

18. National Bank has the following balance sheet (in millions) and has no off-balance-sheet activities.

<u>Assets</u>		<u>Liabilities and Equity</u>	
Cash	\$20	Deposits	\$960
Treasury bills	40	Subordinated debentures	25
Residential mortgages (category 1; loan-to-value ratio = 70%)	600	Common stock	45
Business loans	<u>430</u>	Retained earnings	<u>40</u>
Total assets	<u><u>\$1,090</u></u>	Total liabilities and equity	<u><u>\$1,090</u></u>

a. What is the CET1 risk-based ratio?

The CET1 risk-based ratio is $(\$45 + \$40)/\$730 = 11.64\%$.

b. What is the Tier I risk-based capital ratio?

Risk-adjusted assets = $\$20 \times 0.0 + \$40 \times 0.0 + \$600 \times 0.5 + \$430 \times 1.0 = \$730$.

Tier I capital ratio = $(\$45 + \$40) / \$730 = 0.11644$ or 11.644 percent.

c. What is the total risk-based capital ratio?

The total risk-based capital ratio = $(\$45 + \$40 + \$25) / \$730 = 0.15068$ or 15.068 percent.

d. What is the leverage ratio?

The leverage ratio is $(\$45 + \$40) / \$1,090 = 0.07798$ or 7.798 percent.

e. In what capital risk category would the bank be placed?

The bank would be place in the well-capitalized category.

19. What is the capital conservation buffer? How would this buffer affect your answers to question 18?

Basel III introduced a capital conservation buffer designed to ensure that DIs build up a capital surplus, or buffer, outside periods of financial stress which can be drawn down as losses are incurred during periods of financial stress. The buffer requirements provide incentives for DIs to build up a capital surplus (e.g., by reducing discretionary distributions of earnings (reduced dividends, share buy-backs and staff bonuses)) to reduce the risk that their capital levels would fall below the minimum requirements during periods of stress. The capital conservation buffer must be composed of CET1 capital and are held separately from the minimum risk-based capital requirements. Under Basel III, a DI would need to hold a capital conservation buffer of greater than 2.5 percent of total risk-weighted assets to avoid being subject to limitations on capital distributions and discretionary bonus payments to executive officers.

To have no limitations on the bank's payout ratio, the CET1 ratio must be $> 7\%$, the Tier I ratio must be $> 8.5\%$, and the total capital ratio must be $> 10.5\%$. In problem 18, all three of these conditions are met. So, the bank has no limitations on its payout ratio.

20. What is the countercyclical capital buffer? If the home country set a countercyclical capital buffer of 1.5 percent, how would this buffer affect your answers to question 18?

Basel III also introduced a countercyclical capital buffer which may be declared by any country which is experiencing excess aggregate credit growth. The countercyclical buffer can vary between 0 percent and 2.5 percent of risk-weighted assets. This buffer must be met with CET1 capital and DIs are given 12 months to adjust to the buffer level. Like the capital conservation buffer, if a DI's capital levels fall below the set countercyclical capital buffer, restrictions on earnings payouts are applied. The countercyclical capital buffer aims to protect the banking system and reduce systemic exposures to economic downturns. Losses can be particularly large when a downturn is preceded by a period of excess credit growth. The accumulation of a capital buffer during an expansionary phase would increase the ability of the banking system to remain healthy during periods of declining asset prices and losses from weakening credit conditions. By assessing a countercyclical buffer when credit markets are overheated, accumulated capital buffers can absorb any abnormal losses that a DI might experience when the credit cycle turns. Consequently, even after these losses are realized, DIs would remain healthy and able to access funding, meet obligations, and continue to serve as credit intermediaries.

In problem 18, the bank's CET1 is 7.798%, the Tier I ratio is 11.644%, and the total capital ratio must be $> 15.068\%$. In problem 18, these ratios mean the bank can pay out only 40 percent of its earnings.

21. Onshore Bank has \$20 million in assets, with risk-adjusted assets of \$10 million. CET1 capital is \$500,000, additional Tier I capital is \$50,000 and Tier II capital is \$400,000. How will each of the following transactions affect the value of the Tier I and total capital ratios? What will the new value of each ratio be?

The current value of the CET1 ratio is 5 percent ($\$500,000/\$10m$), of the Tier I ratio is 5.5 percent ($(\$500,000 + \$50,000)/\$10m$), and the total ratio is 9.5 percent ($(\$500,000 + \$50,000 + \$400,000)/\$10m$).

a. The bank repurchases \$100,000 of common stock with cash.

CET1 capital decreases to \$400,000, Tier I capital decreases to \$450,000 and total capital decreases to \$850,000. Cash has a 0 risk weight so risk-weighted assets do not change. Thus, the CET1 ratio decreases to 4 percent, the Tier I ratio decreases to 4.5 percent and the total capital ratio decreases to 8.5 percent.

b. The bank issues \$2 million of CDs and uses the proceeds to issue category 1 mortgage loans with a loan-to-value ratio of 80 percent.

The risk weight for category 1 mortgages with a loan-to-value ratio of 80 percent is 50 percent. Thus, risk-weighted assets increase to $\$10\text{ million} + \$2\text{ million (0.5)} = \11 million . The CET1 ratio decreases to $\$500,000/\$11\text{ million} = 4.54\text{ percent}$, the Tier I ratio decreases to $\$550,000/\$11\text{ million} = 5\text{ percent}$ and the total capital ratio decreases to $\$950,000/\$11\text{ million} = 8.64\text{ percent}$.

- c. The bank receives \$500,000 in deposits and invests them in T-bills.

T-bills have a 0 risk weight so risk-weighted assets remain unchanged. Thus, all three ratios remain unchanged.

- d. The bank issues \$800,000 in common stock and lends it to help finance a new shopping mall.

CET1 equity increases to \$1.3 million, Tier I equity increases to \$1.35 million, and total capital increases to \$1.75 million. The business loan's risk weight is 100 percent. Thus, risk-weighted assets increase to $\$10\text{ million} + \$800,000 (1) = \$10.8\text{ million}$. The CET1 ratio, increases to $\$1.3m/\$10.8m = 12.03\text{ percent}$, the Tier I ratio increases to $\$1.35m/\$10.8m = 12.50\text{ percent}$, and the total capital ratio increases to 16.20 percent.

- e. The bank issues \$1 million in nonqualifying perpetual preferred stock and purchases general obligation municipal bonds.

CET1 and Tier I capital are unchanged. Total capital increases to \$1.95 million. General obligation municipal bonds fall into the 20 percent risk category. So, risk-weighted assets increase to $\$10\text{ million} + \$1\text{ million (0.2)} = \10.2 million . Thus, the CET1 ratio decreases to $\$500,000/\$10.2\text{ million} = 4.90\text{ percent}$, the Tier I ratio decreases to $\$550,000/\$10.2\text{ million} = 5.39\text{ percent}$, and the total capital ratio increases to 19.12 percent.

- f. Homeowners pay back \$4 million of category 1 mortgages with loan-to-value ratios of 40 percent and the bank uses the proceeds to build new ATMs.

The category 1 mortgage loans with loan-to-value ratios of 40 percent have a risk weight of 35 percent. The ATMs are 100 percent risk weighted. Thus, risk-weighted assets increase to $\$10\text{ million} - \$4\text{ million (0.35)} + \$2\text{ million (1.0)} = \10.6 million . The CET1 capital ratio decreases to $\$500,000/\$10.6m = 4.72\text{ percent}$, the Tier I capital ratio decreases to $\$550,000/\$10.6m = 5.19\text{ percent}$, and the total capital ratio decreases to $\$950,000/\$10.6m = 8.96\text{ percent}$.

22. Explain the process of calculating risk-adjusted off-balance-sheet contingent guaranty contracts?

The first step is to convert the off-balance-sheet items to credit equivalent amounts of an on-balance-sheet item by multiplying the notional amounts by an appropriate conversion factor as given in Table 20-10. The converted amounts are then multiplied by the appropriate risk weights as if they were on-balance-sheet items.

a. What is the basis for differentiating the credit equivalent amounts of contingent guaranty contracts?

The factors used in the conversion are arbitrary selections from the list of choices approved by regulators. While a subjective relationship undoubtedly exists between the factors and the respective credit risks to the FI, no theoretical valuation models were utilized to determine the specific weights that are used.

b. On what basis are the risk weights for the credit equivalent amounts differentiated?

The appropriate risk weights depend on the counterparty risk to off-balance-sheet activity.

28. Third Bank has the following balance sheet (in millions), with the risk weights in parentheses.

Assets		Liabilities and Equity	
Cash (0%)	\$21	Deposits	\$176
OECD interbank deposits (20%)	25	Subordinated debt (5 years)	2
Mortgage loans (50%)	70	Cumulative preferred stock	2
Consumer loans (100%)	70	Equity	<u>5</u>
Reserve for loan losses	<u>(1)</u>		
Total Assets	<u><u>\$185</u></u>	Total liabilities and equity	<u><u>\$185</u></u>

The cumulative preferred stock is qualifying and perpetual. In addition, the bank has \$30 million in performance-related standby letters of credit (SLCs) to a public corporation, \$40 million in two-year forward FX contracts that are currently in the money by \$1 million, and \$300 million in six-year interest rate swaps that are currently out of the money by \$2 million. Credit conversion factors follow:

Performance-related standby LCs	50%
1- to 5-year foreign exchange contracts	5%
1- to 5-year interest rate swaps	0.5%
5- to 10-year interest rate swaps	1.5%

a. What are the risk-adjusted on-balance-sheet assets of the bank as defined under the Basel Accord?

Risk-adjusted assets:

Cash	0×21	=	\$0
OECD interbank deposits	0.20×25	=	\$5
Mortgage loans	0.50×70	=	\$35
Consumer loans	1.00×70	=	<u>\$70</u>
Total risk-adjusted assets		=	\$110
			= \$110

b. To be adequately capitalized, what are the CET1, Tier I, and total capital required for both off- and on-balance-sheet assets?

Standby LCs: $\$30 \times 0.50 \times 1.0$ = \$15 = \$15

Foreign exchange contracts:

Potential exposure	$\$40 \times 0.05$	=	\$2
Current exposure	in the money	=	\$1

Interest rate swaps:

Potential exposure	$\$300 \times 0.015$	=	\$4.5
Current exposure	Out-of-the money	=	<u>\$0</u>
		=	\$7.5 x 1.0 = \$7.5

Total risk-adjusted on- and off-balance-sheet assets = \$132.50
 $\times 0.045$

CET1 capital required \$6.0075

Tier I capital required $\frac{x 0.06}{\$8.01}$

Total capital required $\frac{x 0.08}{\$10.68}$

c. Disregarding the capital conservation buffer, does the bank have enough capital to meet the Basel requirements? If not, what minimum CET1, additional Tier 1, or total capital does it need to meet the requirement?

No, the bank does not have sufficient total capital to meet the Basel requirements. It needs CET1 capital of \$6.0075 million, Tier I capital of \$8.01 million, and total capital of \$10.68 million. The bank has \$5 million of CET1 capital, \$7 million of Tier I capital (\$5 million CET1 capital and \$2 million of additional Tier I capital), and \$10 million of total capital (\$3 million (\$2 million in subordinate debt and \$1 million in reserve for loan losses) of Tier II capital).

If the bank issues \$1.0075 million in CET1 capital, it will need \$0.0025 million in additional Tier I capital, and no Tier II capital. With these additions the bank will have \$6.0075 million of CET1 capital, \$8.01 million of Tier I capital, and \$11.01 million of total capital.

A new balance sheet after the issuance of the new required equity is shown below. You will note that the total capital exceeds the minimum of \$10.68 million.

New balance sheet:

Cash	\$22.01	Deposits	\$176
OECD interbank deposits	25	Subordinated debt (over 5 years)	2
Mortgage loans	70	Cumulative preferred stock	2.0025
Consumer loans	70	Equity	<u>6.0075</u>
Reserve for loan losses	<u>(1)</u>		
Total	<u>\$186.01</u>		<u>\$186.01</u>

d. Does the bank have enough capital to meet the Basel requirements, including the capital conservation buffer requirement? If not, what minimum CET1, additional Tier 1, or total capital does it need to meet the requirement?

Total risk-adjusted on- and off-balance-sheet assets	= \$133.50
	<u>x 0.070</u>
CET1 capital required including capital conservation buffer	\$9.345
	<u>x 0.085</u>
Tier I capital required including capital conservation buffer	\$11.3475
	<u>x 0.105</u>
Total capital required	= \$14.0175

No, the bank does not have sufficient total capital to meet the Basel requirements. It needs CET1 capital of \$9.345 million, Tier I capital of \$11.3475 million, and total capital of \$14.0175 million. The bank has \$5 million of CET1 capital, \$7 million of Tier I capital, and \$10 million of total capital.

If the bank issues \$4.345 million in CET1 capital, it will need \$0.0025 million in additional Tier I capital, and no Tier II capital. With these additions the banks will have \$9.345 million of CET1 capital, \$11.345 million of Tier I capital, and \$14.345 million of total capital.

A new balance sheet after the issuance of the new required equity is shown below. You will note that the total capital exceeds the minimum of \$14.0175 million.

New balance sheet:

Cash	\$25.3475	Deposits	\$176
OECD interbank deposits	25	Subordinated debt (over 5 years)	2
Mortgage loans	70	Cumulative preferred stock	2.0025
Consumer loans	70	Equity	<u>9.345</u>
Reserve for loan losses	<u>(1)</u>		
Total	<u>\$189.3475</u>		<u>\$189.3475</u>

Η C-BANK έχει τον κάτωθι ισολογισμό σε τρέχουσες αξίες (εκατ. ευρώ):

Ενεργητικό		Υποχρεώσεις	
Μετρητά στο ταμείο	100	Καταθέσεις	200
Στεγαστικά δάνεια	500	Δάνεια διατραπεζικής	200
Επιχειρηματικά δάνεια	400	Ομολογιακό δάνειο	500
		Ίδια κεφάλαια (καθαρή θέση)	100
Σύνολο	1.000	Σύνολο	1.000

- Τα στεγαστικά δάνεια είναι 10ετούς λήξεως με επιτόκιο 4% ετησίως και ετήσιες τοκοχρεωλυτικές πληρωμές
- Τα επιχειρηματικά δάνεια είναι κυμαινόμενου επιτοκίου (Euribor τριμήνου + 300bps) διάρκειας 5 ετών με τριμηνιαίο επανακαθορισμό (ο προσεχής καθορισμός επιτοκίου σε 3 μήνες)
- Οι καταθέσεις έχουν μέση διάρκεια και duration 3 έτη
- Τα διατραπεζικά δάνεια είναι 3μηνιαίας διάρκειας
- Το ομολογιακό δάνειο έχει διάρκεια 10 έτη επιτόκιο ετήσιου τοκομεριδίου 5% και τρέχουσα απόδοση 6%

1.1 Πόσο είναι το Duration Gap της C-BANK;

1.2 Ποια μεταβολή του επιτοκίου είναι αντίσημη για την C-BANK;

1.3 Αν τα επιτόκια μειωθούν κατά 50 μονάδες βάσης από το επίπεδο του 2%, ποια θα είναι η επίπτωση στην Καθαρή Θέση του Ιδρύματος;

1.4 Αν υποθέσουμε ότι το ΠΙ προβλέπει μείωση των επιτοκίων και έχει σαν μόνη επιλογή να αντικαταστήσει τις ομολογίες που έχει εκδώσει με μια νέα έκδοση. Αν έχει επιλογή ανάμεσα σε ομόλογα με duration 5, 3 και 2 ετών, ποια έκδοση θα επέλεγε και ποια θα ήταν η επίπτωση της μεταβολής αυτής στην καθαρή θέση, αν όντως τα επιτόκια στη συνέχεια μειωθούν όπως στην **1.3**:

Απάντηση:

Βρίσκω πρώτα την duration των στεγαστικών δανείων, $M=10$, επιτόκιο=4%. Ο τύπος της duration για χρονική ροή (ράντα) δίνει:

$$D = \frac{1+r}{r} - \left[\frac{M}{(1+r)^M - 1} \right] = 5,17 \text{ έτη}$$

Συνεπώς, η duration του ενεργητικού είναι:

$$D_A = 100/1000 \times 0 + 500/1000 \times 5,17 + 400/1000 \times 0,25 = 2,6 \text{ έτη}$$

(η duration των επιχειρηματικών δανείων είναι 0,25 έτη - 1τρίμηνο)

Η duration των ομολόγων είναι ($M=10$, $c=0,05$, $r=0,06$):

$$D \text{ Ομολογίας: } D = \frac{1+r}{r} - \frac{M(c-r)+1+r}{(1+r)^M c - (c-r)} = 8,02 \text{ έτη}$$

Επίσης η duration των καταθέσεων είναι 3 έτη και των δανείων διατραπεζικής 0,25, άρα:

$$D_L = 200/900 \times 3 + 200/900 \times 0,25 + 500/900 \times 8 = 5,18 \text{ έτη}$$

$$Dgap = 2,68 - 900/1000 \times 5,18 = -1,97$$

Αντίξοη μεταβολή για την τράπεζα η μείωση των επιτοκίων

$$\Delta E = -(-1,97 \times 1.000.000.000 \times (-0,005)) / 1,02 = -9,7 \text{ εκατ. Ευρώ}$$

Θέλοντας να μειώσει την έκθεση στον κίνδυνο επιτοκίου η τράπεζα θα προσπαθήσει να μειώσει την D_L

Με βάση τις επιλογές της θα διαλέξει ομόλογα με duration 2 οπότε το $D_L = 1,83$ έτη.

$$D_L = 200/900 \times 3 + 200/900 \times 0,25 + 500/900 \times 2 = 1,83 \text{ έτη}$$

Το νέο $Dgap = 1$ και συνεπώς $\Delta E = 5$ εκατ. ευρώ

ΑΣΚΗΣΗ 2

Η D-Bank είναι swap dealer με spread 20 bps. Ανταλλάσει σταθερό έναντι Euribor με διάρκεια 1 έτος με τριμηνιαίες πληρωμές.

[Η σημερινή καμπύλη αποδόσεων του Euribor έχει ως εξής:
3 μήνες 6%, 6 μήνες = 6%, 9 μήνες = 6%, 12 μήνες = 6%). Τα επιτόκια αναφέρονται σε ετήσια βάση με ετήσιο ανατοκισμό]

2.1 Ποιο είναι το swap rate για το ανωτέρω swap;

Η C-BANK επιθυμεί να αντισταθμίσει μερικώς τον κίνδυνο επιτοκίου από το Duration Gap με το προϊόν plain vanilla της D-Bank αντί να προβεί σε νέα έκδοση ομολόγων και απόσυρση των παλαιών.

2.2 Τι θέση πρέπει να πάρει η C-BANK στο swap;

Έστω ότι η C-BANK συνάπτει ανταλλαγή για αντιστάθμιση του κινδύνου επιτοκίου της με νοητό ποσό 1000 εκατ.

2.3 Ποιο θα είναι το κέρδος ή ζημία της 3 μήνες* πριν την λήξη του swap);

*[η καμπύλη αποδόσεων του Euribor στο χρονικό αυτό σημείο είναι επίπεδη στο 5%]

Αν και μια επίπεδη καμπύλη αποδόσεων είναι συμβατή με swap rate ίσο με 6%, μπορούμε να επαληθεύσουμε ότι το swap rate είναι 6% αφού πρώτα αναπροσαρμόσουμε το επιτόκιο σε τρίμηνου ανατοκισμού $(1+0,06/4)^4-1=6,1\%$

$$100 = C(1,061)^{-0,25} + C(1,061)^{-0,5} + C(1,061)^{-0,75} + (C+100)(1,061)^{-1}$$

$$\text{Swap rate} = (4 \times C) / 100 = 6\% \text{ και bid}=5,9\% \text{ ask}=6,1\%$$

Η C –Bank θα πάρει θέση πωλητή έναντι της Dealer bank, για να αντισταθμίσει μια πιθανή πτώση του επιτοκίου.

Τρεις μήνες πριν τη λήξη του SWAP η αξία της κυμανόμενης πληρωμής είναι ίση με το νοητό ποσό 1.000 εκατ. Ευρώ. Μπορείτε να το επαληθεύσετε αφού το επιτόκιο της αγοράς είναι 5% και συνεπώς και η πληρωμή του πωλητή και η προεξόφληση της τελευταίας πληρωμής θα γίνει με 5% για ένα τρίμηνο. Δηλαδή $V_{fl} = 1.012.500.000 / (1+0,05/4) = 1.000.000.000$

Η παρούσα αξία της τελευταίας πληρωμής του αγοραστή είναι:

$$V_{fx} = 1.014.750.000 / (1+0,05/4) = 1.002.222.222$$

Η τελευταία «πληρωμή» είναι με το 5,9% που είναι το bid (για ένα τρίμηνο).

Τα 2.222.222 είναι το κέρδος του πωλητή (C Bank)