

Econ 121
Money and Banking
Instructor: Chao Wei

Answer Key to Midterm

Provide a brief and concise answer to each question. Clearly label each answer. There are 50 points on the exam.

1. (10 points, 3 points each for a and b, and 4 points for c) Predict the effect on the interest rate of the following events using EITHER the bond supply and demand analysis OR liquidity preference framework.

- (a) Federal deficit spending is sharply reduced under Bush administration's new initiative.

Reduction in federal deficit spending reduces the supply of bonds, as a result, bond prices increase and interest rates decline.

- (b) The public suddenly expects a large increase in stock prices.

Expected large increases in stock prices make bonds less attractive compared to stocks. As a result, the demand for bonds decreases, the bond price declines and interest rates increase.

- (c) A decrease in expected inflation.

A decrease in expected inflation raises the demand for bonds and reduces their supply. As a result, bond prices increase and the interest rate declines.

2. (6 points) Suppose the yield on 6 month corporate bond for a highly rated corporation rises relative to the yield on a 6 month Treasury bill. Provide an explanation for why the spread is increasing and what it might signify for the macro economy.

Since both bonds have the same maturity, the spread in the yield reflects a default risk premium and a liquidity premium. The Treasury

is viewed as having zero default risk and is the most liquid type of bond in existence. Hence if the spread increases, the implication is that the default risk has increased and the liquidity premium has increased. The implication for the macro economy is that uncertainty has increased about the future earnings potential of the private sector issuer. Widening spreads for many highly rate private corporations may indicate the onset of a recession.

3. Compute the interest rates.

- (a) What is the yield to maturity on a \$1,000 face value discount bond maturing in 1 year and selling for a price of \$800?

The yield to maturity is:

$$\begin{aligned}i &= \frac{F - P}{P} \\ &= \frac{1000 - 800}{800} \\ &= 25\%\end{aligned}$$

- (b) Determine the current yield on a \$10,000 face value, 10% coupon bond selling for \$8000.

The current yield is:

$$\begin{aligned}i_c &= \frac{C}{P} \\ &= \frac{10,000 \times 10\%}{8,000} \\ &= 12.5\%\end{aligned}$$

- (c) What is the yield on a discount basis on a \$1,000 face value discount bond maturing in 6 months (182 days) and selling for a price of \$950?

The yield on a discount basis is:

$$\begin{aligned}i_d &= \frac{F - P}{F} \times \frac{360}{\text{days to maturity}} \\ &= \frac{1000 - 950}{1000} \times \frac{360}{182} \\ &= 9.89\%\end{aligned}$$

4. (8 points, 2 points for each effect) Describe the response over time of the interest rate to an unexpected increase in the growth rate of the money supply when the liquidity effect is large and expected inflation is slow to adjust.

An unexpected increase in the growth rate of the money supply implies a sudden increase in liquidity. As a result, the liquidity effect immediately kicks in and lowers the interest rate. Eventually both prices and income start to adjust upward, raising the demand for money. These two effects are the so-called price and income effects. People start to adjust their expected inflation slowly. As indicated by the Fisher effect, an increase in expected inflation leads to an increase in the interest rate. All these latter three effects work in opposite direction on the interest rate as compared to the liquidity effect. Since the liquidity effect is large, in the end the interest rate may be still lower than when it starts with before the unexpected increase in the money growth rate.

5. (6 points) An important way in which the Federal Reserve decreases the money supply is by selling bonds to the public. Using a supply and demand analysis for bond, show what effect this action has on interest rates. Is your answer consistent with what you would expect to find with the liquidity preference framework? Explain.

According to the bond supply and demand analysis, the selling of bonds increases the bond supply, lowers the bond price, and raises the interest rate.

This is consistent with the prediction of the liquidity preference framework. A reduction in the money supply leads to an increase in the interest rate.

6. (8 points) Data observation shows that the yield curve is likely to be upward sloping at the start of expansion. Explain these observations using both the bond supply and demand analysis and expectation hypothesis theory.

(4 points) First the bond supply and demand analysis and data observations imply that the interest rate is procyclical. When the economy is heading for expansion, the bond supply increases due to more profitable investment opportunities. The bond demand increases as well, but the increase is typically dominated by the increase in the bond supply. As a result, bond prices decrease, and the interest rate is expected to increase at the start of expansion.

(4 points) According to the expectation hypothesis, the interest rate on long term bonds are averages of expected short term rates. Since the market expects short term rates to increase at the start of expansion, long term rates will be higher than the short term rates, leading to an upward sloping yield curve.

7. (6 points) Compute the rate of returns. (Hint: Calculate the initial price and end-of-period price first, then calculate the return.)
- (a) For a consol with a yearly payment of \$100, calculate the return for the year if its yield to maturity at the beginning of the year is 10% and at the end of the year the interest rate unexpectedly rises to 20%.

Denote the price of consol and the yield to maturity at the beginning of the year respectively as P_t and i_t , and denote the annual coupon payment as C : **(0.5 point)**

$$\begin{aligned} P_t &= \frac{C}{i_t} \\ &= \frac{100}{0.1} \\ &= 1000 \end{aligned}$$

Denote the price of consol and the yield to maturity at the end of the year respectively as P_{t+1} and i_{t+1} , and denote the annual coupon payment as C :**(0.5 point)**

$$\begin{aligned} P_{t+1} &= \frac{C}{i_{t+1}} \\ &= \frac{100}{0.2} \\ &= 500 \end{aligned}$$

The return for the year, R_{t+1} , can be written as **(1 point)**

$$\begin{aligned} R_{t+1} &= \frac{C}{P_t} + \frac{P_{t+1} - P_t}{P_t} \\ &= \frac{100}{1000} + \frac{500 - 1000}{1000} \\ &= -40\%. \end{aligned}$$

- (b) For a 10% coupon bond, with a \$1,000 face value, selling at par with 2 years to maturity ,calculate the return for the year if its yield to maturity at the beginning of the year is 10% and at the end of the year the interest rate unexpectedly rises to 20%.

The price of the coupon bond at the beginning of the year, P_t , is equal to its face value, 1000.**(1 point)**

Denote the price of the coupon bond and the yield to maturity at the end of the year respectively as P_{t+1} and i_{t+1} , and denote the annual coupon payment as C . Note that at the end of the year, the coupon bond will mature in another year. We compute P_{t+1} as the present value of the last coupon payment and principal, both due at maturity.**(1 point)**

$$\begin{aligned} P_{t+1} &= \frac{C}{(1 + i_{t+1})} + \frac{F}{(1 + i_{t+1})} \\ &= \frac{100}{(1 + 0.2)} + \frac{1000}{(1 + 0.2)} \\ &\approx 916.67 \end{aligned}$$

The return for the year, R_{t+1} , can be written as **(1 point)**

$$\begin{aligned} R_{t+1} &= \frac{C}{P_t} + \frac{P_{t+1} - P_t}{P_t} \\ &= \frac{100}{1000} + \frac{916.67 - 1000}{1000} \\ &= 1.67\% \end{aligned}$$

- (c) What explains the differences between the rate of returns in (a) and (b). **(1 point)**

The difference is that the consol has a much longer maturity as compared to the one-year holding period. A sudden increase in the interest rate means that all the future coupon payments (up to infinity) will be subject to higher discount rate, as compared to the two-year bond, which only has one-year coupon payment and principal subject to higher discount rate. As a result, the longer the maturity, the higher capital loss from a sudden increase in the interest rate.