Solutions for End-of-Chapter Questions and Problems: Chapter Eight

1. How do monetary policy actions made by the Federal Reserve impact interest rates?

Through its daily open market operations, such as buying and selling Treasury bonds and Treasury bills, the Fed seeks to influence the money supply, inflation, and the level of interest rates. When the Fed finds it necessary to slow down the economy, it tightens monetary policy by raising interest rates. The normal result is a decrease in business and household spending (especially that financed by credit or borrowing). Conversely, if business and household spending decline to the extent that the Fed finds it necessary to stimulate the economy it allows interest rates to fall (an expansionary monetary policy). The drop in rates promotes borrowing and spending.

2. How has the increased level of financial market integration affected interest rates?

Increased financial market integration, or globalization, increases the speed with which interest rate changes and volatility are transmitted among countries. The result of this quickening of global economic adjustment is to increase the difficulty and uncertainty faced by the Federal Reserve as it attempts to manage economic activity within the U.S. Further, because FIs have become increasingly more global in their activities, any change in interest rate levels or volatility caused by Federal Reserve actions more quickly creates additional interest rate risk issues for these companies.

3. What is the repricing gap? In using this model to evaluate interest rate risk, what is meant by rate sensitivity? On what financial performance variable does the repricing model focus? Explain.

The repricing gap is a measure of the difference between the dollar value of assets that will reprice and the dollar value of liabilities that will reprice within a specific time period, where repricing can be the result of a roll over of an asset or liability (e.g., a loan is paid off at or prior to maturity and the funds are used to issue a new loan at current market rates) or because the asset or liability is a variable rate instrument (e.g., a variable rate mortgage whose interest rate is reset every quarter based on movements in a prime rate). Rate sensitivity represents the time interval where repricing can occur. The model focuses on the potential changes in the net interest income variable. In effect, if interest rates change, interest income and interest expense will change as the various assets and liabilities are repriced, that is, receive new interest rates.

4. What is a maturity bucket in the repricing model? Why is the length of time selected for repricing assets and liabilities important when using the repricing model?

The maturity bucket is the time window over which the dollar amounts of assets and liabilities are measured. The length of the repricing period determines which of the securities in a portfolio are rate-sensitive. The longer the repricing period, the more securities either mature or will be repriced, and, therefore, the more the interest rate risk exposure. An excessively short repricing period omits consideration of the interest rate risk exposure of assets and liabilities are that repriced in the period immediately following the end of the repricing period. That is, it understates the rate sensitivity of the balance sheet. An excessively long repricing period includes many securities that are repriced at different times within the repricing period, thereby overstating the rate sensitivity of the balance sheet.

5. What is the CGAP effect? According to the CGAP effect, what is the relation between changes in interest rates and changes in net interest income when CGAP is positive? When CGAP is negative?

The CGAP effect describes the relation between changes in interest rates and changes in net interest income. According to the CGAP effect, when CGAP is positive the change in NII is positively related to the change in interest rates. Thus, an FI would want its CGAP to be positive when interest rates are expected to rise. According to the CGAP effect, when CGAP is negative the change in NII is negatively related to the change in interest rates. Thus, an FI would want its CGAP to be negative when interest rates are expected to fall.

6. Which of the following is an appropriate change to make on a bank's balance sheet when GAP is negative, spread is expected to remain unchanged, and interest rates are expected to rise?

According to the CGAP effect, when GAP, or CGAP, is positive the change in NII is positively related to the change in interest rates. Thus, an FI would want its GAP to be positive when interest rates are expected to rise.

a. Replace fixed-rate loans with rate-sensitive loans.

Yes. This change will increase RSAs, which will increase GAP.

b. Replace marketable securities with fixed-rate loans.

No. This change will decrease RSAs, which will decrease GAP.

c. Replace fixed-rate CDs with rate-sensitive CDs.

No. This change will increase RSLs, which will decrease GAP.

d. Replace equity with demand deposits.

No. This change will have no impact on either RSAs or RSLs. So, will have no impact on GAP.

e. Replace vault cash with marketable securities.

Yes. This change will increase RSAs, which will increase GAP.

7. If a bank manager was quite certain that interest rates were going to rise within the next six months, how should the bank manager adjust the bank's six-month repricing gap to take advantage of this anticipated rise? What if the manger believed rates would fall in the next six months.

When interest rates are expected to rise, a bank should set its repricing gap to a positive position. In this case, as rates rise, interest income will rise by more than interest expense. The result is an increase in net interest income. When interest rates are expected to fall, a bank should set its repricing gap to a negative position. In this case, as rates fall, interest income will fall by less than interest expense. The result is an increase in net interest income.

8. Consider the following balance sheet positions for a financial institution:

- Rate-sensitive assets = \$200 million. Rate-sensitive liabilities = \$100 million
- Rate-sensitive assets = \$100 million. Rate-sensitive liabilities = \$150 million
- Rate-sensitive assets = \$150 million. Rate-sensitive liabilities = \$140 million

a. Calculate the repricing gap and the impact on net interest income of a 1 percent increase in interest rates for each position.

- Rate-sensitive assets = \$200 million. Rate-sensitive liabilities = \$100 million.

Repricing gap = RSA - RSL = \$200 - \$100 million = +\$100 million.

ΔNII = (\$100 million)(0.01) = +\$1.0 million, or \$1,000,000.

- Rate-sensitive assets = \$100 million. Rate-sensitive liabilities = \$150 million.

Repricing gap = RSA - RSL = \$100 - \$150 million = -\$50 million.

ΔNII = (-\$50 million)(0.01) = -\$0.5 million, or -\$500,000.

- Rate-sensitive assets = \$150 million. Rate-sensitive liabilities = \$140 million.

Repricing gap = RSA - RSL = \$150 - \$140 million = +\$10 million.

ΔNII = (\$10 million)(0.01) = +\$0.1 million, or \$100,000.

b. Calculate the impact on net interest income on each of the above situations assuming a 1 percent decrease in interest rates.

- ΔNII = ($100 million)(-0.01) = -$1.0 million, or -$1,000,000.
- ΔNII = (-$50 million)(-0.01) = +$0.5 million, or $500,000.
- ΔNII = ($10 million)(-0.01) = -$0.1 million, or -$100,000.

c. What conclusion can you draw about the repricing model from these results?

The FIs in parts (1) and (3) are exposed to interest rate declines (positive repricing gap), while the FI in part (2) is exposed to interest rate increases. The FI in part (3) has the lowest interest rate risk exposure since the absolute value of the repricing gap is the lowest, while the opposite is true for the FI in part (1).

9. Consider the following balance sheet for MMC Bancorp (in millions of dollars):

Assets		Liabilities/Equity	
1. Cash and due from	$ 6.25	1. Equity capital (fixed)	$25.00
2. Short-term consumer loans (one-year maturity)	62.50	2. Demand deposits	50.00
3. Long-term consumer loans (two-year maturity)	31.25	3. One-month CDs	37.50
4. Three-month T-bills	37.50	4. Three-month CDs	50.00
5. Six-month T-notes	43.75	5. Three-month bankers' acceptances	25.00
6. Three-year T-bonds	75.00	6. Six-month commercial paper	75.00
7. 10-year, fixed-rate mortgages	25.00	7. One-year time deposits	25.00
8. 30-year, floating-rate mortgages	50.00	8. Two-year time deposits	50.00
9. Premises	6.25		
	$337.50		$337.50

a. Calculate the value of MMC's rate-sensitive assets, rate sensitive liabilities, and repricing gap over the next year.

Looking down the asset side of the balance sheet, we see the following one-year rate-sensitive assets (RSA):

1. Short-term consumer loans: $62.50 million, which are repriced at the end of the year and just make the one-year cutoff.
2. Three-month T-bills: $37.50 million, which are repriced on maturity (rollover) every three months.
3. Six-month T-notes: $43.75 million, which are repriced on maturity (rollover) every six months.
4. 30-year floating-rate mortgages: $50.00 million, which are repriced (i.e., the mortgage rate is reset) every nine months. Thus, these long-term assets are RSA in the context of the repricing model with a one-year repricing horizon.

Summing these four items produces one-year RSA of $193.75 million. The remaining $143.75 million is not rate sensitive over the one-year repricing horizon. A change in the level of interest rates will not affect the interest revenue generated by these assets over the next year. The $6.25 million in the cash and due from category and the $6.25 million in premises are nonearning assets. Although the $131.25 million in long-term consumer loans, three-year Treasury bonds, and 10-year, fixed-rate mortgages generate interest revenue, the level of revenue generated will not change over the next year since the interest rates on these assets are not expected to change (i.e., they are fixed over the next year).

Looking down the liability side of the balance sheet, we see that the following liability items clearly fit the one-year rate or repricing sensitivity test:

1. One-month CDs: $37.50 million, which mature in one months and are repriced on rollover.
2. Three-month CDs: $50 million, which mature in three months and are repriced on rollover.
3. Three-month bankers' acceptances: $25 million, which mature in three months and are repriced on rollover.
4. Six-month commercial paper: $75 million, which mature and are repriced every six months.
5. One-year time deposits: $25 million, which are repriced at the end of the one-year gap horizon.

Summing these five items produces one-year rate-sensitive liabilities (RSL) of $212.5 million. The remaining $125 million is not rate sensitive over the one-year period. The $25 million in equity capital and $50 million in demand deposits do not pay interest and are therefore classified as nonpaying. The $50 million in two-year time deposits generate interest expense over the next year, but the level of the interest generated will not change if the general level of interest rates change. Thus, we classify these items as *fixed-rate liabilities.*

The five repriced liabilities ($37.50 + $50 + $25 + $75 + $25) sum to $212.5 million, and the four repriced assets of $62.50 + $37.50 + $43.75 + $50 sum to $193.75 million. Given this, the cumulative one-year repricing gap (CGAP) for the bank is:

CGAP = (One-year RSA) - (One-year RSL) = RSA - RSL = \$193.75 million - \$212.5 million = -\$18.80 million

b. Calculate the expected change in the net interest income for the bank if interest rates rise by 1 percent on both RSAs and RSLs. If interest rates fall by 1 percent on both RSAs and RSLs.

The CGAP would project the expected annual change in net interest income (ΔNII) of the bank is:

$$\Delta NII = CGAP \times \Delta R$$
$$= (-\$18.80 \text{ million}) \times 0.01$$
$$= -\$188{,}000$$

Similarly, if interest rates fall equally for RSAs and RSLs, NII will fall by:

$$= (-\$18.80 \text{ million}) \times (-0.01)$$
$$= \$188{,}000$$

c. Calculate the expected change in the net interest income for the bank if interest rates rise by 1.2 percent on RSAs and by 1 percent on RSLs. If interest rates fall by 1.2 percent on RSAs and by 1 percent on RSLs.

The resulting change in NII is calculated as:

$$\Delta NII = [RSA \times \Delta R_{RSA}] - [RSL \times \Delta R_{RSL}]$$
$$= [\$193.75 \text{ million} \times 1.2\%] - [\$212.5 \text{ million} \times 1.0\%]$$
$$= \$2.325 \text{ million} - \$2.125 \text{ million}$$
$$= \$200{,}000$$

10. What are the reasons for not including demand deposits as rate-sensitive liabilities in the repricing analysis for a commercial bank? What is the subtle but potentially strong reason for including demand deposits in the total of rate sensitive liabilities? Can the same argument be made for passbook savings accounts?

The regulatory rate available on demand deposit accounts is zero. Although many banks are able to offer NOW accounts on which interest can be paid, this interest rate seldom is changed and thus the accounts are not really interest rate sensitive. However, demand deposit accounts do pay implicit interest in the form of not charging fully for checking and other services. Further, when market interest rates rise, customers draw down their demand deposit accounts, which may cause the bank to use higher cost sources of funds. The same or similar arguments can be made for passbook savings accounts.

11. What is the gap to total assets ratio? What is the value of this ratio to interest rate risk managers and regulators?

The gap to total assets ratio is the ratio of the cumulative gap position to the total assets of the FI. The cumulative gap position is the sum of the individual gaps over several time buckets. The value of this ratio is that it tells the direction of the interest rate exposure and the scale of that exposure relative to the size of the FI.

12. Which of the following assets or liabilities fit the one-year rate or repricing sensitivity test?

3-month U.S. Treasury bills	Yes
1-year U.S. Treasury notes	Yes
20-year U.S. Treasury bonds	No
20-year floating-rate corporate bonds with annual repricing	Yes
30-year floating-rate mortgages with repricing every two years	No
30-year floating-rate mortgages with repricing every six months	Yes
Overnight fed funds	Yes
9-month fixed-rate CDs	Yes
1-year fixed-rate CDs	Yes
5-year floating-rate CDs with annual repricing	Yes
Common stock	No

13. What is the spread effect?

The spread effect is the effect that a change in the spread between rates on RSAs and RSLs has on net interest income as interest rates change. The spread effect is such that, regardless of the direction of the change in interest rates, a positive relation exists between changes in the spread and changes in NII. Whenever the spread increases (decreases), NII increases (decreases).

14. A bank manager is quite certain that interest rates are going to fall within the next six months. How should the bank manager adjust the bank's six-month repricing gap and spread to take advantage of this anticipated rise? What if the manger believes rates will rise in the next six months.

When interest rates are expected to fall, a bank should set its repricing gap to a negative position. Further, the manager would want to increase the spread between the return on RSAs and RSLs. In this case, as rates fall, interest income will fall by less than interest expense. The result is an increase in net interest income. When interest rates are expected to rise, a bank should set its repricing gap to a positive position. Again, the manager would want to increase the spread between the return on RSAs and RSLs. In this case, as rates rise, interest income will rise by more than interest expense. The result is an increase in net interest income.

15. Consider the following balance sheet for WatchoverU Savings, Inc. (in millions):

Assets		Liabilities and Equity	
Floating-rate mortgages		1-year time deposits	
(currently 10% annually)	$50	(currently 6% annually)	$70
30-year fixed-rate loans		3-year time deposits	
(currently 7% annually)	$50	(currently 7% annually)	$20
		Equity	$10
Total assets	$100	Total liabilities & equity	$100

a. What is WatchoverU's expected net interest income (for year 2) at year-end?

Current expected interest income: $50m(0.10) + $50m(0.07) = $8.5m.
Expected interest expense: $70m(0.06) + $20m(0.07) = $5.6m.
Expected net interest income: $8.5m - $5.6m = $2.9m.

b. What will expected net interest income (for year 2) be at year-end if interest rates rise by 2 percent?

After the 2 percent interest rate increase, net interest income is:
50(0.12) + 50(0.07) - 70(0.08) - 20(.07) = $9.5m - $7.0m = $2.5m, a decline of $0.4m.

c. Using the cumulative repricing gap model, what is the expected net interest income (for year 2) for a 2 percent increase in interest rates?

WatchoverU's repricing or funding gap is $50m - $70m = -$20m. The change in net interest income using the funding gap model is (-$20m)(0.02) = -$0.4m.

d. What will expected net interest income (for year 2) be at year-end if interest rates on RSAs increase by 2 percent but interest rates on RSLs increase by 1 percent? Is it reasonable for changes in interest rates on RSAs and RSLs to differ? Why?

After the unequal rate increases, net interest income will be 50(0.12) + 50(0.07) – 70(0.07) – 20(0.07) = $9.5m - $6.3m = $3.2m, an increase of $0.3m. It is not uncommon for interest rates to adjust in an unequal manner on RSAs versus RSLs. Interest rates often do not adjust solely because of market pressures. In many cases, the changes are affected by decisions of management. Thus, you can see the difference between this answer and the answer for part a.

16. Use the following information about a hypothetical government security dealer named M. P. Jorgan. Market yields are in parenthesis, and amounts are in millions.

Assets		Liabilities and Equity	
Cash	$10	Overnight repos	$170
1-month T-bills (7.05%)	75	Subordinated debt	
3-month T-bills (7.25%)	75	7-year fixed rate (8.55%)	150
2-year business loans (7.50%)	50		
8-year mortgage loans (8.96%)	100		
5-year munis (floating rate)			
(8.20% reset every 6 months)	25	Equity	15
Total assets	$335	Total liabilities & equity	$335

a. What is the repricing gap if the planning period is 30 days? 3 months? 2 years? Recall that cash is a non-interest-earning asset.

Repricing gap using a 30-day planning period = \$75m - \$170m = -\$95 million.
Repricing gap using a 3-month planning period = (\$75m + \$75m) - \$170m = -\$20 million.
Reprising gap using a 2-year planning period = (\$75m + \$75m + \$50m + \$25m) - \$170m = +\$55 million.

b. What is the impact over the next 30 days on net interest income if interest rates increase 50 basis points? Decrease 75 basis points?

If interest rates increase 50 basis points, net interest income will decrease by \$475,000.
$\Delta NII = CGAP(\Delta R) = -\$95m(0.005) = -\$0.475m.$

If interest rates decrease by 75 basis points, net interest income will increase by \$712,500. $\Delta NII = CGAP(\Delta R) = -\$95m(-0.0075) = \$0.7125m.$

c. The following one-year runoffs are expected: \$10 million for two-year business loans and \$20 million for eight-year mortgage loans. What is the one-year repricing gap?

The repricing gap over the 1-year planning period = (\$75m. + \$75m. + \$10m. + \$20m. + \$25m.) - \$170m. = +\$35 million.

d. If runoffs are considered, what is the effect on net interest income at year-end if interest rates increase 50 basis points? Decrease 75 basis points?

If interest rates increase 50 basis points, net interest income will increase by \$175,000. $\Delta NII = CGAP(\Delta R) = \$35m(0.005) = \$0.175m.$

If interest rates decrease 75 basis points, net interest income will decrease by \$262,500. $\Delta NII = CGAP(\Delta R) = \$35m(-0.0075) = -\$0.2625m$.

17. A bank has the following balance sheet:

Assets		Avg. Rate	Liabilities/Equity		Avg. Rate
Rate sensitive	\$550,000	7.75%	Rate sensitive	\$375,000	6.25%
Fixed rate	755,000	8.75	Fixed rate	805,000	7.50
Nonearning	265,000		Nonpaying	390,000	
Total	\$1,570,000		Total	\$1,570,000	

Suppose interest rates rise such that the average yield on rate-sensitive assets increases by 45 basis points and the average yield on rate-sensitive liabilities increases by 35 basis points.

a. Calculate the bank's CGAP and gap ratio.

Repricing GAP = \$550,000 - \$375,000 = \$175,000
Gap ratio = \$175,000/\$1,570,000 = 11.15%

b. Assuming the bank does not change the composition of its balance sheet, calculate the resulting change in the bank's interest income, interest expense, and net interest income.

$\Delta II = \$550,000(0.0045) = \$2,475$
$\Delta IE = \$375,000(0.0035) = \$1,312.50$
$\Delta NII = \$2,475 - \$1,312.50 = \$1,162.50$

c. Explain how the CGAP and spread effects influenced the change in net interest income.

The CGAP affect worked to increase net interest income. That is, the CGAP was positive while interest rates increased. Thus, interest income increased by more than interest expense. The result is an increase in NII. The spread effect also worked to increase net interest income. The spread increased by 10 basis points. According to the spread affect, as spread increases, so does net interest income.

18. A bank has the following balance sheet:

Assets		Avg. Rate	Liabilities/Equity		Avg. Rate
Rate sensitive	\$550,000	7.75%	Rate sensitive	\$575,000	6.25%
Fixed rate	755,000	8.75	Fixed rate	605,000	7.50
Nonearning	265,000		Nonpaying	390,000	

Total	\$1,570,000	Total	\$1,570,000

Suppose interest rates fall such that the average yield on rate-sensitive assets decreases by 15 basis points and the average yield on rate-sensitive liabilities decreases by 5 basis points.

a. Calculate the bank's CGAP and gap ratio.

CGAP = \$550,000 - \$575,000 = -\$25,000
Gap ratio = -\$25,000/\$1,570,000 = -1.59%

b. Assuming the bank does not change the composition of its balance sheet, calculate the resulting change in the bank's interest income, interest expense, and net interest income.

ΔII = \$550,000(-0.0015) = -\$825
ΔIE = \$575,000(-0.0005) = -\$287.50
ΔNII = -\$825 – (-\$287.50) = -\$537.50

c. The bank's CGAP is negative and interest rates decreased, yet net interest income decreased. Explain how the CGAP and spread effects influenced this decrease in net interest income.

The CGAP affect worked to increase net interest income. That is, the CGAP was negative while interest rates decreased. Thus, interest income decreased by less than interest expense. The result is an increase in NII. The spread effect, on the other hand, worked to decrease net interest income. The spread decreased by 10 basis points. According to the spread affect, as spread decreases, so does net interest income. In this case, the increase in NII due to the CGAP effect was dominated by the decrease in NII due to the spread effect.

19. The balance sheet of A. G. Fredwards, a government security dealer, is listed below. Market yields are in parentheses, and amounts are in millions.

Assets		Liabilities and Equity	
Cash	\$20	Overnight repos	\$340
1-month T-bills (7.05%)	150	Subordinated debt	
3-month T-bills (7.25%)	150	7-year fixed rate (8.55%)	300
2-year T-notes (7.50%)	100		
8-year T-notes (8.96%)	200		
5-year munis (floating rate)			
(8.20% reset every 6 months)	50	Equity	30
Total assets	\$670	Total liabilities and equity	\$670

a. What is the repricing gap if the planning period is 30 days? 3 months? 2 years?

Repricing gap using a 30-day planning period = \$150m - \$340m = -\$190 million.
Repricing gap using a 3-month planning period = (\$150m + \$150m) - \$340m = -\$40 million.
Repricing gap using a 2-year planning period = (\$150m + \$150m + \$100m + \$50m) - \$340m = \$110 million.

b. What is the impact over the next three months on net interest income if interest rates on RSAs increase 50 basis points and on RSLs increase 60 basis points?

ΔII = (\$150m. + \$150m.)(0.005) = \$1.5m.
ΔIE = \$340m.(0.006) = \$2.04m.
ΔNII = \$1.5m. – (\$2.04m.) = -\$0.54m.

c. What is the impact over the next two years on net interest income if interest rates on RSAs increase 50 basis points and on RSLs increase 75 basis points?

ΔII = (\$150m. + \$150m. + \$100m. + \$50m.)(0.005) = \$2.25m.
ΔIE = \$340m.(0.0075) = \$2.04m.
ΔNII = \$2.25m. – (\$2.04m.) = \$0.21m.

d. Explain the difference in your answers to parts (b) and (c). Why is one answer a negative change in NII, while the other is positive?

For the 3-month analysis, the CGAP affect worked to decrease net interest income. That is, the CGAP was negative while interest rates increased. Thus, interest income increased by less than interest expense. The result is a decrease in NII. For the 3-year analysis, the CGAP affect worked to increase net interest income. That is, the CGAP was positive while interest rates increased. Thus, interest income increased by more than interest expense. The result is an increase in NII.

20. A bank has the following balance sheet:

Assets		Avg. Rate	Liabilities/Equity		Avg. Rate
Rate sensitive	\$225,000	6.35%	Rate sensitive	\$300,000	4.25%
Fixed rate	550,000	7.55	Fixed rate	505,000	6.15
Nonearning	120,000		Nonpaying	90,000	
Total	\$895,000		Total	\$895,000	

Suppose interest rates rise such that the average yield on rate-sensitive assets increases by 45 basis points and the average yield on rate-sensitive liabilities increases by 35 basis points.

a. Calculate the bank's repricing GAP.

Repricing GAP = $225,000 - $300,000 = -$75,000

b. Assuming the bank does not change the composition of its balance sheet, calculate the net interest income for the bank before and after the interest rate changes. What is the resulting change in net interest income?

NII_b = ($225,000(0.0635) +$550,000(0.0755)) – ($300,000(0.0425) + $505,000(0.0615))
= $55,812.50 - $43,807.50 = $12,005

NII_a = ($225,000(0.0635 + 0.0045) +$550,000(0.0755)) – ($300,000(0.0425 + 0.0035) + $505,000(0.0615)) = $56,825 - $44,857.50 = $11,967.50

ΔNII = $11,967.50 - $12,005 = -$37.50

c. Explain how the CGAP and spread effects influenced this increase in net interest income.

The CGAP affect worked to decrease net interest income. That is, the CGAP was negative while interest rates increased. Thus, interest income increased by less than interest expense. The result is a decrease in NII. In contrast, the spread effect worked to increase net interest income. The spread increased by 10 basis points. According to the spread affect, as spread increases, so does net interest income. However, in this case, the increase in NII due to the spread effect was dominated by the decrease in NII due to the CGAP effect.

21. What are some of the weakness of the repricing model? How have large banks solved the problem of choosing the optimal time period for repricing? What is runoff cash flow, and how does this amount affect the repricing model's analysis?

The repricing model has four general weaknesses:

(1) It ignores market value effects.

(2) It does not take into account the fact that the dollar value of rate-sensitive assets and liabilities within a bucket are not similar. Thus, if assets, on average, are repriced earlier in the bucket than liabilities, and if interest rates fall, FIs are subject to reinvestment risks.

(3) It ignores the problem of runoffs. That is, that some assets are prepaid and some liabilities are withdrawn before the maturity date.

(4) It ignores income generated from off-balance-sheet activities.

Large banks are able to reprice securities every day using their own internal models so reinvestment and repricing risks can be estimated for each day of the year.

Runoff cash flow reflects the assets that are repaid before maturity and the liabilities that are withdrawn unexpectedly. To the extent that either of these amounts is significantly greater than expected, the estimated interest rate sensitivity of the FI will be in error.

The following questions and problems are based on material in Appendix 8A, located on the website (www.mhhe.com/saunders9e).

22. What is a maturity gap? How can the maturity model be used to immunize an FI's portfolio? What is the critical requirement that allows maturity matching to have some success in immunizing the balance sheet of an FI?

Maturity gap is the difference between the average maturity of an FI's assets and liabilities. If the maturity gap is zero, it is possible to immunize the portfolio so that changes in interest rates will result in equal but offsetting changes in the value of assets and liabilities. Thus, if interest rates increase (decrease), the fall (rise) in the value of the assets will be offset by an identical fall (rise) in the value of the liabilities. The critical assumption is that the timing of the cash flows on the assets and liabilities must be the same.

23. Nearby Bank has the following balance sheet (in millions):

Assets		Liabilities and Equity	
Cash	$60	Demand deposits	$140
5-year Treasury notes	60	1-year certificates of deposit	160
30-year mortgages	200	Equity	20
Total assets	$320	Total liabilities and equity	$320

What is the maturity gap for Nearby Bank? Is Nearby Bank more exposed to an increase or decrease in interest rates? Explain why?

M_A = [0x$60m + 5x$60m + 30x$200m]/$320m = 19.6875 years, and M_L = [0x$140m + 1x$160m]/$300m = 0.5333 years. Therefore, the maturity gap = MGAP = 19.6875 – 0.5333 = 19.1542 years. Nearby Bank is exposed to an increase in interest rates. If rates rise, the value of assets will decrease by more than the value of liabilities.

24. County Bank has the following market value balance sheet (in millions, all interest at annual rates). All securities are selling at par equal to book value.

Assets		Liabilities and Equity	
Cash	$20	Demand deposits	$100
15-year commercial loan at 10% interest, balloon payment	160	5-year CDs at 6% interest, balloon payment	210
30-year mortgages at 8% interest, balloon payment	300	20-year debentures at 7% interest, balloon payment	120
		Equity	50
Total assets	$480	Total liabilities and equity	$480

a. What is the maturity gap for County Bank?

M_A = [0x$20m + 15x$160m + 30x$300m]/$480m = 23.75 years.
M_L = [0x$100m + 5x$210m + 20x$120m]/$430m = 8.02 years.
MGAP = 23.75 – 8.02 = 15.73 years.

b. What will be the maturity gap if the interest rates on all assets and liabilities increase by 1 percent?

If interest rates increase one percent, the value and average maturity of the assets will be:

Cash = $20m
Commercial loans = $16mxPVA$_{n=15,\ i=11\%}$ + $160mxPV$_{n=15,i=11\%}$ = $148.49m
Mortgages = $24mxPVA$_{n=30,i=9\%}$ + $300mxPV$_{n=30,i=9\%}$ = $269.18m
M_A = [0x$20m + 15x$148.49m + 30x$269.18m]/($20m + $148.49m + $269.18m) = 23.54 years

The value and average maturity of the liabilities will be:

Demand deposits = $100m
CDs = $12.60mxPVA$_{n=5,i=7\%}$ + $210mxPV$_{n=5,i=7\%}$ = $201.39m
Debentures = $8.4mxPVA$_{n=20,i=8\%}$ + $120mxPV$_{n=20,i=8\%}$ = $108.22m
M_L = [0x$100m + 5x$201.39m + 20x$108.22m]/($100m + $201.39m + $108.22m) = 7.74 years

The maturity gap = MGAP = 23.54 – 7.74 = 15.80 years. The maturity gap increased because the average maturity of the liabilities decreased more than the average maturity of the assets. This result occurred primarily because of the differences in the cash flow streams for the mortgages and the debentures.

c. What will happen to the market value of the equity?

The market value of the assets has decreased from \$480m to \$437.67m, or \$42.33m. The market value of the liabilities has decreased from \$430m to \$409.61m, or \$20.39m. Therefore, the market value of the equity will decrease by \$42.33m - \$20.39m = \$21.94m, or 43.88 percent.

25. If a bank manager is certain that interest rates were going to increase within the next six months, how should the bank manager adjust the bank's maturity gap to take advantage of this anticipated increase? What if the manager believes rates will fall? Would your suggested adjustments be difficult or easy to achieve?

When rates rise, the value of the longer-lived assets will fall by more the shorter-lived liabilities. If the maturity gap is positive, the bank manager will want to shorten the maturity gap or make it negative. If the maturity gap is negative, the manager might do nothing. If rates are expected to decrease, the manager should reverse these strategies. Changing the maturity on the balance sheet often involves changing the mix of assets and liabilities. Attempts to make these changes may involve changes in financial strategy for the bank which may not be easy to accomplish. Later in the text, methods of achieving the same results using derivatives will be explored.

26. An insurance company has invested in the following fixed-income securities: (a) \$10,000,000 of five-year Treasury notes paying 5 percent interest and selling at par value, (b) \$5,800,000 of 10-year bonds paying 7 percent interest with a par value of \$6,000,000, and (c) \$6,200,000 of 20-year subordinated debentures paying 9 percent interest with a par value of \$6,000,000.

   a. What is the weighted-average maturity of this portfolio of assets?

$M_A = [5x\$10m + 10x\$5.8m + 20x\$6.2m]/\$22m = 232/22 = 10.55$ years

   b. If interest rates change so that the yields on all of the securities decrease 1 percent, how does the weighted-average maturity of the portfolio change?

To determine the weighted-average maturity of the portfolio for a rate decrease of 1 percent, the new value of each security must be determined. This calculation will require knowing the yield to maturity of each security before the rate change.

T-notes are selling at par, so the yield to maturity = 5 percent. Therefore, the new value will be PV = $\$500,000xPVA_{n=5,i=4\%} + \$10,000,000xPV_{n=5,i=4\%} = \$10,445,182$.

10-year bonds: Par = \$6,000,000, PV = \$5,800,000, Cpn = 7 percent $\Rightarrow$ YTM = 7.485%. The new PV = $\$420,000xPVA_{n=10,i=6.485\%} + \$6,000,000xPV_{n=10,i=6.485\%} = \$6,222,161$.

Debentures: Par = \$6,000,000, PV = \$6,200,000, Cpn = 9 percent $\Rightarrow$ 8.644 percent. The new PV = \$540,000x$PVA_{n=20,i=7.644\%}$ + \$6,000,000x$PV_{n=20,i=7.644}$ = \$6,820,378.

The total value of the assets after the change in rates will be \$23,487,721, and the weighted-average maturity will be [5x\$10,445,182 + 10x\$6,222,030 + 20x\$6,820,378]/\$23,487,721 = 250,855,080/23,487,721 = 10.68 years.

c. Explain the changes in the weighted-average maturity of the portfolio if the yields increase by 1 percent.

When interest rates increase 1 percent, the value of the T-note is \$9,578,764, the value of the 10-year bond is \$5,414,885, and the value of the debenture is \$5,662,851, and the new value of the assets is \$20,656,500. The weighted-average maturity is 10.42 years.

d. Assume that the insurance company has no other assets. What will be the effect on the market value of the company's equity if the interest rate changes in (b) and (c) occur?

Assuming that the company is financed entirely with equity, the market value will increase \$1,487,721 when interest rates decrease 1 percent, and the market value will decrease \$1,343,500 when rates increase 1 percent. Notice that for the same absolute rate change, the increase in value is greater than the decrease in value.

27. The following is a simplified FI balance sheet:

Assets		Liabilities and Equity	
Loans	\$1,000	Deposits	\$850
		Equity	\$150
Total assets	\$1,000	Total liabilities & equity	\$1,000

The average maturity of loans is four years and the average maturity of deposits is two years. Assume loan and deposit balances are reported as book value, zero-coupon items.

a. Assume that interest rate on both loans and deposits is 9 percent. What is the market value of equity?

The market value of loans = \$1,000/$(1.09)^4$ = \$708.4252, and the market value of deposits = \$850/$(1.09)^2$ = \$715.4280. The net worth = \$708.4252 - \$715.4280 = -\$7.0028. (That is, net worth is negative.)

b. What must be the interest rate on deposits to force the market value of equity to be zero? What economic market conditions must exist to make this situation possible?

In this case the deposit value should equal the loan value. Thus, $\$850/(1+x)^2 = \$708.4252$. Solving for x, we get 9.5374%. That is, deposit rates will have to increase more because they have a shorter maturity. Further, this result suggests that deposit rates would have to be higher than loan rates.

c. Assume that interest rate on both loans and deposits is 9 percent. What must be the average maturity of deposits for the market value of equity to be zero?

In this case, we need to solve the equation in part (b) for N, i.e., $\$850/(1+0.09)^N = \$708.4252$. The result is N = 2.1141 years. If interest rates remain at 9 percent, then the average maturity of deposits has to be higher in order to match the value of a 4-year loan.

28. Gunnison Insurance has reported the following balance sheet (in thousands):

Assets		Liabilities and Equity	
2-year Treasury note	$175	1-year commercial paper	$135
15-year munis	165	5-year note	160
		Equity	45
Total assets	$340	Total liabilities and equity	$340

All securities are selling at par equal to book value. The two-year notes are yielding 5 percent, and the 15-year munis are yielding 9 percent. The one-year commercial paper pays 4.5 percent, and the five-year notes pay 8 percent. All instruments pay interest annually.

a. What is the weighted-average maturity of the assets for Gunnison?

$M_A = [2\text{x}\$175 + 15\text{x}\$165]/\$340 = 8.31$ years

b. What is the weighted-average maturity of the liabilities for Gunnison?

$M_L = [1\text{x}\$135 + 5\text{x}\$160]/\$295 = 3.17$ years

c. What is the maturity gap for Gunnison?

MGAP = 8.31 - 3.17 = 5.14 years

d. What does your answer to part (c) imply about the interest rate exposure of Gunnison Insurance?

Gunnison Insurance is exposed to interest rate risk. If interest rates rise, net worth will decrease because the average maturity of the assets is higher than the average maturity of the liabilities. The opposite holds true if interest rates fall. That is, net worth will increase.

e. Calculate the values of all four securities on Gunnison Insurance's balance sheet assuming that all interest rates increase 2 percent. What is the dollar change in the total asset and total liability values? What is the percentage change in these values?

T-notes: $PV = 8.75xPVA_{i=7\%,n=2} + 175xPV_{i=7\%,n=2} = \$168.67$
Munis: $PV = 14.85xPVA_{i=11\%,n=15} + 165xPV_{i=11\%,n=15} = \$141.27$
Commercial Paper: $PV = 6.075xPVA_{i=6.5\%,n=1} + 135xPV_{i=6.5\%,n=1} = \$132.46$
Note: $PV = 12.80xPVA_{i=10\%,n=5} + 160xPV_{i=10\%,n=5} = \$147.87$

Total assets = \$168.67 + \$141.27 = \$309.94 $\Rightarrow \Delta A$ = -\$30.06 or -8.84 percent change
Total liabilities = \$132.46 + \$147.87 = \$280.33 $\Rightarrow \Delta L$ = -\$14.67 or -4.97 percent change

f. What is the dollar impact on the market value of equity for Gunnison? What is the percentage change in the value of the equity?

$\Delta E = \Delta A - \Delta L$ = -\$30.06 – (-\$14.67) = -\$15.39 $\Rightarrow$ -34.2 percent

g. What would be the impact on Gunnison's market value of equity if the liabilities paid interest semiannually instead of annually?

The value of liabilities will be lower with semi-annual compounding, increasing the value of net worth. The one-year CP will decline in value to \$132.43. The five-year note will decline in value to \$147.64. The value of equity will decrease to \$29.87 = (\$168.67 + \$141.27) - (\$132.43 + \$147.64).

29. Scandia Bank has issued a one-year, \$1million CD paying 5.75 percent to fund a one-year loan paying an interest rate of 6 percent. The principal of the loan will be paid in two installments: \$500,000 in six months and the balance at the end of the year.

a. What is the maturity gap of Scandia Bank? According to the maturity model, what does this maturity gap imply about the interest rate risk exposure faced by Scandia Bank?

The maturity gap is 1 year – 1 year = 0. The maturity gap model would state that the bank is immunized against changes in interest rates because assets and liabilities are of equal maturity.

b. Assuming no change in interest rates over the year, what is the expected net interest income at the end of the year?

Principal received in six months	$500,000
Interest received in six months (0.03 x $1,000,000)	30,000
Total	$530,000

Principal received at the end of the year	$500,000
Interest received at the end of the year (0.03 x $500,000)	15,000
Future value of interest received in six months ($530,000 x 1.03)	545,900
Total principal and interest received	$1,060,900
Principal and interest paid on deposits ($1,000,000 x 0.0575)	$1,057,500
Net interest income received	$3,400

c. What would be the effect on annual net interest income of a 2 percent interest rate increase that occurred immediately after the loan was made? What would be the effect of a 2 percent decrease in rates?

If interest rates increase 2 percent, then the reinvestment benefits of cash flows in six months will be higher:

Principal received in six months	$500,000
Interest received in six months (0.03 x $1,000,000)	30,000
Total	$530,000

Principal received at the end of the year	$500,000
Interest received at the end of the year (0.03 x $500,000)	15,000
Future value of interest received in six months ($530,000 x 1.04)	551,200
Total principal and interest received	$1,066,200
Principal and interest paid on deposits ($1,000,000 x 0.0575)	$1,057,500
Net interest income received	$8,700

If interest rates decrease by 2 percent, then reinvestment income is reduced.

Principal received in six months	$500,000
Interest received in six months (0.03 x $1,000,000)	30,000
Total	$530,000

Principal received at the end of the year	$500,000
Interest received at the end of the year (0.03 x $500,000)	15,000
Future value of interest received in six months ($530,000 x 1.02)	540,600
Total principal and interest received	$1,055,600
Principal and interest paid on deposits ($1,000,000 x 0.0575)	$1,057,500

Net income received	-$1,900

d. What do these results indicate about the ability of the maturity model to immunize portfolios against interest rate exposure?

The results indicate that just matching assets and liabilities by maturity is not sufficient to immunize a portfolio against interest rate risk. If the timing of the cash flows within a period is different for assets and liabilities, the effects of interest rate changes are different. For a truly effective immunization strategy, one also needs to account for the timing of cash flows.

30. EDF Bank has a very simple balance sheet. Assets consist of a two-year, $1 million loan that pays an interest rate of LIBOR plus 4 percent annually. The loan is funded with a two-year deposit on which the bank pays LIBOR plus 3.5 percent interest annually. LIBOR currently is 4 percent, and both the loan and the deposit principal will be paid at maturity.

a. What is the maturity gap of this balance sheet?

Maturity gap = 2 - 2 = 0 years

b. What is the expected net interest income in year 1 and year 2?

Interest received in year 1	$80,000	Interest received in year 2	$80,000
Interest paid in year 1	75,000	Interest paid in year 2	75,000
Net interest income in year 1	$5,000	Net interest income in year 2	$5,000

c. Immediately prior to the beginning of year 2, LIBOR rates increased to 6 percent. What is the expected net interest income in year 2? What would be the effect on net interest income of a 2 percent decrease in LIBOR?

Year 2: If interest rates increase 2 percent		Year 2: If interest rates decrease 2 percent	
Interest received in year 2	$100,000	Interest received in year 2	$60,000
Interest paid in year 2	95,000	Interest paid in year 2	55,000
Net interest income in year 2	$5,000	Net interest income in year 2	$5,000

d. What do the answers to parts (b) and (c) of this question suggest about the use of maturity gap to immunize an FI against interest rate risk?

The solutions above suggest that, as long as the FI's assets are financed entirely with liabilities and the timing of the cash flows on the assets and liabilities of the FI are perfectly matched, setting the maturity gap equal to zero immunizes the FI against interest rate risk.

31. What are the weaknesses of the maturity gap model?

First, the maturity gap model does not consider the degree of leverage on the balance sheet. For example, if assets are not financed entirely with deposits, a change in interest rates may cause the assets to change in value by a different amount than the liabilities. Second, the maturity model does not take into account the timing of the cash flows of either the assets or the liabilities, and thus reinvestment and/or refinancing risk may become important factors in profitability and valuation as interest rates change.

The following questions and problems are based on material in Appendix 8B to the chapter.

32. Suppose that the current one-year rate (one-year spot rate) and expected one-year T-bill rates over the following three years (i.e., years 2, 3, and 4, respectively) are as follows:

$_1R_1 = 6\%$ $E(_2r_1) = 7\%$ $E(_3r_1) = 7.5\%$ $E(_4r_1) = 7.85\%$

Using the unbiased expectations theory, calculate the current (long-term) rates for one-, two-, three-, and four-year-maturity Treasury securities. Plot the resulting yield curve.

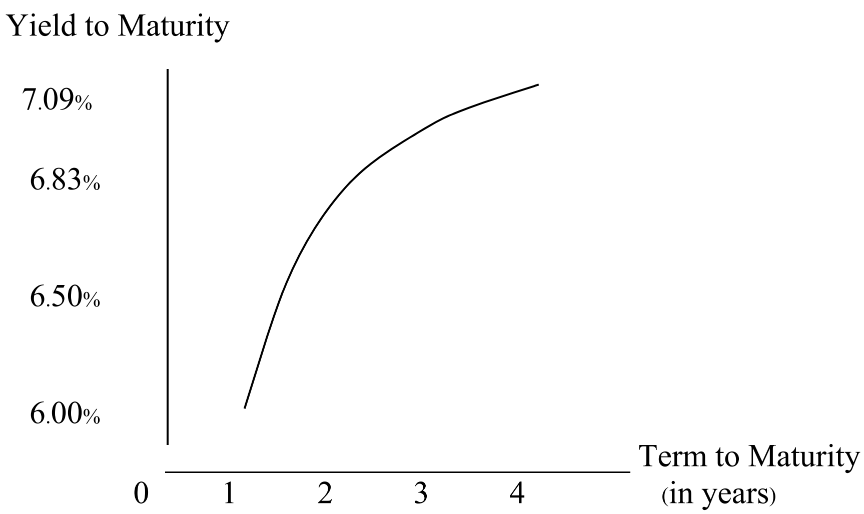
$_1R_1 = 6.00\%$

$_1R_2 = [(1 + 0.06)(1 + 0.07)]^{1/2} - 1 = 6.50\%$

$_1R_3 = [(1 + 0.06)(1 + 0.07)(1 + 0.075)]^{1/3} - 1 = 6.83\%$

$_1R_4 = [(1 + 0.06)(1 + 0.07)(1 + 0.075)(1 + 0.0785)]^{1/4} - 1 = 7.09\%$

and the current yield to maturity curve will be upward sloping as shown:



33. The current one-year Treasury bill rate is 5.2 percent, and the expected one-year rate 12 months from now is 5.8 percent. According to the unbiased expectations theory, what should be the current rate for a two-year Treasury security?

$(1.052)(1.058) = (1 + {}_1R_2)^2 = 1.113016;\ (1 + {}_1R_2) = 1.054996 \Rightarrow {}_1R_2 = 0.0550$ or 5.50 percent

34. *The Wall Street Journal* reported interest rates of 6 percent, 6.35 percent, 6.65 percent, and 6.75 percent for three-year, four-year, five-year, and six-year Treasury notes, respectively. According to the unbiased expectations theory, what are the expected one-year rates for years 4, 5, and 6?

$[1 + E({}_ir_1)] = (1 + {}_1R_i)^i \div (1 + {}_1R_{i\text{-}1})^{i\text{-}1}$
$[1 + E({}_4r_1)] = (1.0635)^4 \div (1.06)^3 = 1.0741 \Rightarrow E({}_4r_1) = 7.41$ percent for period 4
$[1 + E({}_5r_1)] = (1.0665)^5 \div (1.0635)^4 = 1.0786 \Rightarrow E({}_5r_1) = 7.86$ percent for period 5
$[1 + E({}_6r_1)] = (1.0675)^6 \div (1.0665)^5 = 1.0725 \Rightarrow E({}_6r_1) = 7.25$ percent for period 6

35. *The Wall Street Journal* reports that the rate on three-year Treasury securities is 5.60 percent and the rate on four-year Treasury securities is 5.65 percent. According to the unbiased expectations hypothesis, what does the market expect the one-year Treasury rate to be in year 4, $E({}_4r_1)$?

$${}_1R_4 = [(1+{}_1R_1)(1+E({}_2r_1))(1+E({}_3r_1))\,(1+E({}_4r_1))]^{1/4}-1$$

Thus, $0.0565 = [(1+0.056)^3(1+ E({}_4r_1))]^{1/4} - 1$

and $E({}_4r_1) = [(1+0.0565)^4/(1+0.056)^3] - 1 = 5.80\%$

36. How does the liquidity premium theory of the term structure of interest rates differ from the unbiased expectations theory? In a normal economic environment, that is, an upward-sloping yield curve, what is the relationship of liquidity premiums for successive years into the future? Why?

The unbiased expectations theory asserts that long-term rates are a geometric average of current and expected short-term rates. The liquidity premium theory asserts that long-term rates are a geometric average of current and expected short-term rates plus a liquidity risk premium. The premium is assumed to increase with the maturity of the security because the uncertainty of future returns grows as maturity increases.

37. Based on economists= forecasts and analysis, one-year Treasury bill rates and liquidity premiums for the next four years are expected to be as follows:

$_1R_1 = 5.65\%$

$E(_2r_1) = 6.75\%$ $L_2 = 0.05\%$

$E(_3r_1) = 6.85\%$ $L_3 = 0.10\%$

$E(_4r_1) = 7.15\%$ $L_4 = 0.12\%$

Using the liquidity premium hypothesis, plot the current yield curve. Make sure you label the axes on the graph and identify the four annual rates on the curve both on the axes and on the yield curve itself.

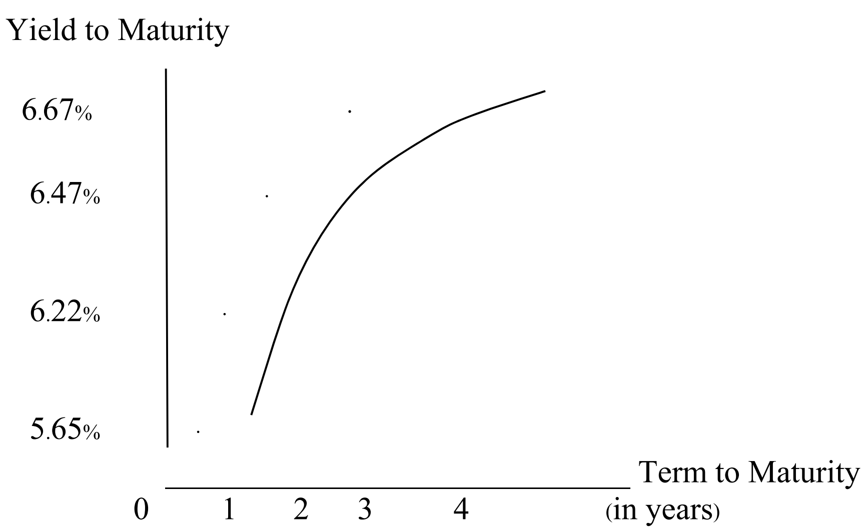
$_1R_1 = 5.65\%$

$_1R_2 = [(1 + 0.0565)(1 + 0.0675 + 0.0005)]^{½} - 1 = 6.22\%$

$_1R_3 = [(1 + 0.0565)(1 + 0.0675 + 0.0005)(1 + 0.0685 + 0.001)]^{1/3} - 1 = 6.47\%$

$_1R_4 = [(1 + 0.0565)(1 + 0.0675 + 0.0005)(1 + 0.0685 + 0.001)(1 + 0.0715 + 0.0012)]^{1/4} - 1$
$= 6.67\%$

and the current yield curve will be upward sloping as shown:



38. *The Wall Street Journal* reports that the rate on three-year Treasury securities is 5.25 percent and the rate on four-year Treasury securities is 5.50 percent. The one-year interest rate expected in year four, $E(_4r_1)$, is 6.10 percent. According to the liquidity premium hypothesis, what is the liquidity premium on the four-year Treasury security, L_4?

$_1R_4 = [(1 + {}_1R_1)(1 + E({}_2r_1) + L_2)(1 + E({}_3r_1) + L_3)(1 + E({}_4r_1) + L_4)]^{1/4} - 1$

Thus, $0.055 = [(1 + 0.0525)^3(1 + E({}_4r_1) + L_4)]^{1/4} - 1$

and $0.061 + L_4 = [(1 + 0.055)^4/(1 + 0.0525)^3] - 1 \Rightarrow L_4 = 0.00154 = 0.154\%$

39. You note the following yield curve in *The Wall Street Journal*. According to the unbiased expectations hypothesis, what is the one-year forward rate for the period beginning two years from today, $_2f_1$?

Maturity	**Yield**
One day	2.00%
One year	5.50
Two years	6.50
Three years	9.00

$_2f_1 = [(1 + {}_1R_2)^2/(1 + {}_1R_1)] - 1$

$_2f_1 = [(1.065)^2/(1.055)] - 1 = 7.51\%$

Integrated Mini Case: Calculating and Using the Repricing GAP

State Bank's balance sheet is listed below. Market yields are in parenthesis, and amounts are in millions.

Assets		Liabilities and Equity	
Cash	$20	Demand deposits	$250
Fed funds (1.05%)	150	Savings accounts (1.5%)	20
3-month T-bills (5.25%)	150	MMDAs (2.5%)	
2-year T-notes (6.50%)	100	(no minimum balance requirement)	340
8-year T-bonds (7.50%)	200	3-month CDs (4.2%)	120
5-year munis (floating rate)		6-month CDs (4.3%)	220
(8.20%, repriced @ 6 months)	50	1-year CDs (4.5%)	375
6-month consumer loans (6%)	250	2-year CDs (5%)	425
1-year consumer loans (5.8%)	300	4-year CDs (5.5%)	330
5-year car loans (7%)	350	5-year CDs (6%)	350
7-month C&I loans (5.8%)	200	Fed funds (1%)	225
2-year C&I loans (floating rate)		Overnight repos (1.25%)	290
(5.15%, repriced @ 6-months)	275	6-month commercial paper (3%)	300

15-year variable rate mortgages		Subordinate notes:	
(5.8%, repriced @ 6-months)	200	3-year fixed rate (6.55%)	200
15-year variable rate mortgages		Subordinated debt:	
(6.1%, repriced @ year)	400	7-year fixed rate (7.25%)	100
15-year fixed-rate mortgages (7.85%)	300	Total liabilities	$3,545
30-year variable rate mortgages			
(6.3%, repriced @ quarter)	225		
30-year variable rate mortgages			
(6.4%, repriced @ month)	355		
30-year fixed-rate mortgages (8.2%)	400		
Premises and equipment	20	Equity	400
Total assets	$3,945	Total liabilities and equity	$3,945

a. What is the repricing gap if the planning period is 30 days? 6 months? 1 year? 2 years? 5 years?

Assets		Repricing period
Cash	$20	Not rate sensitive
Fed funds (1.05%)	150	30-days
3-month T-bills (5.25%)	150	6-months
2-year T-notes (6.50%)	100	2-years
8-year T-bonds (7.50%)	200	Not rate sensitive
5-year munis (floating rate)		
(8.20%, repriced @ 6 months)	50	6-months
6-month consumer loans (6%)	250	6-months
1-year consumer loans (5.8%)	300	1-year
5-year car loans (7%)	350	5-years
7-month C&I loans (5.8%)	200	1-year
2-year C&I loans (floating rate)		
(5.15%, repriced @ 6-months)	275	6-months
15-year variable rate mortgages		
(5.8%, repriced @ 6-months)	200	6-months
15-year variable rate mortgages		
(6.1%, repriced @ year)	400	1-year
15-year fixed-rate mortgages (7.85%)	300	Not rate sensitive
30-year variable rate mortgages		
(6.3%, repriced @ quarter)	225	6-months
30-year variable rate mortgages		
(6.4%, repriced @ month)	355	30-days
30-year fixed-rate mortgages (8.2%)	400	Not rate sensitive
Premises and equipment	20	Not rate sensitive

Liabilities and Equity		Repricing Period
Demand deposits	$250	Not rate sensitive
Savings accounts (1.5%)	20	30-days
MMDAs (4.5%)		
(no minimum balance requirement)	340	30-days
3-month CDs (4.2%)	120	6-months
6-month CDs (4.3%)	220	6-months
1-year CDs (4.5%)	375	1-year
2-year CDs (5%)	425	2-years
4-year CDs (5.5%)	330	5-years
5-year CDs (6%)	350	5-years
Fed funds (1%)	225	30-days
Overnight repos (1.25%)	290	30-days
6-month commercial paper (3%)	300	6-months
Subordinate notes		
3-year fixed rate (6.55%)	200	5-years
Subordinated debt		
7-year fixed rate (7.25%)	100	Not rate sensitive
Equity	400	Not rate sensitive

30-day repricing gap: RSAs = $150m. + $355m. = $505m.
RSLs = $20m. + $340m. + $225m. + $290m. = $875m.
CGAP = $505m. - $875m. = -$370m.

6-month repricing gap: RSAs = $505m. + $150m. + $50m. + $250m. + $275m. + $200m. + $225m. = $1655m.
RSLs = $875m. + $120m. + $220m. + $300m. = $1515m.
CGAP = $1655m. - $1515m. = $140m.

1-year repricing gap: RSAs = $1655m. + $300m. + $200m. + $400m. = $2555m.
RSLs = $1515m. + $375m. = $1890m.
CGAP = $2555m. - $1890m. = $665m.

2-year repricing gap: RSAs = $2555m. + $100m. = $2655m.
RSLs = $1890m. + $425m. = $2315m.
CGAP = $2655m. - $2315m. = $340m.

5-year repricing gap: RSAs = $2655m. + $350m. = $3005m.
RSLs = $2315m. + $330m. + $350m. + $200m. = $3195m.
CGAP = $3005m. - $3195m. = -$190m.

b. What is the impact over the next six months on net interest income if interest rates on RSAs increase 60 basis points and on RSLs increase 40 basis points?

ΔNII (6-months) = ΔII (6-months) – ΔIE (6-months)

= \$1655m.(0.0060) - \$1515m.(0.0040) = \$3.87m.

c. What is the impact over the next year on net interest income if interest rates on RSAs increase 60 basis points and on RSLs increase 40 basis points?

ΔNII (1-year) = ΔII (1-year) – ΔIE (1-year)

= \$2555m.(0.0060) - \$1890m.(0.0040) = \$7.77m.