Midterm 2 Study Guide

March 28, 2012

Practice Questions

1) *Suppose Steve has won the lottery. He can take $500 today or $100 payments over the next eight years including this year. Determine which plan he would choose with the following interest rates:* $10\%, 20\%$

10%: Steve will choose $100 over 8 years. You need to compare $500 and the present value of $100. For the second option $PV = \sum_{t=0}^{7} \frac{100}{(1+.1)^t} = \$586$. In general a payment of Y given over T years (including this year) with interest rate i is $\sum_{t=0}^{T-1} \frac{Y}{(1+i)^t}$. Note the sum sign means in your calculator you would put in $100/(1+.1)^0 + 100/(1+.1)^1 + \ldots$ t only goes up to 7 because the eight years include today, which is year 0 (since there is no interest rate on money received today).

20%: You should do the same exercise as before with the new new interest rate. The present value of $100 is now $460.46, which is less than the $500, so Steve will pick the $500 today.

2) *Suppose Steve has $500 to use today. Which of the following options should Steve choose? (assume he can only choose one)*
a) A 1-year T-bill paying 5% real interest
b) Stocks that will return next year $i = -1$ with 5% probability, $i = .05$ with 45% probability, $i = .1$ with 45% probability, and $i = .5$ with 5% probability

Under plan a he will receive $\$500 * (1 + .05) = \$505$. Under plan b he will receive an expected return of $(1 - 1) * .05 * 500 + (1 + .05) * .45 * 500 + (1 + .1) * .45 * 500 + (1 + .5) * .05 * 500 = \$521.25$. Since his expected return on the second plan is higher, Steve will choose b. Note in general that expected return is $\sum_{event} Pr(event) * (1 + i(event)) * Y$, where $i(event)$ is the interest rate for some event, $Pr(event)$ is the chance it happens, and Y is the initial money invested.

For the following questions (3-5), you will need to use the following data about iIsland:

Year	iPhones Produced	Nom. Price of iPhones	MacBooks Produced	Nom. Price of MacBooks	Nokia Phones Produced	Nom. Price of Nokia Phones
2005*	0	0	150	$900	300	$40
2007	200	$100	190	$950	350	$30
2010	800	$150	250	$1100	10	$5

*Base year

3) *Let the market basket be 3 Nokia phones and 2 MacBooks. Determine CPI Inflation from 2005 to 2007. 2007 to 2010?*

First calculate CPI in 2005, 2007, 2010. $CPI_{year} = \frac{COS_{year}}{COS_{base}} * 100$ where COS is the cost of living given the market basket and prices in that year. So $COS_{base} = 3 * \$40 + 2 * \$900 = \$1920$, $COS_{2007} = 3 * \$30 + 2 * \$950 = \$1990$, $COS_{2010} = 3 * \$5 + 2 * 1100 = \$2215$. So $CPI_{2005} = \frac{COS_{2005}}{COS_{base}} * 100 = \frac{1920}{1920} * 100 = 100$. Likewise, $CPI_{2007} = 103.65$, $CPI_{2010} = 115.36$. $Inflation(\text{year 1 to year 2}) = \frac{CPI_2 - CPI_1}{CPI_1} * 100$. So inflation from 2005 to 2007 is $\frac{103.65 - 100}{100} * 100 = 3.65\%$. Inflation from 2007 to 2010 is $\frac{115.36 - 103.65}{103.65} * 100 = 11.3\%$.

4) *With the introduction of the iPhone in 2007, economists decided readjust the market basket to be 3 iPhones and 2 MacBooks. Determine CPI Inflation from 2007 to 2010. Compare this to the result from question 3.*

You have to recalculate the CPI for 2007 and 2010. Note the CPI for 2005 does not change because the change came after the basket change. Foolishly, the economists did not change the base year either (normally it should) so we will have to keep track of the old cost of living in 2005. $COS_{2007} = 3*\$100 + 2*\$950 = \$2200$ and $COS_{2010} = 3 * \$150 + 2 * \$1100 = \$2650$. So $CPI_{2007} = \frac{2200}{1920} * 100 = 114.58$ and $CPI_{2010} = 138.02$. We now use these CPIs to calculate inflation from 2007 to 2010 $\frac{138.02 - 114.58}{114.58} * 100 = 20.46\%$. So calculated inflation is higher than before.

5) *Suppose Steve was earning a wage of \$5000 in 2007, and by 2010 earned a wage of \$5500. Is he richer or poorer in 2010? Does it depend on which market basket you use?*

Remember that wage in todays term requires an inflation index, which is $\frac{CPI_{base}}{CPI_{today}}$. And, wage today in base dollars is $base = today * index$ Here we are implicitly assuming 2007 as our base year because we are curious if he is richer today from his state in 2007. So under the Nokia basket pay in base year $= 5500 * \frac{103.65}{115.36} = \$4941.70$. Under the iPhone basket pay in base year $= 5500 * \frac{114.58}{138.02} = \$4565.93$. So under either measure of inflation, Steve is poorer than before.

For the rest of the questions, you will need to use the following data about iKingdom in long-run equilibrium:

RGDP: \$5500	Natural Rate of Unemployment = .03
Money Demand = 2000 - 6000i	Loanable Funds Demand = 2500 - 6000i
Initial Deposits =\$150	MPC = .75
Reserve Ratio = .1	Government Purchases = \$1000
Price Level = \$10	Tax Revenue = \$700

6) *What is the velocity of money in iKingdom?*

Remember the money equation $MV = PY$ so $V = \frac{PY}{M}$, where M is the money supply and Y is output. We need to calculate the money supply, which is simply $Initial Deposits * Money Multiplier = 150 * 10 = 1500$ because the money multiplier is the reciprocal of the reserve ratio. Therefore $V = \frac{10 * 5500}{1500} \approx 37$ (the fraction answer does not make much sense).

Now suppose that the country has fallen into a recession. The short-run RGDP has been calculated to be \$5300:

7) *Consider the equation for unemployment. If actual inflation is 5%, unemployment is 10%, and $A = 1$. What must expected inflation be?*

The equation for unemployment is $NRU - A(\text{actual inflation} - \text{expected inflation})$. So $.10 = .03 - 1(.05 - expected)$ and the solution is expected inflation is 12%.

8) *In the short-run, how would an expansionary fiscal or monetary policy impact the level of unemployment? Use the equation used from question 7 to explain.*

An expansionary fiscal or monetary policies ultimately expands aggregate demand, which increases the level of actual inflation. In the short-run expectations do not change so as actual inflation increases, the unemployment level should drop. (If you consider a change in expectations, you might claim that the policy would eventually increase expected unemployment and could increase unemployment. Make sure you can justify your case either way.)

9) *What is the GDP gap?*

GDP gap = Natural Rate − Current Output = $5300 − $5500 = −$200. Remember long-run GDP should be equal to the natural rate.

10) *If the government were to implement a fiscal policy to close the GDP gap, how much would it need to change taxes by? Government spending?*

Remember that $GDP = C + I + G + X = AD$. So a change in aggregate demand is equal to a change in GDP. And for any change in spending in the output market, we need to remember that extra spending is cycled through the economy again and again through the multiplier effect. THIS MULTIPLIER IS COMPLETELY DIFFERENT THAN THE MONEY MULTIPLIER (some of you may still miss that note). So $\Delta GDP = Multiplier * CISOM$, where the multiplier is $\frac{1}{1-MPC}$ and $CISOM$ is the initial change in spending in the output market.

Taxes: We have a target change in GDP of $200 to close the gap. So use the equation from before $200 = 4 * CISOM$, since $\frac{1}{1-.75} = 4$. So the initial change in spending must be $50. In the initial change in spending through taxes is not equal to the tax break because consumers, through the MPC, only spend a fraction of new money. So $CISOM = MPC * ExtraMoney = .75 * Taxes$. So since $CISOM = 50$, the tax break must be 66.67.

Government Spending: The target CISOM is the same as before, but government spending is not diluted like a tax break is. So the government must spend $50.

11) *Consider at least two reasons why, even if the ideal plan is implemented in 8 (i.e. there is no political problem), the fiscal policy may fail to close the GDP gap.*

The tax plan can fail to close the GDP gap 1) consumers believe tax breaks are temporary and save more of them than would a permament tax break. In this situation the propensity to consume the money returned in the tax break is smaller than predicted. 2) The decrease in government savings from less revenue or more spending can cause crowding out. Crowding out can also work through a demand channel. More spending can lead to more demand for money; more demand for money with a fixed money supply increases interest rates; higher interest rates decrease investment (see knowledge assessment 4).

12) *The Central Bank believed Congress would fail to implement a policy, and so creates its own to close the GDP gap. Answer the following questions:*
a) If the Central Bank can only target investment spending, what change in investment would close the GDP gap?

This is basically the same question as what level of government spending closes the GDP since neither government nor investment is diluted like a tax break. So $\Delta I = 50.

b) Provide the three initial conditions for this scenario.

With the information you are given, you can determine money supply, which in turn can determine interest rates because money supply must equal money demand in the money market equilibrium, and finally, interest rates can be applied to the loanable funds market to find the level of investment. The key thing to remember is that loanable funds equation gives you investment, money demand equation must equal money supply.

Money supply: We assume the only money is from banks so $MS = InitialDeposits * MM = 10 * 150 = 1500. (And note we assume banks lend out as much of those initial deposits so we can use the money multiplier.)

Interest rates: $MS = MD = 2000 − 6000i$. So $1500 = 2000 − 6000i$ or $i = \frac{1}{12}$

Investment: $Investment = LoanableDemand = 2500 − 6000 * \frac{1}{12} = 2000. So the initial level of investment is $I = 2000.

c) *What will the new money supply be to achieve the policy in (a) given what you found in (b)?*

To figure out the desired conditions, we need to work backwards. We figured out in a that we want to change I by some amount, which we can add to the initial investment we found in b. From there we have an equation from investment so we can get interest rates because investment equals loanable funds demand. Finally, with interest rates we can get money supply from the money demand equation since money supply must equal money demand.

New investment: $2000 + \Delta I = \$2050 = \hat{I}$.

New interest rates: $\hat{I} = 2050 = 2500 - 6000\hat{i}$. So new interest rates $\hat{i} = \frac{3}{40}$

New money supply: $\hat{MS} = \hat{MD} = 2000 - 6000\hat{i} = 2000 - 6000 * \frac{3}{40}$. So the new money supply is $\hat{MS} = \$1550$.

d) *Use the reserve ratio to achieve this new money supply that will close the GDP gap.*

We now return to our original equation for money supply used in part b $MS = Initial Deposits * MM$. In this case we have MS, and initial deposits. So we can find the money multiplier, which in turn gives us the reserve ratio. $1550 = 150 * MM$ so $MM = \frac{31}{3}$. Since $RR = \frac{1}{MM}$, $RR = \frac{3}{31}$ is the new reserve ratio (which is the lower than the original as expected.

e) *Use OMOs to do the same.*

We have the same equation, but this time we are keeping the reserve ratio, and thus MM, the same and changing initial deposits. $1550 = 10 * Initial Deposits$. So the new initial deposits must be equal to $155. Since the original level of desposits was $150, the Fed must increase deposits by $5, which requires **buying** five dollars in bonds.

f) *Explain how the discount rate could be manipulated to achieve the same goal.*

We can't calculate anything normally, but lowering the discount rate will ultimately increase money supply as we did with OMOs and the reserve ratio. Recall the discount rate is the rate at which private banks can borrow money from the Fed. The banks then in turn loan that money out, which increases the money supply. The higher the discount rate, the less willing or able banks are to borrow from the Fed to lend out again. So lowering the discount rate will increase supplies for loans, and the money supply.

g) *Provide at least one reasons why the fiscal policy may fail to impact aggregate demand.*

I actually meant to ask monetary policy... 1) If banks do not lend out money as expected, Fed reserve policy is completely ineffective. Notice in any of the three tools we covered, money supply is increased through the actions of private banks (although OMOs have a small effect on money supply, if it the purchased bonds are sitting in a bank, it does no one in the real economy any good). So if private banks don't lend, money supply does not increase and none of the nice results about aggregate demand follow.

2) With zero nominal interest rates, no one would be willing to offer lower interest rates (think about it ... you can basically borrow and get paid to borrow). Now consider an expansionary monetary policy if interest rates are near zero. The Fed can increase money supply, but interest rates will not decrease as needed because no one would be willing to offer those lower rates.