8. Capital Measurement and Management

Asia Pacific Economic Cooperation Forum –
Financial Regulators Training Initiative –
Bank Analysis and Supervision Seminar

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Functions of Capital

Why does a bank need capital?

- Capital ***protects depositors and other creditors of the bank*** against the possibility that a certain portion of the assets of the bank will become worthless (or at least decline in value)
  - Which assets could become worthless? **Loans** are the best example – *they might not be repaid!* **Investments** are another good example – *their value can change due to interest rate risk or credit risk.* **Other assets** can also decline in value – *fixed assets, property taken back from the borrower are good examples*
  - Assets which decline in value or disappear, become unavailable to pay depositors or creditors.
  - Also, as a bank's capital declines, shareholders of the bank may decide to take higher risks – they don't have much to lose.
- Capital also ***supports other risk-taking activities***, like new products, business lines, or branches.

Example of Capital's Protective Function

Bank A and **Bank B** hold identical assets, but **Bank A has more capital** and fewer deposits.

Bank A				Bank B			
Assets		Liabs + Cap		Assets		Liabs + Cap	
Cash	20	Deposits	60	Cash	20	Deposits	80
Loans	60	Other liabs	10	Loans	60	Other liabs	10
Fixed Assets	10	**Total Liabs**	70	Fixed Assets	10	**Total Liabs**	90
Other Assets	10	Capital	30	Other Assets	10	Capital	10
TOTAL ASSETS	**100**	**TOTAL LIAB+CAP**	**100**	**TOTAL ASSETS**	**100**	**TOTAL LIAB+CAP**	**100**

Example of Capital's Protective Function

Now assume that one-fourth of the loans at each bank become worthless.
Bank A's depositors are protected, while Bank B is insolvent!

Bank A				Bank B			
Assets		Liabs + Cap		Assets		Liabs + Cap	
Cash	20	Deposits	60	Cash	20	Deposits	80
Loans	45	Other liabs	10	Loans	45	Other liabs	10
Fixed Assets	10	**Total Liabs**	70	Fixed Assets	10	**Total Liabs**	90
Other Assets	10	Capital	15	Other Assets	10	Capital	-5
TOTAL ASSETS	**85**	**TOTAL LIAB+CAP**	**85**	**TOTAL ASSETS**	**85**	**TOTAL LIAB+CAP**	**85**

Evaluating Capital from Off-site

How do we analyze and evaluate a bank's capital from off-site?

- What is the ***level*** and ***trend*** of capital? Is capital growth keeping up with asset growth?
- Will the bank's ***earnings*** allow adequate capital growth, or will the bank have to sell additional shares in the near future? If selling new shares will likely be necessary, how accommodating is the market for this bank's existing shares? Who will the new shareholders likely be?
- How do the bank's various capital ratios compare to its peers? If the ratios are different, are those differences justified by differences in the bank's risk profile?
- What are the ***threats*** to capital?
  - **Is asset quality deteriorating?**
  - **Is the bank's loan portfolio concentrated in a few sectors?**
  - **Is the bank exposed to excessive interest-rate, F/X, or equity risk?**

Fundamentals of Capital Measurement and Management

With capital, **there are two basic questions**, and there can be many possible answers to each question –

How is capital measured?

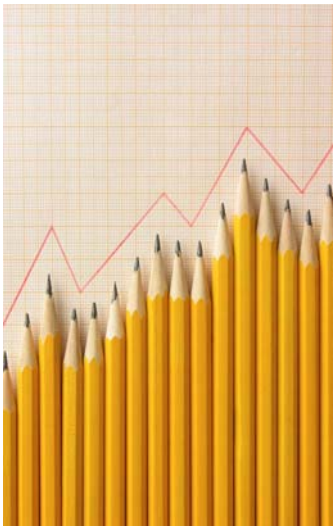
Many different measurements of capital, necessary to distinguish

Accounting capital, *"balance sheet capital" "shareholder's equity,"* and *"net worth"* all refer to: Assets minus Liabilities

Tangible equity capital: accounting capital minus intangible assets

Regulatory capital: **In Basel III,**

- Common Equity Tier 1 ("core" Tier 1) +
- Additional Tier 1 +
- Tier 2
- In moving from accounting capital to regulatory capital, certain assets are required to be deducted, in whole or in part, and certain liabilities and contra-assets are allowed to be included, in whole or in part.



How is the *need* for capital determined?

The first principle of capital management is that capital must be enough to cover unexpected losses in every aspect of banking activity.

Put differently, it is not enough simply to meet regulatory requirements.

Expected Loss v. Unexpected Loss

Example: The bank gives a loan to a firm in the amount of USD 1 million. What is the range of possible outcomes for the bank? What is the amount that the borrower is *expected* to repay?

Multiply possible outcomes by probability of each outcome, and sum. Expected Loss = Total Amount Due from Borrower – Expected Repayment

31,200 in this example, or about 3.1 percent of the loan amount. Not bad!

Outcome – Borrower pays back:	Probability	Cumulative probability	Outcome x Probability	Cumulative
1,000,000	0.900	0.900	900,000	900,000
900,000	0.030	0.930	27,000	927,000
800,000	0.020	0.950	16,000	943,000
700,000	0.017	0.967	11,900	954,900
600,000	0.010	0.977	6,000	960,900
500,000	0.007	0.984	3,500	964,400
400,000	0.006	0.990	2,400	966,800
300,000	0.004	0.994	1,200	968,000
200,000	0.003	0.997	600	968,600
100,000	0.002	0.999	200	968,800
0	0.001	1.000	0	968,800
Total	1.000		968,800	

Expected Loss v. Unexpected Loss

Expected Loss = 31,200. **What is the *unexpected loss?***

Answer: The unexpected loss is the additional amount of loss that would occur in unlikely, but still possible, outcomes.

A loss of 200,000 is better than all but 5 percent of possible outcomes. Put differently, we are 95 percent confident that we will not lose more than 200,000**.**

A loss of 600,000 is better than all but 1 percent of possible outcomes. Put differently, we are 99 percent confident that we will not lose more than 600,000**.**

So now, is this really such a good loan?

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1,000,000	0.900	0.900	900,000	900,000
900,000	0.030	0.930	27,000	927,000
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At 95 percent confidence level, expected loss is still 31,200. Total loss is 200,000. Therefore, unexpected loss is 168,800.

At 99 percent confidence, EL = 31,200, TL = 600,000, UL = 568,800

Handling Expected v. Unexpected Losses

- **Expected losses should be covered by *provisions* *(also known as valuation allowances, loan-loss reserves, loan-loss allowances, etc.).* In our example, the provision would be 31,200**
- **Unexpected losses should be covered by *capital.* In our example, the amount of required additional capital would be 568,800.**
- **If our bank had provisions of 31,200 and additional capital of 568,800, then the bank would be fully protected against all possible losses *except those with less than 1 percent probability of occurring.***
- **This works out to a capital requirement of almost 57 percent of the outstanding principal balance! Clearly, this is not a low-risk loan when we view all the possible outcomes!**
- **If this loan were a standard, 100%-risk-weighted loan under Basel III, and the required minimum capital were 8.0% of risk-weighted assets, the capital requirement for this loan would be only 80,000! In the case of this loan, the Basel III calculation is not enough to cover the risk.**
- **If our bank wanted to be less protected, it could choose to guard against all possible losses except those with less than a 5 percent probability. In that case, it would have to hold only 168,800 of additional capital, about twice the Basel III amount.**
- **The reason this loan would have such a high capital requirement under the "unexpected loss" concept is that very bad outcomes still have a not-insignificant probability of occurring. In the language of statistics, this would be a "fat-tailed" distribution.**

New Concept and Definition: Economic Capital

Economic capital: Economic capital is the amount of capital, calculated with the Group's own models, required to cover unexpected losses over the next year. The calculation of economic capital takes into account all relevant types of risk, including concentration and migration risks, as well as diversification within the individual risk types. The aggregation across risk types does not take into account the potential benefit from diversification among various risk types***. (Danske Bank Risk Management Report, 2013)***

--Danske Bank calculates economic capital up to a 99.9 percent confidence.

In capital management, the determination of economic capital is an important step in answering the question "How much capital do we NEED"?

Requires models to build the probability distributions.

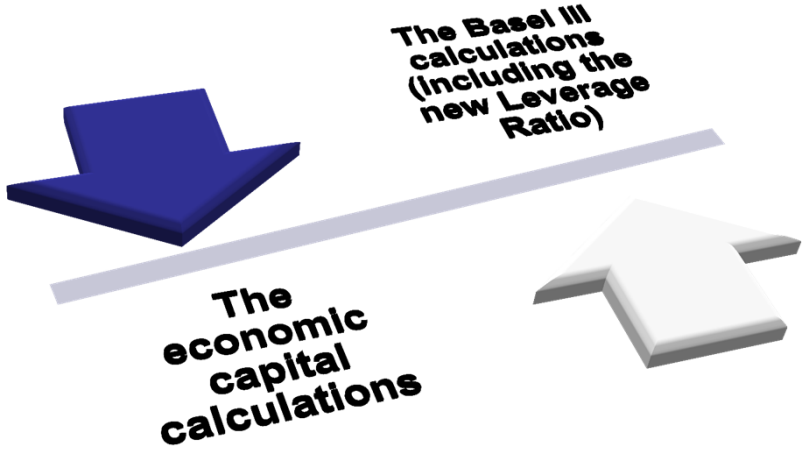
New Concept and Definition: The Solvency Need

Banks, even those that calculate their economic capital, cannot ignore Basel III…

- **Pillar I contains a set of mathematical formulas for the calculation of Risk-Weighted Assets (RWA) for credit risk, market risk, and operational risk. The capital requirement is 8% of RWA (differs across jurisdictions).**
- **Pillar II contains the framework for the contents of the Internal Capital Adequacy Assessment Process (ICAAP), including the identification of a bank's risks, the calculation of the capital NEED, and stress testing. It also includes required capital for risks not covered in Pillar I, such as interest-rate risk in the banking book.**
- **Pillar III deals with market discipline and sets forth disclosure requirements for risk management and capital management.**
- **A Leverage Ratio has been introduced, requiring a minimum level of Common Equity Tier 1 capital as a percentage of total assets and off-balance-sheet items (not risk-weighted).**

The Solvency Need is the HIGHER of economic capital and the amount of required capital calculated using the Basel III rules.

New Concept and Definition: The Solvency Need



Requirements for an Adequate ICAAP

To be considered successful, the ICAAP must:

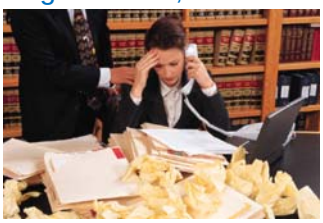
- **Cover ALL material risks to which the bank is exposed**
- **May require "add-ons" if neither Pillar I + Pillar II or economic capital appear to be sufficiently conservative**
- **Requires a determination of the means by which the risks will be mitigated (business procedures, contingency plans, provisions, other measures)**
- **Remaining risks must be covered by capital**
- **ICAAP must also include capital planning – will the capital base cover future growth? Will it cover expected expansion into new business lines or products?**
- **ICAAP also requires commentary on projected changes in regulatory requirements and how these will be met.**

The Role of Stress Testing in the ICAAP

Unfavorable macroeconomic scenarios can affect BOTH the capital base (amount of capital the bank has) and the solvency need…

Adverse movements in interest rates, exchange rates, equity or commodity prices, real estate prices, the level of economic activity, etc., can affect the capital base directly through higher costs, lower revenues, need for provisions

Changes in these macroeconomic indicators can also affect the solvency need, by increasing or decreasing risk (narrowing or widening range of outcomes)



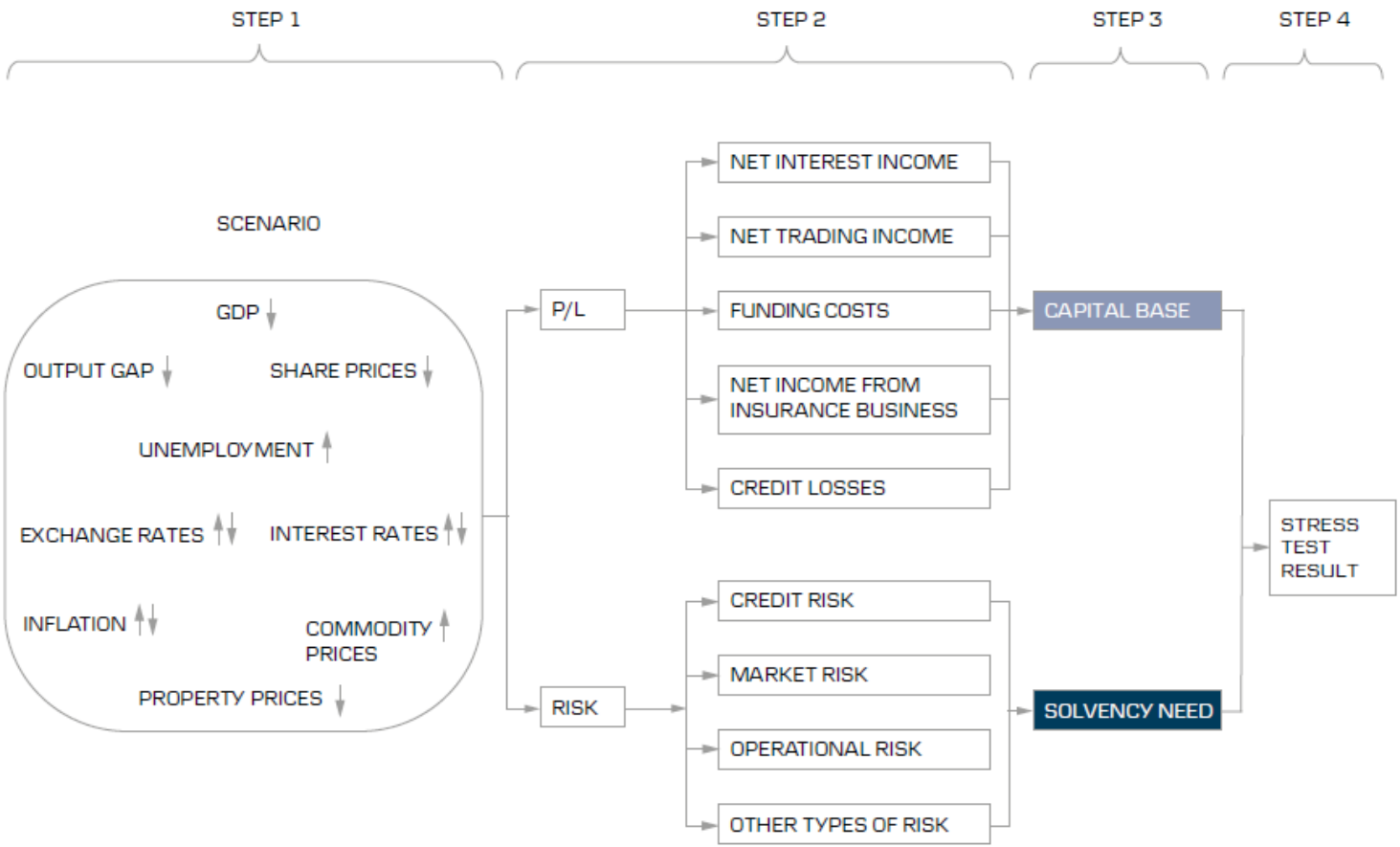
The Role of Stress Testing in the ICAAP

Stress tests in the ICAAP are an important means of analyzing the risk profile – give management a better understanding of how portfolios are affected by possible macroeconomic changes.

Financial crisis highlighted the need to project: loan impairment charges, loss on market risk, and stress applied to RWA to improve the capital projections**.**

Pictorial Illustration of Stress Testing

EFFECT OF STRESS TEST SCENARIOS ON EARNINGS AND RISK



Sample Macro Stress Test Scenarios

SCENARIO	DURATION	DESCRIPTION
Mild recession	3 years	Changes in financial regulations lead to tighter credit standards. While unemployment increases, low interest rates limit the decline in property prices. This scenario assumes slight economic contraction in the first year followed by a slow recovery.
Severe recession	3 years	A sharp slowdown in the global economy reduces exports and GDP. In addition, a new eurozone country falls into an unresolved debt trap. Property prices decrease because of weak consumer confidence, high unemployment and tight credit policies. There is no recovery within the 3-year duration of this scenario.
Extreme recession	3 years	Confidence regarding sovereign debt payments weakens significantly. Higher risk premiums lead to a temporary interest rate hike, causing property prices to decline and unemployment to increase. EU-wide austerity measures drive the economy into a state of deflation with significant GDP declines and no signs of recovery.

The sample bank uses the "severe recession" scenario to determine whether its capital level is satisfactory. If it's too small, the bank will lower the risk profile or increase capital.

Effective Capital Planning and Longer-Term Capital Maintenance

"Sound capital planning is critical for determining the prudent amount, type, and composition of capital that is consistent with a longer-term strategy of being able to pursue business objectives, while also withstanding a stressful event."

-- Basel Committee on Banking Supervision, "A Sound Capital Planning Process: Fundamental Elements (January 2014)

The Basel Committee surveyed banks worldwide and came up with the following four fundamental elements:

- **Internal control and governance**
- **Capital policy and "risk capture"**
- **Forward-looking view**
- **Management's framework for preserving capital**

Effective Capital Planning: Internal Control and Governance

- ✓ *Reflects input of different experts from across the bank, including business lines, risk committee, finance, and treasury.*
- ✓ *Has a process to resolve irreconcilable strategies or assumptions*
- ✓ *Involves Board and senior management – often a management committee*
- ✓ *Is guided by Board's forward strategy, risk tolerance, and desired return for shareholders*
- ✓ *Reviews and approves capital plans at least annually, including forward-looking assessments of feasibility of issuing new capital instruments or making capital distributions*

Effective Capital Planning: Capital Policy and "Risk Capture"

- *Banks require a capital policy that will allow the bank to maintain ready access to funding, meet obligations to creditors and other counterparties, and continue to serve as a credit intermediary before, during, and after a stressful scenario.*
- *The capital policy should identify sources of capital to be tapped in the future if required, internal limits below which the bank is not allowed to drop, and performance measures (such as ROE and risk-adjusted return on capital).*
- *The policy should set out the considerations for determining the risk tolerance (risk appetite) of the bank.*
- *The policy should require capital coverage for all risks, including those that are difficult to quantify.*
- *The policy should address possible linkages between capital planning and liquidity planning.*

Effective Capital Planning: Forward-Looking View

- ***Stress testing should be done over a specific time horizon, showing the difference between the baseline and adverse scenarios.***
- ***Stress tests should consider both market-wide and idiosyncratic (i.e., affecting only the bank) events that could have a negative impact.***
- ***May include the effect of possible actions to mitigate the adverse impact – such as limiting growth, divesting of assets, reducing expenses (including personnel), stopping dividends -- but only if the Board and senior management approve of these mitigating actions in advance.***

Note: It may be difficult for all banks to pursue the same mitigating actions all at once!

Effective Capital Planning: Management Framework for Preserving Capital

- ***The Board and senior management need to prioritize and quantify the capital actions available to them to cover unexpected events.***
- ***If these actions (such as stopping dividends, selling additional shares, and reducing risk-weighted assets) are not feasible in a stressed environment, they should not be included in the bank's capital plan.***

Note: It is the job of the regulatory authority to review the bank's ICAAP and capital management/planning process, as part of the Supervisory Review and Evaluation Process under Basel II/III.

Capital Measurement and Management – Concluding Thoughts

For a risk-based approach, do <u>not</u> simply ask: Does the capital meet minimum standards?

Instead ask: Have all current and emerging risks been identified? Is the capital enough to cover these risks?

Additional criterion

1. The supervisor requires banks to have appropriate policies and processes for assessing other material risks not directly addressed in the subsequent Principles, such as reputational and strategic risks.

Principle 16: Capital adequacy[56]

The supervisor sets prudent and appropriate capital adequacy requirements for banks that reflect the risks undertaken by, and presented by, a bank in the context of the markets and macroeconomic conditions in which it operates. The supervisor defines the components of capital, bearing in mind their ability to absorb losses. At least for internationally active banks, capital requirements are not less than the applicable Basel standards.

(Reference documents: *Revisions to the Basel II market risk framework*, February 2011; *Minimum requirements to ensure loss absorbency at the point of non-viability*, January 2011; *Capitalisation of bank exposures to central counterparties*, July 2012; *Sound practices for backtesting counterparty credit risk models*, December 2010; *Guidance for national authorities operating the countercyclical capital buffer*, December 2010; *Basel III: A global regulatory framework for more resilient banks and banking systems*, December 2010; *Guidelines for computing capital for incremental risk in the trading book*, July 2009; *Enhancements to the Basel II framework*, July 2009; *Range of practices and issues in economic capital frameworks*, March 2009; *International convergence of capital measurement and capital standards: a revised framework, comprehensive version*, June 2006; and *International convergence of capital measurement and capital standards*, July 1988.)

Essential criteria

1. Laws, regulations or the supervisor require banks to calculate and consistently observe prescribed capital requirements, including thresholds by reference to which a bank might be subject to supervisory action. Laws, regulations or the supervisor define the qualifying components of capital, ensuring that emphasis is given to those elements of capital permanently available to absorb losses on a going concern basis.

2. At least for internationally active banks,[57] the definition of capital, the risk coverage, the method of calculation and thresholds for the prescribed requirements are not lower than those established in the applicable Basel standards.

3. The supervisor has the power to impose a specific capital charge and/or limits on all material risk exposures, if warranted, including in respect of risks that the supervisor considers not to have been adequately transferred or mitigated through transactions

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[56] The Core Principles do not require a jurisdiction to comply with the capital adequacy regimes of Basel I, Basel II and/or Basel III. The Committee does not consider implementation of the Basel-based framework a prerequisite for compliance with the Core Principles, and compliance with one of the regimes is only required of those jurisdictions that have declared that they have voluntarily implemented it.

[57] The Basel Capital Accord was designed to apply to internationally active banks, which must calculate and apply capital adequacy ratios on a consolidated basis, including subsidiaries undertaking banking and financial business. Jurisdictions adopting the Basel II and Basel III capital adequacy frameworks would apply such ratios on a fully consolidated basis to all internationally active banks and their holding companies; in addition, supervisors must test that banks are adequately capitalised on a stand-alone basis.

(eg securitisation transactions[58]) entered into by the bank. Both on-balance sheet and off-balance sheet risks are included in the calculation of prescribed capital requirements.

4. The prescribed capital requirements reflect the risk profile and systemic importance of banks[59] in the context of the markets and macroeconomic conditions in which they operate and constrain the build-up of leverage in banks and the banking sector. Laws and regulations in a particular jurisdiction may set higher overall capital adequacy standards than the applicable Basel requirements.

5. The use of banks' internal assessments of risk as inputs to the calculation of regulatory capital is approved by the supervisor. If the supervisor approves such use:

   (a) such assessments adhere to rigorous qualifying standards;

   (b) any cessation of such use, or any material modification of the bank's processes and models for producing such internal assessments, are subject to the approval of the supervisor;

   (c) the supervisor has the capacity to evaluate a bank's internal assessment process in order to determine that the relevant qualifying standards are met and that the bank's internal assessments can be relied upon as a reasonable reflection of the risks undertaken;

   (d) the supervisor has the power to impose conditions on its approvals if the supervisor considers it prudent to do so; and

   (e) if a bank does not continue to meet the qualifying standards or the conditions imposed by the supervisor on an ongoing basis, the supervisor has the power to revoke its approval.

6. The supervisor has the power to require banks to adopt a forward-looking approach to capital management (including the conduct of appropriate stress testing).[60] The supervisor has the power to require banks:

   (a) to set capital levels and manage available capital in anticipation of possible events or changes in market conditions that could have an adverse effect; and

   (b) to have in place feasible contingency arrangements to maintain or strengthen capital positions in times of stress, as appropriate in the light of the risk profile and systemic importance of the bank.

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[58] Reference documents: *Enhancements to the Basel II framework*, July 2009 and: *International convergence of capital measurement and capital standards: a revised framework, comprehensive version*, June 2006.

[59] In assessing the adequacy of a bank's capital levels in light of its risk profile, the supervisor critically focuses, among other things, on (a) the potential loss absorbency of the instruments included in the bank's capital base, (b) the appropriateness of risk weights as a proxy for the risk profile of its exposures, (c) the adequacy of provisions and reserves to cover loss expected on its exposures and (d) the quality of its risk management and controls. Consequently, capital requirements may vary from bank to bank to ensure that each bank is operating with the appropriate level of capital to support the risks it is running and the risks it poses.

[60] "Stress testing" comprises a range of activities from simple sensitivity analysis to more complex scenario analyses and reverse stress testing.

Additional criteria

1. For non-internationally active banks, capital requirements, including the definition of capital, the risk coverage, the method of calculation, the scope of application and the capital required, are broadly consistent with the principles of the applicable Basel standards relevant to internationally active banks.

2. The supervisor requires adequate distribution of capital within different entities of a banking group according to the allocation of risks.[61]

Principle 17: Credit risk[62]

The supervisor determines that banks have an adequate credit risk management process that takes into account their risk appetite, risk profile and market and macroeconomic conditions. This includes prudent policies and processes to identify, measure, evaluate, monitor, report and control or mitigate credit risk[63] (including counterparty credit risk[64]) on a timely basis. The full credit lifecycle is covered including credit underwriting, credit evaluation, and the ongoing management of the bank's loan and investment portfolios.

(Reference documents: *Sound practices for backtesting counterparty credit risk models*, December 2010; FSB *Report on Principles for Reducing Reliance on CRA Ratings*, October 2010; *Enhancements to the Basel II framework*, July 2009; *Sound credit risk assessment and valuation for loans*, June 2006; and *Principles for the management of credit risk*, September 2000.)

Essential criteria

1. Laws, regulations or the supervisor require banks to have appropriate credit risk management processes that provide a comprehensive bank-wide view of credit risk exposures. The supervisor determines that the processes are consistent with the risk appetite, risk profile, systemic importance and capital strength of the bank, take into account market and macroeconomic conditions and result in prudent standards of credit underwriting, evaluation, administration and monitoring.

2. The supervisor determines that a bank's Board approves, and regularly reviews, the credit risk management strategy and significant policies and processes for assuming,[65] identifying, measuring, evaluating, monitoring, reporting and controlling or mitigating credit risk (including counterparty credit risk and associated potential future exposure) and that these are consistent with the risk appetite set by the Board. The supervisor also determines that senior management implements the

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[61] Please refer to Principle 12, Essential Criterion 7.

[62] Principle 17 covers the evaluation of assets in greater detail; Principle 18 covers the management of problem assets.

[63] Credit risk may result from the following: on-balance sheet and off-balance sheet exposures, including loans and advances, investments, inter-bank lending, derivative transactions, securities financing transactions and trading activities.

[64] Counterparty credit risk includes credit risk exposures arising from OTC derivative and other financial instruments.

[65] "Assuming" includes the assumption of all types of risk that give rise to credit risk, including credit risk or counterparty risk associated with various financial instruments.