

Midterm 1

A U.S. treasury bond carries 6% annual coupon rate with maturity date on Dec 15,2025. Remember this is semiannually. You may set face value (fv)

- a) The bond yield on June 16, 2017 was 3%. What was the bond price quote?  
 $N=17$   $I/Y=1.5\%$   $PV=?$   $PMT=3$  (6/2)  $FV=100$  (自己设的) 算出后,  $pv=122.36\%$  of par
- b) Today is oct 17, 2017. If the yield remains at 3%, how should be the price be quoted?  
 Number of days from June 16, 2017 to oct 17, 2017: 122  
 Number of days in this period: 182 (June 16-dec 15)  
 $P_{standard}=pv$  on June 16, 2017 at yield of  $3\%= 122.36\%$   
 $P_{full}=(1 + \frac{3\%}{2})^u * P_{standard}, where u = 122/182 = 1.01 * 122.36\% = 123.59\%$   
 $C=\frac{6\%*100}{2} = 3$   $AI=C*U=3*1.01 = 2.011$   
 $P_{quote}=P_{full}-AI=123.59-2.011=121.58\%$  of par
- c) If you want to sell the bond today to yield 2.8%, how should you quote the price?  
 $N=17$   $I/Y=1.4$   $PV=?$   $PMT=3$   $FV=100$   $PV=124.0566\%$   
 $P_{full}=(1 + \frac{2.8\%}{2})^u * P_{standard}, where u = 122/182 = 1.7983 * 124.0566\% = 125.22\%$   $AI-CU=2.011$   
 $P_{quote}=P_{full}-AI=125.22-2.011=123.21\%$  of par

A 5% 10-year U.S. treasury bond is quoted at 108.18 % of par.

- a) Someone suggests the current bond yield is 4.5%. is it right?  
 $N=20$   $I/Y=?$   $PV=-108.18$   $PMT=2.5$   $FV=100$   $I/Y=1.99975$   $YTM=1.99975*2=3.9995\%$   
 so 4.5% is wrong.
- b) If the yield on the bond in two years is 3%, how much can you sell it for?  
 $N=16$   $I/Y=1.5$   $PV=?$   $PMT=2.5$   $FV=100$   $PV=114.13\%$  of par
- c) If the yield is 3.75% in 6 month, 3.5% in 1 year, 3.25% in 1.5 year, what will the cumulative interests be in two years?

year	YTM%	PRICE	Cumulative int.
0	4	108.18	0
0.5	3.75		2.5
1	3.5		
1.5	3.25		
2	3	114.13	

$$\text{Cumulative interest} = 2.5 * (1 + \frac{0.0375}{2}) * (1 + \frac{0.0035}{2}) + (1 + \frac{0.0325}{2}) + 2.5 * (1 + \frac{0.0035}{2}) + (1 + \frac{0.0325}{2}) + 2.5 * (1 + \frac{0.0325}{2}) = 10.2593$$

- d) What is your annualized return over two years?

$$\frac{Pt + cum int.}{P0} = \frac{114.13 + 10.2593}{108.18} = 1.1498$$

$$r = \sqrt[4]{1.1498} - 1 = 3.55\% \text{ so annualized return is } 3.55\% * 2 = 7.1\%$$

## Midterm 2

A house is \$400,000; mortgage rate is 9%. APR monthly. The required LTV is less than 80%.

1. How much loan do you have to borrow to meet the required LTV?  
Loan =  $80\% * 400,000 = \$320,000$
2. You choose 25 years amortization with monthly payment, how much is your monthly payment?  
N = 300 (25\*12) I/Y = 0.75% (9%/12) PV = -320,000 PMT = ? FV = 0  
PMT = \$2685/month
3. Your gross annual income is \$150,000. The real estate tax is \$6000/yr. It's freehold. What is your PTI?  
Payment (annually) =  $12 * \$2685 + 6000 = \$38,220$   
PTI =  $\$38,220 / 150,000 = 25.48\%$
4. The mortgage allows prepayment, explain why prepayment is a risk to the bank "declining interest rate"  
If the interest rate falls, the bank will earn less than before and people are more willing to make some more prepayment before the maturity
5. Why is the payment option equivalent to the right of refinancing?  
If bank refuses, you can easily go to another bank. This bank loses customers.
6. The mortgage rate declines to 8% after 3 years,, will you refinance if there's a refinance fee of \$2000?  
N = 264 I/Y = 0.75 PMT = 2685 PV = ? FV = 0  
PV = 308,253  $308,253 + 2000 = \$310,253$   
N = 264 I/Y = 0.6667 PMT = ? PV = 310,253 FV = 0  
PMT = 2500

YES, refinancing. Because new payment is lower

You have purchased a freehold house for \$300,000 with 20% down payment and the rest borrowed from your local bank as a 30-year mortgage loan at 6%, APR with monthly compounding. The mortgage can be paid off any time without penalty, it allows prepayment.

1. What is your loan to value ratio (LTV)?  
LTV =  $1 - 20\% = 80\%$

A mortgage pass-through security of 30-year conforming mortgage is issued with initial balance of \$250 million and initial WAM of 354 months. The WAC is 8% and coupon rate is 7%.

1. First month payment  
 $rm = WAC/12 = 8\%/12 = 0.6667\%$   
 $N = 354 \quad I/Y = 0.6667 \quad PMT = ? \quad PV = -250,000,000 \quad FV = 0$   
 $PMT = 1,842,021$
2. SMM for the first month is 0.001767. what is the total principal to be received by the pass-through in this month?  
Scheduled principle payment =  $1,842,021 - 0.6667\% * 250,000,000 = 175,271$   
Prepayment of the first month =  $0.001767 * (250,000,000 - 175,271) = 441,440$   
Total principle payment =  $441,440 + 175,271 = 616,711$
3. What is the cash flow to the investors of the pass-through in the first month?  
Interest to investors:  $250,000,000 * 7\%/12 = 1,458,333$   
Cash flow =  $1,458,333 + 616,711 = 2,075,044$
4. Second month payment  
 $MB2 = 250,000,000 - 616,711 = 249,383,289$   
 $N = 353 \quad I/Y = 0.6667 \quad PMT = ? \quad PV = -249,383,289 \quad FV = 0$   
 $PMT = 1,838,766$
5. If the prepayment speed on the second month is calculated based on the PSA 150. What is the cash flow of second month?  
100 PSA CPR =  $T/30 * 6\% = (12 * 30 - 354 + 2)/30 * 0.06 = 0.016$   
150 PSA CPR =  $0.016 * 1.5 = 0.024$   
 $SMM = 1 - (1 - 0.024)^{1/12} = 0.002022$   
Scheduled principle payment =  $1,838,766 - 0.006667 * 249,383,289 = 176,128$   
Prepayment of the second month =  $0.002022 * (249,383,289 - 176,128) = 503,897$   
Total principle payment =  $503,897 + 176,128 = 680,025$   
Interest to investor =  $249,383,289 * 7\%/12 = 1,454,736$   
Cash flow =  $1,454,736 + 680,025 = 2,134,761$

A 5% fixed-rate coupon tranche of \$75 million is split into a floater of \$50 million with coupon payment equal to LIBOR+0.5%, and an inverse floater of \$25 million with coupon payment determined by the formula:  $K - L * LIBOR$ . Specify the parameters of the formula for the inverse floater.

$$\frac{L}{1 + L} = \frac{50}{75} = \frac{2}{3}$$

$$\frac{50}{75} * (LIBOR + 0.5\%) + \frac{50}{75} * (K - L * LIBOR) = 5\%$$

$$\frac{2}{3} * (2 + 0.5\%) + \frac{1}{3} * (k - 2 * 2) = 0.05 \quad K = 0.14$$

Tranche	Par amount	Coupon rate (%)
A	\$194,500,000	7.5
B	36,000,000	7.5
C	96,500,000	7.5
D	73,000,000	7.5
Total	\$400,000,000	

The principle payment is to be received first by Tranche A, then B C D

1. Before tranche A is paid off, what is the total cash flow to the Tranche B investors per month?

$$CFB = 36,000,000 * \frac{7.5\%}{12} = \$225,000$$

2. Which tranche is most sensitive to the declining interest rate?

A. Because A has the highest par value. If the interest rate is decreasing, then the prepayment will increase. People will more willing to pay to before the maturity date and with a cheaper price.

A CMO contains one planned amortization class bond, and one supporting bond S. the PAC bond is created between PSA 90 and PSA 300. Assuming that the supporting bond S will be exhausted by Month 210. Given the actual principal payments in the 4<sup>th</sup> column, fill out the respective principal payments to this PAC bondholders in the last column, then explain.

month	90% PSA	300% PSA	Actual principle payment	Principal payment to the PAC bondholder
1	508,169	1,075,931	600,000	508,169
2	569,843	1,279,412	800,000	569,843
The supporting bond S has gone on Month 210				
211	949,282	213,309	200,000	200,000
212	946,033	309,409	300,000	300,000

Before the month 210, there are more attract prepayment. Then we are looking for the lowest price about PSA that our PAC bondholders are willing to pay  
 After month 210, the supporting bond S is exhausted. The bondholders will to pay with actual principal payment.

Chapter 27

**1. Suppose that the present value of the liabilities of some financial institution is \$600 million and the surplus \$800 million. The duration of the liabilities is equal to 5. Suppose further that the portfolio of this financial institution includes only bonds and the duration for the portfolio is 6.**

**(a) What is the market value of the portfolio of bonds?**

market value of assets = \$800 million + \$600 million = **\$1.4 billion.**

**(b) What does a duration of 6 mean for the portfolio of assets?**

assets is about  $0.06(\$1.4 \text{ billion}) = \mathbf{\$84 \text{ million}}$  for a 100 basis points decrease in interest rates. Similarly, the decrease in the market value of the assets is about  $-0.06(\$1.4 \text{ billion}) = \mathbf{-\$84 \text{ million}}$  for a 100 basis points increase in interest rates.

**(c) What does a duration of 5 mean for the liabilities?**

If the duration of the liabilities is 5, the present value of the liabilities will increase by 5% or  $0.05(\$600 \text{ million}) = \mathbf{\$30 \text{ million}}$  for a 100 basis point decrease in interest rates. Similarly, it will decrease by  $\mathbf{-\$30 \text{ million}}$  for every 100 basis point increase in interest rates.

**(d) Suppose that interest rates increase by 50 basis points; what will be the approximate new value for the surplus?**

The decrease in assets will be  $\frac{-0.06(\$1.4 \text{ billion})}{2} = \mathbf{-\$42 \text{ million}}$ . The decrease in liabilities

will be  $\frac{-0.05(\$600 \text{ million})}{2} = \mathbf{-\$15 \text{ million}}$ ,  $(-\$42 \text{ million}) - (-\$15 \text{ million}) = \mathbf{-\$27}$

million.  $\$800 \text{ million} + (-\$27 \text{ million}) = \mathbf{\$773 \text{ million}}$ .

**(e) Suppose that interest rates decrease by 50 basis points; what will be the approximate new value for the surplus?**

The increase in assets will be  $\frac{0.06(\$1.4 \text{ billion})}{2} = \mathbf{\$42 \text{ million}}$ . The increase in liabilities

will be  $\frac{0.05(\$600 \text{ million})}{2} = \mathbf{\$15 \text{ million}}$ .  $\$42 \text{ million} - \$15 \text{ million} = \mathbf{\$27 \text{ million}}$ .

old surplus value + change in surplus value =  $\$800 \text{ million} + \$27 \text{ million} = \mathbf{\$827 \text{ million}}$ .

You have a fixed liability of \$1,000,000 at the end of the fifth year. The current term structure of interest rates is flat at 8% BEY.

- a) If coupon bonds of wide variety of coupon rates and maturities are available, what should you do to meet your liability according to the immunization theory of Reddington (1952)? What is the critical assumption on the term structure of interest rates?

$$Pv = \frac{1,000,000}{(1+0.04)^{10}} = 675,564.17$$

The assumption in the Reddington theory is that the term structure is flat, and it may change immediately after the purchase then remaining constant thereafter.

- b) Assume there are only two bonds available: bond 1 carries 10% coupon with 10 years to maturity and bond 2 carries 13% coupon with 5 years to maturity, both bonds have par value of \$100. Assume both bonds have just paid out their respective semi-annual coupon interests today. What can you do to meet your liability?

Bond 1:

$$\text{Duration: } \frac{1+rs}{rs} - \frac{1+rs+n\left(\frac{i}{2}-rs\right)}{is[(1+rs)^n-1]+rs} = \frac{1+0.04}{0.04} - \frac{1+0.04+20(0.05-0.04)}{0.05[(1+0.04)^{20}-1]+0.04} = 13.5447 \text{ half year}$$

$$N=20 \text{ I/Y}=4 \text{ PV=? PMT}=5 \text{ FV}=100 \text{ PV}=\$113.59$$

Bond

2:

$$\text{Duration: } \frac{1+rs}{rs} - \frac{1+rs+n\left(\frac{i}{2}-rs\right)}{is[(1+rs)^n-1]+rs} = \frac{1+0.04}{0.04} - \frac{1+0.04+10(0.065-0.04)}{0.065[(1+0.065)^{10}-1]+0.04} = 7.8861$$

$$N=10 \text{ I/Y}=4 \text{ PV=? PMT}=6.5 \text{ FV}=100 \text{ PV}=\$120.28$$

$$W1+W2=1$$

$$13.5447W1+7.8861W2=10 \rightarrow W1=0.3731 \text{ } W2=0.6269$$

$$\text{Bond 1: } \frac{0.3731 * \$675564.17}{\$113.59} = 2218.97 \quad \text{Bond 2} = \frac{0.6269 * \$675564.17}{\$120.28} = 3521.04$$

So, buy 2218.97 bond 1 and 3521.04 bond 2.

- c) Rebalance after 6 month, term structure changes to 9%.

$$Pv = \frac{1,000,000}{(1+0.045)^9} = 672,904.43$$

$$\text{Bond 1: } \frac{1+0.045}{0.045} - \frac{1+0.045+19(0.05-0.045)}{0.05[(1+0.045)^{19}-1]+0.045} = 12.9$$

$$N=19 \text{ I/Y}=4.5 \text{ PV=? PMT}=5 \text{ FV}=100 \text{ PV}=\$106.2966$$

$$\text{Bond 2: } \frac{1+0.045}{0.045} - \frac{1+0.045+9(0.065-0.045)}{0.065[(1+0.045)^9-1]+0.045} = 7.23$$

$$N=9 \text{ I/Y}=4.5 \text{ PV=? PMT}=6.5 \text{ FV}=100 \text{ PV}=\$114.54$$

$$W1+W2=1$$

$$12.9W1+7.23W2=9 \rightarrow W1=0.3122 \text{ } W2=0.6878$$

$$\text{Bond 1: } \frac{0.3122 * \$672904.43}{\$106.2966} = 1976.36 \quad \text{Bond 2} = \frac{0.6878 * \$672904.43}{114.54} = 4040.71$$

Net purchase: bond 1: 2218.97 - 1976.36 = 242.61 (sell this much)

Bond 2: 4040.71 - 3521.04 = 519.67 buy

Chapter 5

Year	YTM%	Spot rate
0.5	5.25	5.25
1	5.5	5.5
1.5	5.75	5.76
2	6	6.02
2.5	6.25	<b>6.28</b>

Step 1:  $0.0625/2 * \$100 = \$3.125$  for  $t=1,2,3,$  and  $4$

Step 2:  $0.0525/2$   $0.055/2$   $0.0575/2$   $0.06/2$

Step 3:  $100 = \frac{3.125}{1 + \frac{0.0525}{2}} + \frac{3.125}{(1 + \frac{0.055}{2})^2} + \frac{3.125}{(1 + \frac{0.0575}{2})^3} + \frac{3.125}{(1 + \frac{0.06}{2})^4} + \frac{103.125}{(1 + \frac{y}{2})^5}$   $y = 0.03141$

Step 4:  $0.03141 * 2 = 0.0628$

Maturity (Year)	YTM (%)	Spot Rate (%)	Forward Rate (%)
0.5	1.500	1.5	1.752
1.0	2.500	2.5	3.505
1.5	3.300	3.319	4.545
2.0	3.600	3.624	

(a)(1 points) What are the spot rate with 0.5 and 1 year to maturity? Why?

1.5 and 2.5 first two periods' spot rate should equal to TYM since they are treasury bills (no coupon rate). For more than 1 year, there is coupon rate. More than 1 year, we call it on the run coupon

(b)(1 points) The forward rate in the table, 3.505%, is quoted as APR based on the semi-annual compounding assumption. It applies to the time interval between Year 0.5 and Year 1. What is the meaning of this forward rate? How is it calculated?

forward rates are expected future spot rate that may differ from the actual spot rates that occur in the future. Spot rates can be used to compute the forward rate for any time in the future for any investment horizon.

We can calculate by  $f_{12} = \frac{(1+y)^{13}}{(1+y)^{12}} - 1 = \frac{(1+0.03624)^4}{(1+0.03319)^3} - 1 = 0.0227$   $0.0227 * 2 = 4.54$

(c)(2 points) The pure expectation theory suggests that the 6-month spot rate (quoted as APR based on semi-annual compounding assumption) in 6 months (i.e., half year from today) is expected to be 3.505%. Which theory suggests that this future spot rate should be lower than 3.505%? What are the key arguments? (if they equal, it should be pure expectation theory) Based on biased expectation theory, I think liquid theory suggests... because The liquidity preference theory, on the other hand, specifies that the liquidity premium is positive so that the forward rate is less than the market's expectation of the future short rate.

The current term structure of interest rates is presented equivalency in terms of the yield to maturity (YTM) of the on the run Treasury securities and the spot rates. All the rates are quoted as APR based on the semi-annual compounding assumptions.

Maturity (Year)	YTM (%)	Spot Rate (%)
0.5	6.000	6.000
1.0	6.500	6.500
1.5	6.750	6.765
2.0	6.900	6.919
2.5	7.000	7.023
3.0	7.080	7.107
3.5	7.150	7.181
4.0	7.220	7.257
4.5	7.250	7.288
5.0	7.260	7.296

(a)(2 points) You hold an off-the-run Treasury bond with 10% coupon and 5 year XX left. If you want to sell the bond for the YTM of the same maturity as shown in the above table, how much should you ask (on face value of \$100)? Be accurate 1/10 of \$100 (e.g., 103.275).  
 $N=10$   $I/Y=7.26/2=3.63$   $PV=?$   $PMT= 5$   $FV=100$   $PV= 111.32$

(b)(3 points) What is the fair market value of this off-the-run bond according XX yield curve? Why is this value different from the value in Part (a)?

$$P = \frac{5}{\left(1 + \frac{0.06}{2}\right)} + \dots + \frac{5}{\left(1 + \frac{0.07288}{2}\right)^9} + \frac{105}{\left(1 + \frac{0.07296}{2}\right)^{10}} = \dots$$

Value different is because one use constant u to calculate while the other one is based on different yields with different maturity.

Issuer	Rating	Yield (%)	Spread (basis points)	Treasury Benchmark (years)
General Electric Capital Company (GEEC)	Triple A	7.87	50	10
Mobil Corporation	Double A	7.77	40	10
Southern Bell Telephone & Telegraph (SBTT)	Triple A	8.60	72	30
Bell Telephone Company of Pennsylvania (BTCP)	Double A	8.66	78	30
AMR Corporation	Triple B	9.43	155	30

**(a) What does rating mean?**

A rating classifies the credit worthiness of the security issue. High ratings indicate very low default risk or credit risk in terms of the issuer not being able to make timely principal and/or interest payments.

**(b) Which of the five bonds has the greatest credit risk?**

In terms of highest rating, the rating classification follows this ordering in terms of least credit risk to greatest credit risk: triple A, double A, single A, triple B, double B, single B, and below. Thus, since Mobil Co. and (BTCP) have double B ratings (while the other three issuers have higher ratings), these two companies have the lowest rating and thus greatest credit risk. In terms of maturity, the last three issues listed above have a higher maturity premium because each has 30 years to maturity.

**(c) What is meant by spread?**

A spread refers to the difference in yields between two securities. The difference is measured in basis points.

**(d) What is meant by Treasury benchmark?**

The benchmark interest rate is the minimum interest rate that investors demand for investing in a non-Treasury security. The base interest rate is typically viewed as the yield to maturity offered on a comparable maturity Treasury security that was most recently issued.

**(e) Why do each of the spreads reported above reflect a risk premium?**

Each spread reflects a risk premium because each spread results from additional risks the investor faces by acquiring a security that is not issued by the U.S. government.

**(a) What is the yield spread between the Southern Bell Telephone and Telegraph (SBTT) bond issue and the Bell Telephone Company of Pennsylvania (BTCP) bond issue?**

Yield spreads are typically measured in terms of the difference between the yields on two bonds. The difference is measured in basis points. Inserting in our numbers, we have:  
yield spread = yield BTCP – yield SBTT = 8.66% – 8.60% = 0.06% which is **6 basis points**.

**(b) The Southern Bell Telephone and Telegraph (SBTT) bond issue is not callable, but the Bell Telephone Company of Pennsylvania (BTCP) bond issue is callable. What does the yield spread in part (a) reflect?**

BTCP has a lower bond rating (double A) compared to SBTT (triple A). This can explain the 6-basis-point greater yield for BTCP. Also, the presence of an embedded option has an effect on the spread of an issue relative to otherwise comparable issues that do not have an embedded option.

**(c) AMR Corp. is the parent company of American Airlines and is therefore classified in the transportation industry. The issue is not callable. What is the yield spread between AMR Corp. and Southern Bell Telephone and Telegraph (SBTT) bond issue, and what does this spread reflect?**

Yield spread = yield AMR Corp – yield SBTT = 9.43% – 8.60% = 0.83% which is 83 basis points.

This yield spread of 83 basis points represents the higher credit risk for AMR which has a triple B rated bond compared to the higher rated triple A bond for SBTT. Since both are not callable, the spread does not embody an extra premium required by investors for accepting a callable bond. The spread does not reflect any difference in a maturity premium since both are 30-year bonds.

**(d) What is the spread between the General Electric Capital Co. (GECC) issue and the Mobil Corp. issue?**

Yield spread = yield GECC – yield Mobil Corp. = 7.87% – 7.77% = 0.1% which is ten basis points.

**(e) The Mobil Corp. issue is not callable. However, the General Electric Capital Co. issue is callable. How does this information help you in understanding the spread between these two issues?**

GECC has a triple A bond rating compared to Mobil's rating of double A. Thus, everything else equal, one would think that GECC would have a lower yield. However, everything else is not equal because GECC's bond is callable causing investors to demand a higher return on GECC's bond compared to similarly rated bonds. In this case, the callable feature appears to dominate the fact GECC has a higher bond rating which indicates less credit risk. Thus, knowing GECC's bonds are callable helps us understand why its yield is higher. Since both have the same maturity, this factor cannot account for the spread of ten basis points.

Chapter 24

**Below are two portfolios with a market value of \$500 million. The bonds in both portfolios are trading at par value. The dollar duration of the two portfolios is the same.**

Issue	Years to Maturity	Par Value (in millions)
Bonds Included in Portfolio I		
A	2.0	\$120
B	2.5	\$130
C	20.0	\$150
D	20.5	\$100
Bonds Included in Portfolio II		
E	9.7	\$200
F	10.0	\$230
G	10.2	\$ 70

**(a) Which portfolio can be characterized as a bullet portfolio?**

Portfolio II can be characterized as a bullet portfolio because the maturities of its securities are concentrated around one maturity (ten years).

**(b) Which portfolio can be characterized as a barbell portfolio?**

Portfolio I can be characterized as a barbell portfolio because the maturities of its securities are concentrated at two extreme maturities (two years and twenty years).

**(c) The two portfolios have the same dollar duration; explain whether their performance will be the same if interest rates change.**

Even if the yield curve shifts in a parallel fashion due to changes in interest rates, two portfolios with the same dollar duration will not give the same performance if they have differences in dollar convexity. Although with all other things equal, it is better to have more convexity than less; the market charges for convexity in the form of a higher price or a lower yield. But the benefit of the greater convexity depends on how much yields change.

**(d) If they will not perform the same, how would you go about determining which would perform best assuming that you have a six-month investment horizon?**

To determine which portfolio would have the superior performance, we would want to look at the total return for the six-month investment horizon given expectations about change in yields and how the yield curve will shift.

**The excerpt that follows is taken from an article titled “Smith Plans to Shorten,” which appeared in the January 27, 1992, issue of *BondWeek*, p. 6: Smith Affiliated Capital will**  
**What type of portfolio strategy is Smith Affiliated Capital pursuing?**

Smith appears to be following an interest-rate expectation strategy. A manager who believes that he or she can accurately forecast the future level of interest rates will alter the portfolio's sensitivity to interest-rate changes. As duration is a measure of interest-rate sensitivity, this involves increasing a portfolio's duration if interest rates are expected to fall and reducing duration if interest rates are expected to rise. For those managers whose benchmark is a bond index, this means increasing the portfolio duration relative to the benchmark index if interest rates are expected to fall and reducing it if interest rates are expected to rise. The degree to which the duration of the managed portfolio is permitted to diverge from that of the benchmark index may be limited by the client.

If we can assume the remaining maturities or the same, it appears that Smith is following a substitution swap strategy. A swap in which a money manager exchanges one bond for another bond that is similar in terms of coupon, maturity, and credit quality, but offers a higher yield, is called a **substitution swap**. This swap depends on a capital market imperfection. Such situations sometimes exist in the bond market owing to temporary market imbalances and the fragmented nature of the non-Treasury bond market. The risk the money manager faces in making a substitution swap is that the bond purchased may not be truly identical to the bond for which it is exchanged. Moreover, typically, bonds will have similar but not identical maturities and coupon. This could lead to differences in the convexity of the two bonds, and any yield spread may reflect the cost of convexity.

**21. The following excerpt is taken from an article titled “MERUS to Boost Corporates,” which appeared in the January 27, 1992, issue of *BondWeek*, p.6: MERUS Capital**  
**What types of active portfolio strategies is MERUS Capital Management pursuing?**

MERUS is increasing corporates in its long investment-grade fixed-income portfolio in the next months to one year. They are focusing upon investment-grade securities because they expect the spread will tighten and some issues will be given higher ratings thus increasing their value. Thus, now is the time to lock in a higher spread as well as investing in investment-grade securities that will be strengthened by a robust economy.

Thus, MERUS is employing a **yield spread strategy** that involves positioning a portfolio to capitalize on expected changes in yield spreads between sectors of the bond market.

Swapping (or exchanging) one bond for another when the manager believes that the prevailing yield spread between the two bonds in the market is out of line with their historical yield spread, and that the yield spread will realign by the end of the investment horizon, are called **intermarket spread swaps**.

MERUS is also employing a **credit spread strategy**. Credit or quality spreads change because of expected changes in economic prospects. Credit spreads between Treasury and non-Treasury issues widen in a declining or contracting economy and narrow during economic expansion (which is MERUS's case). The economic rationale is that in a declining or contracting economy, corporations experience a decline in revenue and reduced cash flow, making it difficult for corporate issuers to service their contractual debt obligations. To induce investors to hold non-Treasury securities of lower-quality issuers, the yield spread relative to Treasury securities must widen. The converse is that during economic expansion and brisk economic activity, revenue and cash flow pick up, increasing the likelihood that corporate issuers will have the capacity to service their contractual debt obligations. Yield spreads between Treasury and federal agency securities will vary depending on investor expectations about the prospects that an implicit government guarantee will be honored.

**22. This excerpt comes from an article titled “Eagle Eyes High-Coupon Callable Corporates” in the January 20, 1992, issue of *BondWeek*, p. 7: If the bond market rallies What types of active portfolio strategies are being pursued by Eagle Asset Management?**

Blanton may take profits by trading seven- to 10-year Treasuries for high-coupon single-A industrials that are callable in two to four years because the market rally will fade. This means Blanton believes the spread will stop decreasing and may even increase making these securities less desirable. By buying callable bonds, it is implied that interest rates may increase. Blanton has already sold some seven- to 10 year Treasuries to buy high-coupon single-A nonbank financial credits implying that he further believes interest rates will increase. In anticipation of interest rates increasing, Blanton has cut the duration of his portfolio so as not to be stuck with long-term investments in securities paying low coupon rates relative to market yields. Finally, Blanton has shifted from Treasuries to industrial and financials where the spread are believed to be relatively high.

From the above, Blanton appears to be following a strategy to capitalize on differences in **spreads between callable and noncallable securities**. For example, Blanton has bought some callable securities. Spreads attributable to differences in callable and noncallable bonds and differences in coupons of callable bonds will change as a result of expected changes in (i) the direction of the change in interest rates and (ii) interest-rate volatility. An expected drop in the level of interest rates will widen the yield spread between callable bonds and noncallable bonds as the prospects that the issuer will exercise the call option increase. The reverse is true: the yield spread narrows if interest rates are expected to rise.

Next, Blanton is also involved in a credit spread strategy. For example, Blanton has already sold seven- to 10-year Treasuries to buy \$25 million of high-coupon, single-A nonbank financial credits. Credit or quality spreads change because of expected changes in economic prospects. Credit spreads between Treasury and non-Treasury issues widen in a declining or contracting economy and narrow during economic expansion.

Additionally, Blanton is engaged in a strategy that involves changing his portfolio's duration. A money manager who believes that he or she can accurately forecast the future level of interest rates will alter the portfolio's sensitivity to interest-rate changes. As duration is a measure of interest-rate sensitivity, this involves increasing a portfolio's duration if interest rates are expected to fall and reducing duration if interest rates are expected to rise. For those managers whose benchmark is a bond index, this means increasing the portfolio duration relative to the benchmark index if interest rates are expected to fall and reducing it if interest rates are expected to rise. The degree to which the duration of the managed portfolio is permitted to diverge from that of the benchmark index may be limited by the client. A portfolio's duration may be altered by swapping (or exchanging) bonds in the portfolio for new bonds that will achieve the target portfolio duration. Such swaps are commonly referred to as **rate anticipation swaps**.

Further, it appears that Blanton is following a **yield spread strategy**. Blanton is involved in positioning a portfolio to capitalize on expected changes in yield spreads between sectors of the bond market. For example, the excerpt states: “Blanton said he likes single-A industrials and financials with 9 1/2–10% coupons because these are selling at wide spreads of about 100–150 basis points off Treasuries.” Swapping (or exchanging) one bond for another when the manager believes that the prevailing yield spread between the two bonds in the market is out of line with their historical yield spread, and that the yield spread will realign by the end of the investment horizon, are called **intermarket spread swaps**.

**23. The following excerpt is taken from an article titled “W.R. Lazard Buys Triple Bs,” which appeared in the November 18, 1991, issue of *BondWeek*, p. 7:**

**What types of active portfolio strategies are being followed by W.R. Lazard & Co.?**

Schultz wants to capitalize on what he believes are underpriced bonds rated triple B's and single A's. Thus, Schultz appears to be using a **credit spread strategy**.

Credit or quality spreads change because of expected changes in economic prospects. Credit spreads between Treasury and non-Treasury issues widen in a declining or contracting economy and narrow during economic expansion. To induce investors to hold non-Treasury securities of lower-quality issuers, the yield spread relative to Treasury securities must widen. Schultz wants to earn a higher spread for issues that are below AA because he thinks these spreads will be reduced.

Schultz's strategy can also be viewed as a **yield spread strategy** which involves differences in yields within the corporate sectors.

**24. In an article titled “Signet to Add Pass-Throughs,” which appeared in the October 14, 1991, issue of *BondWeek*, p. 5, it was reported that Christian Goetz, assistant vice president of Signet Asset Management, “expects current coupons to outperform premium pass-throughs as the Fed lowers rates because mortgage holders will refinance premium mortgages.” If Goetz pursues a strategy based on this, what type of active strategy is it?**

Goetz appears to be pursuing an active strategy that relies on forecasts of future interest-rate levels. Future interest rates, for instance, affect the value of options embedded in callable bonds and the value of prepayment options embedded in mortgage-backed securities. Callable corporate and municipal bonds with coupon rates above the expected future interest rate will underperform relative to noncallable bonds or low-coupon bonds. This is because of the negative convexity feature of callable bonds.

Goetz is also concerned with an active strategy used in the mortgage-backed securities market. This strategy involves identifying individual issues of pass-throughs, CMO classes, or stripped MBS that are mispriced, given the assumed prepayment speed to price the security. Another active strategy commonly used in the mortgage-backed securities market is to create a package of securities that will have a better return profile for a wide range of interest-rate and yield curve scenarios than similar duration securities available in the market. Because of the fragmented nature of the mortgage-backed securities market and the complexity of the structures, such opportunities are not unusual.

**25. The following excerpt comes from an article titled “Securities Counselors Eyes Cutting Duration” in the February 17, 1992, issue of *BondWeek*, p. 5:**

**(a) Why would Securities Counselors want to shorten duration if it believes that interest rates will rise?**

Securities Counselors is planning for the possibility that interest rates will increase. The plan involves shortening its duration so that it can be in a position to reinvest funds in longer term investments. This is because a short duration implies investments will be maturing and thus these funds will be available to buy securities with a higher coupon rate if interest rates do increase.

**(b) How does the purchase of cash equivalents and short-maturity high-grade utilities accomplish the goal of shortening the duration?**

Cash equivalents and short-maturity high-grades utilities are very liquid and thus by nature will mature quickly. Ceteris paribus, these investments involve very short durations.

**(c) What risk is Securities Counselors indicating in the last sentence of the excerpt that it is seeking to avoid by not buying corporate bonds?**

A hostile takeover can involve retiring holdings making the duration very short. The risk is the unexpected nature of the takeover that would cause a portfolio manager to rearrange their portfolio and perhaps have to invest in securities that do not pay as high a rate of return.

**26. The next excerpt is taken from an article titled “Wood Struthers to Add High-Grade Corporates,” which appeared in the February 17, 1992, issue of *BondWeek*, p. 5:**

As the economy improves, there will be less risk. This implies that corporate fixed-income investments may be upgraded. The upgrade will increase the value of these securities. If Wood Struthers & Winthrop (WS&W) increases its corporate allocation it will be in a position to increase its value due to price appreciation. By selling Treasuries and agencies, WS&W will be increasing its coupon payments and thus its value due to interest payments. In conclusion, WS&W will be in a position to profit through both price appreciation and increase fixed payments. This risk is inherent whenever shifting away from Treasuries to corporates is the greater probability of not receiving principal and interest payments in full.