Complexity and Funding Stability

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Two Dimensions of Funding

- Core and non-core funding
- Short-term and long-term funding
- Both distinctions bear on the procyclicality of the financial sector, but the former is more important
  - Complexity of the financial system is about former
  - Risk-taking behavior is mostly about former

Punchline

"If you take care of the aggregates, the complexity will take care of itself"

Three Modes of Leveraging Up

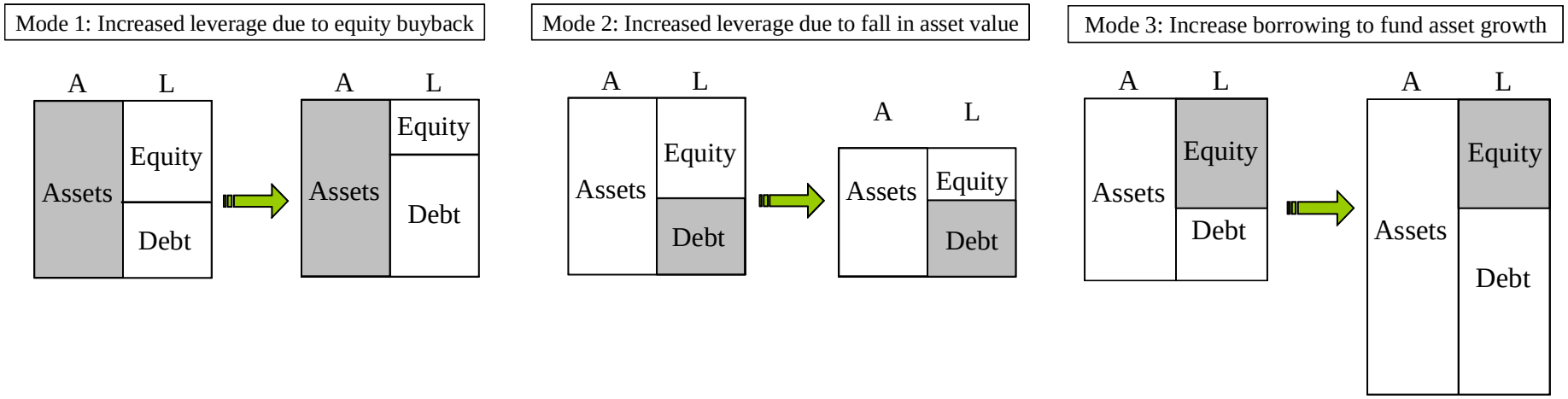


Figure 1. **Three modes of leveraging up:** Mode 1 is through an equity buyback through a debt issue. Mode 2 is through a dividend financed by asset sale. Mode 3 is through increased borrowing to fund new assets. In each case the grey area indicates balance sheet component that is held fixed

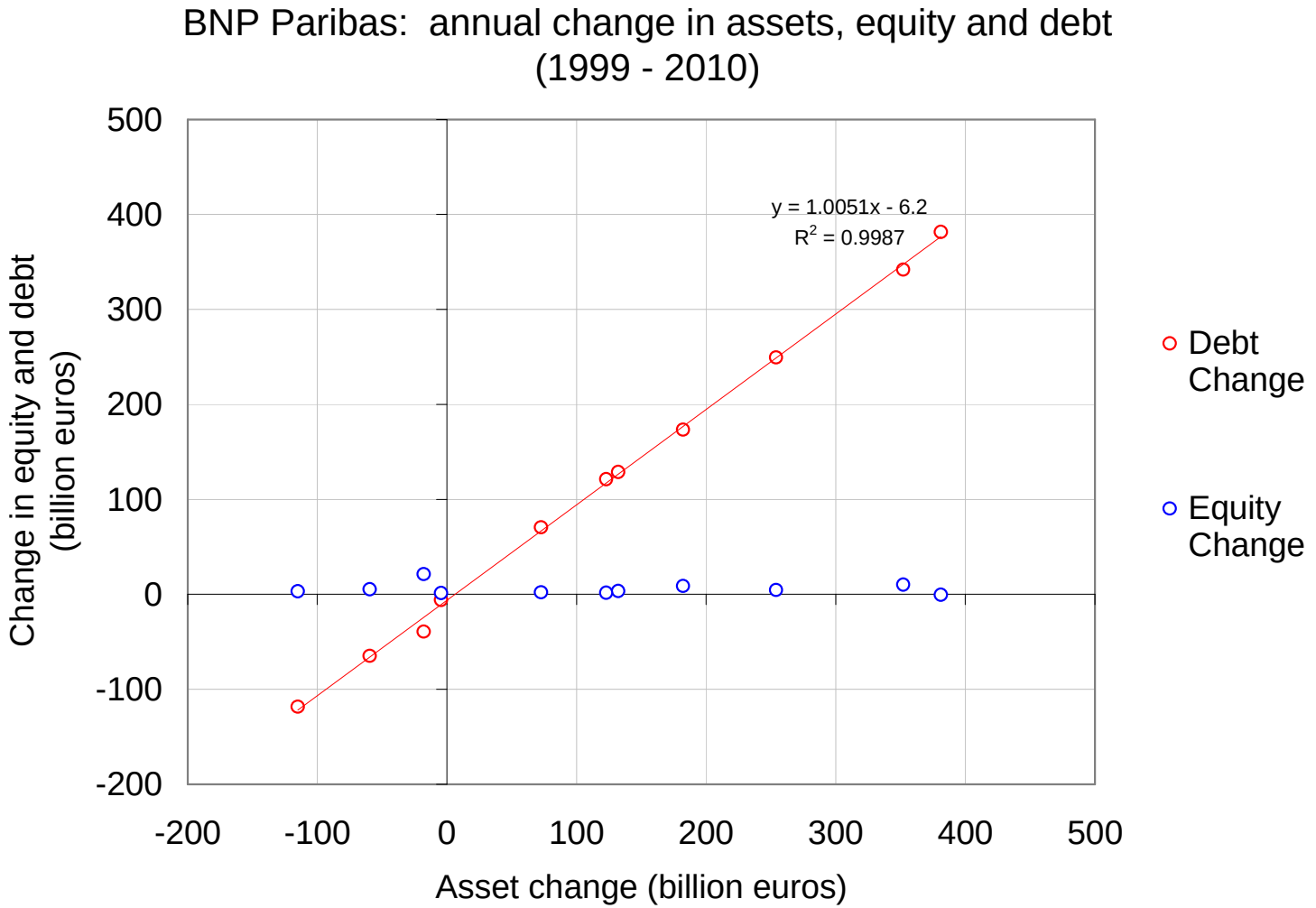


Figure 2. BNP Paribas: annual change in assets, equity and debt (1999-2010) (Source: Bankscope)

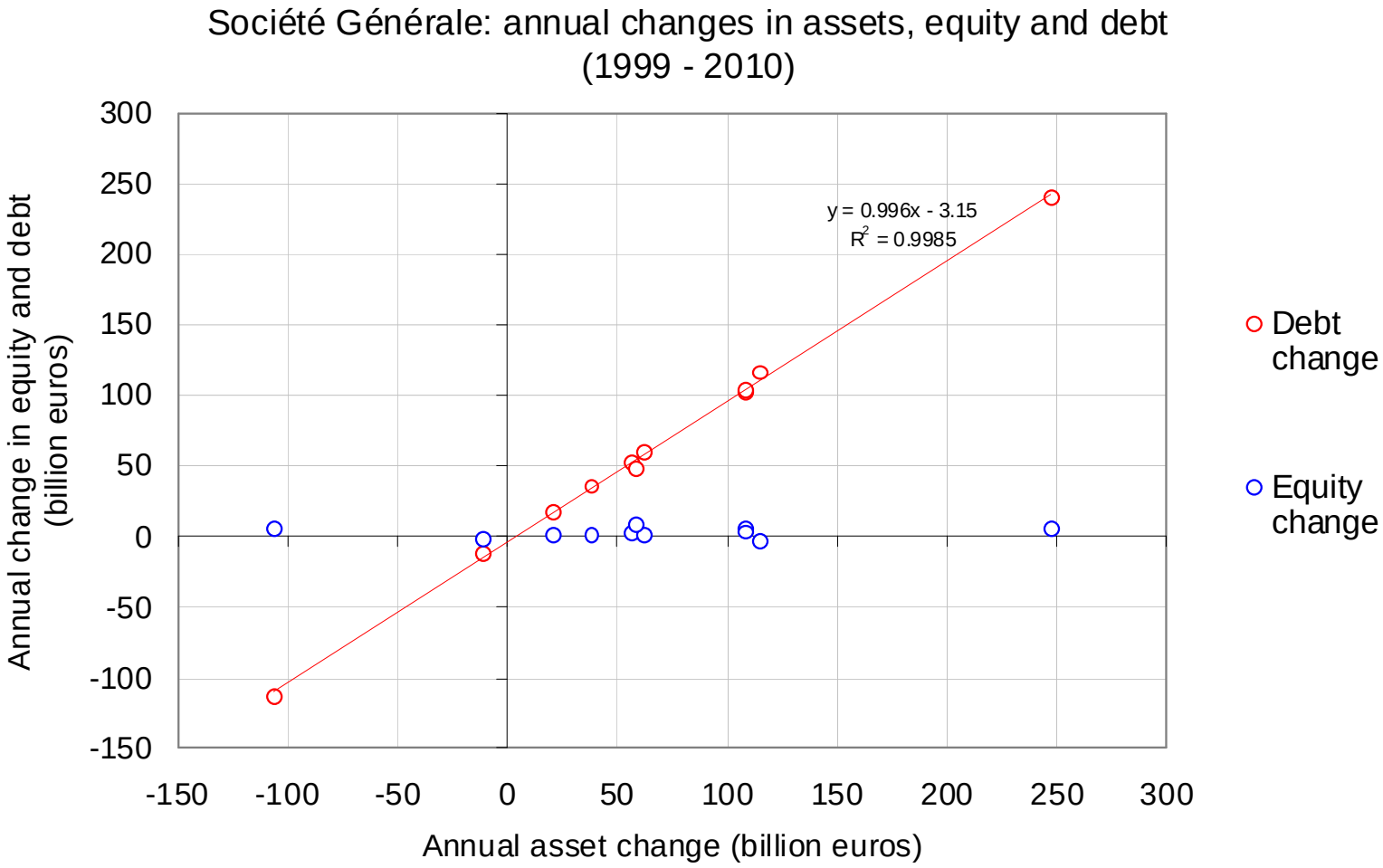


Figure 3. Société Générale: annual change in assets, equity and debt (1999-2010) (Source: Bankscope)

An Analogy

- Bank capital $\longmapsto$ Foundations of building
- Bank lending $\longmapsto$ Building itself
- Leverage $\longmapsto$ Relationship between height of building relative to its foundations

Leverage regulation $\longmapsto$ Building code stipulating how tall the building can be relative to foundation

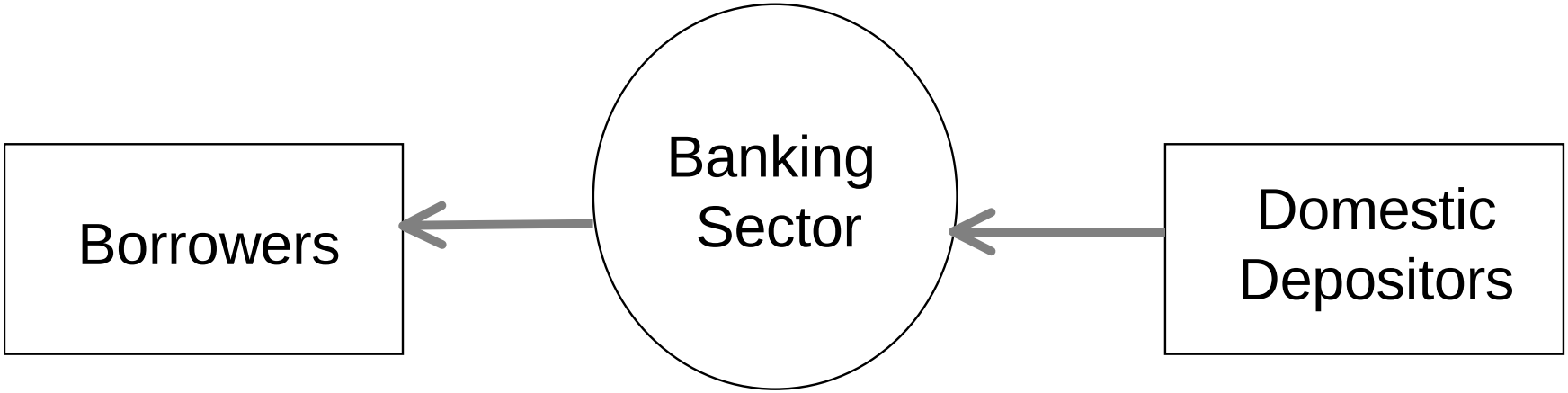
Figure 4. Sutyagin House, Archangel

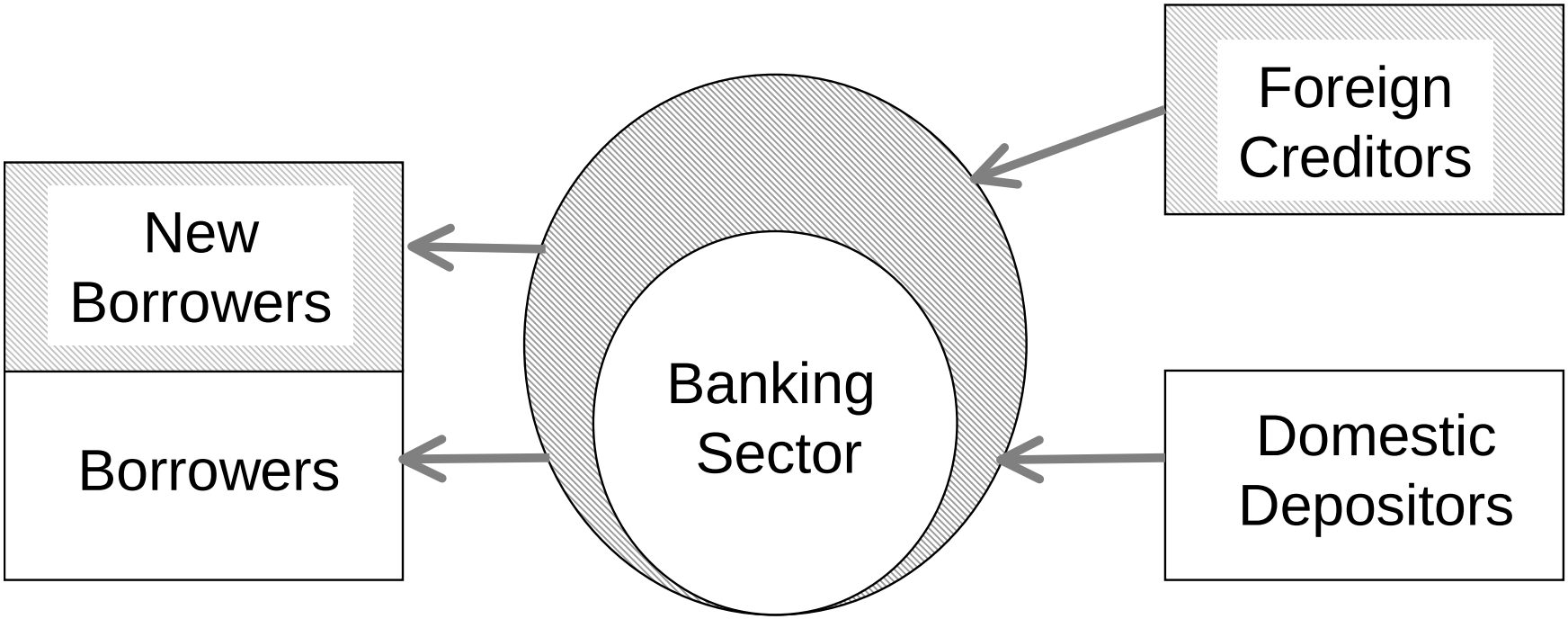
Core and Non-Core Bank Liabilities

- **Core:** Liabilities to domestic household and non-financial claim holders
- **Non-Core:** Liabilities to financial intermediaries and foreign creditors

Ratio of non-core to core liabilities is:

- Procyclical
- Mirrors lowering of credit standards


Borrowers
Banking Sector
Domestic Depositors


Foreign
Creditors
New
Borrowers
Banking
Sector
Borrowers
Domestic
Depositors

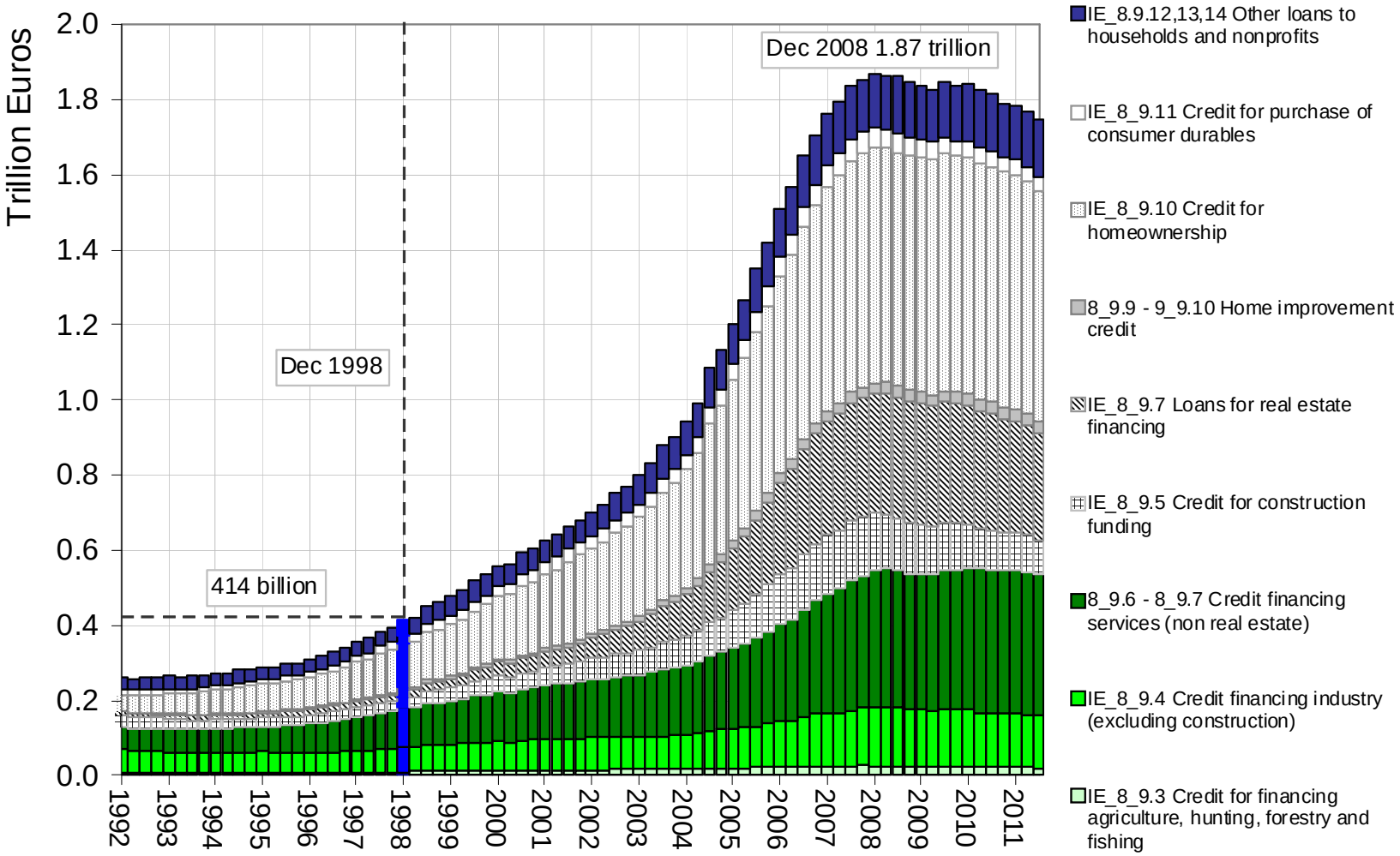


Figure 5. **Spain:** banking sector total domestic credit (Source: Bank of Spain)

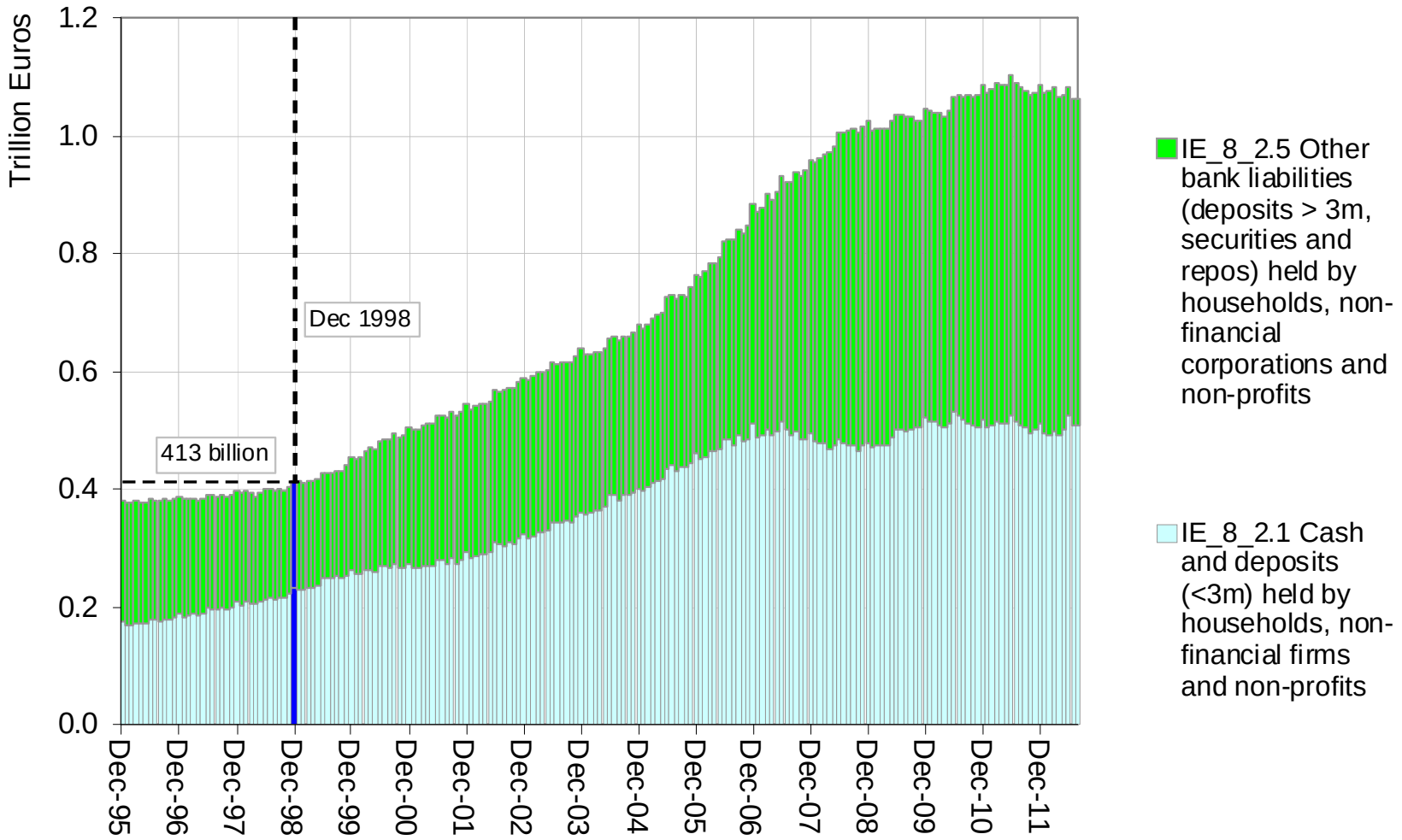


Figure 6. **Spain:** Core liabilities of banking sector (Source: Bank of Spain)

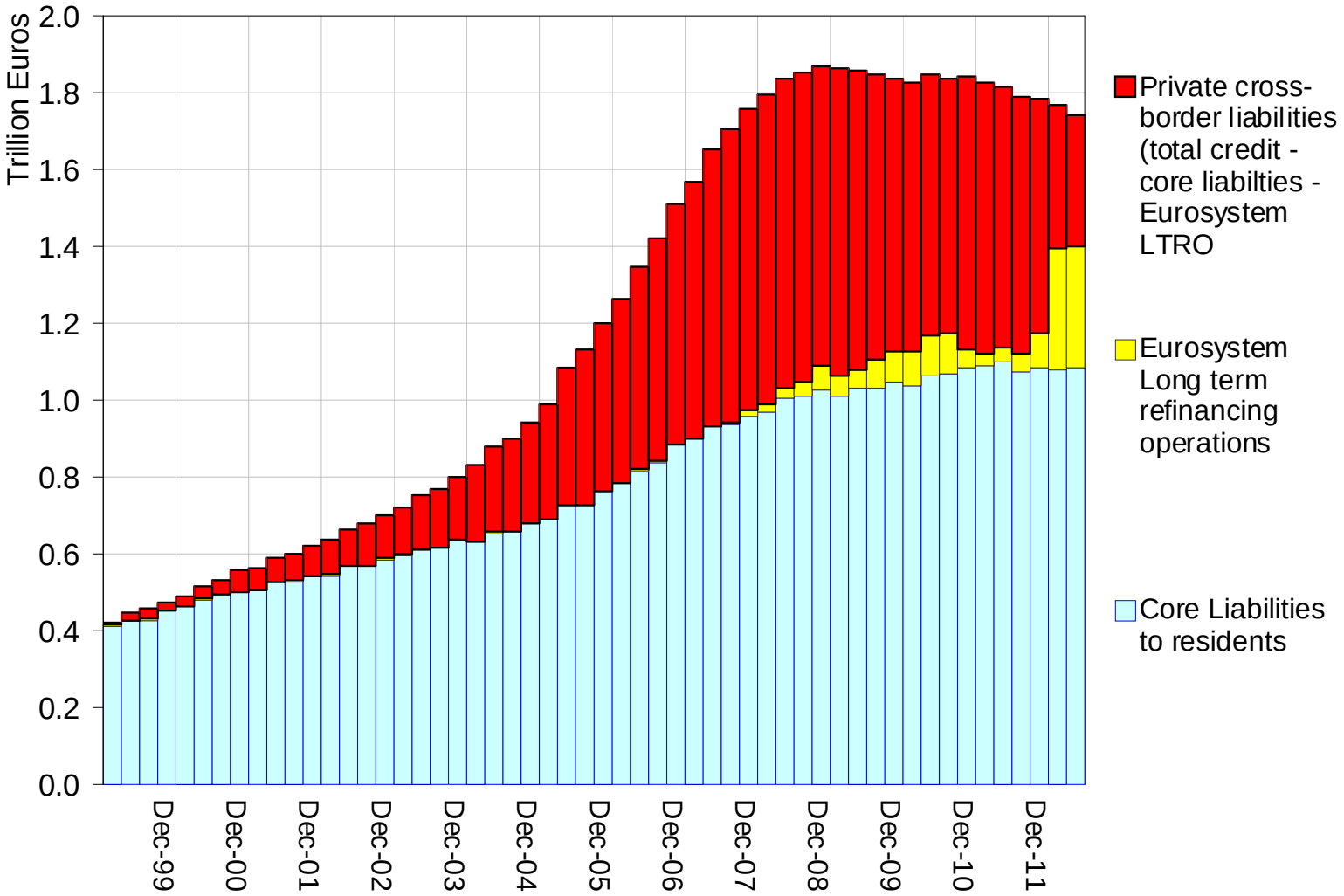


Figure 7. **Spain:** funding gap of Spanish banks (Source: Bank of Spain)

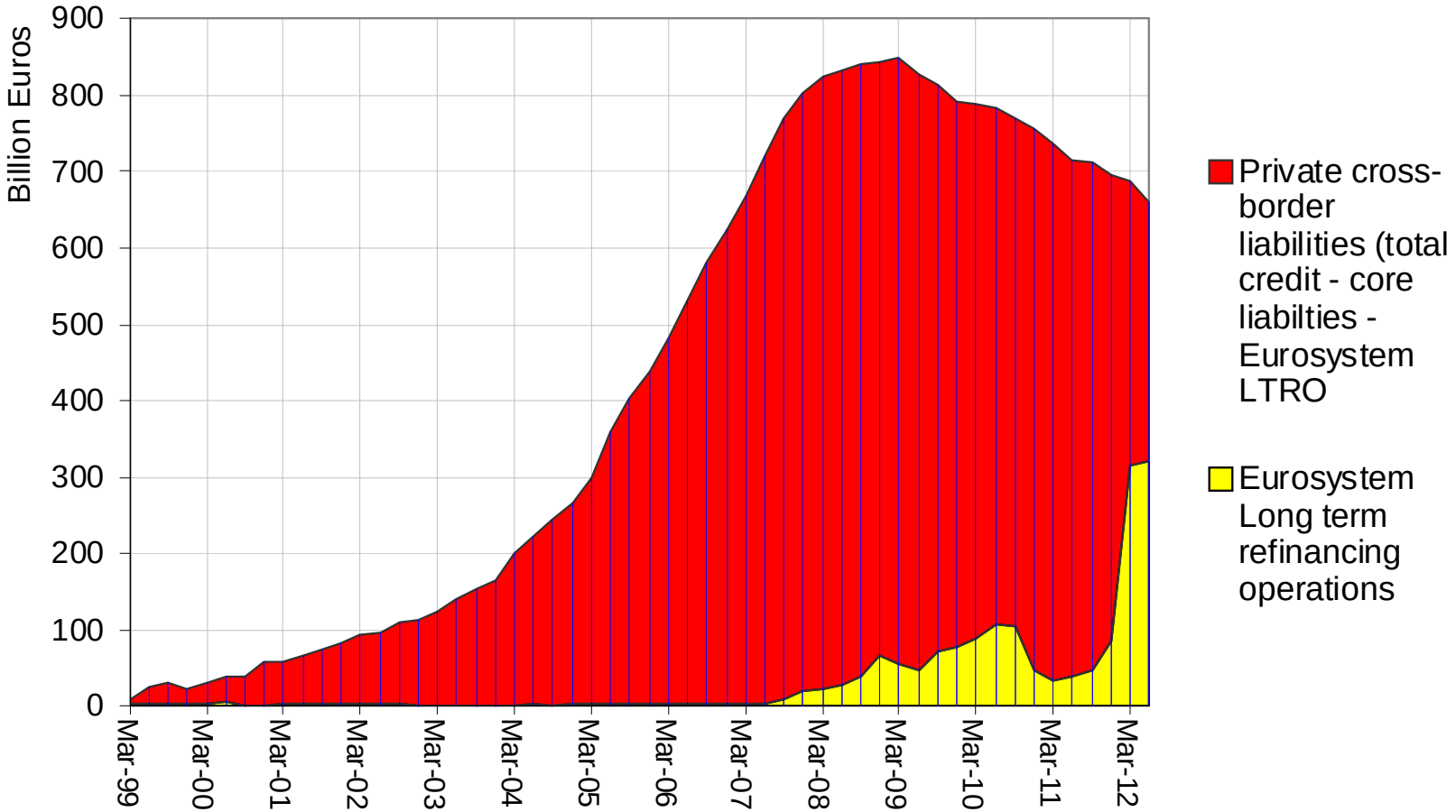


Figure 8. **Spain:** funding gap of Spanish banks (Source: Bank of Spain)

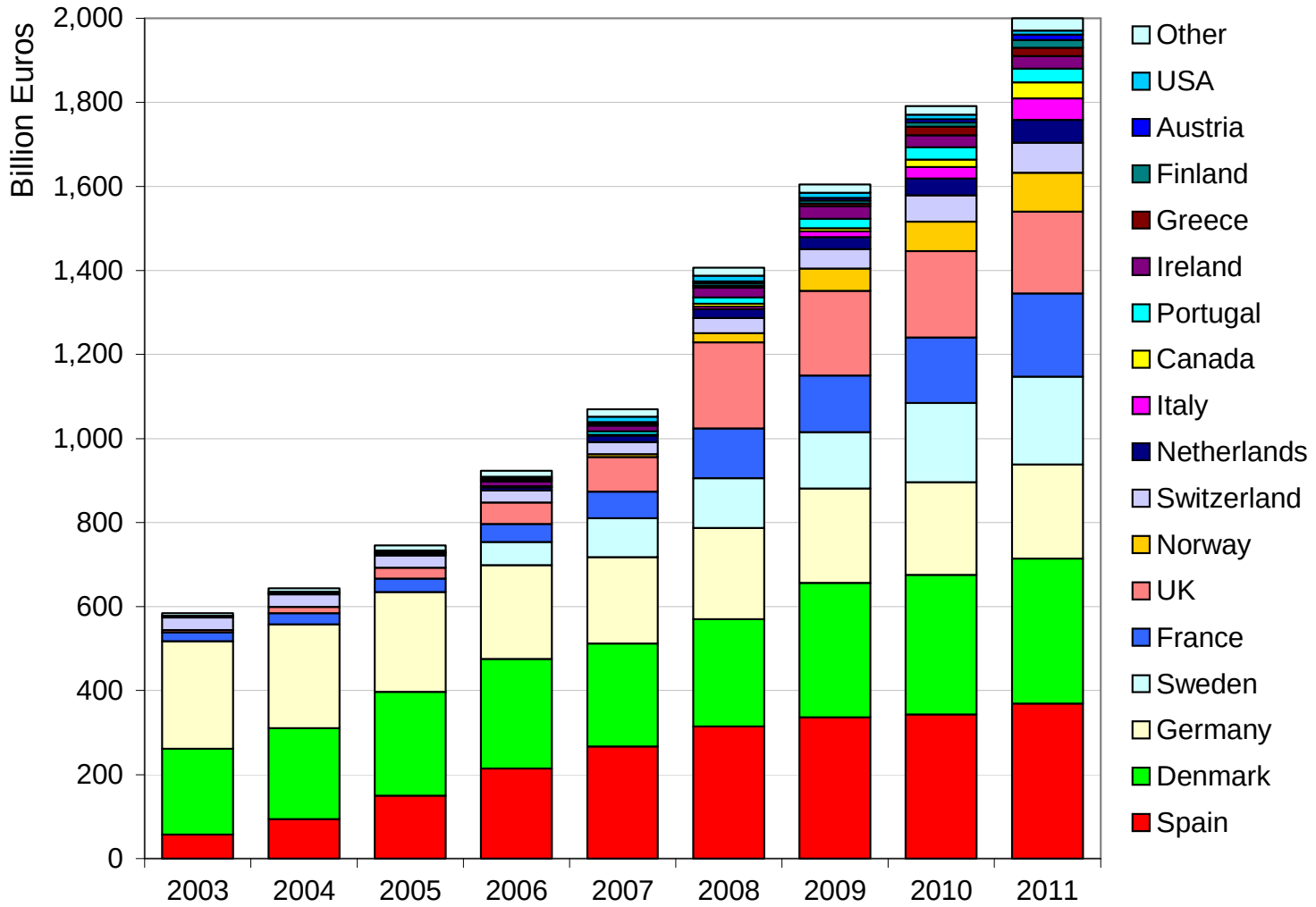


Figure 9. Mortgage covered bonds outstanding by country and by year (Source: European Covered Bond Council Factbook 2012)

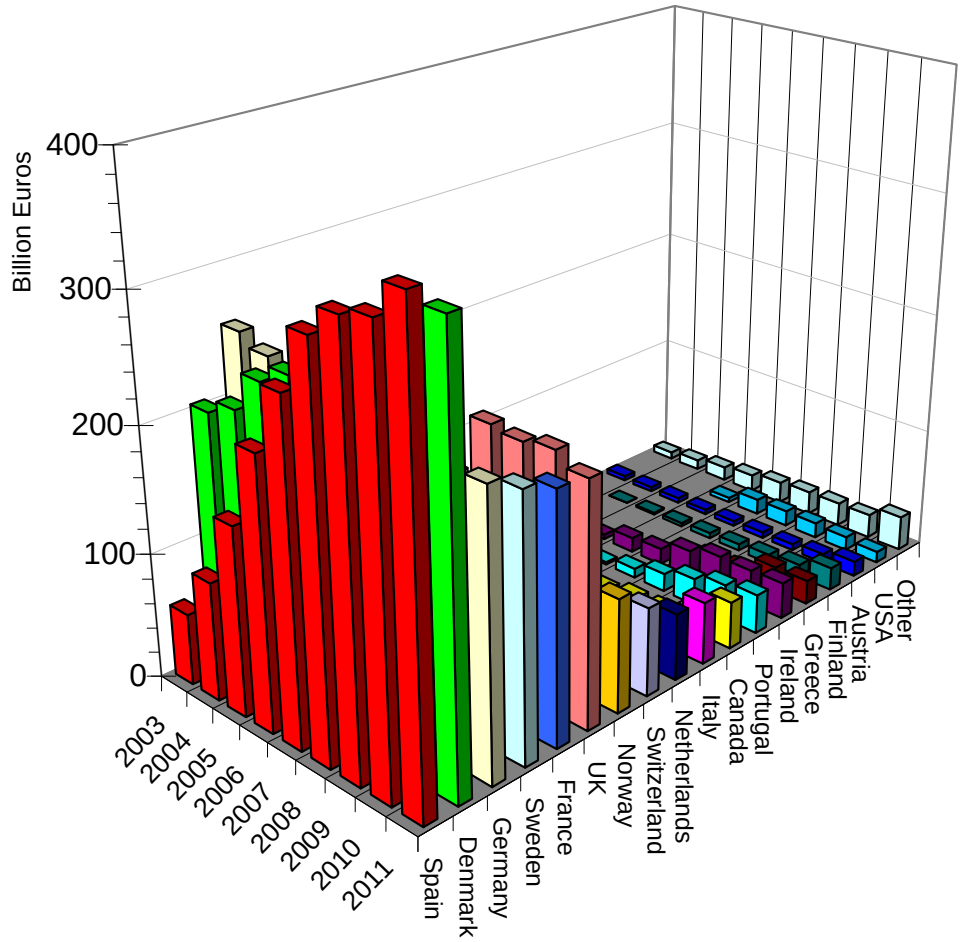


Figure 10. Mortgage covered bonds outstanding by country and by year (Source: European Covered Bond Council Factbook 2012)

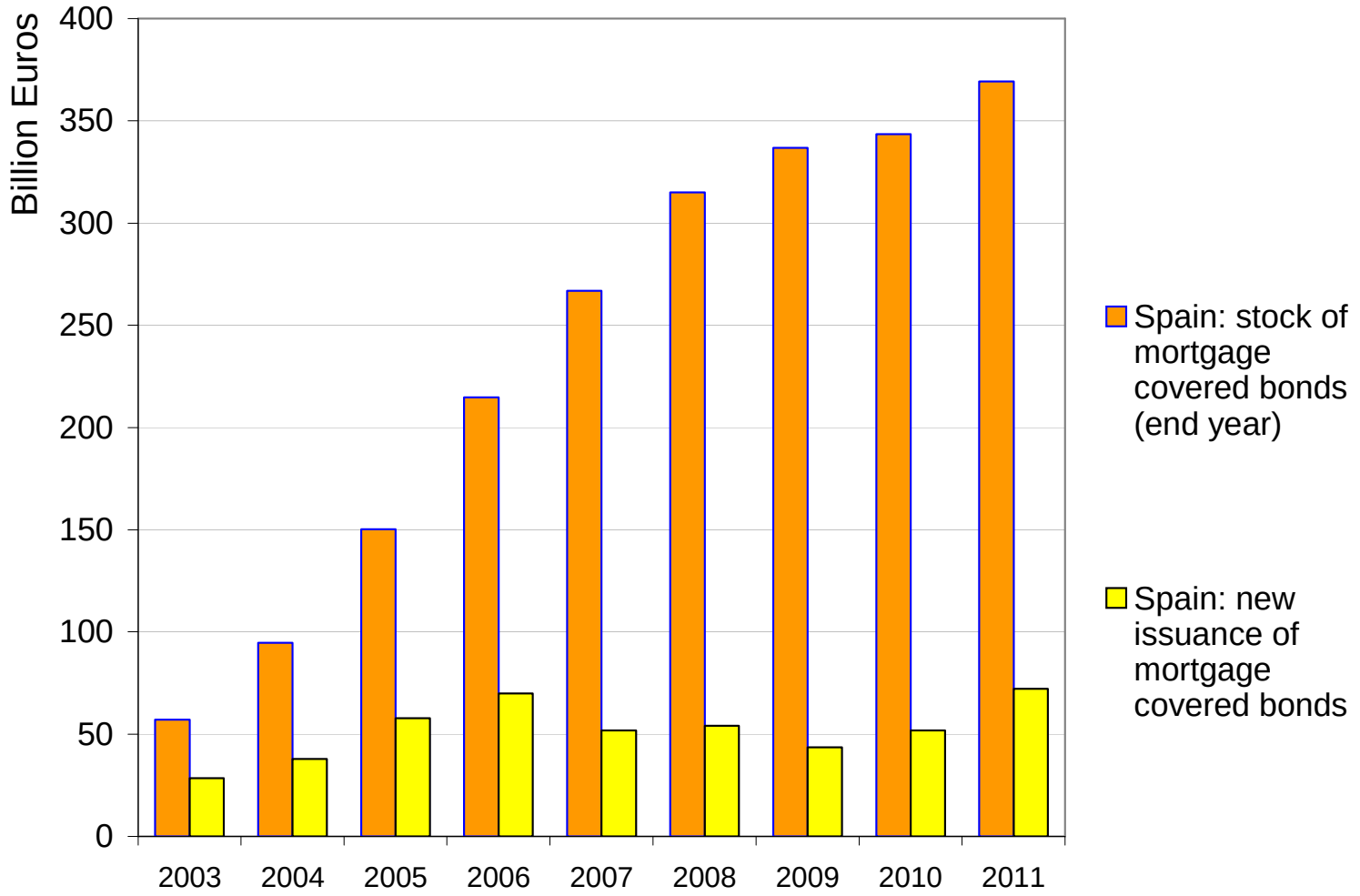


Figure 11. **Spain:** stock and new issuance of mortgage covered bonds (Source: European Coveren Bond Council)

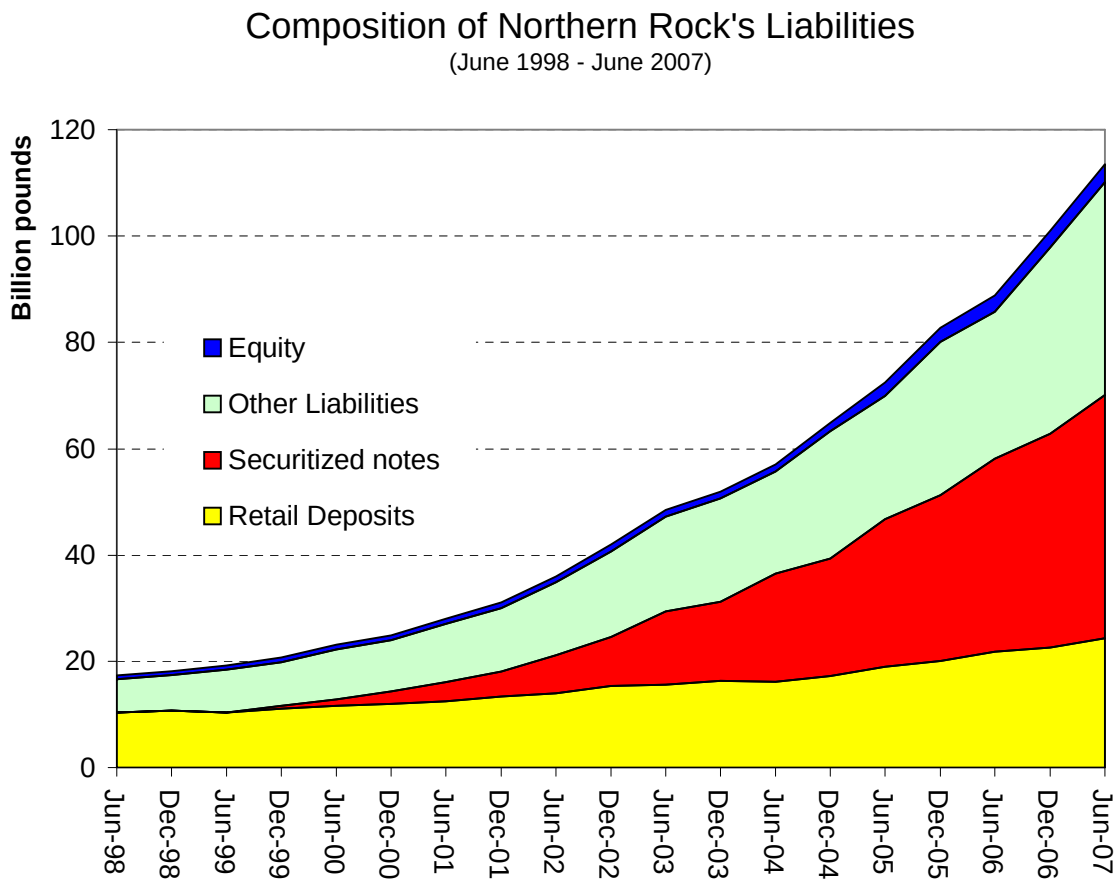


Figure 12. Liabilities of Northern Rock (1998 - 2007) (Source: Shin (2009))

Comparing Spain and Korea

- Both Korea and Spain highlight role of non-core liabilities
- Korea's non-core is
  - Short maturity
  - Denominated in foreign currency
- Spain's non-core is
  - Medium to long maturity
  - Denominated in domestic currency

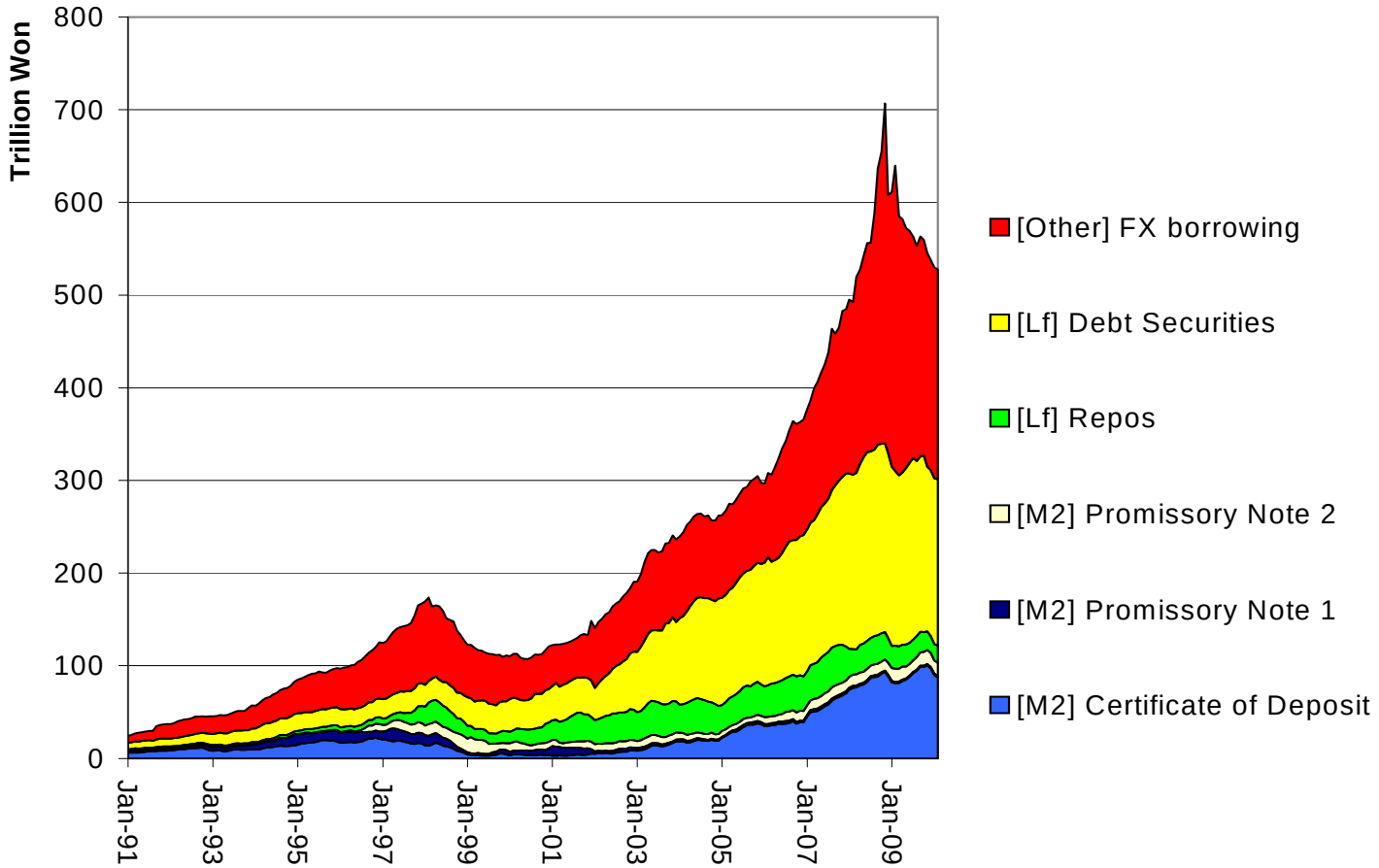


Figure 13. Non-core liabilities of Korean banks (Source: Shin and Shin (2010), data from Bank of Korea)

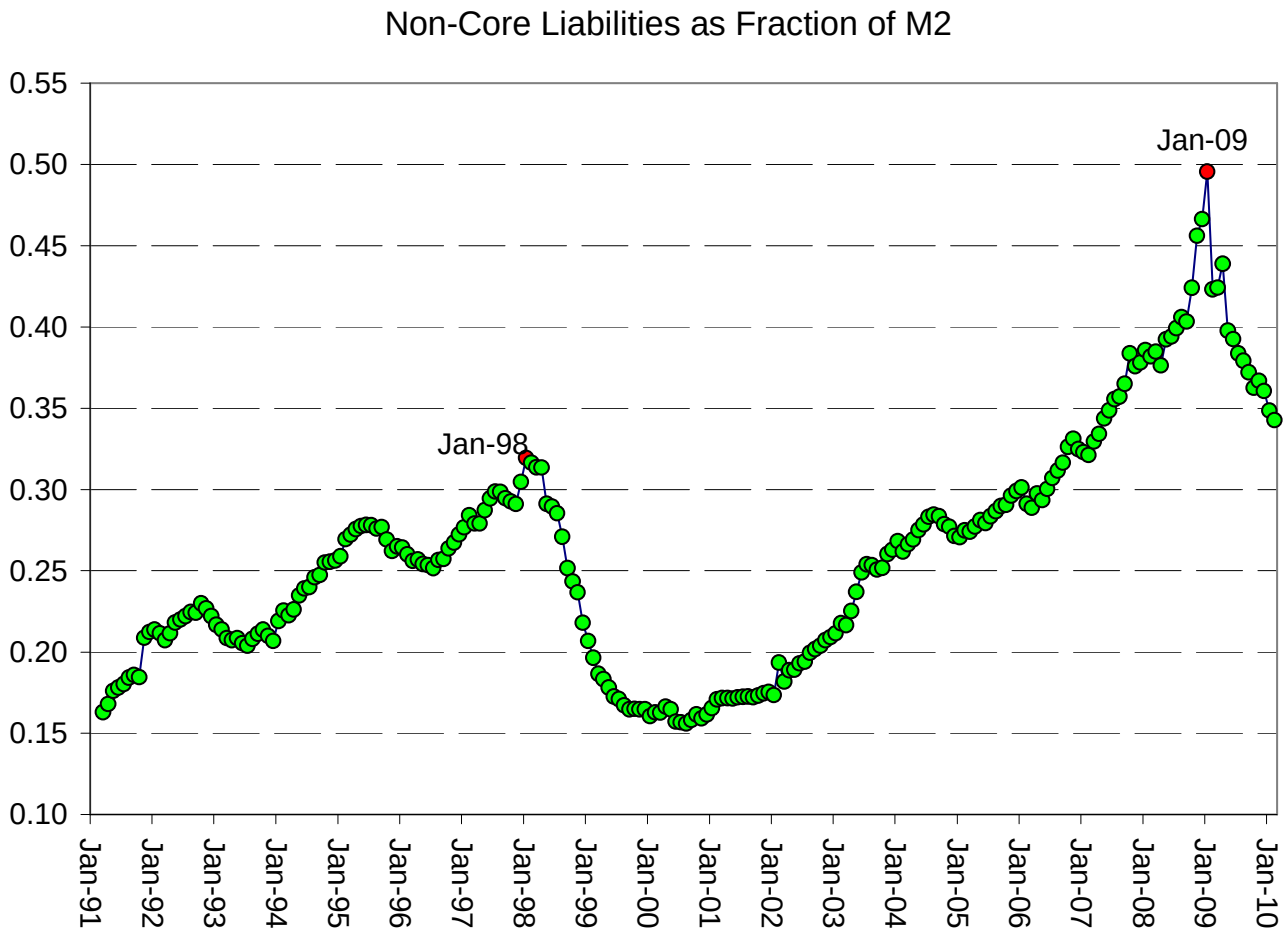


Figure 14. Non-core liabilities of Korean banks as proportion of M2 (Source: Shin and Shin (2010), data from Bank of Korea)

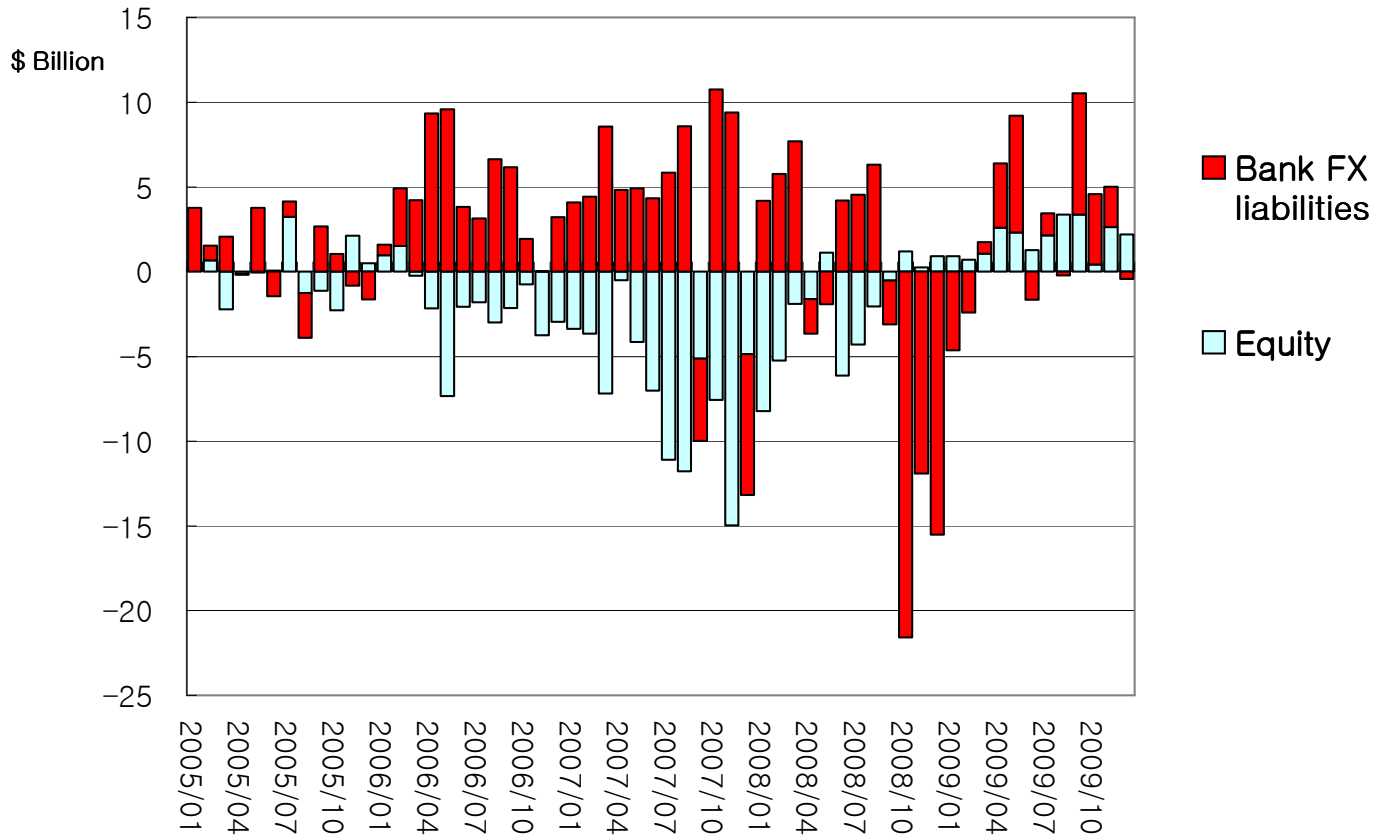


Figure 15. Capital flows for Korea in equity and banking sector (Source: Shin and Shin (2010), data from Bank of Korea)

Complexity and Non-Core Liabilities

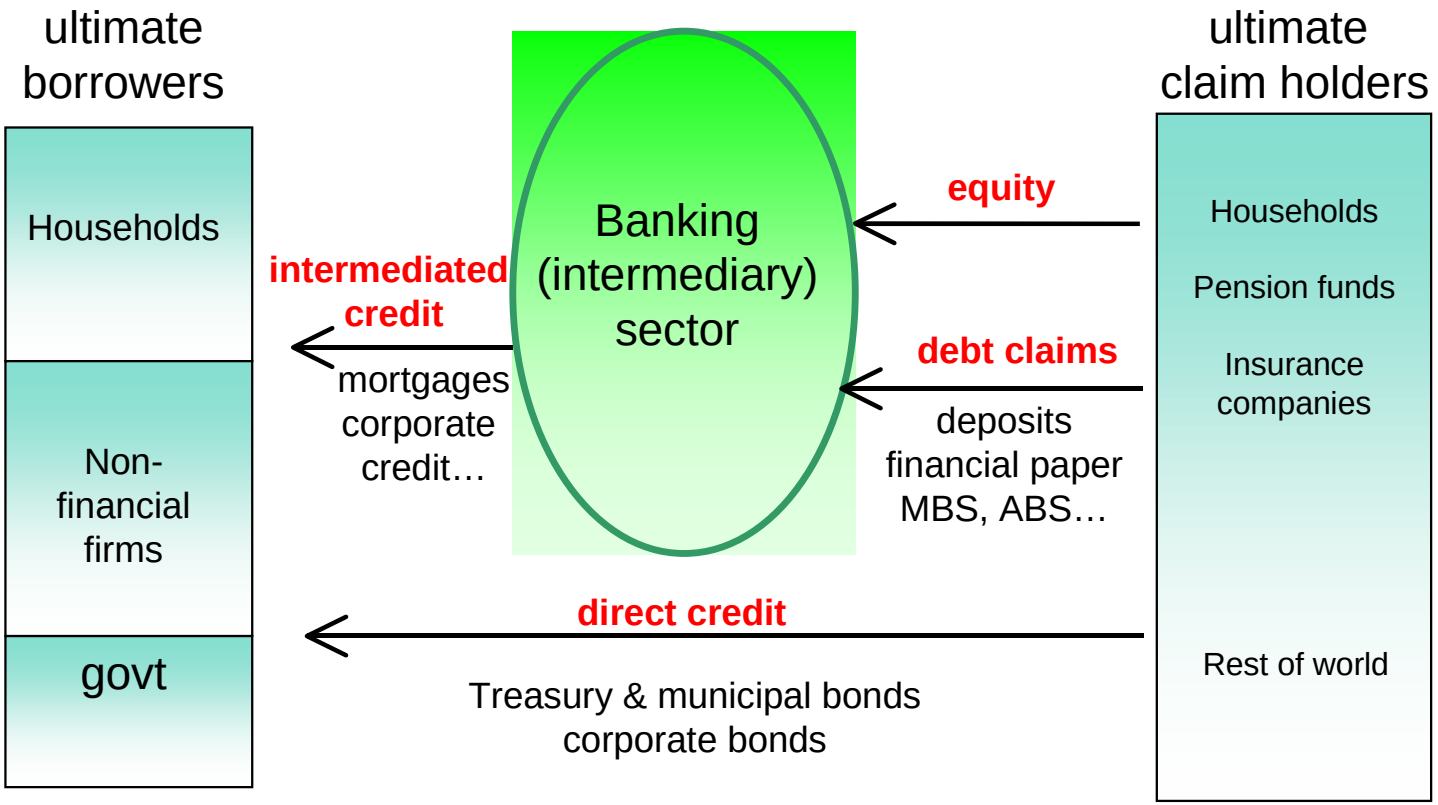


Figure 16. Stylized Financial System for Credit

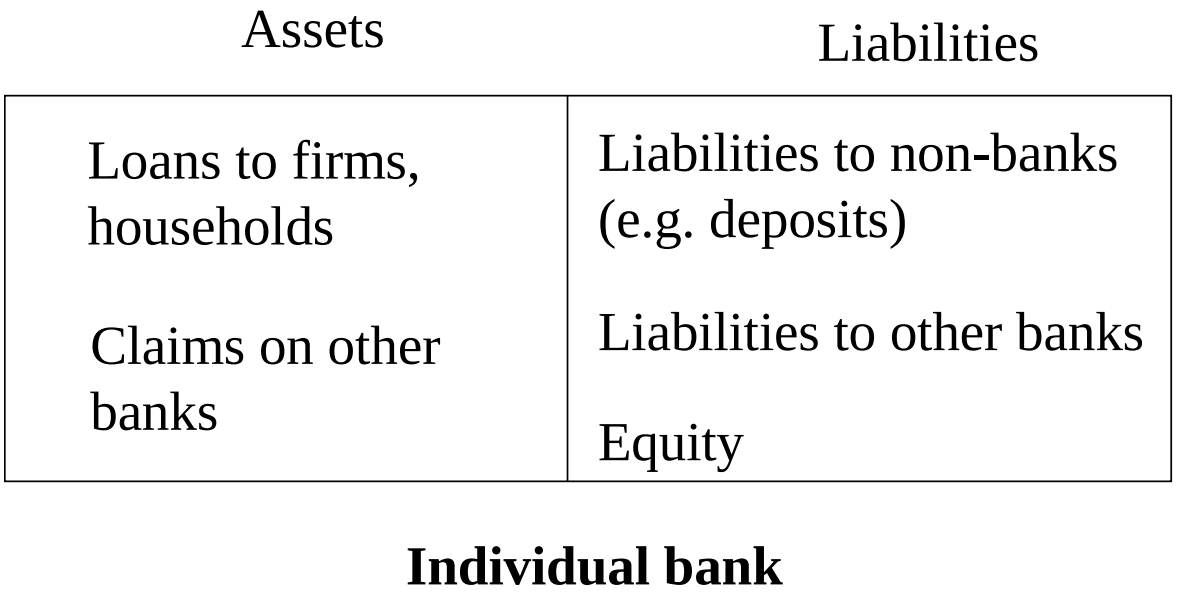


Figure 17. Balance Sheet of Individual Bank

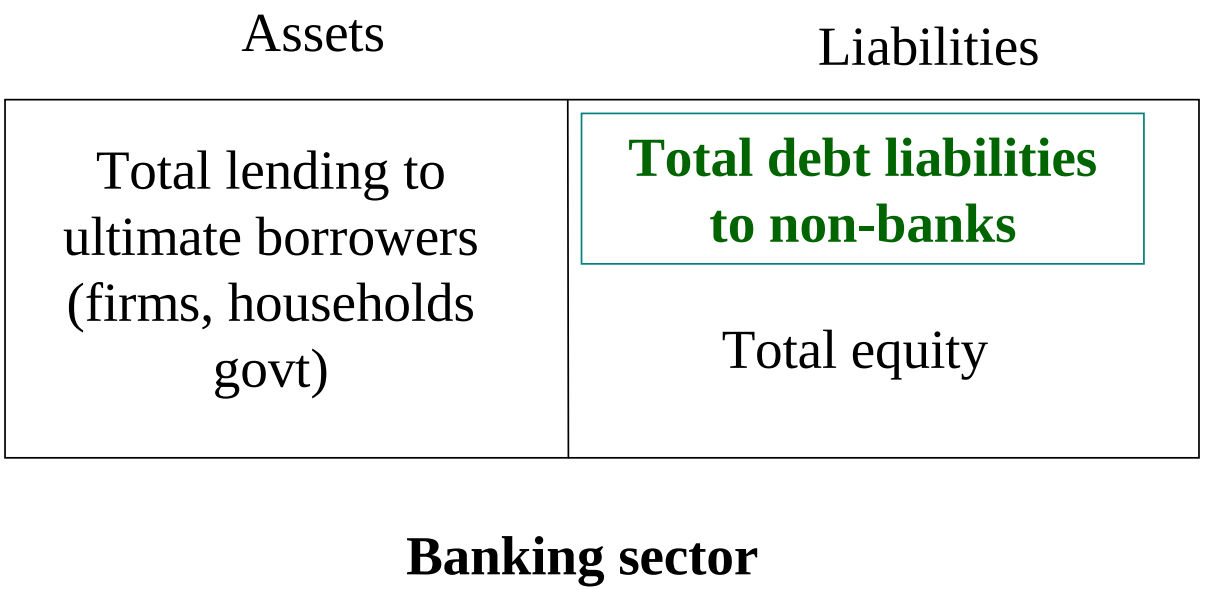


Figure 18. Aggregate Balance Sheet of Banking Sector

An Accounting Identity

Aggregate lending and aggregate funding satisfy:

$$\sum_{i=1}^{n} y_i = \sum_{i=1}^{n} e_i z_i \left(\lambda_i - 1\right) + \sum_{i=1}^{n} e_i$$

where

z_i is proportion of bank i's liabilities held by non-banks

λ_i is leverage of bank i

e_i is equity of bank i

An Accounting Identity

When leverage λ_i increases, but outside funding remains "sticky" the consequences are twofold:

- Non-core to core funding ratio increases for individual banks (z_i declines)
- Complexity of the system increases (z_i declines)

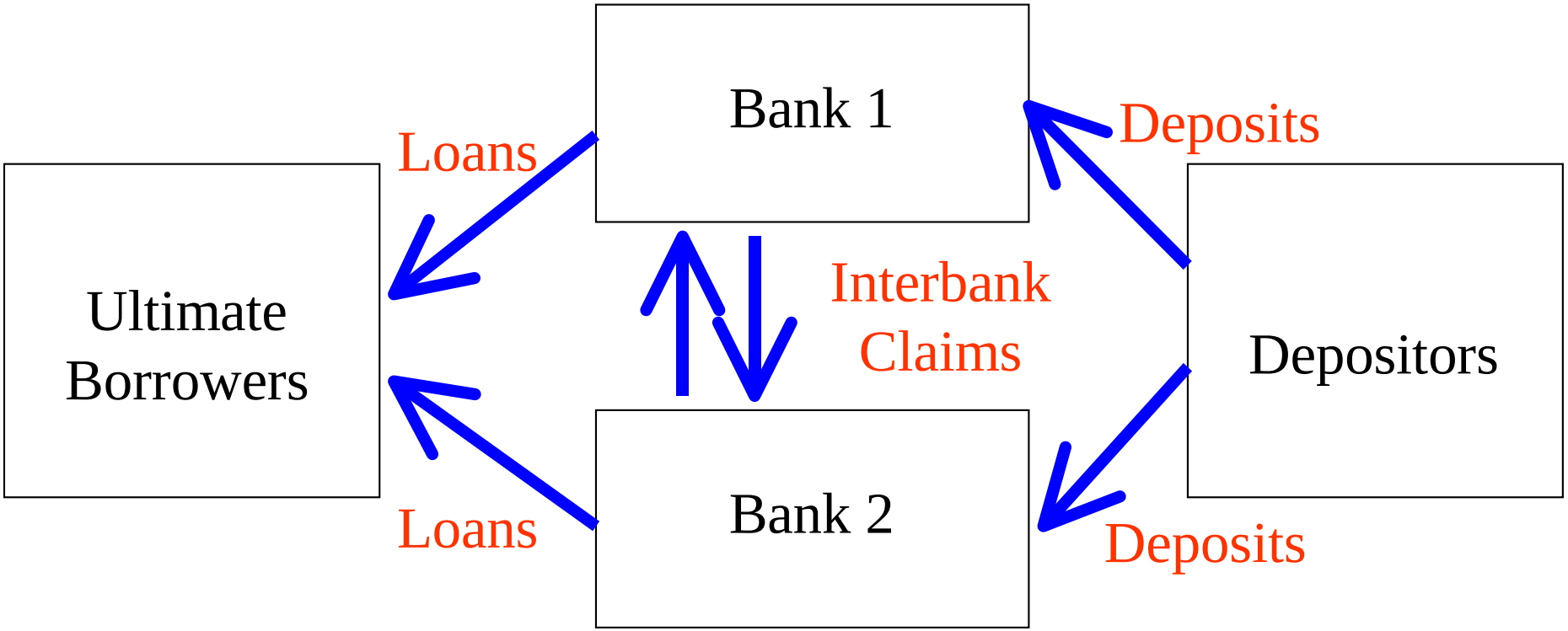
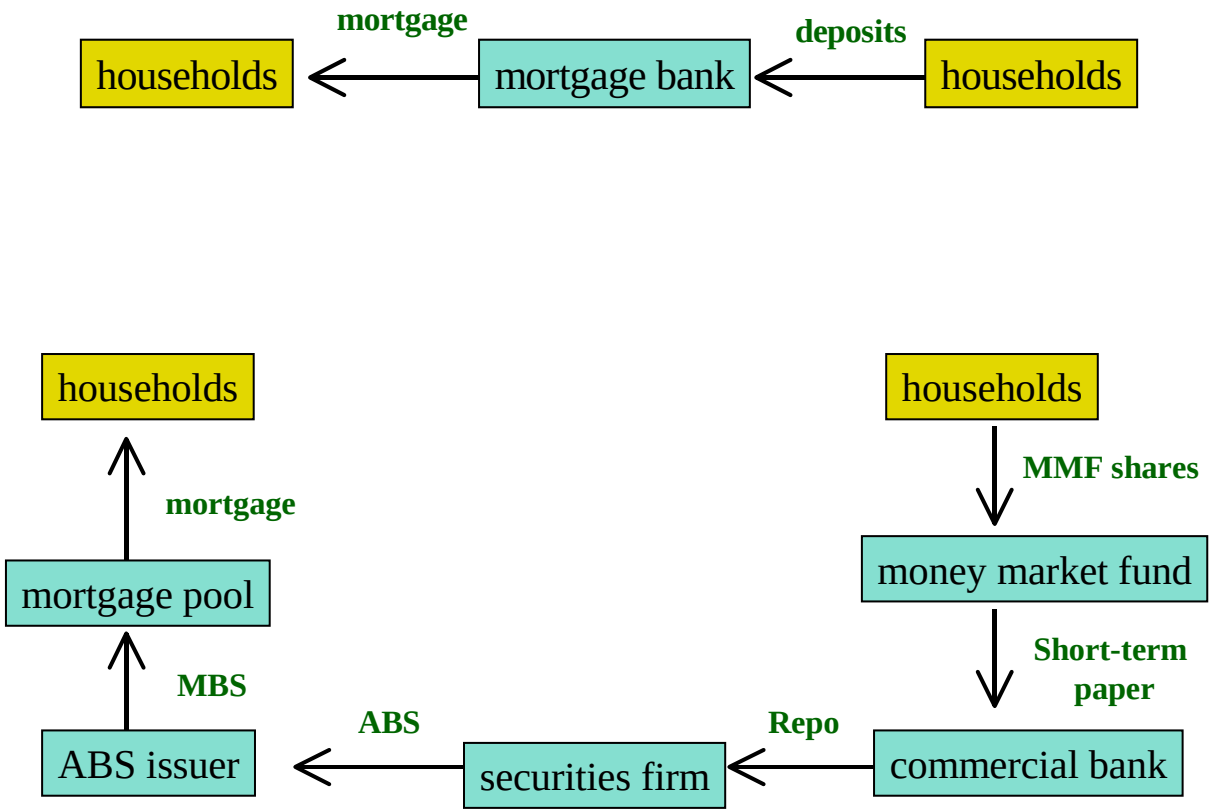


Figure 19. Complexity and leverage

Short and Long Intermediation Chains



Punchline (Again)

"If you take care of the aggregates, the complexity will take care of itself"

Implications for Early Warning Indicators

- Quantities matter
  - Credit
  - Bank liabilities
  - Monetary aggregates
- Ratio of non-core to core liabilities most informative
  - But what counts as non-core depends on financial system and context
- Double-counting adds to usefulness of the non-core measure
  - Double-counting matters when complexity increases
  - Double-counting enhances signal/noise ratio