Managing Interest Rate Risk II

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Learning outcome

- Explain the mathematics of Duration Gap and Economic Value of Equity
- Understand how to use Economic Value of Equity sensitivity analysis to manage bank’s interest rate risk
- Understand the yield curve strategy and business circle
- Describe the financial derivative which can be use to hedge bank’s interest rate risk

Duration Analysis

Macaulay's Duration (D):

$$D = \sum_{t}^{n} \frac{[\text{cashflow}_t/(1+i)^t] \times t}{P^*}$$

where P* is the initial price, i is the market interest rate, and t is equal to the time until the cash payment is made

Duration Analysis (Continued…)

Measure of price sensitivity in the approximate price elasticity relationship where P refers to the price of the underlying security:

$$\frac{\Delta P}{P} \cong -\frac{D}{(1+i)} \times \Delta i$$

Modified Duration indicates the price change of a security in percentage for a given change in interest rates:

$$\text{Modified duration} = D/(1+i)$$

Duration Analysis (Continued…)

Effective Duration estimates how price sensitive a security is when it contains embedded options:

$$\text{Eff Dur} = \frac{P_{i-} - P_{i+}}{P_0(i+ - i-)}$$

where

P_{i-} = price if rates fall
P_{i+} = price if rates rise
P_0 = initial (current) price
$i+$ = initial market rate plus the increase in rate
$i-$ = initial market rate minus the decrease in rate

Example:

- Bond with \$10,000 face value and fixed interest payments of \$470 that matures in three years:
- Semiannual coupon rate is 4.7% (\$470/\$10,000) or 9.4% per annum.
- If the market rate of interest equals 4.7% semiannually, the bond sells for face value:

$$\text{Price} = \sum_{t=1}^{6} \frac{470}{1.047^t} + \frac{10,000}{1.047^6} = \$10,000$$

Example (continued…)

- If the market rate of interest rises to 5% semi- annually, the price falls and bond sells at a discount:

$$\text{Price} = \sum_{t=1}^{6} \frac{470}{1.05^{t}} + \frac{10{,}000}{1.05^{6}} = \$9{,}847.73$$

- If the market rate of interest falls to 4.4% semi- annually, the price rises and bond sells at a premium:

$$\text{Price} = \sum_{t=1}^{6} \frac{470}{1.044^{t}} + \frac{10{,}000}{1.044^{6}} = \$10{,}155.24$$

Example: measuring duration

A. Time Line Characterizing Cash Flows

0	1	2	3	4	5	6
	470	470	470	470	470	470 10,000

B. Estimated Macaulay's Duration

$$\text{Duration} = \frac{\frac{470(1)}{1.047^1} + \frac{470(2)}{1.047^2} + \frac{470(3)}{1.047^3} + \frac{470(4)}{1.047^4} + \frac{470(5)}{1.047^5} + \frac{470(6)}{1.047^6}}{10{,}000}$$

$$= \frac{448.9(1) + 428.8(2) + 409.5(3) + 391.1(4) + 375.6(5) + 7{,}948.2(6)}{10{,}000}$$

$= 5.37$ semiannual periods (or 2.68 years)

Example

- Assume a three-year 9.4% coupon bond selling for $10,000 par and callable at par.
  - Effective duration for a 30 base-point (0.3 percent) semiannual move in rates:

$$\text{Eff Dur} = \frac{\$10{,}000 - \$9{,}847.72}{\$10{,}000(0.05 - 0.044)} = 2.54$$

- Demonstrates possibility of negative duration:
  - Can happen when the price of a security in a falling-rate environment falls below the price in a rising-rate environment making the numerator negative.

Duration GAP (DGAP) Model

Duration GAP analysis:

- Compares the price sensitivity of bank's total assets with the price sensitivity of total liabilities to assess whether the market value of assets or liabilities changes more when rates change.
- Any differential impact will indicate how the bank's economic value of equity will change.

DGAP Model

Focuses on managing net interest income or the economic value of stockholders' equity.

- Focuses on price sensitivity (how the price will change when interest rates change) rather than rate sensitivity (the ability to reprice when interest rates change).
- Measure of bank's aggregate portfolio interest rate risk that compares the weighted average duration of assets with the weighted average duration of liabilities.
- Management can adjust to hedge or accept interest rate risk by speculating on future interest rate changes.

DGAP Model (continued…)

Steps in Duration GAP Analysis:

- Forecast interest rates.
- Estimate the market values of bank assets and liabilities.
- Estimate the weighted average duration of assets and the weighted average duration of liabilities.
    - Incorporate the effects of both on- and off-balance sheet items. These estimates are used to calculate duration gap.
- Forecast changes in EVE across different interest rate environments.
    - Account for differential changes in rates and the exercise of embedded options.

DGAP Model (continued…)

Weighted Average Duration of Bank Assets (DA):

$$DA = \sum_{i}^{n} w_i Da_i$$

where

A_i = market value of asset i (i equals 1, 2, . . . n)
w_i = A_i divided by the market value of all bank assets (MVA);
($MVA = A_1 + A_2 + \ldots + A_n$)
Da_i = Macaulay's duration of asset i
n = number of different bank assets

DGAP Model (continued…)

Weighted Average Duration of Bank Liabilities (DL):

$$DL = \sum_{j}^{m} z_j Dl_j$$

where

L_j = market value of liability j (j equals 1, 2, … m)
z_j = L_j divided by the market value of all bank liabilities (MVL);
($MVL = L_1 + L_2 + \ldots + L_m$)
Dl_j = Macaulay's duration of liability j
m = number of different bank liabilities

DGAP Model (continued…)

- $\Delta EVE = \Delta MVA - \Delta MVL$
- $\Delta EVE = -[DA - (MVL/MVA)DL][\Delta y/(1 + y)]MVA$
- Duration GAP = DGAP = $DA - (MVL/MVA)DL$ then
- $\Delta EVE = -DGAP[\Delta y/(1+y)]MVA$
- DA and DL account for present value of all cash flows.
- Approximate estimate of the sensitivity of EVE to changes in the general level of interest rates.
- Interest (y) typically a weighted-average.

Example:

Assets	Market Value	Rate	Duration	Liabilities and Equity	Market Value	Rate	Duration
Cash	\$100			1-yr. time deposit	\$620	5%	1.00 yr.
3-yr. commercial loan	700	12%	2.69 yrs.	3-yr. certificate of deposit	300	7%	2.81 yrs.
6-yr. Treasury bond	200	8	4.99	Total liabilities	920		1.59 yrs.
				Equity (EVE)	\$80		
Total	\$1,000		2.88 yrs.		\$1,000		

Weighted avg. duration of assets (DA) = (\$100/\$700)(0) + (\$700/\$1,000)(2.69) + (\$200/\$1,000)(4.99) = 2.88 yrs.

Weighted avg. duration of liabilities (DL) = (\$620/\$920)(1.0) + (\$300/\$920)(2.81) = 1.59 yrs.

Expected economic net interest income = 0.12(\$700) + 0.08(\$200) − 0.05(\$620) − 0.07(\$300) = \$48.00

DGAP = 2.88 − (\$920/\$1,000)(1.59) = 1.42 yrs.

Sample Duration Calculations Using Equation 8.1

$$\text{Commercial loan} = \frac{\dfrac{84}{(1.12)^1} + \dfrac{84(2)}{(1.12)^2} + \dfrac{784(3)}{(1.12)^3}}{\$700} = 0.107(1) + 0.096(2) + 0.797(3) = 2.69 \text{ years}$$

$$\text{Certificate of deposit} = \frac{\dfrac{21}{(1.07)^1} + \dfrac{21(2)}{(1.07)^2} + \dfrac{321(3)}{(1.07)^3}}{\$300} = 0.065(1) + 0.061(2) + 0.874(3) = 2.81 \text{ years}$$

Example:

Assets	Market Value	Rate	Duration	Liabilities and Equity	Market Value	Rate	Duration
Cash	$100			1-yr. time deposit	$614	6%	1.00 yr.
3-yr. commercial loan	683	13%	2.68 yrs.	3-yr. certificate of deposit	292	8	2.80
6-yr. Treasury bond	191	9	4.97	Total liabilities	$906		1.58 yrs.
Total	$974		2.86 yrs.	Equity (EVE)	$68		
					$974		

Duration of assets = 0.702(2.68) + 0.196(4.97) = 2.86 yrs.

Duration of liabilities = 0.68(1) + 0.32(2.80) = 1.58 yrs.

Expected economic net interest income = $45.81.

DGAP = 2.86 − ($906/$974)(1.58) = 1.36 yrs.

Change in market value of: assets = −$26

liabilities = −$14

equity = −$12

Sample Duration Calculations of Market Value Using Equation 8.2

Commercial loan: $\Delta P = (0.01/1.12)(-2.69)(\$700) = -\$16.8$

Certificate of deposit: $\Delta P = (0.01/1.07)(-2.81)(\$300) = -\$7.9$

Example:

- DGAP As a Measure of Risk
  - Can be used to approximate expected change in economic value of equity for a given change in rates.

$$
\begin{aligned}
\Delta \text{EVE} &= -\text{DGAP}[\Delta \text{y}/(1 + y)]\text{MVA} \\
\Delta \text{EVE} &= -1.42[0.01/1.10]\$1{,}000 \\
&= -0.0127[\$1{,}000] \\
&= -\$12.70
\end{aligned}
$$

  - The farther DGAP is from zero, the greater the potential impact on EVE and hence the greater the risk.

Example:

- Implications of DGAP > 0:

  - The value of DGAP at 1.42 years indicates the bank has a substantial mismatch in average durations of assets and liabilities.

  - Since the DGAP is positive, the market value of assets will change more than the market value of liabilities if all rates change by comparable amounts.
    - In this example, an increase in rates will cause a decrease in EVE, while a decrease in rates will cause an increase in EVE.

DGAP Model (continued…)

- When DGAP > 0 :
  - Banks benefit when rates fall (EVE rises) and loses when rates rise (EVE falls).
- When DGAP < 0:
  - Banks benefit when rates rise (EVE falls) and loses when rates fall (EVE rises).
- The greater the absolute value of DGAP, the greater the interest rate risk.
  - A bank that is perfectly hedged will have a DGAP of zero.

Example: DGAP = 0

Bank Balance Sheet: DGAP = 0

Assets	Market Value	Rate	Duration	Liabilities and Equity	Market Value	Rate	Duration
Cash	$100			1-yr. time deposit	$340	5%	1.00 yr.
3-yr. commercial loan	700	12%	2.69 yrs.	3-yr. certificate of deposit	300	7	2.81
6-yr. Treasury bond	200	8	4.99	6-yr. zero coupon CD*	280	8	6.00
			2.88 yrs.	Total liabilities	$920		3.11 yrs.
				Equity	$80		
Total	$1,000				$1,000		

DGAP = 2.88 – 0.92(3.11) ≅ 0

1% Increase in All Rates

Assets	Market Value	Rate	Duration	Liabilities and Equity	Market Value	Rate	Duration
Cash	$100			1-yr. time deposit	$337	6%	1.00 yr.
3-yr. commercial loan	683	13%	2.68 yrs.	3-yr. certificate of deposit	292	8	2.80
6-yr. Treasury bond	191	9	4.97	6-yr. certificate of deposit	265	9	6.00
			2.86 yrs.	Total liabilities	$894		3.07 yrs.
				Equity	$80		
Total	$974				$974		

*Par (maturity) value = $444.33

DGAP Model (continued...)

DGAP Summary

		Change in Economic (Market) Value				
DGAP	**Change in Interest Rates**	**Assets**		**Liabilities**		**Equity**
Positive	Increase	Decrease	>	Decrease	→	Decrease
Positive	Decrease	Increase	>	Increase	→	Increase
Negative	Increase	Decrease	<	Decrease	→	Increase
Negative	Decrease	Increase	<	Increase	→	Decrease
Zero	Increase	Decrease	=	Decrease	→	None
Zero	Decrease	Increase	=	Increase	→	None

Managing Interest Rate Risk with Duration GAP

- Objective: Reduce Interest Rate Risk with DGAP > 0:
  - Shorten asset durations by:
    - Buying short-term securities and selling long-term securities.
    - Making floating-rate loans and selling fixed-rate loans.
  - Lengthen liability durations by:
    - Issuing longer-term CDs.
    - borrowing via longer-term FHLB advances.
    - obtaining more core transactions accounts from stable sources.

Managing Interest Rate Risk with Duration GAP

- Objective: Reduce Interest Rate Risk with DGAP < 0:
  - Lengthen asset durations by:
    - Buying long-term securities and selling short-term securities.
    - Buying securities without call options.
    - Making fixed rate loans and selling floating-rate loans.
  - Shorten liability durations by:
    - Issuing shorter-term CDs.
    - Borrowing via shorter-term FHLB advances.
    - Using short-term purchased liability funding from federal funds and repurchase agreements.

Economic Value of Equity Sensitivity Analysis

Consists of conducting “what if” analysis of the all factors that effect EVE across a wide range of interest rate environments.

- Repeats static DGAP analysis under different assumed interest rates.
- Important component is rate shock analysis incorporating projections of when embedded options will be exercised and what different values assets and liabilities might take.
- The greater potential volatility in EVE, the greater the risk.
- The greater potential reduction in EVE, the greater the risk.

Economic Value of Equity Sensitivity Analysis (Continued…)

- Estimating the timing of cash flows and subsequent durations of assets and liabilities is complicated by:
  - Prepayments that exceed (fall short of) those expected with shorten (lengthen) duration.
  - A bond being called will shorten duration.
  - A deposit that is withdrawn early or not withdrawn as expected with shorten (lengthen) duration.
  - An interest rate cap that becomes binding will generally reduce cash flows and lower duration.
  - An interest rate floor that becomes binding will generally increase cash flows and increase duration.

EVE Sensitivity Analysis: An Example

- First Savings Bank:
  - Average duration of assets equals 2.6 years
  - Market value of assets equals $1,001,963
  - Average duration of liabilities equals 2 years
  - Market value of liabilities equals $919,400

EXHIBIT 8.4 First Savings Bank's Economic Value of Stockholders Equity

	Market Value/Duration Report as of 12/31/2013 Most Likely Rate Scenario—Base Strategy			
	Book Value	Market Value	Book Yield	Duration*
Loans				
Prime based	$ 100,000	$ 102,000	9.00%	—
Equity credit lines	25,000	25,500	8.75%	—
Fixed rate > 1 yr.	170,000	170,850	7.50%	1.1
Var.-rate mortgage 1 yr.	55,000	54,725	6.90%	0.5
30-year fixed-rate mortgage	250,000	245,000	7.60%	6.0
Consumer	100,000	100,500	8.00%	1.9
Credit card	25,000	25,000	14.00%	1.0
Total loans	725,000	723,575	8.03%	2.6
Loan loss reserve	(15,000)	(11,250)	0.00%	8.0
Net loans	710,000	712,325	8.03%	2.5
Investments				
Eurodollars	80,000	80,000	5.50%	0.1
CMOs fixed rate	35,000	34,825	6.25%	2.0
U.S. Treasury	75,000	74,813	5.80%	1.8
Total investments	190,000	189,638	5.76%	1.1
Fed funds sold	25,000	25,000	5.25%	—
Cash & due from banks	15,000	15,000	0.00%	6.5
Noninterest-bearing assets	60,000	60,000	0.00%	8.0
Total assets	1,000,000	1,001,963	6.93%	2.6

EXHIBIT 8.4 First Savings Bank's Economic Value of Stockholders Equity

	Market Value/Duration Report as of 12/31/2013 Most Likely Rate Scenario—Base Strategy				
	Book Value	Market Value	Book Yield	Duration*	
Deposits					
MMDAs	240,000	232,800	2.25%	—	
Retail CDs	400,000	400,000	5.40%	1.1	
Savings	35,000	33,600	4.00%	1.9	
NOW	40,000	38,800	2.00%	1.9	
DDA Personal	55,000	52,250		8.0	
DDA Commercial	60,000	58,200		4.8	
Total deposits	830,000	815,650		1.6	
Treasury tax & loan	25,000	25,000	5.00%	—	
L-T notes fixed rate	50,000	50,250	8.00%	5.9	
Fed funds purchased	—	—	5.25%	—	
Noninterest-bearing liabilities	30,000	28,500		8.0	
Total liabilities	935,000	919,400		2.0	
Equity capital	65,000	82,563		9.9	
Total liabilities & equity	1,000,000	1,001,963		2.6	
Off-balance sheet					Notional
Interest rate swaps	—	1,250	6.00%	2.8	$ 50,000
Adjusted equity	65,000	83,813		7.9	

*Duration is reported in years.

Note: Values are in thousands of dollars.

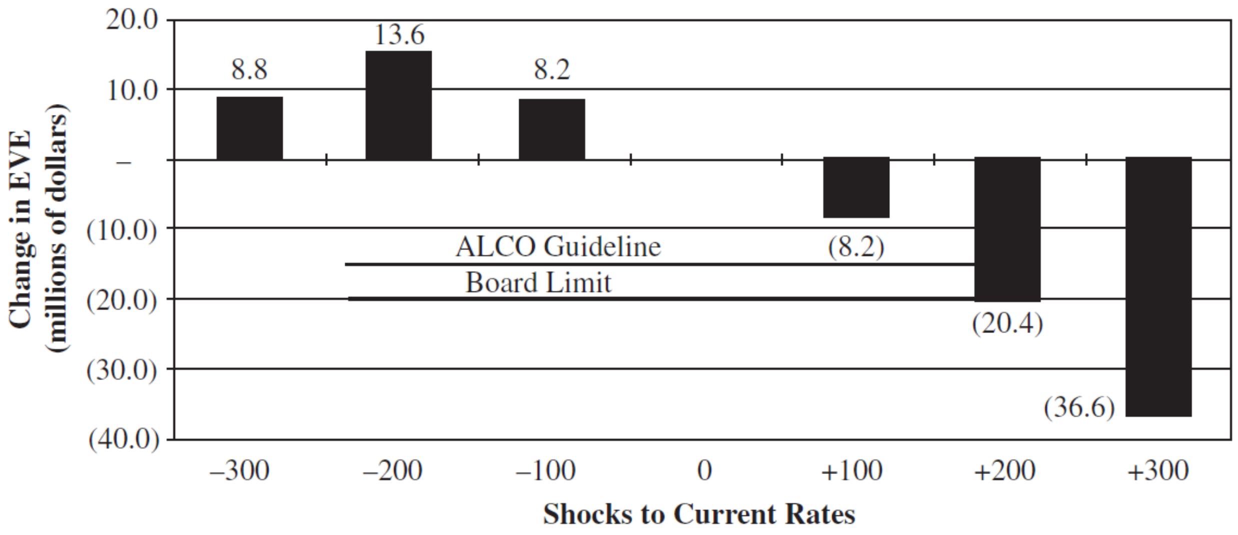
EVE Sensitivity Analysis: An Example

- Duration Gap:
  - 2.6 – ($919,400/$1,001,963) × 2.0 = 0.765 years
  - A 1% increase in rates would reduce EVE by $7.2 million:
    - $\Delta MVE = -DGAP[\Delta y/(1+y)]MVA$
    - $\Delta MVE = -0.765\ (0.01/1.0693) \times \$1{,}001{,}963{,}000$
  - This estimate ignores the impact of interest rates on embedded options, the effective duration of assets and liabilities and interest rate swaps.

  - Higher interest rates are associated with a decline in EVE and lower rates are associated with an increase in EVE.

EVE Sensitivity Analysis: An Example

EXHIBIT 8.5 **Sensitivity of Economic Value of Equity (EVE) versus Most Likely (Zero Shock) Interest Rate Scenario**



Note: *Sensitivity of economic value of equity* measures the change in the economic value of the corporation's equity under various changes in interest rates. Rate changes are instantaneous changes from current rates. The change in EVE is derived from the difference between changes in the market value of assets and changes in the market value of liabilities.

Strengths and Weaknesses: DGAP and EVE Sensitivity Analysis

Strengths:

- Duration analysis provides a comprehensive measure of interest rate risk for the total portfolio.
- Duration measures are additive so that total assets may be matched with total liabilities rather than matching of individual accounts.
- Duration analysis takes a longer-term view and provides managers with greater flexibility in adjusting rate sensitivity because they can use a wide range of instruments to balance value sensitivity.

Strengths and Weaknesses: DGAP and EVE Sensitivity Analysis

Weaknesses:

- It is difficult to compute duration accurately.
- “Correct” duration analysis requires that each future cash flow be discounted by a distinct discount rate.
- A bank must continuously monitor and adjust the duration of its portfolio.
- It is difficult to estimate the duration on assets and liabilities that do not earn or pay interest.
- Duration measures are highly subjective.

Yield Curve Strategies

Interest Risk Management: An Example

- Consider the case where a liability sensitive bank decides to reduce risk by marketing 2-year, 6% time deposits rather than 1-year deposits paying 5.5%.

Cash flows from investing $1,000 either in a two-year security yielding 6 percent or two consecutive one-year securities, with the current one-year yield equal to 5.5 percent.

	0 → 1	1 → 2	
Two-year security	$60	$60	$120 at 6 percent per year
One-year security; then another one-year security	$55	?	

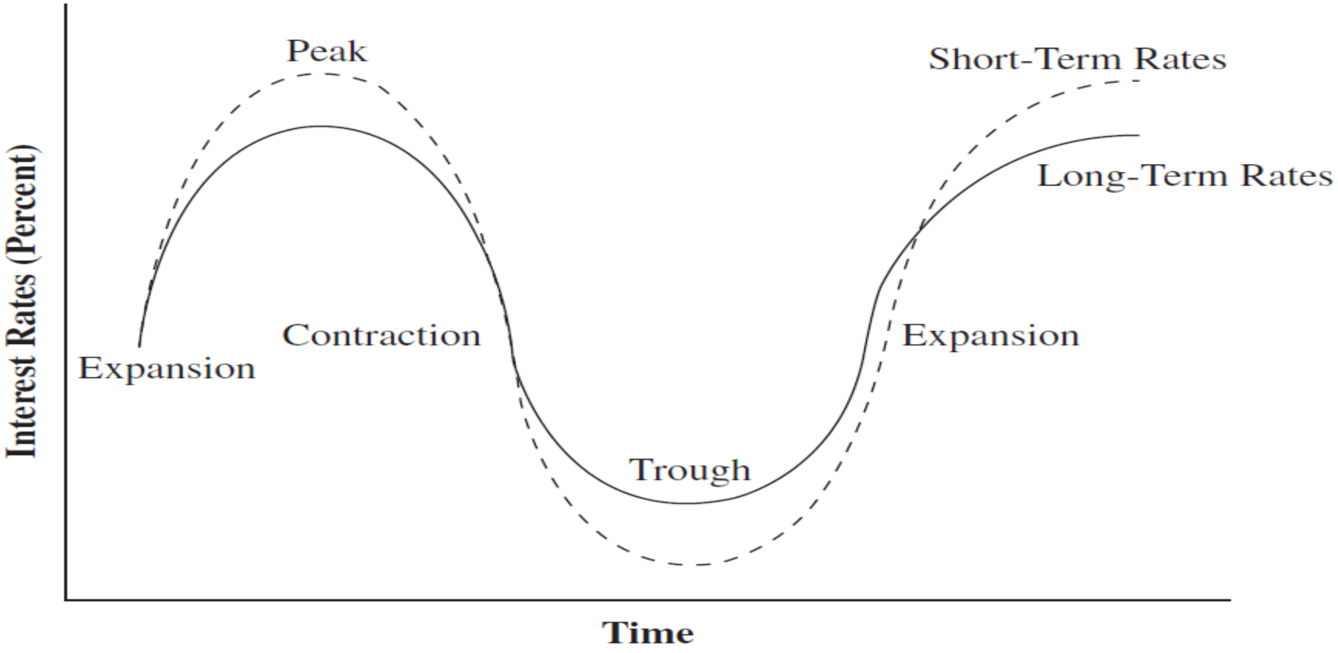
Yield Curve Strategies (continued…)

- Interest Rate Risk: An Example
  - For the two consecutive 1-year securities to generate the same $120 in interest, ignoring compounding, the 1-year security must yield 6.5% one year from the present.
    - 6% + 6% = 5.5% + ? so ? must = 6.5%
  - By <u>investing</u> in the 1-year security, depositor is betting the 1-year interest rate in one year will be greater than 6.5%.
  - By <u>issuing</u> the 2-year security, the bank is betting that the 1-year interest rate in one year will be greater than 6.5%.

Yield Curve Strategies (continued…)

- Analysts typically view business cycle effects in terms of how the 10-year (long term) Treasury yield varies relative to the 1-year (short term) yield.
- Expansionary and peak economic activity periods:
  - Strong consumer spending, growing loan demand and limited bank liquidity.
  - Federal Reserve slows money growth out of fear that inflation will get out of control.
- Peak is followed by a contractionary period as spending and loan demand declines.

Yield Curve Strategies (continued…)



The inverted yield curve has predicted the last five recessions

DATE WHEN 1-YEAR RATE FIRST EXCEEDS 10-YEAR RATE	LENGTH OF TIME UNTIL START OF NEXT RECESSION
Apr. '68	20 months (Dec. '69)
Mar. '73	8 months (Nov. '73)
Sept. '78	16 months (Jan. '80)
Sept. '80	10 months (July '81)
Feb. '89	17 months (July '90)
Dec. '00	15 months (March '01)
Jun. '06	23 months (Dec. '07)

Expansion: Increasing consumer spending, inventory accumulation, rising loan demand, Federal Reserve begins to slow money growth.

Peak: Monetary restraint, high loan demand, little liquidity.

Contraction: Falling consumer spending, inventory contraction, falling loan demand, Federal Reserve accelerates money growth.

Trough: Monetary ease, limited loan demand, excess liquidity.

Source: Federal Reserve.

Interest Rate Derivatives

- Derivative:
  - Any instrument or contract that derives its value from another underlying asset, instrument, or contract.
- Most common interest rate derivatives:
  - Interest rate swaps, caps, and floors.
  - Financial futures contracts and credit default swaps.
- When used prudently, derivatives represent a cost- effective means to manage risk.
  - Banks can replicate on-balance sheet transactions with off balance sheet contracts.

Financial Future

- Financial Futures Contracts:
  - A commitment, between a buyer and a seller, on the quantity of a standardized financial asset or index.
- Futures Markets:
  - Organized exchanges where futures contracts are traded.
- Interest Rate Futures:
  - The underlying asset is an interest-bearing security.

Example

- You want to invest $1 million in 10-year T-bonds in six months and believe that rates will fall.
  - You want to “lock in” today’s 3%, 10-year yield.
  - Buy a futures contract on 10-year T-bonds with an expiration date just after the six-month period, priced at a 3.25% rate.

- If 10-year Treasury rates fall during the six months, the futures rate will fall and the futures price rises.
  - An increase in the futures price generates a profit on the futures trade.

Example

- Prior to investing the $1 million, you sell the futures contract to exit the trade.
  - Effective yield determined by the prevailing 10-year Treasury rate and the gain (or loss) on the futures trade.
  - The loss from a drop in the 10-year rates below 3% will be offset by profit on the long futures position.

	Today		Six months later: exit futures contract
10-yr Treasury rate	3.0%		2.70%
10-year Treasury futures rate	3.25%		2.68%
Opportunity loss on the cash Treasury		**Buy@2.70%,** not 3.0%	= 0.30%
Gain on the futures contract	**Buy@3.25%**	**Sell@2.68%**	Gain = 0.57%
Effective yield on the investment			2.70% + 0.57% = 3.27%

Forward Rate Agreement

- FRA is a forward contract based on interest rates.
  - Counterparties agree to a notional principal amount that serves as a reference figure in determining cash flows.
  - "Notional" refers to the condition that the principal does not change hands, but is only used to calculate the value of interest payments.

- Buyer agrees to pay a fixed-rate coupon payment and receive a floating-rate payment in the future. Seller agrees to the opposite.
  - Cash only changes hands if the actual interest rate at settlement differs from that initially expected.

Example:

- Metro Bank (as seller) enters into a receive fixed-rate/pay floating-rating FRA with County Bank (as buyer) with a six-month maturity based on a $1 million notional principal amount.

  - The floating rate is three-month LIBOR and the fixed (exercise) rate is 5%.
  - Metro Bank would refer to this as a “3 vs. 6” FRA at 5% on a $1 million notional amount from County Bank.
  - The only cash flow will be determined in six months at contract maturity by comparing the prevailing 3-month LIBOR with 5%.

Example:

- Assume that in 3 months three-month LIBOR equals 6%.

- Country would receive payment from Metro:

  - The interest settlement amount is $2,500:
    - Interest = (.06 - .05)(90/360) $1,000,000 = $2,500

  - Represents interest that would be paid three months later at maturity of the instrument, so actual payment is discounted at the prevailing 3-month LIBOR.
    - Actual interest = $2,500/[1+(90/360).06]=$2,463

Example:

- Assume instead that in 3 months three-month LIBOR equals 3%.

- Country would make payment to Metro:
  - The interest settlement amount is \$5,000:
    - Interest = (.05 - .03)(90/360) \$1,000,000 = \$5,000
  - Actual payment is discounted at the prevailing 3-month LIBOR.
    - Actual interest = \$2,500/[1+(90/360).03]=\$4,963

Interest Rate Swap

- Basic Interest Rate Swap:
  - Agreement between two parties to exchange a series of cash flows based on specified notional principal amount.
    - One party makes payments based on a fixed interest rate and receives floating-rate payments. Other party does the reverse.
  - A swap dealer generally serves as an intermediary so a party can take any position and the dealer takes the other.
    - Intermediary may serve as an agent with no risk exposure or a dealer who accepts the risk of adverse rate changes.
    - If risk not assumed, intermediary hopes to earn the bid-offer spread.

Example

Consider the following two-year swap:

- Involves eight quarterly payments and based on the three-month LIBOR floating rate:

- If the currently three-month LIBOR is 0.27%

Party FIX :	Pay: 0.56%	Receive: three-month LIBOR
Party FLT :	Pay : three-month LIBOR	Receive : 0.54%

Example

Two-Year Maturity, $10 Million Notional Principal
with Eight Quarterly Swap Payments

FIX: Pay 0.56 Percent, Receive LIBOR
FLT: Pay LIBOR, Receive 0.54 Percent

		0	1	2	3	4	5	6	7	8
Party FIX	Pay		$13,962	13,962	13,962	13,962	13,962	13,962	13,962	13,962
	Rec.		$6,825	LIB_2	LIB_3	LIB_4	LIB_5	LIB_6	LIB_7	LIB_8
Net	Pay		$7,137	?	?	?	?	?	?	?
Party FLT	Pay		$6,825	LIB_2	LIB_3	LIB_4	LIB_5	LIB_6	LIB_7	LIB_8
	Rec.		$13,423	13,423	13,423	13,423	13,423	13,423	13,423	13,423
Net	Rec.		$6,638	?	?	?	?	?	?	?
Dealer			$499							

Party FIX: Period 1

Pay: 0.0056 (91/365) $10,000,000 = $13,962
Rec: 0.0027 (91/360) $10,000,000 = $6,825
Net Payment = $7,137

Party FLT: Period 1

Pay: 0.0027 (91/360) $10,000,000 = $6,825
Rec: 0.0054 (91/365) $10,000,000 = $13,463
Net Receipt = $6,638

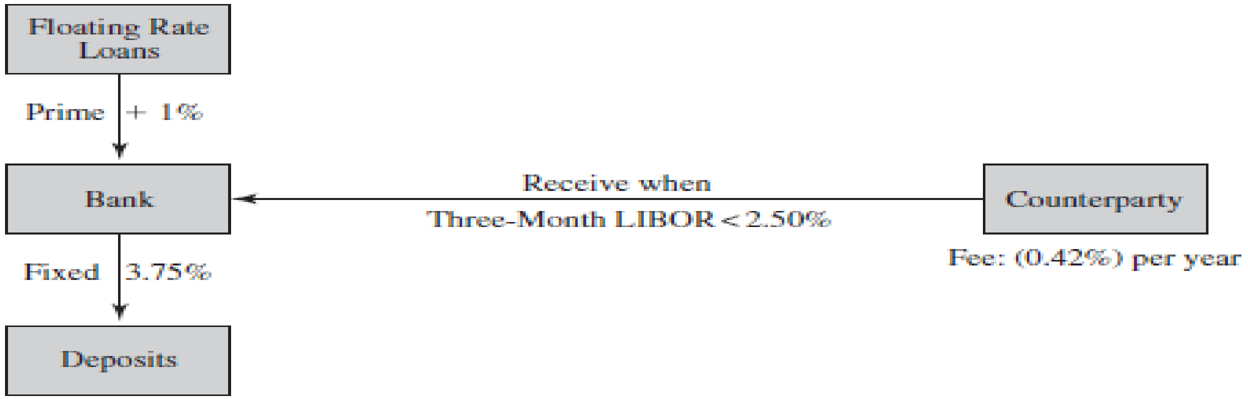
Note: The notation LIB refers to three-month LIBOR, with the subscript denoting the period for which the applicable floating LIBOR applies.

Interest Rate Caps and Floors

- Interest rate cap is an agreement between two counter-parties that limits buyer’s interest rate exposure to a maximum rate.
  - Buying a cap is the purchase of a call option on an interest rate.
- Interest rate floor is an agreement between two counter-parties that limits buyer’s interest rate exposure to a minimum rate.
  - Buying a floor is the purchase of a put option on an interest rate.

Example

Floor Terms: Buy a 2.50 Percent Floor on Three-Month LIBOR*

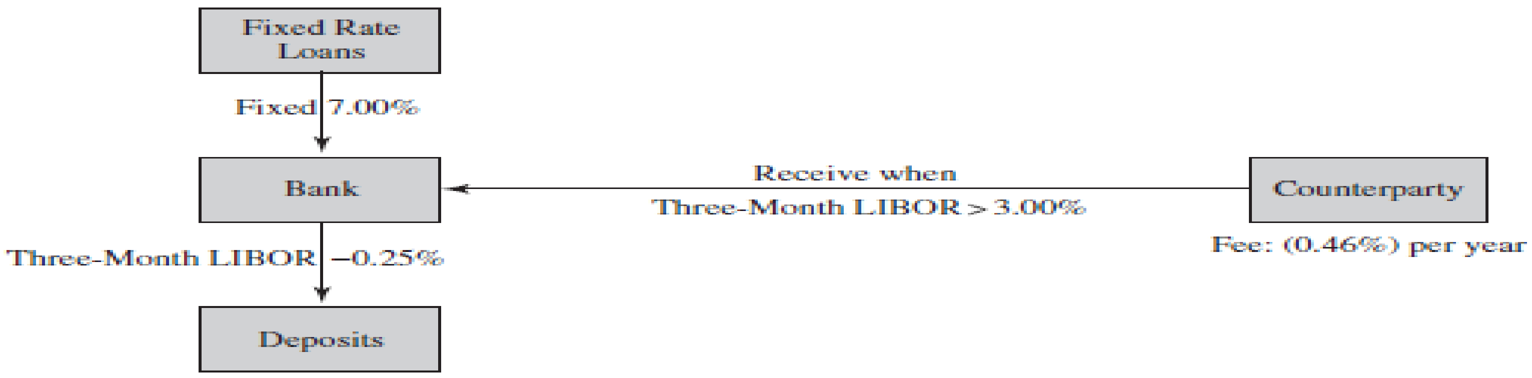


	Current Rates Constant	Rates Fall 100 Basis Points	Rates Rise 100 Basis Points
	Prime 5.00% LIBOR 3.00%	Prime 4.00% LIBOR 2.00%	Prime 6.00% LIBOR 4.00%
Balance Sheet Flows:			
Loan	6.50%	5.50%	7.50%
Deposit	(3.75%)	(3.75%)	(3.75%)
Spread	2.25%	1.25%	3.25%
Floor Flows:			
Payout	0.00%	0.82%	0.00%
Fee Amort.	(0.42%)	(0.42%)	(0.42%)
Spread	(0.42%)	+0.40%	(0.42%)
Margin	1.83%	1.65%	2.83%

*Assume floor term is three years and perfect correlation between Prime and LIBOR.

Example

Strategy: Buy a Cap on Three-Month LIBOR at 3.00 Percent*



	Current Rates Constant	Rates Fall 100 Basis Points	Rates Rise 100 Basis Points
	LIBOR 2.68%	LIBOR 1.68%	LIBOR 3.68%
Balance Sheet Flows:			
Loan	7.00%	7.00%	7.00%
Deposit	(2.43%)	(1.43%)	(3.43%)
Spread	4.57%	5.57%	3.57%
Cap Flows:			
Payout	0.00%	0.00%	0.68%
Fee Amort.	(0.46%)	(0.46%)	(0.46%)
Spread	(0.46%)	(0.46%)	0.22%
Margin	4.11%	5.11%	3.79%

*Assume cap term is three years.

Summary

- We discussed the duration GAP method which is wide used to measure bank's interest rate risk.

- We summarised how bank could use the EVE sensitivity analysis to manage bank's interest rate risk and the strategies.

- We discussed the yield curve strategy and the business circle.

- We reviewed 5 financial depravities which could help banks' to hedge their interest rate risk.