

Principles of Money, Banking and Finance

Banking Risks, Regulation Framework and Securitization

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Learning objectives

- Understand bank risks
- Understand bank regulation framework
- Understand the process of securitization

Session outline

- Banking risks
- Regulation framework and bank solvency
- Securitization

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Section 1: Banking Risks & Regulation framework



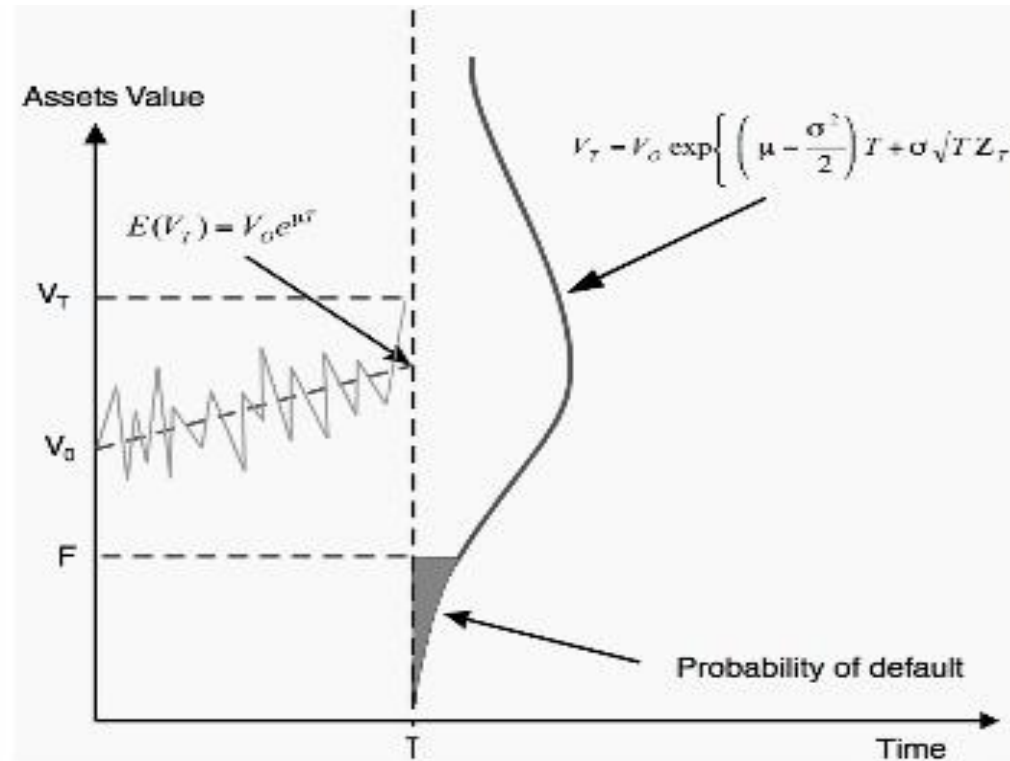
Capital adequacy and banking risks

- The banking system is subject to a strict regulatory framework because its inadequate functioning can lead to negative externalities.
- The negative externalities are caused because the social costs and the negative effects on the economy from a systemic banking crisis outweigh the financial costs incurred by private shareholders and bank creditors.
- Financial stability is a public good that must be protected. The rules have been formulated under Basel Accords set by the Basel Committee on Banking Supervision (Basel I, Base II, Basel III).
- The capital adequacy ratio indicates the ability of a banking institution to absorb losses from credit risk, market risk and operational risk, without endangering its liabilities to creditors. Deposits are liabilities of commercial banks and are held as assets from households and businesses.

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Capital adequacy and banking risks

- **Bank Solvency:** The decrease in the value of the assets causes an equal decrease in the value of equity. When the value of the assets is less than the value of the liabilities to creditors, the banking institution becomes insolvent. **Assets = Liabilities + Equity** or **Equity = Assets - Liabilities**



Source: Crouhy, M., Galai, D., Mark, R. (2000). "A Comparative Analysis of Current Credit Risk Models", *Journal of Banking and Finance* 24 59–117

Capital adequacy and banking risks

- Banks are extremely vulnerable to systemic crises due to the high financial leverage they use. Financial leverage refers to the composition of liabilities. High financial leverage means that liabilities mainly consist of obligations in the form of debt (deposits, bonds, interbank loans, etc.). Banks are extremely vulnerable to asset volatility. For example, if the ratio of equity to total assets is 10%, this means that a fall in the value of assets of more than 10% is sufficient to render a banking institution insolvent. Of course, high leverage increases the return on equity and the risk of the shareholders.
- **Return on Equity = Net income/Equity = (Net income /Assets) x (Assets/Equity)**
ROE = ROA x EM
- If net income as a percentage of asset value is 3% and leverage is 10 (100/10), shareholders' earnings will be three times higher, 30%. Conversely, if net income is -3% as a percentage of assets, the return on equity will be -30%.
- The capital adequacy ratio indicates the ability of a banking institution to absorb losses from credit risk, market risk and operating risk, without endangering its liabilities to creditors..

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Capital adequacy and banking risks

- Regulatory capital is divided into Tier 1 and Tier 2. Tier 1 capital includes Common Equity capital (CET1) and Tier 1 additional capital. CET1 funds include common shares and stock surplus, retained earnings, other comprehensive income, qualifying minority interest. The additional Tier 1 funds include hybrid securities and non-cumulative preference shares. Tier 2 funds include subordinated bonds, subordinated loans and preference shares with a cumulative dividend.
- ☐ CET1 Equity Ratio = Common Equity / Weighted Assets $\geq 4.5\%$
 - ☐ Tier 1 capital ratio = Tier 1 capital / Weighted assets $\geq 6\%$
 - ☐ Capital adequacy ratio (Tier 1 and Tier 2) = (Tier 1 + Tier 2) / Weighted assets $\geq 8\%$
 - ☐ Leverage ratio = Tier 1 capital / assets $\geq 3\%$.
 - ☐ Capital Conservation Buffer = Common Equity / Weighted Assets = 2.5%
- According to ECB “The capital conservation buffer (CCoB) is a capital buffer of 2.5% of a bank’s total exposures that needs to be met with an additional amount of Common Equity Tier 1 capital. The buffer sits on top of the 4.5% minimum requirement for Common Equity Tier 1 capital. Its objective is to conserve a bank’s capital. When a bank breaches the buffer, automatic safeguards apply to limit the amount of dividend and bonus payments it can make.”

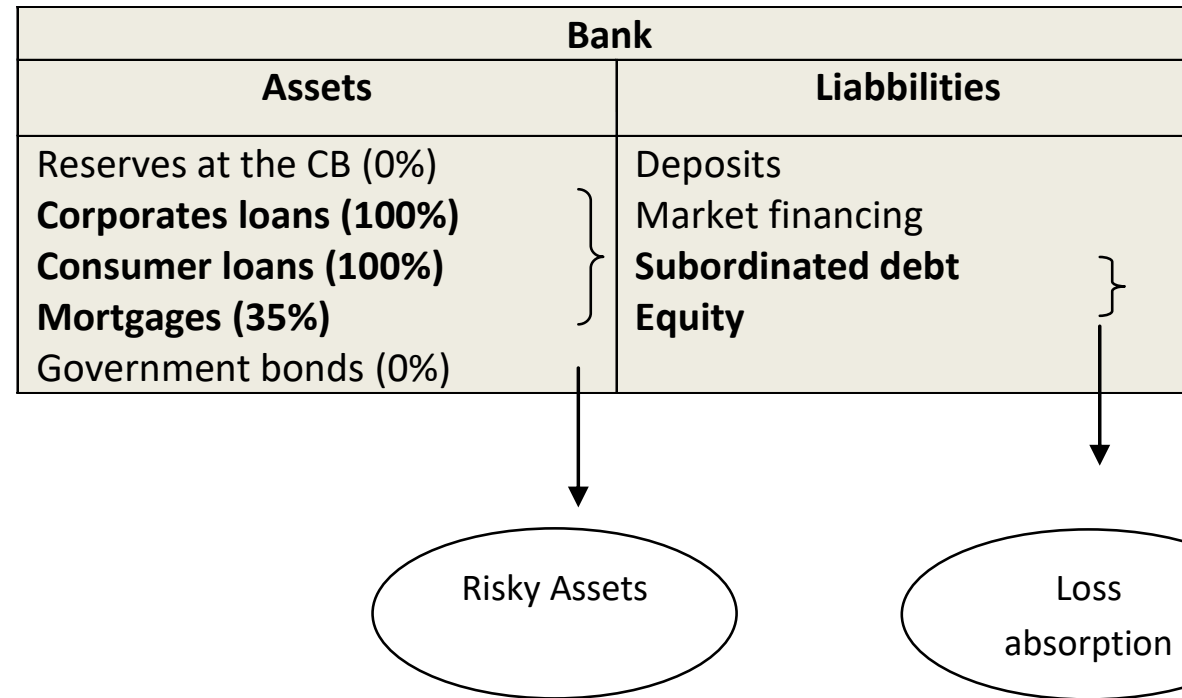
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Capital adequacy and banking risks

- **Liquidity Coverage Ratio (LCR)**
$$\frac{\text{Stock of HQLA}}{\text{Total net cash outflows over the next 30 calendar days}} \geq 100\%$$
- The LCR is designed to ensure that banks hold a sufficient reserve of high-quality liquid assets (HQLA) to allow them to survive a period of significant liquidity stress lasting 30 calendar days. The supervisory scenario capturing the period of stress combines elements of bank-specific and market-wide stress (includes many of the shocks experienced in 2008)
- **Net Stable Funding Ratio (NSFR)**
$$\frac{\text{Total Available Stable Funding (ASF)}}{\text{Total Required Stable Funding (RSF)}} \geq 100\%$$
- The NSFR is expressed as a ratio that must equal or exceed 100%. The ratio relates the bank's available stable funding to its required stable funding. Sources of available Stable funding includes: customer deposits, *long-term* wholesale funding (interbank market), and equity. "Stable funding" excludes *short-term* wholesale funding (also from the interbank lending market). A bank's Required Stable Funding (RSF) is **calculated from its assets, weighted according to their maturity, credit quality and liquidity**, together with an amount in relation to off balance sheet commitments.

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Capital adequacy and banking risks



Capital adequacy ratio =

(Equity + Subordinated bonds)

$100\% * \text{Corporate loans} + 75\% * \text{Consumer loans} + 35\% * \text{Mortgages}$

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Capital adequacy and banking risks

- **Risky weighted assets** are computed by multiplying each asset component with its corresponding weight and then summing the products. The weights capture credit risk.

$$RWA = A_1 \times w_1 + A_2 \times w_2 + \dots + A_n \times w_n$$

- For risk free assets the weights are zero.
- The standardized approach assigns standardized risk weights to asset components (see notes).
- Banks that meet certain conditions can develop their own models for measuring credit risk (Internal ratings-based approach).

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Capital adequacy and banking risks

- Suppose the value of assets is 50 billions, the value of liabilities is 45 billions and the value of equity is 5 billions. The capital adequacy ratio is $5/50 = 10\%$. For the sake of simplicity, I assume that the capital adequacy ratio is calculated on the basis of total assets (as is the leverage ratio) and not on the basis of the total weighted assets. For typical bank balance sheets, the capital adequacy ratio is usually twice the leverage ratio.

Bank	
Assets	Liabilities
Reserves at the CB	Deposits
Corporate loans (-3 billion)	Market financing
Mortgages (-3 billion)	Net worth (-6 billion)
Government bonds	
Other assets	

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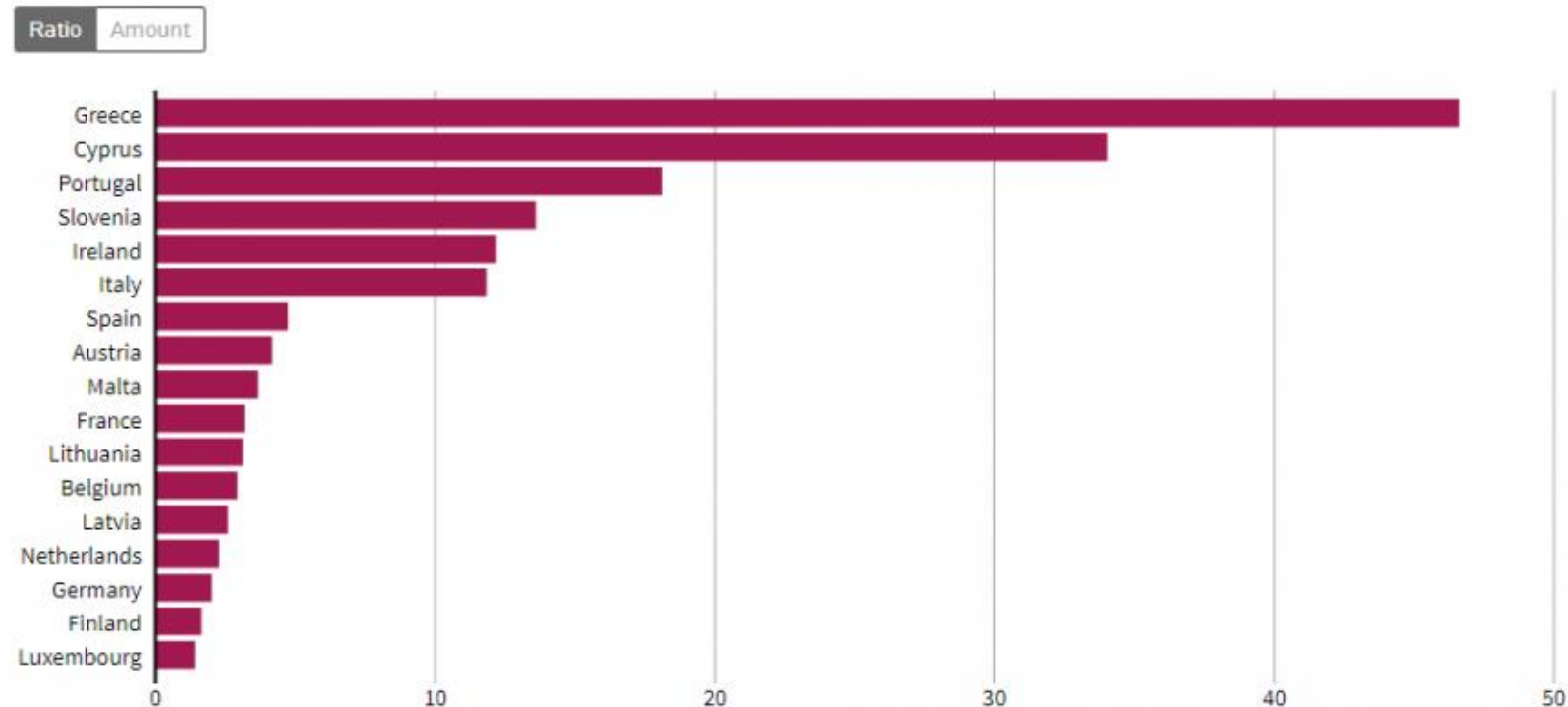
Non-performing loans in Eurozone

Bad loans across the euro zone

The European central bank supervises all banks in the euro zone countries, focusing especially on non-performing loans since European banks have a high stock of bad loans on their balance sheets.

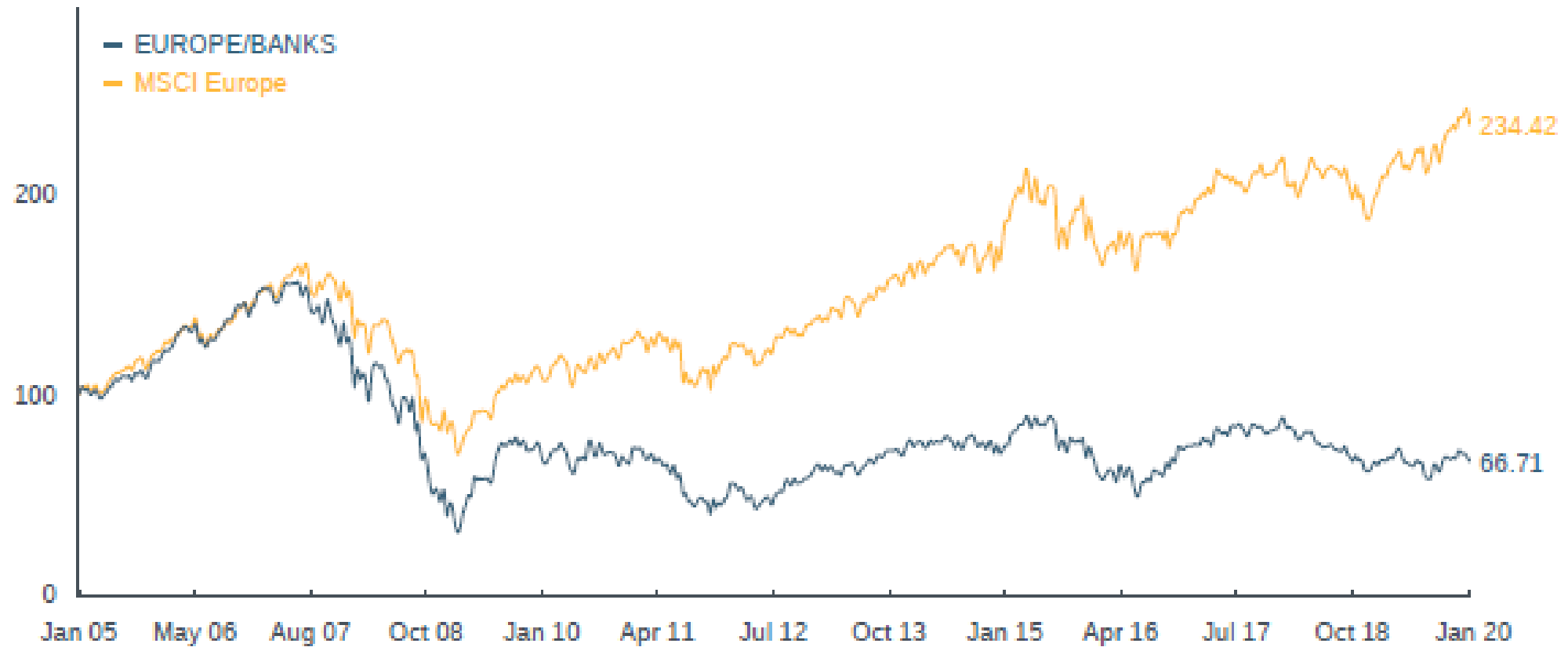
NON-PERFORMING LOANS

Amount in billion euros and ratio as a percentage of total loans



MSCI Europe Banks Index

CUMULATIVE INDEX PERFORMANCE - NET RETURNS (EUR) (JAN 2005 – JAN 2020)



Source: Bloomberg data on index

Bank risks

- **Credit risk.** Credit risk refers to the possibility of a loss if a borrower or, in general, a counterparty does not fulfill its financial obligations.
- **Market risk.** Market risk refers to the likelihood of adverse changes in the prices of financial assets that are mark-to-market.
- **Exchange rate risk.** Exchange rate risk refers to the possibility of adverse changes in net worth due to changes in exchange rates

	Assets in FX	Liabilities in FX
Appreciation of domestic currency	-	-
Depreciation of domestic currency	+	+

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Bank risks

- **Interest rate risk.** Interest rate risk arises from differences in the maturity dates of assets and liabilities. Interest rate fluctuations affect both the market value of the securities held by banks (market risk) and net interest income. Interest is the main source of income / expense of banks and therefore changes in interest rates have a significant impact on their profitability and equity. Banks deal with their exposure to interest rate risk using derivative products (interest rate swaps).
- **Liquidity risk.** Liquidity risk arises due to differences in the sizes of assets and liabilities and differences in their maturity dates (maturity gap). Banks classify the cash-flows generated by assets and liabilities according to when they occur, and calculate their difference (liquidity gap). Liquidity exposure, depending on its sign, implies either new financing of overdue liabilities (refinancing risk) or a new purchase of assets (risk of reinvestment). As a result, liquidity exposure also causes interest rate risk.
- **Operational Risk.** According to the Basel Committee, operational risk is the risk of direct or indirect damage that may result from inadequate or failed internal processes, people and systems, or from external events.

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The Sovereign-Bank Diabolic Loop in Eurozone

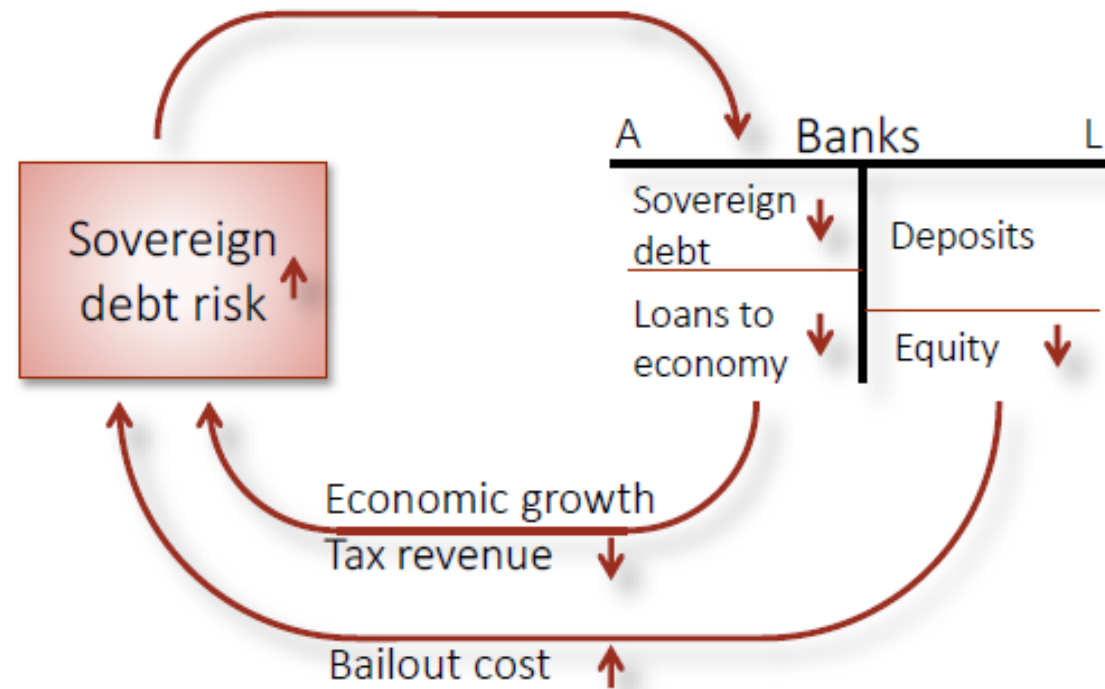


Figure 1: Two Diabolic Loops. Source: Brunnermeier et al. (2011)

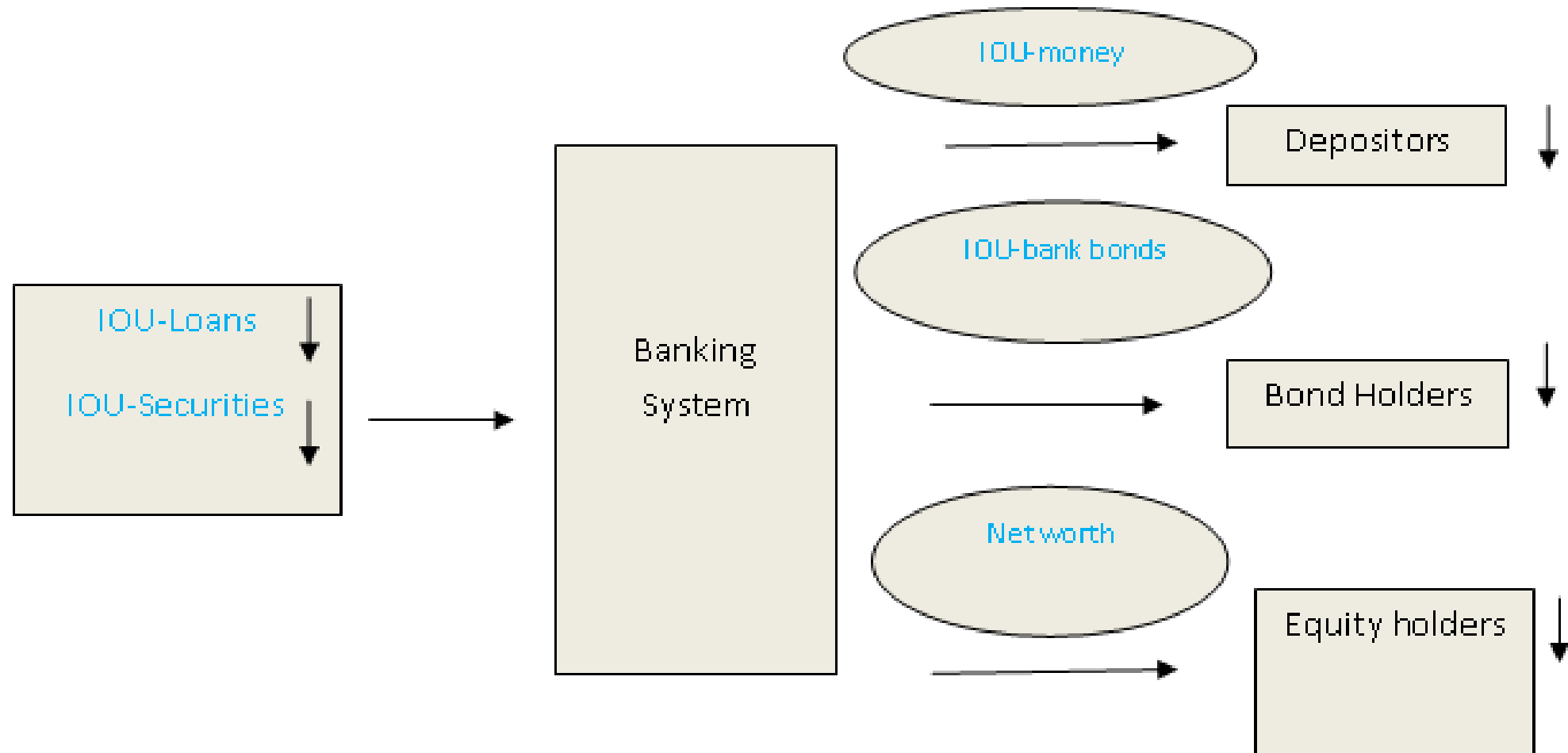
Source: Lorem ipsum dolor sit amet **Source:** <https://voxeu.org/article/esbies-realistic-reform-europes-financial-architecture>

The Sovereign-Bank Diabolic Loop in Eurozone

- The crisis in the Eurozone began in 2008 as a result of the global financial crisis and evolved into a sovereign debt crisis of member countries, notably the countries of southern Europe. The close interconnection between government debt and the banking sector has caused significant disruption to both the financial sector and the real economy, and has highlighted the need for institutional reforms aimed at creating a unified banking market and adopting common rules.
- In Greece, the sovereign debt crisis and the haircut of the nominal value of government bonds in 2012 caused enormous losses to the banking system, while in Ireland, bailout of the banking sector with public funds significantly burdened government debt.
- The purpose of the banking union, which is still in progress, is to establish common rules for the supervision and resolution of banking institutions in the European Union. Participation in the banking union is mandatory for all euro area member states. Countries outside the eurozone that are members of the European Union can also join on a voluntary basis. The banking union is undoubtedly an important step towards the effective completion of economic and monetary union.

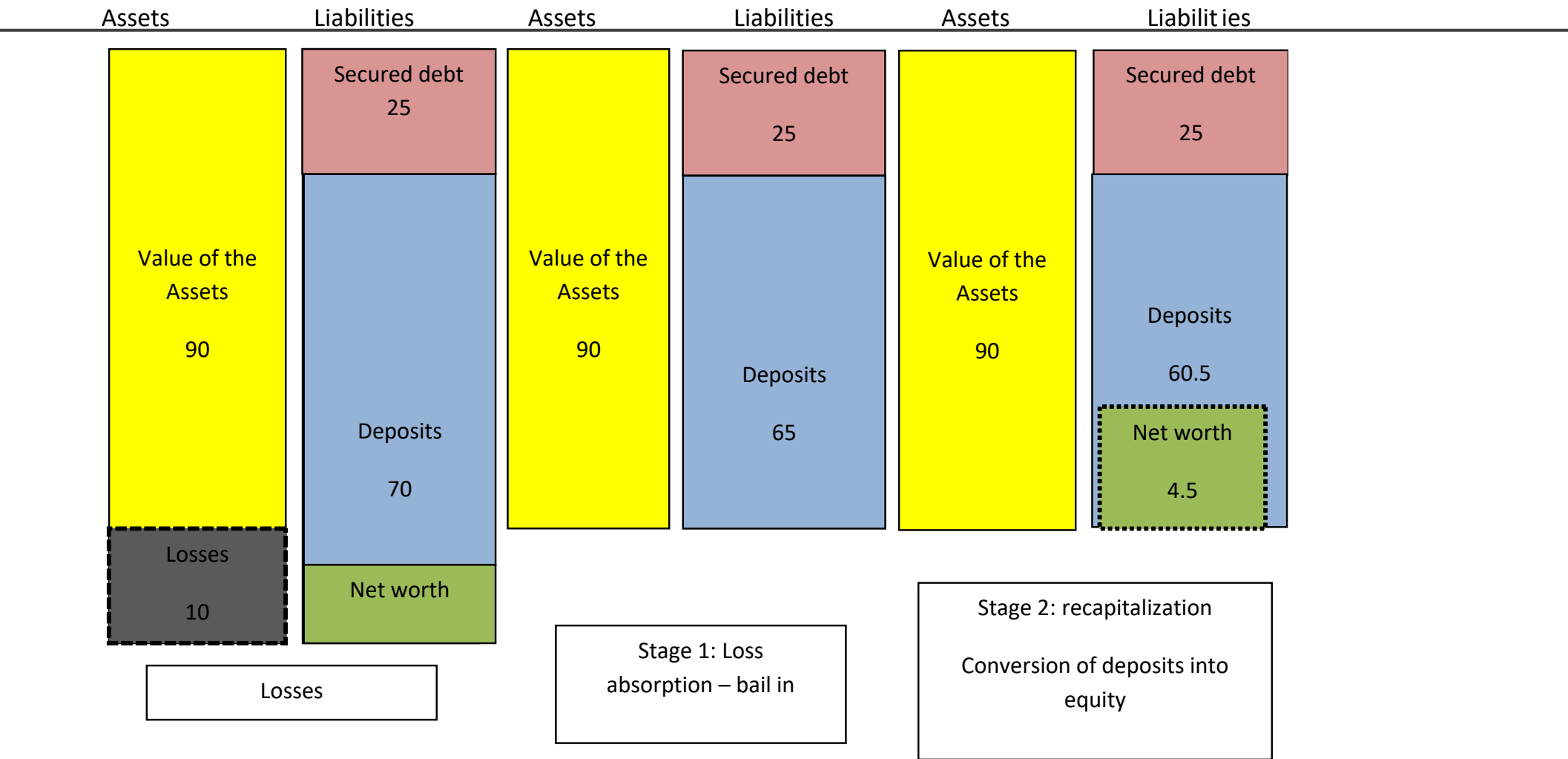
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Bank Recapitalization with Equity issue



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Bank Recapitalization with deposit haircut



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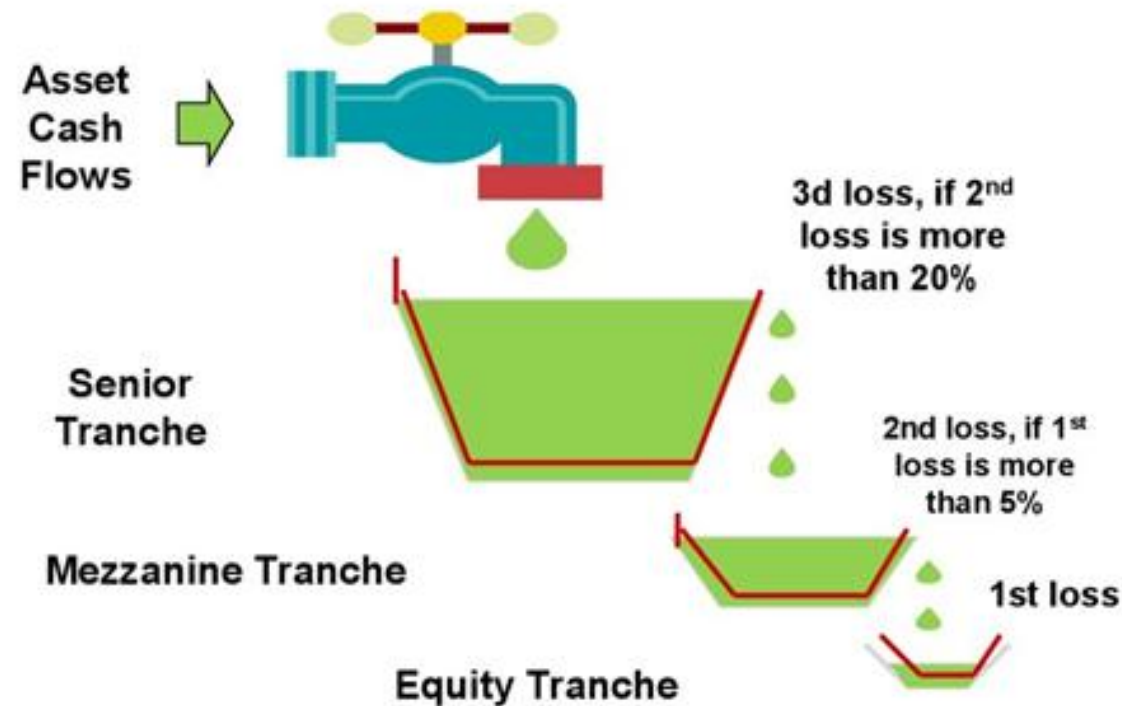
Section 2: Securitization

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The Alchemy of Finance

- Securitization transforms risky cash-flows from risky securities into asset-backed securities with virtually zero risk. A sum of IOUs may have different risk / performance characteristics than each IOU individually.



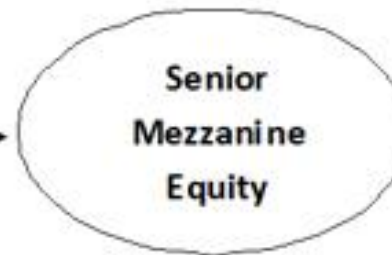
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Securitization-Changes in Balance sheets

Bank	
Assets	Liabilities
Loans ↓	Deposits
Reserves ↑	Market financing
Other assets	Net worth

SPE	
Assets	Liabilities
Loans ↑	Asset Backed Securities

Credit enhancement



Investors

Creating a riskless IOU (independent events)

- Suppose a loan portfolio consists of two loans (A and B) worth EUR 100 million each. The probability of default for each one of the two loans is 10%. In case of default, the value of the loan becomes zero (0% recovery rate).

Events	Loss
Both loans default, $0.1 \times 0.1 = \mathbf{1\%}$	200 m.
Only one loan defaults (either A or B), $2 \times 0.90 \times 0.10 = \mathbf{18\%}$	100 m.
No default, $0.90 \times 0.90 = \mathbf{81\%}$	0 m.

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Creating a riskless IOU (independent events)

- The two loans are securitized and two tranches of nominal value of 100 m. each are created. The first part (senior tranche) has credit support up to 50% of the total value of the loans, i.e., the holder completely loses his capital if and only if neither of the loans is repaid.
- The second (junior tranche) has a low repayment priority and its value is completely wiped out if one of the two loans defaults or if both loans default. It can be seen from the previous table that the probability of loss in the senior tranche is only 1%, while the probability of a loss in the junior tranche is 19% (18% + 1%). Because the senior tranche has a very low probability of loss, it can receive a high credit rating.
- The likelihood of losses in both tranches of the securitization depends on the likelihood of default. If, for example, this probability increases to 20%, then the likelihood of damage to the senior tranche increases from 1% to 4% and the probability of damage to the junior tranche from 19% to 36%. However, the most important parameter that determines the risk characteristics of securitization is the correlation of defaults.

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Creating a riskless IOU (dependent events)

- Suppose a loan portfolio consists of two loans (A and B) worth EUR 100 million each. The probability of default for each one of the two loans is 10%. The loans default simultaneously.
- In cases where the default events are completely positively correlated, it is impossible to create tranches with different risk characteristics. The conclusion is that a basic prerequisite for the creation of low-risk tranches is the low correlation of default between the underlying loans. In this case, it is true that securities with better credit rating than the credit rating of the underlying asset group can be created.

Events	Loss
Both loans default , 10%	200 m.
Only one loan defaults (either A or B), 0%	100 m
No default, 90%	0 m.

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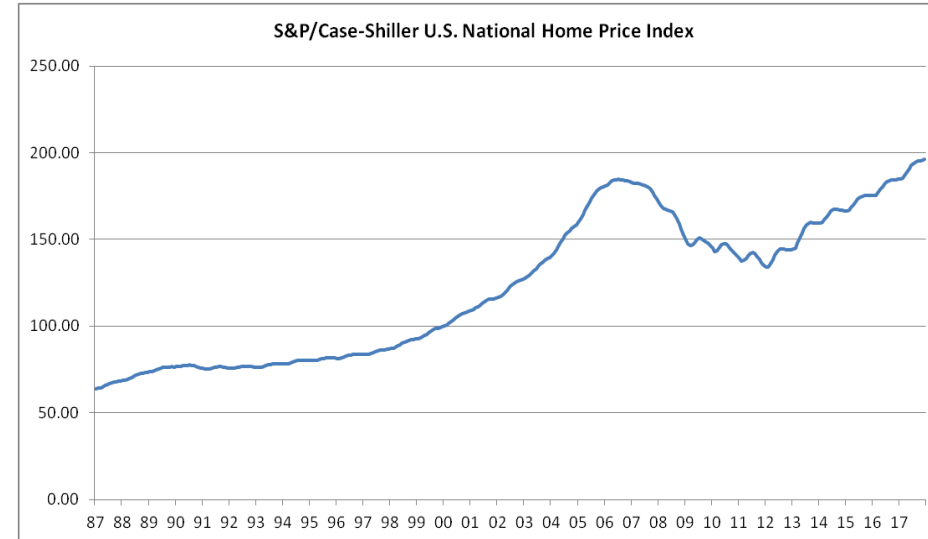
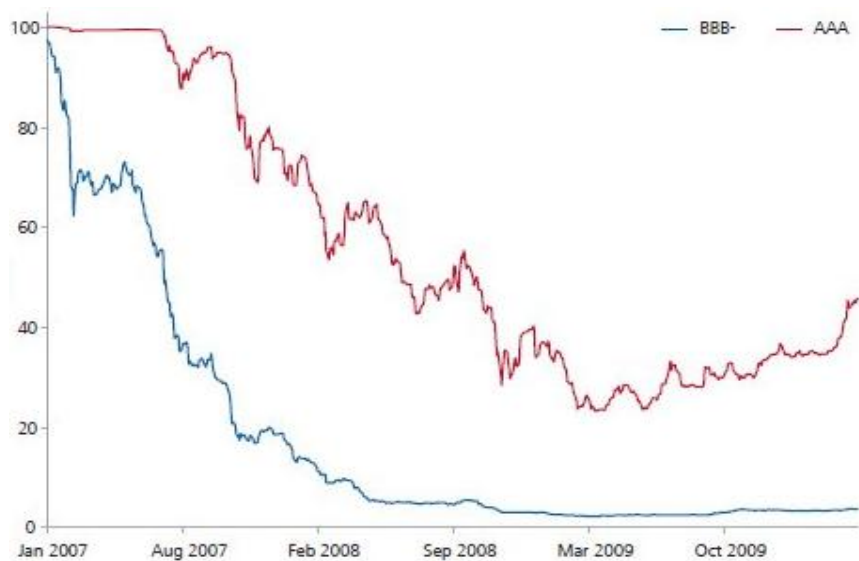
CDOs (Collateralized Default Obligation)

- Prior to the 2008 crisis, the mezzanine tranches that resulted from the initial securitization were more difficult to sell than the senior tranches, which were mainly bought by institutional investors, or the junior tranches, which were mainly bought by hedge funds. For this reason, the middle tranches were securitized again. Parts of a securitization can be re-securitized to create new securities called CDOs (Collateralized Default Obligation)

SPE 1		SPE 2	
A	L	A	L
Loans	Asset backed securities with high credit rating (80%)	Asset backed securities with medium credit rating	CDOs with high credit rating (75%)
	Asset backed securities with medium credit rating (15%)		CDOs with medium credit rating (15%)
	Asset backed securities with low credit rating (5%)		CDOs with low credit rating (10%)

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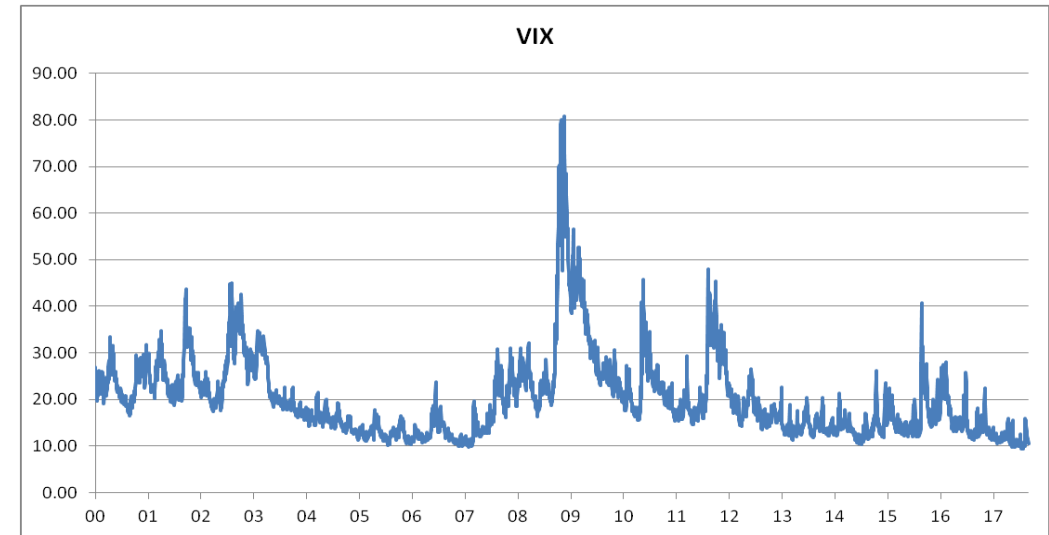
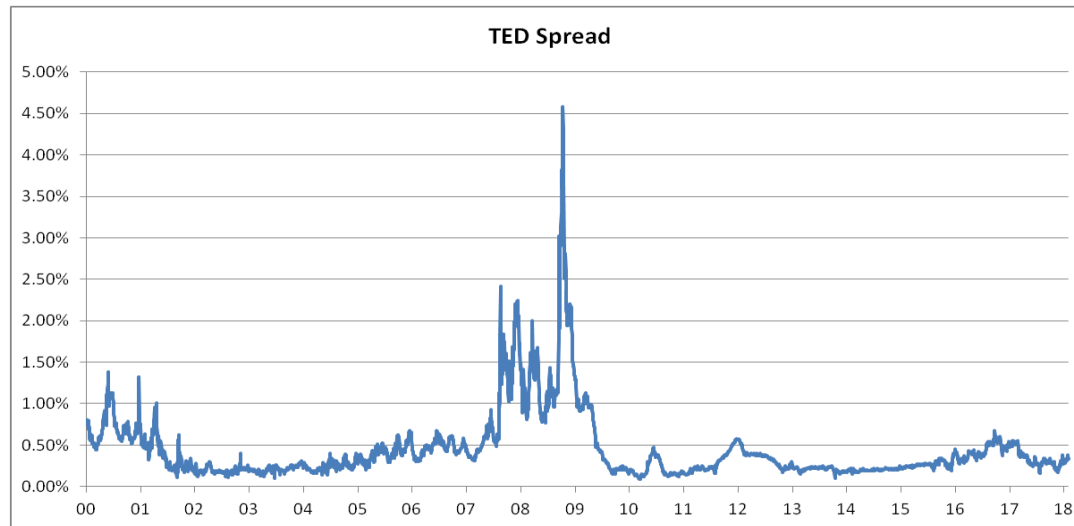
Global Financial Crisis in 2008



Investment banks	
Assets	Liabilities
Asset backed securities ↓	Short-term funding ↓
	Net worth ↓

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Global Financial Crisis in 2008



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Conclusions



Conclusions

- Bank as creators of money face significant risks
- Bank failures can create significant externalities
- Bank regulation imposes a minimum level of net worth to allow banks to absorb losses and remain solvent
- Manufacturing of safe assets is feasible through securitization if certain conditions are met

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Further reading



Further reading

- Dotsis G., IOU, Money, Banking and Cryptocurrencies, lecture notes.
- Ryan-Collins et al. (2011): Chapters 5.

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Further reading (optional)

- Minsky, H. (1992). The financial instability hypothesis. Working Paper 74, Jerome Levy Economics Institute, Annandale on Hudson, NY. (<http://www.levyinstitute.org/pubs/wp74.pdf>)
- Stein, J. 2010. Securitisation, Shadow Banking, and Financial Fragility. Daedalus, 139, 41–51. (<https://scholar.harvard.edu/files/stein/files/daedalus-sept-2010-final.pdf>)

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