital is $\frac{1}{4}(\frac{L}{K})^{\frac{1}{2}}$. Thus we can find the choice of $K$ as a function of the real rental rate:

$$K^D = \frac{L}{(\frac{R}{P})^{\frac{1}{2}}}$$

Since $\frac{R}{P}$ is in the denominator, a higher real rental rate means less capital demanded.

2. Derive the function for the supply of capital $K^S$ (that rental firms supply to production firms) that maximizes the real profits of rental firms. This will be a function of the real price of capital $P_K$, the real interest rate $r$, and the depreciation rate. [NOTE: This involves substituting the $MPK$ relation from the production firms’ problem into the rental firms’ profit maximization problem.]
- Rental firms choose how much capital to supply, $K^S$ in order to maximize their nominal profits:

$$\max_K (R \ast K) - P_K K (r + \delta)$$

The first order condition states that at the optimal choice of $K$:

$$\frac{\partial \Pi}{\partial K} = R - P_K (r + \delta) = 0$$

There is no $K$ in this equation, but we know from solving the problem of producing firms that, $MPK = \frac{P}{P}$. Divide the above equation by $P$ to get (alternatively, you can get here by setting up the problem as maximizing real profits):

$$\frac{R}{P} = \frac{P_K}{P} (r + \delta) \implies MPK = \frac{P_K}{P} (r + \delta) \implies \frac{1}{4} \left( \frac{L}{K} \right)^{\frac{1}{2}} = \frac{P_K}{P} (r + \delta)$$

Now we have $K$ in the equation and we can solve for $K^S$ by rearranging the equation so that $K$ is on a side all by itself. After some algebra we find:

$$K^S = \frac{L}{\left( \frac{MPK}{P} (r + \delta) \right)^2}$$

3. Investment, $I$, is a flow and capital, $K$, is a stock, so $I = \Delta K + \delta K$. Show the channel of the effect on $I$ of the following exogenous shocks:

- Anti-inflationary monetary policy raises the real interest rate.
  * Anti-inflationary policy $\implies r \uparrow \implies$ a higher cost of capital $\implies$ less capital supplied and lower investment

- An earthquake destroys part of the capital stock.
  * An earthquake destroying capital means a higher $MPK$, which means more demand for capital and more investment

- Immigration of foreign workers increases the size of the labor force.
  * Immigration $\implies L \uparrow \implies MPK \uparrow \implies$ more demand for capital and more investment