Financial Risk Management

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Banking Regulation

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THINK IN THE NEXT

Agenda

- Banking Basics
- History of Bank Failures and Regulation
- Basel Framework
- Risk Based Capital (Risk Weighted Assets)
- Internal Ratings and Internal Model Approaches
- Basel 3 and Post-Crisis Updates
- Liquidity Ratios
- Dodd Frank Act

Bank Balance Sheet

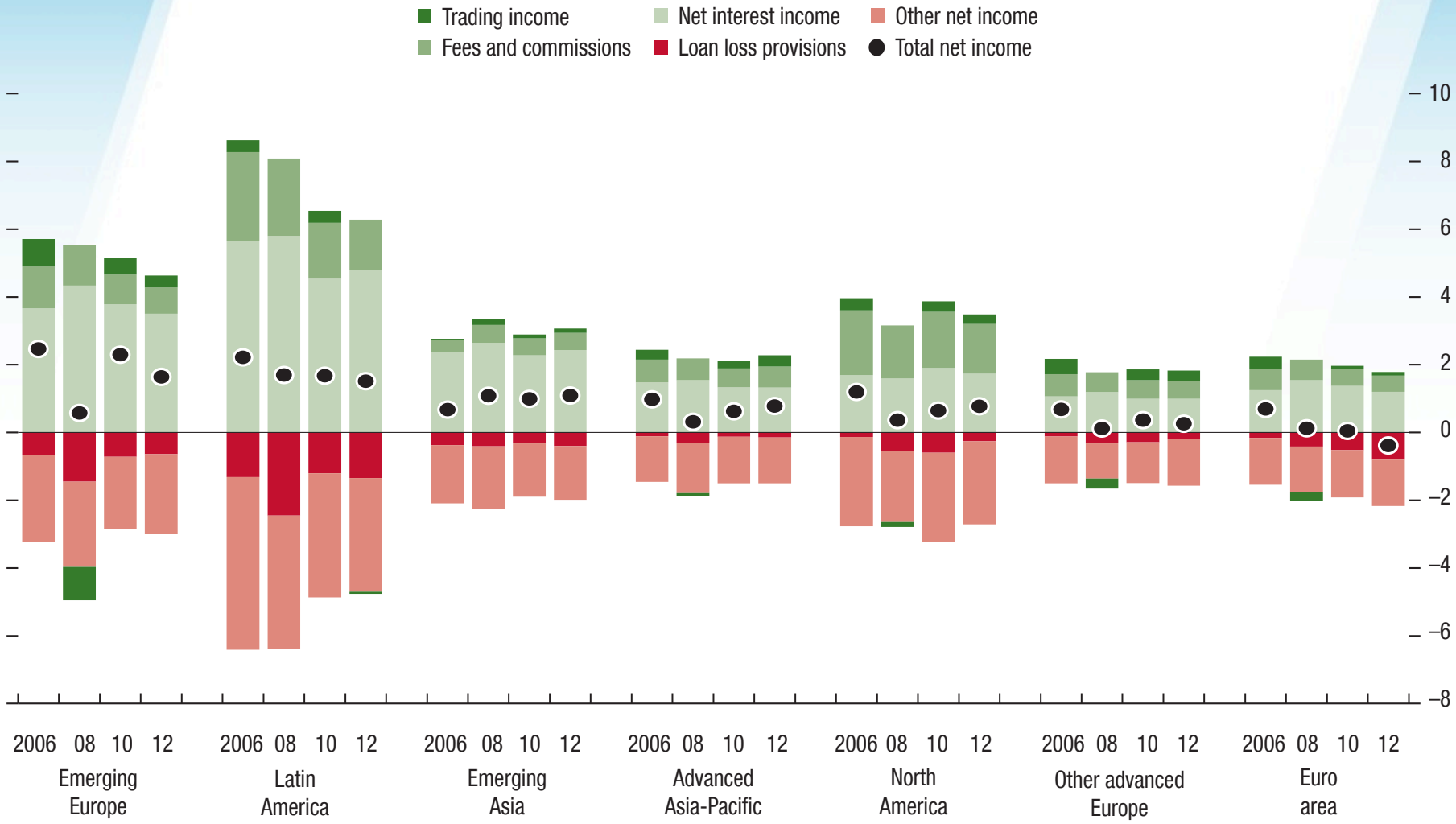
Assets	Liabilities and Equity
Cash	Deposits
Securities	Long Term Debt
Loans	
Trading Assets	Trading Liabilities
	Shares
	Retained Earnings

Income Statement
+ Net Interest Income (Interest Income – Interest Expense)
+ Non-Interest Revenue (Fees, Commissions, Trading Revenue)
– Non-Interest Expenses (Compensation, Technology, Marketing)
– Provision for Loan Losses
EBT

Pre-Provision Net Revenue (PPNR)

Figure 1.57. Bank Profitability Comparison

(Percent of total assets)

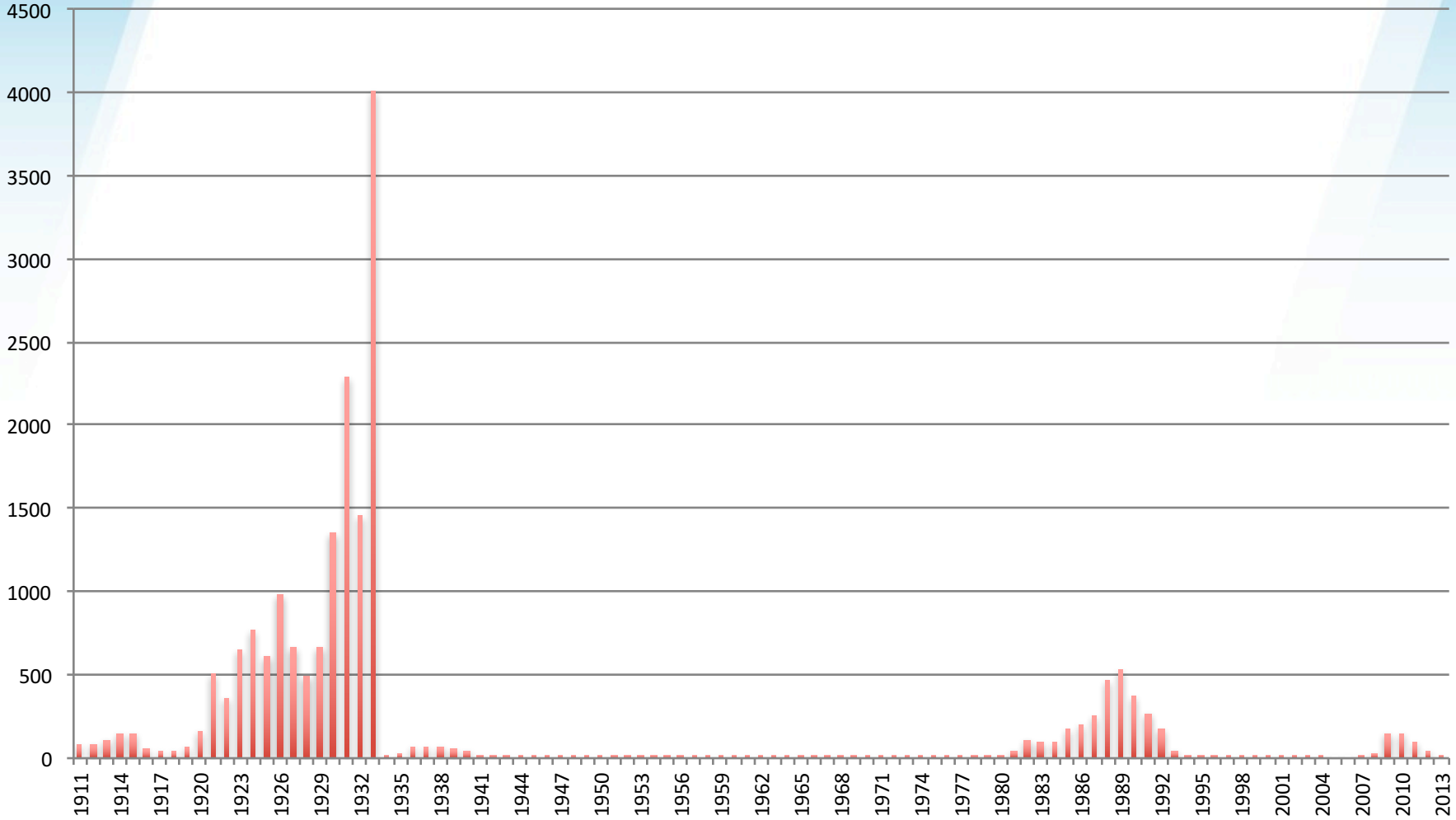


IMF Global Stability Report, October 2013

Bank Runs and Lender of Last Resort

- During Late 19th-early 20th Century, banking crises struck US quite often
  - characterized by runs on many small banks
  - private "clearing houses" sometimes came together to save liquidity-strained banks
- The Federal Reserve System was created in 1913 following the panic of 1907
- The original charter was to counteract at times of crisis through monetary policy and as lender of last resort

Annual Bank Failures



Source: “Historical Statistics of the United States: Colonial Times to 1970” and FDIC Website.

Depression Era Regulation

- Federal government increased supervisory role in 1933, leading to 50 years of no crises
- Glass-Steagall Act (1933) introduced deposit insurance, expanded supervision, and separation of commercial and investment banking
- Increased regulation and supervision were tools to counter “moral hazard”

Deposit Insurance

- Most countries have deposit insurance programs that insure depositors against losses up to a certain level
- In the US the FDIC has provided protection for depositors since 1933
- FDIC manages the Deposit Insurance Fund, which assesses fees on participating banks based on risk level and bank size.
- The amount insured was $2,500 in 1933. It has been increased several times.
- Following the recent crisis it was increased from $100,000 to $250,000 temporarily, and was made permanent with Dodd-Frank Act .
- Deposit insurance lowers bank costs of finance significantly, but creates a “moral hazard” problem.

Bank Regulation in US Since 1933

- Interstate banking and consolidation:
  - Until the 70s, regulators tried to limit interstate banking: Douglas Amendment (1956), Bank Holding Companies Act (1970). Regulations served to prevent "race to the bottom" competition, but limited monopolistic rents
  - Since the 70s interstate banking restrictions disappear until 90s, when major consolidation begins: Riegel-Neal Interstate Banking and Branching Efficiency Act (1994).
- Gramm-Leach-Bliley (1999) – Repealed Glass-Steagall

Assessment of Financial Condition

- There are various models for assessing a financial institution's condition and its viability
- Most are derived from FDIC Uniform FI Ratings System, AKA "CAMELS"
  - Capital Adequacy
  - Asset Quality
  - Management
  - Earnings
  - Liquidity
  - Sensitivity to Market Risk
- Each aspect is analyzed using current and past trends, expected performance and stress case scenarios

History of Internationally Coordinated Bank Regulation

- Pre-1988
- 1988: BIS Accord (Basel I)
- 1996: Amendment to BIS Accord
- 1999: Basel II first proposed
- 2004-2009：Basel II implementation
- 2011: Basel 2.5
- 2013 - 2019: Basel III

Pre-Basel

- Banks were regulated using balance sheet measures such as the ratio of capital to assets
- Definitions and required ratios varied from country to country
- Enforcement of regulations varied from country to country
- Bank leverage increased in 1980s
- Off-balance sheet derivatives trading increased

1988: Basel Accord

- Basel Committee on Bank Supervision set up at the Bank International Settlements (BIS)
- Focus on regulation of leverage, or capital adequacy, as measure of risk taking
- Leverage Ratio: The assets to capital ratio must be less than 20.
- New Risk Based Capital Regulations.

Types of Capital

- **Tier 1 Capital**: common equity, non-cumulative perpetual preferred shares
- **Tier 2 Capital:** cumulative preferred stock, certain types of 99-year debentures, subordinated debt with an original life of more than 5 years

Risk-Weighted Capital in Basel I

- A risk weight is applied to each on-balance- sheet asset according to its risk. For example,
  - 0% for cash and government bonds
  - 20% for claims on OECD banks
  - 50% to residential mortgages
  - 100% to corporate loans, corporate bonds
- For each off-balance-sheet item we first calculate a credit equivalent amount and then apply a risk weight
- Cooke Ratio: Capital must be 8% of risk weighted amount. At least 50% of capital must be Tier 1.

Summing Up RWA

$$RWA = \sum_{i=1}^{N} w_i L_i + \sum_{j=1}^{M} w_j^* C_j$$

On-balance sheet items: principal times risk weight

Off-balance sheet items: credit equivalent amount times risk weight

For a derivative $C_j = \max(V_j, 0) + a_j L_j$ where V_j is value, L_j is principal and a_j is add-on factor

Credit Equivalent Amount

- The credit equivalent amount is calculated as the current replacement cost (if positive) plus an add-on factor
- The add-on amount varies from instrument to instrument (e.g. 0.5% for a 1-5 year interest rate swap; 5.0% for a 1-5 year foreign currency swap)
- Captures what might be the Exposure At Default
  - If market variables moves in a way which increases the replacement cost for derivatives
  - If certain letters of credits or lending commitments are drawn down

Add-on Factors for Derivatives (% of Principal)

Remaining Maturity (yrs)	Interest rate	Exch Rate and Gold	Equity	Precious Metals except gold	Other Commodities
<1	0.0	1.0	6.0	7.0	10.0
1 to 5	0.5	5.0	8.0	7.0	12.0
>5	1.5	7.5	10.0	6.0	15.0

Example: A $100 million swap with 3 years to maturity worth $5 million would have a credit equivalent amount of $5.5 million

The Market Risk Capital - 1996

- The capital requirement is

$$\max(\mathrm{VaR}_{t\text{-}1}, m_c \times \mathrm{VaR}_{\mathrm{avg}}) + \mathrm{SRC}$$

where m_c is a multiplicative factor chosen by regulators (at least 3), VaR is the 99% 10-day value at risk, and SRC is the specific risk charge for idiosyncratic risk related to specific companies. $\mathrm{VaR}_{t\text{-}1}$ is the most recently calculated VaR and $\mathrm{VaR}_{\mathrm{avg}}$ is the average VaR over the last 60 days

Basel II

- Implemented since 2007 at different rates across the globe
  - USA for most part skipped from Basel 1 to Basel 3
- Three pillars:
  I. New minimum capital requirements for credit and operational risk
  II. Supervisory review: guidelines for regulators how to supervise banks under their jurisdiction, and for banks how to manage risk
  III. Market discipline: significantly more disclosure regarding risk and risk management

New Capital Requirements

- Risk weights based on either external credit rating (standardized approach) or a bank's own internal credit ratings (IRB approach)
- Recognition of credit risk mitigants
- Separate capital charge for operational risk

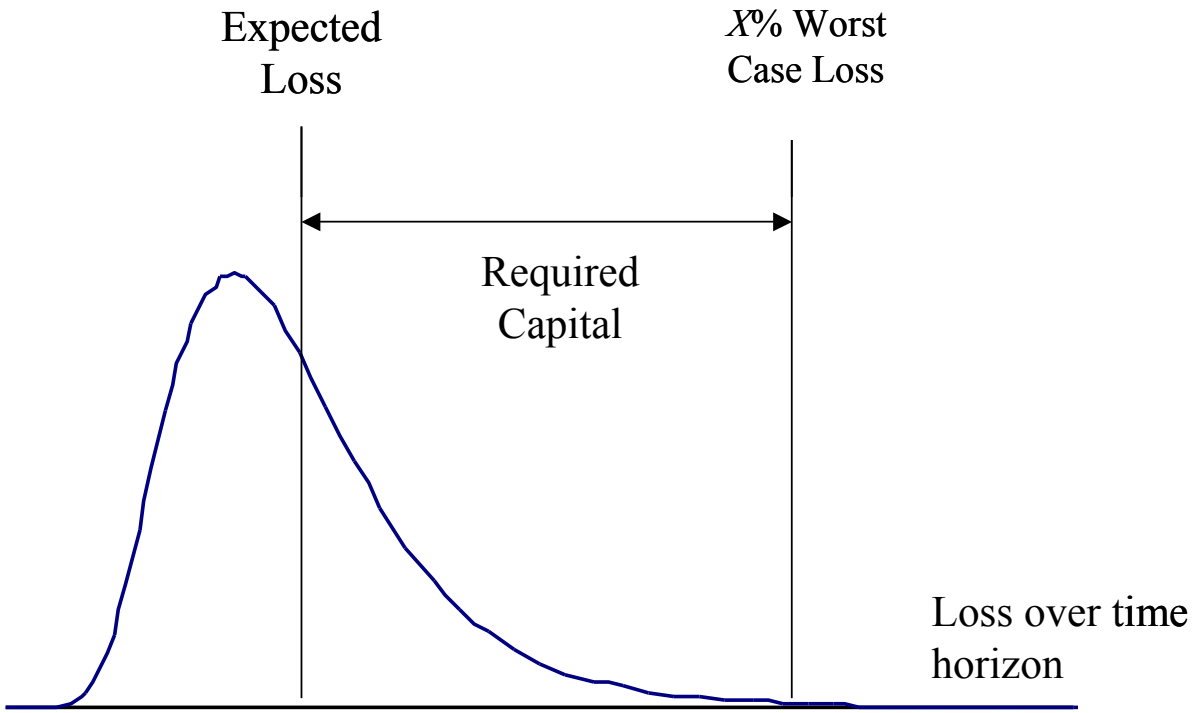
RWA - Standardized Approach

Rating	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to BB-	B+ to B-	Below B-	Unrated
Governments	0%	20%	50%	100%	100%	150%	100%
Banks	20%	50%	50%	100%	100%	150%	50%
Corporates	20%	50%	100%	100%	150%	150%	100%

Internal Ratings Based Approach (IRBA)

- Basel II provides a formula for translating PD (probability of default), LGD (loss given default), EAD (exposure at default), and M (effective maturity) into a risk weight
- Under the Advanced IRB approach banks estimate PD, LGD, EAD, and M
- Under the Foundation IRB approach banks estimate only PD and the Basel II guidelines determine the other variables for the formula

Capital Required is the Unexpected Loss at 99.9%



Key Model (Gaussian Copula)

The 99.9% worst case default rate is

$$WCDR = N\left[\frac{N^{-1}(PD) + \sqrt{\rho} \times N^{-1}(0.999)}{\sqrt{1-\rho}}\right]$$

ρ – correlation between two exposures

Based on formula given by Basel, which depends on PD and the type of exposure (corporate, SMB, retail, mortgage)

Capital Requirements for a Loan under IRB

$$\text{Capital} = \text{EAD} \times \text{LGD} \times (\text{WCDR} - \text{PD}) \times \text{MA}$$

Risk Weighted Assets are 12.5*Capital. So, Capital is 8% of RWA.

MA is an adjustment for the effective maturity of the loan (M). Its role is to adjust for the fact that the model is Default-Only, and loans may deteriorate, but not default during the year. It's an approximation based on the MTM model.

$$\text{MA} = \frac{1 + (\text{M} - 2.5) \times b}{1 - 1.5 \times b}$$

$$b = [0.11852 - 0.05478 \times \ln(PD)]^2$$

Capital Requirements

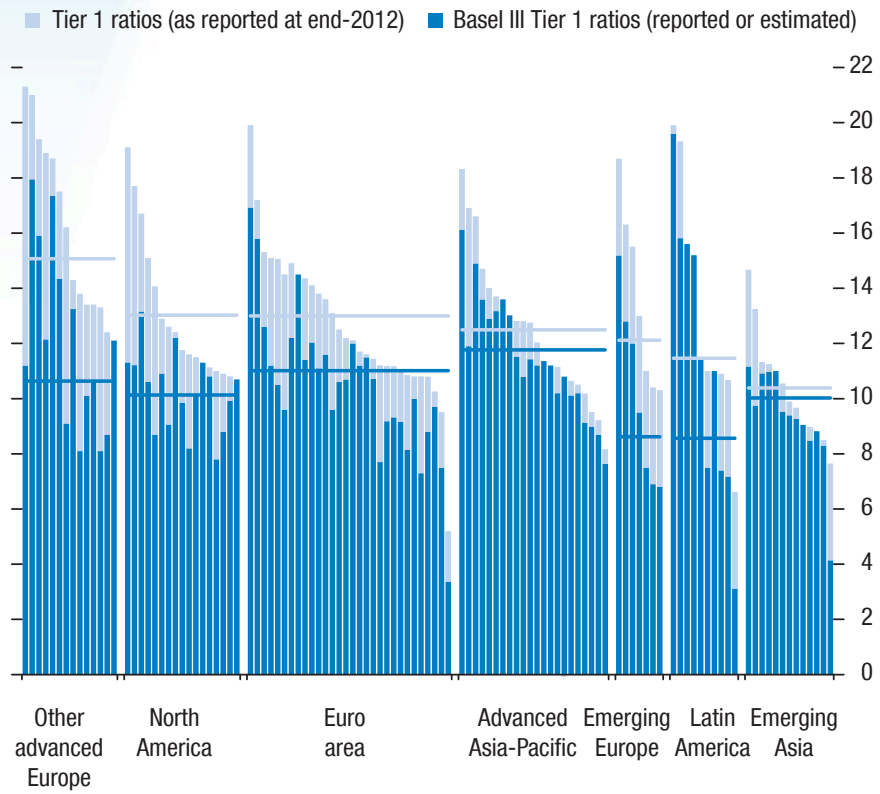
- Requirements are calculated exposure by exposure and summed up
- Portfolio features like size concentration or industry concentration are NOT taken into account
- Regulator has to approve models for PD, LGD, EAD before a bank may use them for capital calculations
  - International banks use IRB for about 60% of exposure
  - Major US banks have only recently been allowed to use such methods
  - Requires several years of running the model not for capital allocation, to perform back-testing.

Weakness of RWA measures

- Pro-cyclical requirements – in downturn loans are downgraded and may require more capital
- Vary regionally – so playing field might not be leveled.
- May be easy to manipulate in terms of classification of exposure, or through models for PD, LGD, EAD
- Ex-ante not clear which exposure are risk free (Spanish government bonds, AAA RMBS, …)
- Regulatory arbitrage between trading book and banking book
- Do not account for portfolio concentration due to large borrowers or sectors

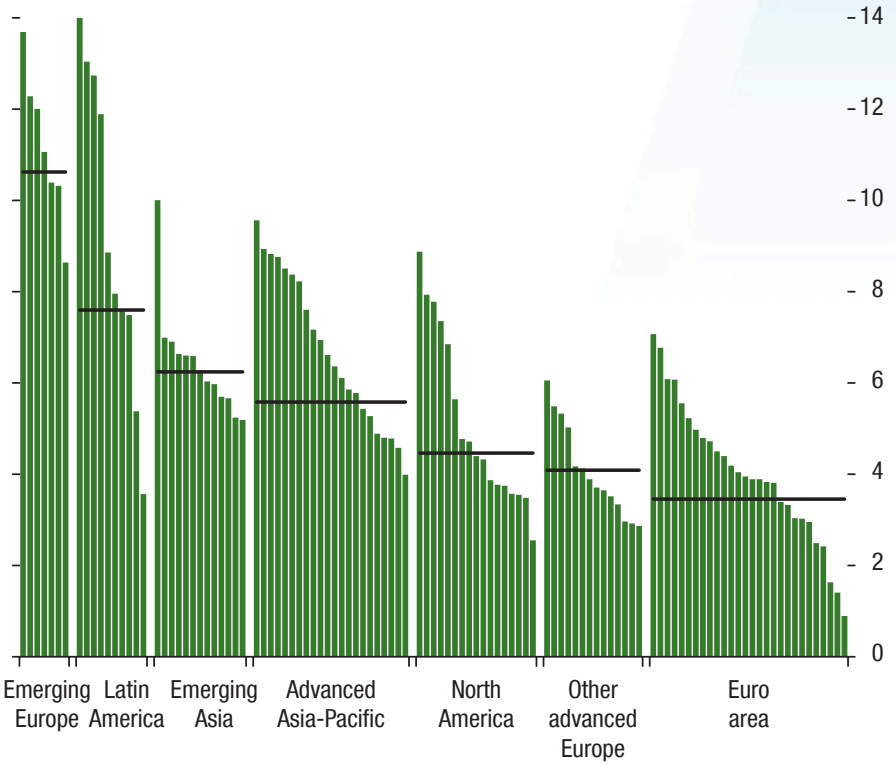
RWA vs. Asset Based measures

Figure 1.54. Large Bank Tier 1 Ratios
(Percent)



RWA in denominator

Figure 1.55. Large Bank Tangible Leverage Ratios, 2012:Q4
(Percent)



Tangible Assets in denominator

Operational Risk

Operational Risk categories considered by Basel:

1. Internal Fraud - tax evasion, intentional mismarking of positions, rogue trading
2. External Fraud- hacking damage, third-party theft and forgery
3. Employment Practices and Workplace Safety - discrimination, workers compensation, employee health and safety
4. Clients, Products, & Business Practice- antitrust, product defects fiduciary breaches
5. Damage to Physical Assets - natural disasters, terrorism
6. Business Disruption & Systems Failures - utility disruptions, software failures, hardware failures
7. Execution, Delivery, & Process Management - data entry errors, accounting errors, failed mandatory reporting

Operational Risk Capital

- Basic Indicator Approach: 15% of gross income
- Standardized Approach: different multiplicative factor for gross income arising from each business line
- Internal Measurement Approach: assess 99.9% worst case loss over one year.

Pillar 2 - Supervisory Review

- Banks perform Internal Capital Adequacy Assessment Process (ICAAP), and regulator reviews that process, SREP
- Implemented differently by different local regulators to suit local conditions
- Banks verify they have sufficient capital for stress scenarios and for risks that are not accounted for in pillar I

Pillar 3 - Market Discipline

- Banks are required to disclose
  - Scope and application of Basel framework
  - Nature of capital held
  - Regulatory capital requirements
  - Nature of institution's risk exposures
- Reports include significant information about the risk in bank assets and about its policies and methods for managing risks

Basel 2.5 (Implementation: Dec 31, 2011)

- Stressed VaR for market risk
  - Calculated over one year period of stressed market conditions
  - Capital = $\max(VaR_{t-1}, m_c \times VaR_{avg})$
    $+\max(sVaR_{t-1}, m_s \times VaR_{avg})$
- Incremental Risk Charge
  - Ensures that products such as bonds and credit derivatives in the trading book have the same capital requirement that they would if they were in the banking book
- Comprehensive Risk Measure and additional capital for securitizations and re-securitizations
  - Designed to make sure sufficient capital is kept for instruments in the trading book that depend on credit default correlations, i.e. CDO, securitizations and re-securitizations

Basel III

- Capital Definition and Requirements
- Capital Conservation Buffer
- Countercyclical Buffer
- Leverage Ratio
- Liquidity Ratios
- Capital for CVA Risk

Capital Definition and Requirements

- Three types:
  - Common equity
  - Additional Tier 1
  - Tier 2
- Definitions tightened for each tier
- Limits
  - Common equity > 4.5% of RWA
  - Tier 1 > 6% of RWA
  - Tier 1 plus Tier 2 > 8% of RWA

Capital Conservation Buffer

- Extra 2.5% of common equity required in normal times to absorb losses in periods of stress
- If total common equity is less than 7% (=4.5%+2.5%) dividends and bonuses are restricted until the violation is remedied

Countercyclical Buffer

- Extra equity capital to allow for cyclicality of bank earnings
- Triggered by rapid growth in credit (a credit "bubble")
- Left to the discretion of national regulators
- Typically at national level, but can be limited to a subset of banks
- Can be as high as 2.5% of RWA

Leverage Ratio

- Ratio of Tier 1 capital to total exposure (not risk weighted) must be greater than 3%
- In the US a 5% minimum has been introduced, and 6% for large banks
- Denominator includes all items on balance sheet and some off-balance sheet items in Basel and in Large Bank implementation in US

Capital for CVA Risk

- CVA is the adjustment to the value of transactions with a counterparty to allow for counterparty credit risk
- Basel III requires CVA risk arising from changing credit spreads to be incorporated into market-risk VaR calculations

Basel III phase-in arrangements

(All dates are as of 1 January)

	Phases	2013	2014	2015	2016	2017	2018	2019
Capital	Leverage Ratio		Parallel run 1 Jan 2013 – 1 Jan 2017 Disclosure starts 1 Jan 2015				Migration to Pillar 1	
	Minimum Common Equity Capital Ratio	3.5%	4.0%	4.5%				**4.5%**
	Capital Conservation Buffer				0.625%	1.25%	1.875%	**2.5%**
	Minimum common equity plus capital conservation buffer	3.5%	4.0%	4.5%	5.125%	5.75%	6.375%	**7.0%**
	Phase-in of deductions from CET1*		20%	40%	60%	80%	100%	**100%**
	Minimum Tier 1 Capital	4.5%	5.5%	6.0%				**6.0%**
	Minimum Total Capital		8.0%					**8.0%**
	Minimum Total Capital plus conservation buffer		8.0%		8.625%	9.25%	9.875%	**10.5%**
	Capital instruments that no longer qualify as non-core Tier 1 capital or Tier 2 capital		Phased out over 10 year horizon beginning 2013					
Liquidity	Liquidity coverage ratio – minimum requirement			60%	70%	80%	90%	**100%**
	Net stable funding ratio						Introduce minimum standard	

* Including amounts exceeding the limit for deferred tax assets (DTAs), mortgage servicing rights (MSRs) and financials.

– – transition periods

Globally Systemically Important Banks (G-SIBS)

- Designated by the Financial Stability Board (FSB)
- TLAC - Required to hold a minimum amount of regulatory capital (Tier 1 and Tier 2) plus long term unsecured debt of 16-20% of RWA
- Leverage Ratio – Minimum leverage ratio of 6%
- Pillar 2 – Additional capital based on qualitative firm-specific risks, recovery and resolution plans, systemic footprint, risk profile, and other factors.

Liquidity

- Top reason for banks failure is illiquidity
- Confidence-sensitive (less-stable) sources of funding include wholesale and brokered deposits, interbank deposits, and commercial paper
  - they are not based on long-term relationships, and are susceptible to adverse news and negative information
  - A bank financed by a high proportion of wholesale deposits is likely to be more vulnerable to liquidity risk than a predominately retail deposit funded bank

Liquidity

- High Quality Liquid Assets (HQLA)
  - Assets readily convertible to cash without undue loss.
  - Banks hold a portfolio of “marketable” securities that can be liquidated in a crisis.
- We would like to know are there enough liquid securities that can be sold off, if the bank’s deposits and short-term funding disappear

High Quality Liquid Assets

- Characteristics of HQLA by Basel:
  - Low Risk – Good credit ratings, but also low duration, low legal risk, low inflation and currency risk
  - Ease and certainty of valuation – Rules out structured and exotic securities
  - Low correlation with risky assets or cycle– For example, Bonds issued by Financial Institutions are more likely to be illiquid in a liquidity shortage scenario
  - Active and sizable market
  - Low volatility assets
  - Flight to quality assets

High Quality Liquid Assets

- The characteristics are translated to specific guidelines:
- Level 1 assets may be included with no haircut: cash, central bank reserves, sovereign bonds in local currency
- Level 2 assets may constitute only 40% of HQLA, with different haircuts:
  - 15% haircut for GSE and non-financial corporates rated AA or AAA
  - 25% haircut for RMBS rated AA or AAA
  - 50% haircut for non-financial corporates rated BBB or A, or stocks in a major index

Liquidity Coverage Ratio

$$\text{Liquidity Coverage Ratio} = \frac{\text{High Quality Liquid Assets}}{\text{Net Cash Outflows for 30 day period}} \geq 100\%$$

for an acute 30 - day stress period (3 notch downgrade, partial loss of deposits, loss of unsecured wholesale funding, increased haircuts on secured funding, increased collateral requirements, drawdowns on lines of credit, etc)

Net Stable Funding Ratio

We would like to know to what extent are a bank's illiquid assets (primarily loans) funded by stable core liabilities (primarily customer deposit, long-term debt and equity)

$$\text{Net Stable Funding Ratio} = \frac{\text{Amount of Stable Funding}}{\text{Required Amount of Stable Funding}} \geq 100\%$$

for a period of longer term stress. Each category of funding (capital, deposits, etc) is multiplied by an available stable funding (ASF) factor to form numerator. Each category of required funding (assets, off - balance sheet exposures is multiplied by a required stable funding factor (RSF) to form denominator

Dodd-Frank Act (USA 2010)

- New bodies to monitor systematic risk (FSOC and OFR)
- Expansion of the orderly liquidation powers of FDIC
- Volcker rule and separately capitalized affiliates for more risky business
- Exchange traded derivatives and Central clearing for OTC derivatives – SEF and CCP
- SIFIs: Higher capital requirements, living wills, stricter risk management

Dodd-Frank Act (USA 2010)

- Rating agencies: No use of external ratings in regulation, stricter oversight of agencies
- Originators of asset backed securities must keep “skin in the game”
- Federal Insurance Office
- Consumer Financial Protection Bureau

Thanks