Economics 330
Fall 2006
University of Wisconsin-Madison

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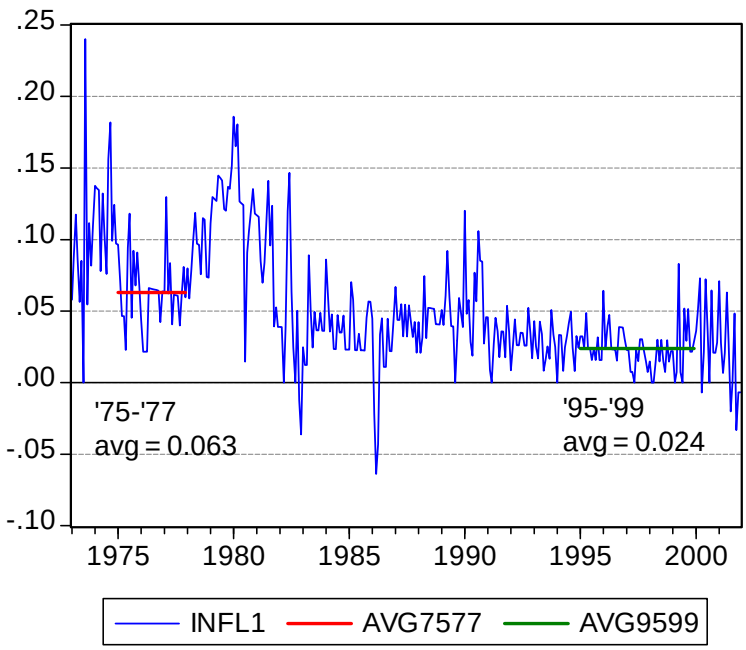
Social Sciences 7418

Problem Set #1 Answers

Due in lecture on **Monday, September 25th**. No late submissions will be accepted. Make sure your name is on your problem set, as well as the name of your (*official*) TA. The numbering system for the questions is in this case identical between the 7th and 8th editions (7/e and 8/e, respectively).

1. Was money a better store of value in the 1975-1979 or 1995-1999? You may wish to consult this database to answer this question.
http://research.stlouisfed.org/fred2/series/CPIAUCSL?&cid=9
Be sure to explain how you obtained your answer.

Calculate the inflation rate as $\left(\frac{CPI_t}{CPI_{t-1}}\right)^{12} - 1$. Take the average over the respective sample. The annualized monthly inflation rate is plotted below, as well as the average for the 1975-77 (red) and 19995-99 period (green). (Note: One could also calculate the inflation rate as quarter-on-quarter annualized, or year-on-year).

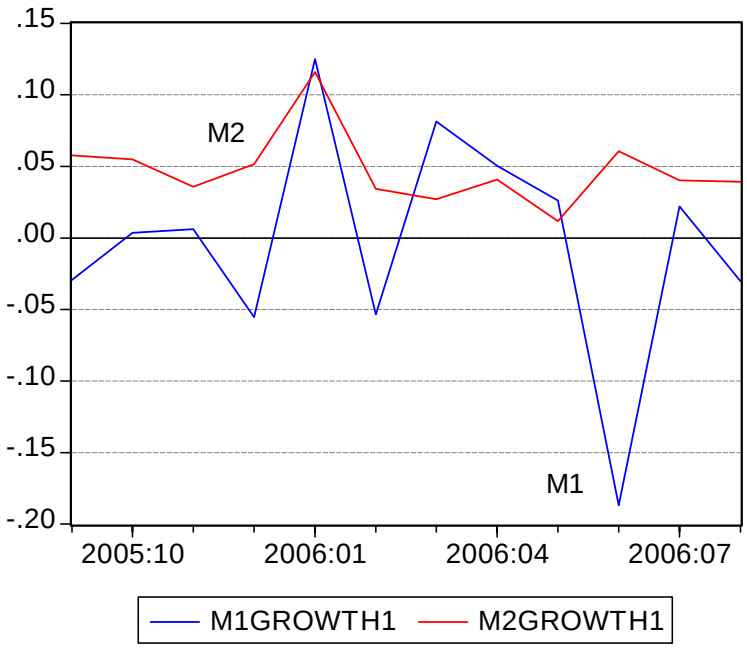


Since inflation is lower during the latter period, then money is a better store of money during the latter period.

2. Chapter 3, #12. For Question #12, calculate the annualized month-on-month percentage changes in order to answer the question. You can access the data online at:
http://www.federalreserve.gov/releases/H6/hist/h6hist1.txt
[For those who have the 7/e, you do not need to calculate the growth rates for *M3*]

Calculate the month on month annualized growth rate as $\left(\frac{M_t}{M_{t-1}}\right)^{12} - 1$. This leads to the following data.

obs	M1SA	M2SA	M1GROWTH1	M2GROWTH1
2005:09	1374.100	6595.100	-0.029220	0.057781
2005:10	1374.500	6624.500	0.003499	0.054826
2005:11	1375.200	6643.900	0.006128	0.035714
2005:12	1368.700	6671.800	-0.055268	0.051572
2006:01	1382.200	6733.100	0.124997	0.116001
2006:02	1375.900	6752.100	-0.053345	0.034393
2006:03	1384.900	6767.200	0.081381	0.027169
2006:04	1390.600	6789.800	0.050523	0.040820
2006:05	1393.600	6796.400	0.026197	0.011727
2006:06	1369.800	6829.800	-0.186742	0.060593
2006:07	1372.300	6852.300	0.022122	0.040257
2006:08	1368.800	6874.300	-0.030180	0.039215



3. Chapter 4, #4. Show your algebraic work, "boxing-in" your answers.
The yield to maturity is less than 10 percent. Only if the interest rate was less than 10 percent would the present value of the payments add up to $3500, which is more than the $3,000 present value in Chapter 4, #3. (Remember, for i=10%, the present value is $3,000). Indeed if one kept on trying different interest rates, one would find that the yield to maturity for present value = $3500 is somewhere slightly below 0.02 (2%).

4. What is the yield to maturity of a $1000 face value discount bond maturing in one year that sells for $900? Show your algebraic work, "boxing-in" your answers.

11.1% = ($1,000 – $900)/$900 = $100/$900 = **0.111** .

5. Calculation of real interest rates.

Take the 3 month interest rates for the U.S., the Euro area, and Japan reported in the tables below (drawn from the Sept. 16th – 22nd issue of the *Economist*). Calculate the real interest rate, assuming that the expected (annualized) inflation rate for the next 3 months equals the most recently recorded inflation rate. [For future reference: These data are updated weekly, and are available at: http://www.economist.com, and are also reported in the hard copy version of the magazine.]

	Money supply* % change on year ago			Interest rates % p.a. (Sep 13th 2006)					
				3-mth money market		2-year gov't bonds	10-year gov't bonds		corporate bonds
	narrow	broad		latest	year ago		latest	year ago	
Australia	+ 9.4	+10.4	Jul	6.22	5.62	5.86	5.60	5.15	6.82
Britain	+ 5.4	+13.1	Jul	4.95	4.56	4.92	4.56	4.17	5.65
Canada	+15.5	+ 6.5	Jul	4.15	2.74	4.02	4.12	3.86	5.36
Denmark	+10.3	+ 7.4	Jul	3.30	2.20	3.69	3.78	3.02	5.14‡
Japan	+ 2.3	+ 0.5	Aug	0.34	0.02	0.61	1.65	1.35	1.87
Sweden	+ 0.5	+11.0	Jul	2.56	1.47	3.33	3.69	2.94	3.84
Switzerland	– 1.3	+ 0.8	Jul	1.71	0.76	2.02	2.43	1.80	2.53
United States	+ 0.2	+ 4.9	Jul	5.26	3.84	4.81	4.76	4.16	5.74
Euro area†	+ 7.4	+ 7.8	Jul	3.32	2.14	3.65	3.76	3.06	4.40

*Narrow: M1 except Britain notes and coin and Sweden M0, broad: M2 or M3 except Britain M4. †Germany for bonds. ‡New series. Benchmarks: US 30-year 4.89%, Japan No. 282 1.67%. Central bank rates: US fed funds 5.25%, ECB refinancing 3.00%, BOJ overnight call 0.25%, BOE repo 4.75%. Sources:Bank of Canada, Commerzbank, Danske Bank, Global Insight, JPMorgan Chase, Lehman Brothers, Stockholmsbörsen, UBS, Westpac, Thomson Datastream. Rates cannot be construed as banks' offers.

% change on year ago

	Consumer prices			The Economist poll consumer prices forecast		Producer prices			Wages/earnings		
	latest		year ago	2006	2007	latest		year ago	latest		year ago
Australia	+ 4.0	Q2	+ 2.5	+ 3.2	+ 2.7	+ 9.9	Q2	+ 6.9	+ 4.7	Q2	+ 5.8
Austria	+ 1.5	Jul	+ 2.3	+ 1.9	+ 1.8	+ 3.9	Aug	+ 0.9	+ 2.7	Jul	+ 2.3
Belgium	+ 1.6	Aug	+ 3.1	+ 2.1	+ 1.9	+ 6.3	Jul	+ 1.9	+ 2.3	Apr	+ 2.6
Britain	+ 2.5	Aug*	+ 2.4	+ 2.2	+ 2.1	+ 2.8	Jul	+ 3.1	+ 4.4	Jul†	+ 4.2
Canada	+ 2.4	Jul	+ 2.0	+ 2.3	+ 2.1	+ 4.3	Jul	– 0.3	+ 0.3	May	+ 1.0
Denmark	+ 2.0	Aug	+ 2.2	+ 2.0	+ 2.0	+ 4.6	Jul	+ 4.7	+ 3.2	Q2	+ 2.9
France	+ 1.9	Aug	+ 1.8	+ 2.0	+ 1.7	+ 3.9	Jun	+ 2.9	+ 3.1	Q2	+ 3.0
Germany	+ 1.7	Aug	+ 1.9	+ 1.8	+ 2.3	+ 5.3	Aug	+ 1.9	+ 1.0	Jun	+ 0.9
Italy	+ 2.2	Aug	+ 2.0	+ 2.2	+ 1.9	+ 6.9	Jul	+ 3.6	+ 3.0	Jul	+ 2.8
Japan	+ 0.3	Jul	– 0.3	+ 0.4	+ 0.8	+ 3.4	Aug	+ 1.8	– 0.3	Jul	+ 2.5
Netherlands	+ 1.4	Aug	+ 1.8	+ 1.5	+ 1.6	+ 5.3	Jul	+ 5.3	+ 1.9	Aug	+ 0.8
Spain	+ 3.7	Aug	+ 3.3	+ 3.7	+ 3.0	+ 6.4	Jul	+ 4.6	+ 3.0	Q1	+ 2.5
Sweden	+ 1.6	Aug	+ 0.6	+ 1.5	+ 1.9	+ 3.7	Jul	+ 3.7	+ 3.8	Jun	+ 3.0
Switzerland	+ 1.4	Aug	+ 1.0	+ 1.3	+ 1.4	+ 2.9	Jul	+ 1.1	+ 1.0	2005	+ 0.9
United States	+ 4.1	Jul	+ 3.2	+ 3.5	+ 2.6	+ 4.2	Jul	+ 4.7	+ 3.9	Aug	+ 2.7
Euro area	+ 2.3	Aug	+ 2.2	+ 2.2	+ 2.1	+ 5.9	Jul	+ 4.1	+ 2.2	Q1	+ 3.2
MORE COUNTRIES	Data for the countries below are not provided in printed editions of *The Economist*										
Finland	+ 1.9	Aug	+ 1.0	na	na	+ 6.0	Jul	+ 4.0	+ 2.9	Q2	+ 3.7
Greece	+ 3.5	Aug	+ 3.7	na	na	+ 7.2	Jul	+ 5.1	na		na
Iceland	+ 7.6	Sep	+ 4.8	na	na	+11.5	Aug	+ 4.3	+10.2	Jul	+ 6.6
Ireland	+ 4.5	Aug	+ 2.3	na	na	– 0.2	Jul	+ 0.2	+ 2.2	Q1	+ 6.4
Luxembourg	+ 2.9	Jul	+ 2.6	na	na	+ 7.3	Jun	+ 6.4	+ 0.7	Jun	+ 2.0
New Zealand	+ 4.0	Q2	+ 2.8	na	na	+ 7.8	Q2	+ 4.7	+ 3.3	Q2	+ 2.6
Norway	+ 1.9	Aug	+ 1.9	na	na	+ 8.8	Aug	+19.9	+ 3.6	Q2	+ 3.8
Portugal	+ 2.3	Jul	+ 2.2	na	na	+ 4.8	Jul	+ 4.1	– 1.5	Jul	– 2.1

*RPI inflation rate 3.4% in Aug. †May-Jul.

The real interest rate is calculated thus:

$$i_t = i_{r,t} + \pi^e_{t+1}$$

where i_t is the nominal interest rate at time t, $i_{r,t}$ is the real (expected) interest rate, and π^e_{t+1} is the expected inflation rate at time t for the period from time t to t+1. Re-arranging, one obtains:

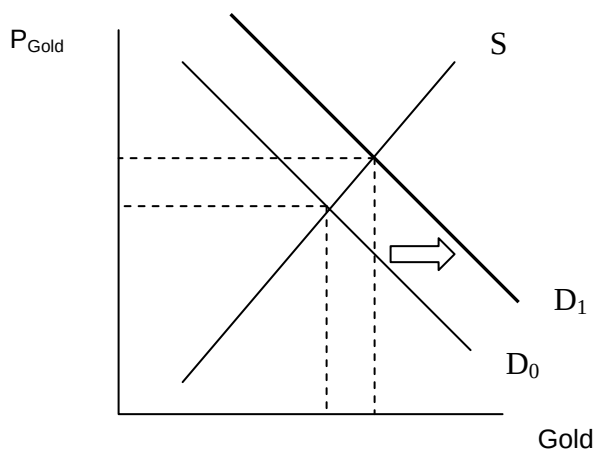
$$i_{r,t} = i_t - \pi^e_{t+1}$$

Substituting in for the U.S., Euro Area, and Japan, respectively, leads to:

1.16 = 5.26 - 4.1
1.02 = 3.32 - 2.3
0.04 = 0.34 - 0.3

6. Chapter 5, #3. Use graphs to help explain the answer to each of the cases.

(a) More, because it has become more liquid; (b) less, because it has become more risky; (c) more, because its expected return has risen; (d) more, because its expected return has risen relative to the expected return on long term bonds, which has declined. Cases a, c, d are presented in the figure below. Case b would reverse that, with the demand curve shifting in.



7. Chapter 5, #7. Use graphs and/or equations to help explain your answer.

In the loanable funds framework, when the economy booms, the demand for bonds increases: the public's income and wealth rises while the supply of bonds also increases, because firms have more attractive investment opportunities. Both the supply and demand curves (Bd and Bs) shift to the right, but as is indicated in the text, the demand curve probably shifts less than the supply curve so the equilibrium interest rate rises. Similarly, when the economy enters a recession, both the supply and demand curves shift to the left, but the demand curve shifts less than the supply curve so that the interest rate falls. The conclusion is that interest rates rise during booms and fall during recessions: that is, interest rates are procyclical. The same answer is found with the liquidity preference framework. When the economy booms, the demand for money increases: people need more money to carry out an increased amount of transactions and also because their wealth has risen. The demand curve, Md, thus shifts to the right, raising the equilibrium interest rate. When the economy enters a recession, the demand for money falls and the demand curve shifts to the left, lowering the equilibrium interest rate. Again, interest rates are seen to be procyclical.

8. Chapter 5, #10. Use graphs to help explain your answer.

Interest rates fall. The increased volatility of gold prices makes bonds relatively less risky relative to gold and causes the demand for bonds to increase. The demand curve, Bd, shifts to the right and the equilibrium interest rate falls.

9. Suppose Ben Bernanke and all the other members of the Federal Open Market Committee that controls monetary policy suddenly declare that they want money growth to be faster than in before. Show what would likely happen to interest rates, using graphs and/or equations to help explain your answer.

The faster rate of money growth will lead to a liquidity effect, which drops interest rates, while the higher price level, income, and inflation rates in the future will tend to raise interest rates. There are three possible scenarios for what will happen: (a) if the liquidity effect is larger than the other effects, then interest rates will fall; (b) if the liquidity effect is smaller than the other effects and expected inflation adjusts slowly, then interest rates will fall at first but will eventually rise above their initial level; and (c) if the liquidity effect is smaller than the expected inflation effect and there is rapid adjustment of expected inflation, then interest rates will immediately rise. These cases are exactly that depicted in Figure 11 in Chapter 5.

Appendix: Data and inflation rates from question 1.

obs	CPIAUCSL	INFL1
1975:01	52.30	0.097
1975:02	52.60	0.071
1975:03	52.80	0.047
1975:04	53.00	0.046
1975:05	53.10	0.023
1975:06	53.50	0.094
1975:07	54.00	0.118
1975:08	54.20	0.045
1975:09	54.60	0.092
1975:10	54.90	0.068
1975:11	55.30	0.091
1975:12	55.60	0.067
1976:01	55.80	0.044
1976:02	55.90	0.022
1976:03	56.00	0.022
1976:04	56.10	0.022
1976:05	56.40	0.066
1976:06	56.70	0.066
1976:07	57.00	0.065
1976:08	57.30	0.065
1976:09	57.60	0.065
1976:10	57.90	0.064
1976:11	58.10	0.042
1976:12	58.40	0.064
1977:01	58.70	0.063
1977:02	59.30	0.130
1977:03	59.60	0.062
1977:04	60.00	0.084
1977:05	60.20	0.041
1977:06	60.50	0.061
1977:07	60.80	0.061
1977:08	61.10	0.061
1977:09	61.30	0.040
1977:10	61.60	0.060
1977:11	62.00	0.081
1977:12	62.30	0.060

obs	CPIAUCSL	INFL1
1995:01	150.5	0.032
1995:02	150.9	0.032
1995:03	151.2	0.024
1995:04	151.8	0.049
1995:05	152.1	0.024
1995:06	152.4	0.024
1995:07	152.6	0.016
1995:08	152.9	0.024
1995:09	153.1	0.016
1995:10	153.5	0.032
1995:11	153.7	0.016
1995:12	153.9	0.016
1996:01	154.7	0.064
1996:02	155.0	0.024
1996:03	155.5	0.039
1996:04	156.1	0.047
1996:05	156.4	0.023
1996:06	156.7	0.023
1996:07	157.0	0.023
1996:08	157.2	0.015
1996:09	157.7	0.039
1996:10	158.2	0.039
1996:11	158.7	0.039
1996:12	159.1	0.031
1997:01	159.4	0.023
1997:02	159.7	0.023
1997:03	159.8	0.008
1997:04	159.9	0.008
1997:05	159.9	0.000
1997:06	160.2	0.023
1997:07	160.4	0.015
1997:08	160.8	0.030
1997:09	161.2	0.030
1997:10	161.5	0.023
1997:11	161.7	0.015
1997:12	161.8	0.007
1998:01	162.0	0.015
1998:02	162.0	0.000
1998:03	162.0	0.000
1998:04	162.2	0.015
1998:05	162.6	0.030
1998:06	162.8	0.015
1998:07	163.2	0.030
1998:08	163.4	0.015
1998:09	163.5	0.007
1998:10	163.9	0.030
1998:11	164.1	0.015
1998:12	164.4	0.022
1999:01	164.7	0.022
1999:02	164.7	0.000
1999:03	164.8	0.007
1999:04	165.9	0.083
1999:05	166.0	0.007
1999:06	166.0	0.000
1999:07	166.7	0.052
1999:08	167.1	0.029
1999:09	167.8	0.051
1999:10	168.1	0.022
1999:11	168.4	0.022
1999:12	168.8	0.029