The Corporate Finance of Banks and Firms

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(Based on joint work with Elena Carletti and Robert Marquez and with Xian Gu)

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Introduction

- In practice corporations are financed through equity and bond markets and loans from banks and other financial institutions
- Banks compete with firms in equity and bond markets
- The academic literature tends to focus on markets or banks but both are important in practice
- The reliance on markets and financial institutions varies significantly across countries

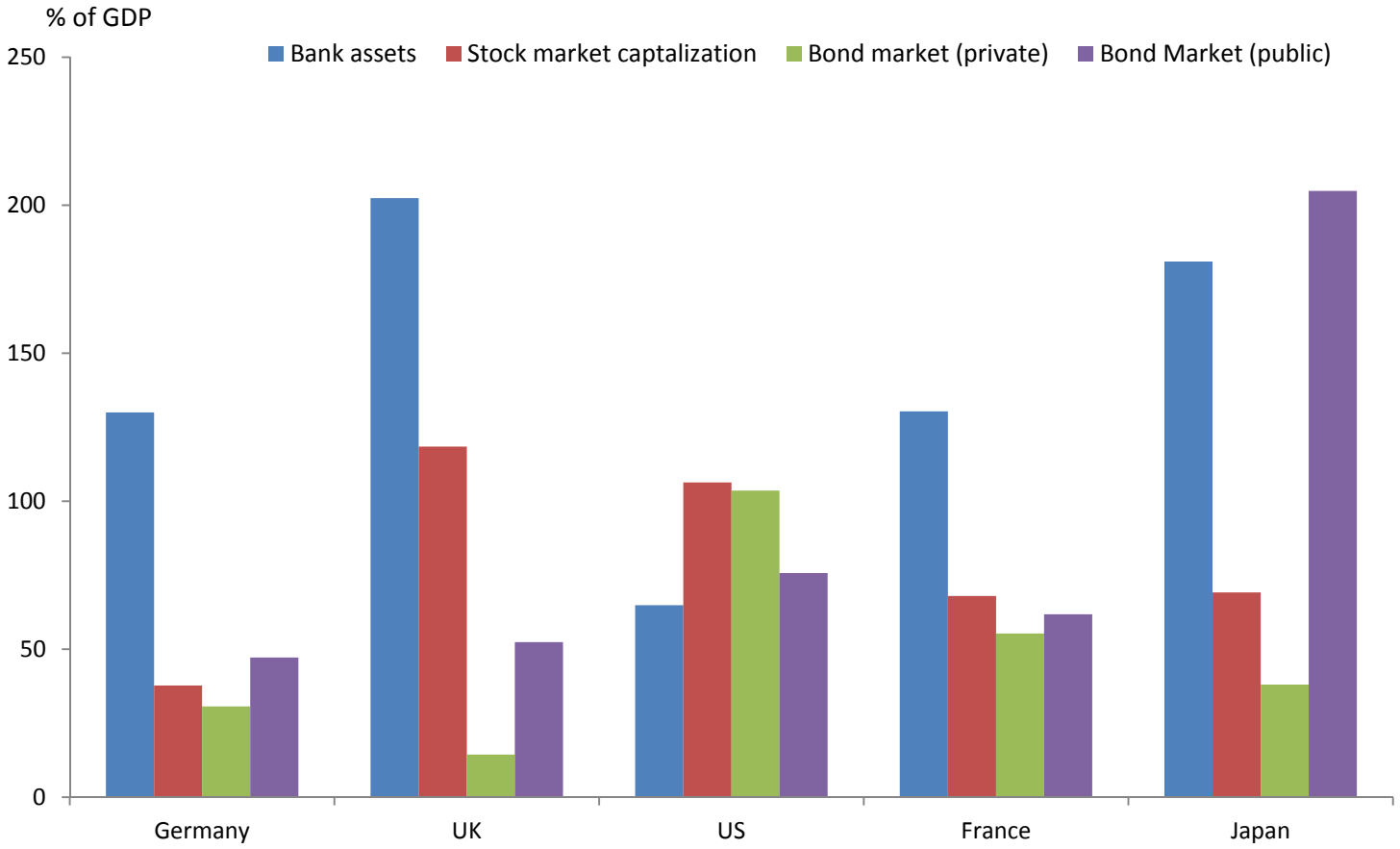
Data and Other Issues

There are many data issues when comparing financial markets, banks, and other financial institutions in different countries including:

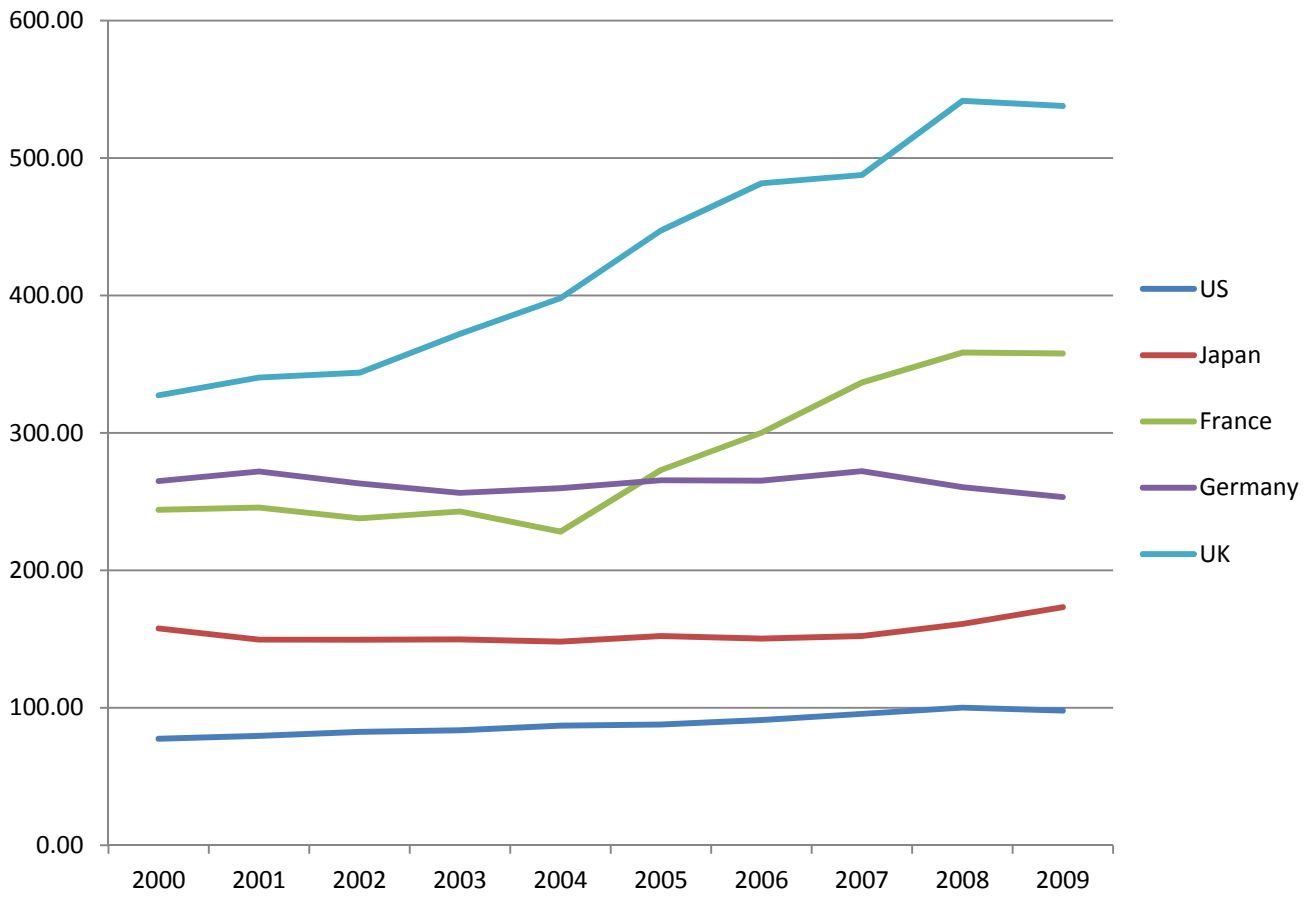
- Accounting differences
- Mix of organizational forms (commercial vs. cooperative vs. public)
- Structural differences in business models
- Differences in the nature of assets and liabilities
- Legal issues

Where possible we use OECD data where they have tried as best as they could to make the data comparable and focus on France, Germany, Japan, the UK and US

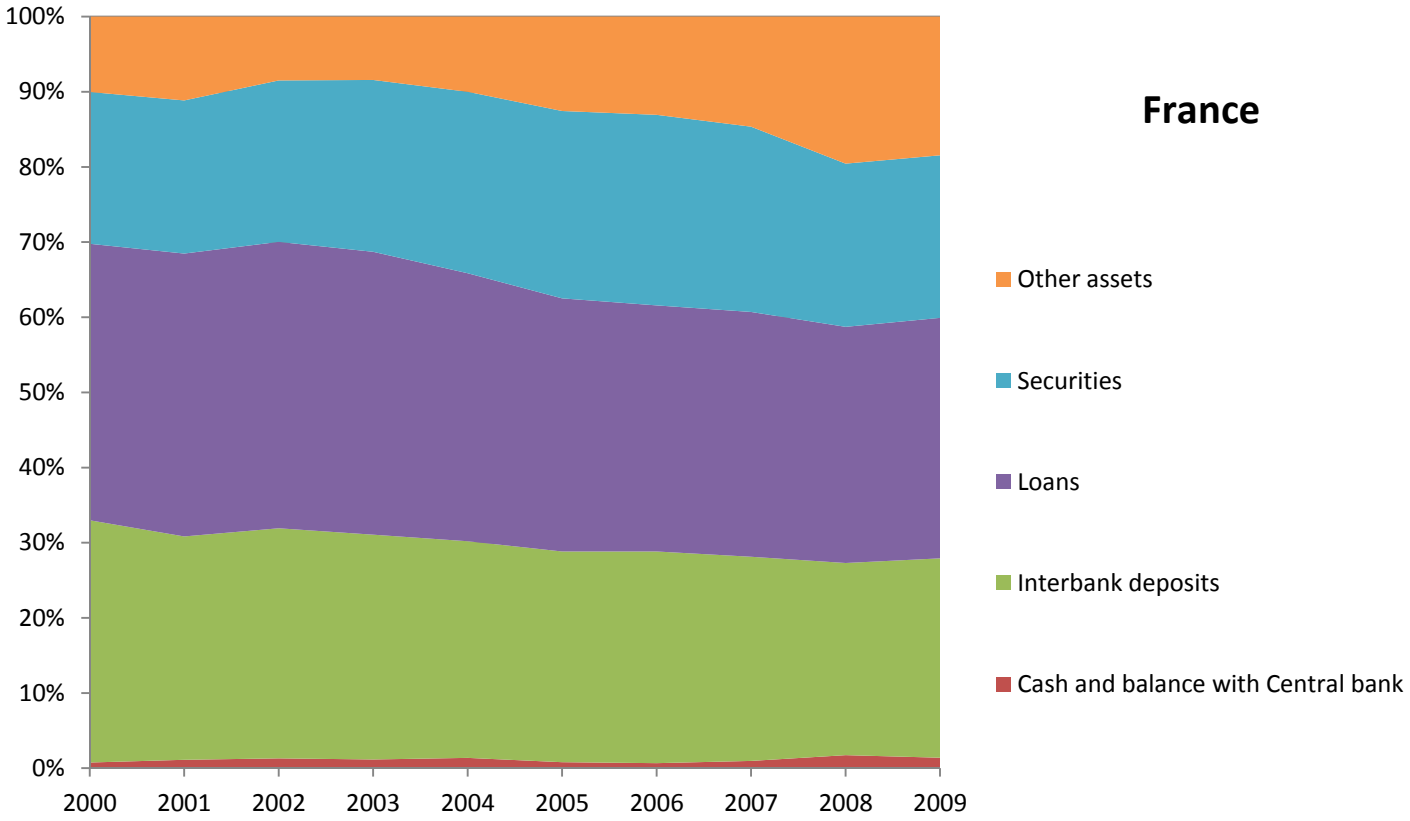
Comparison of Financial Systems 2009-2011 Average



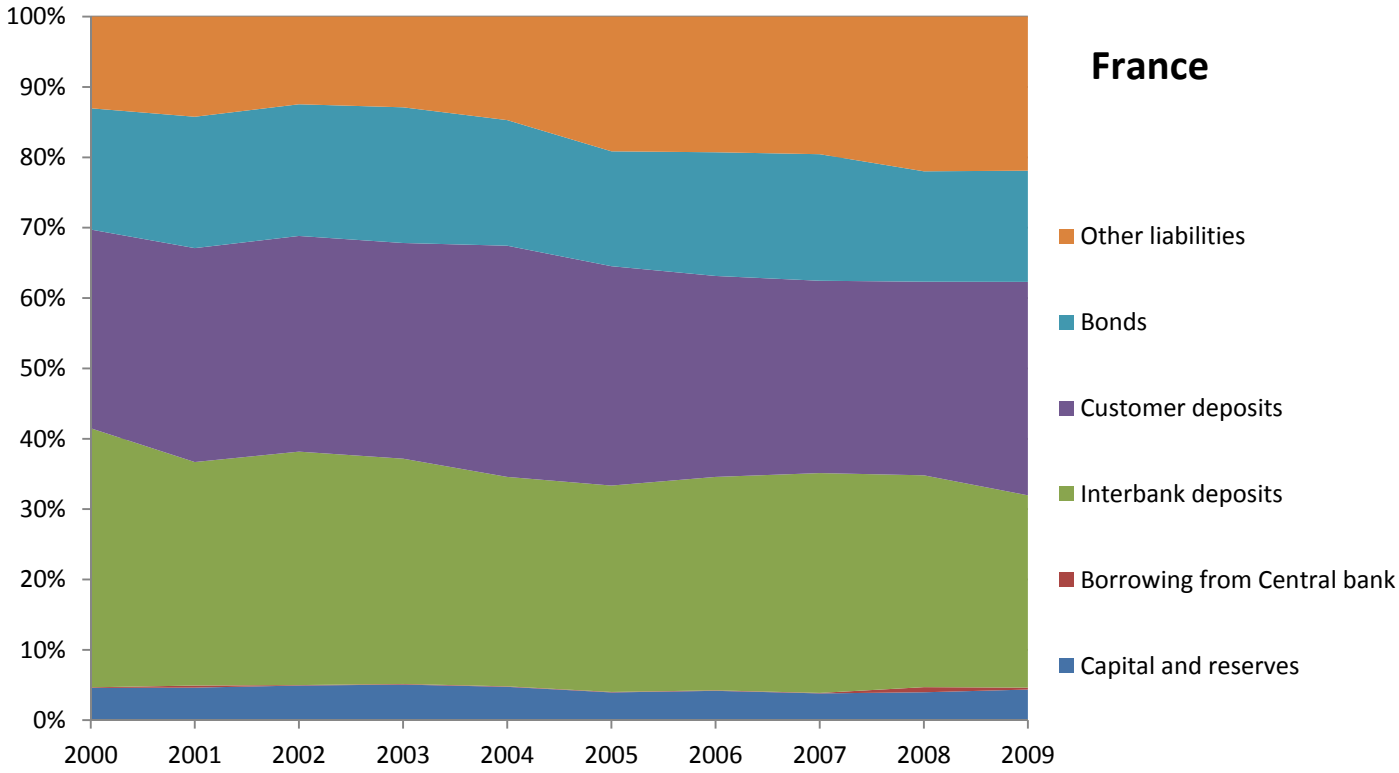
Comparison of Bank Assets/GDP



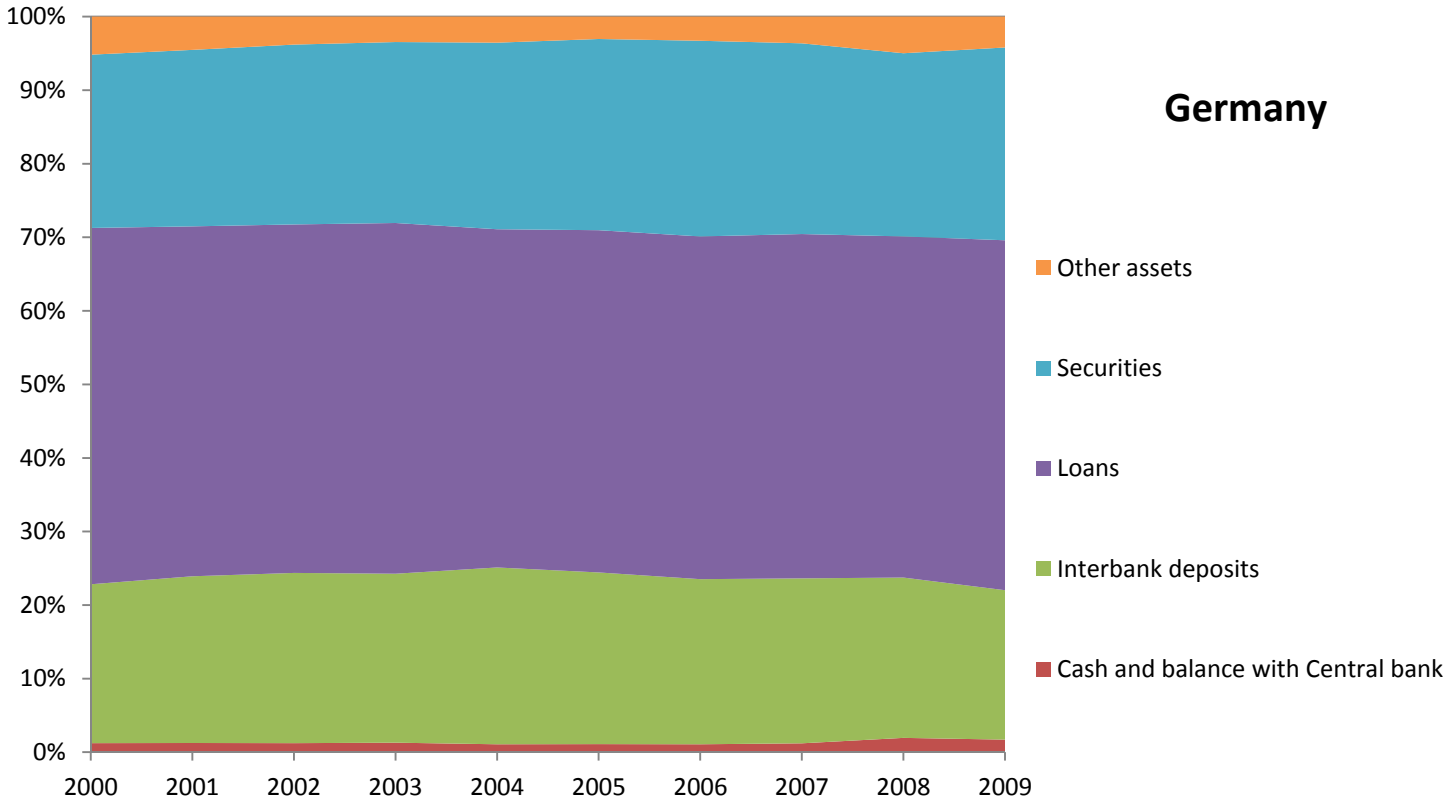
France - Assets



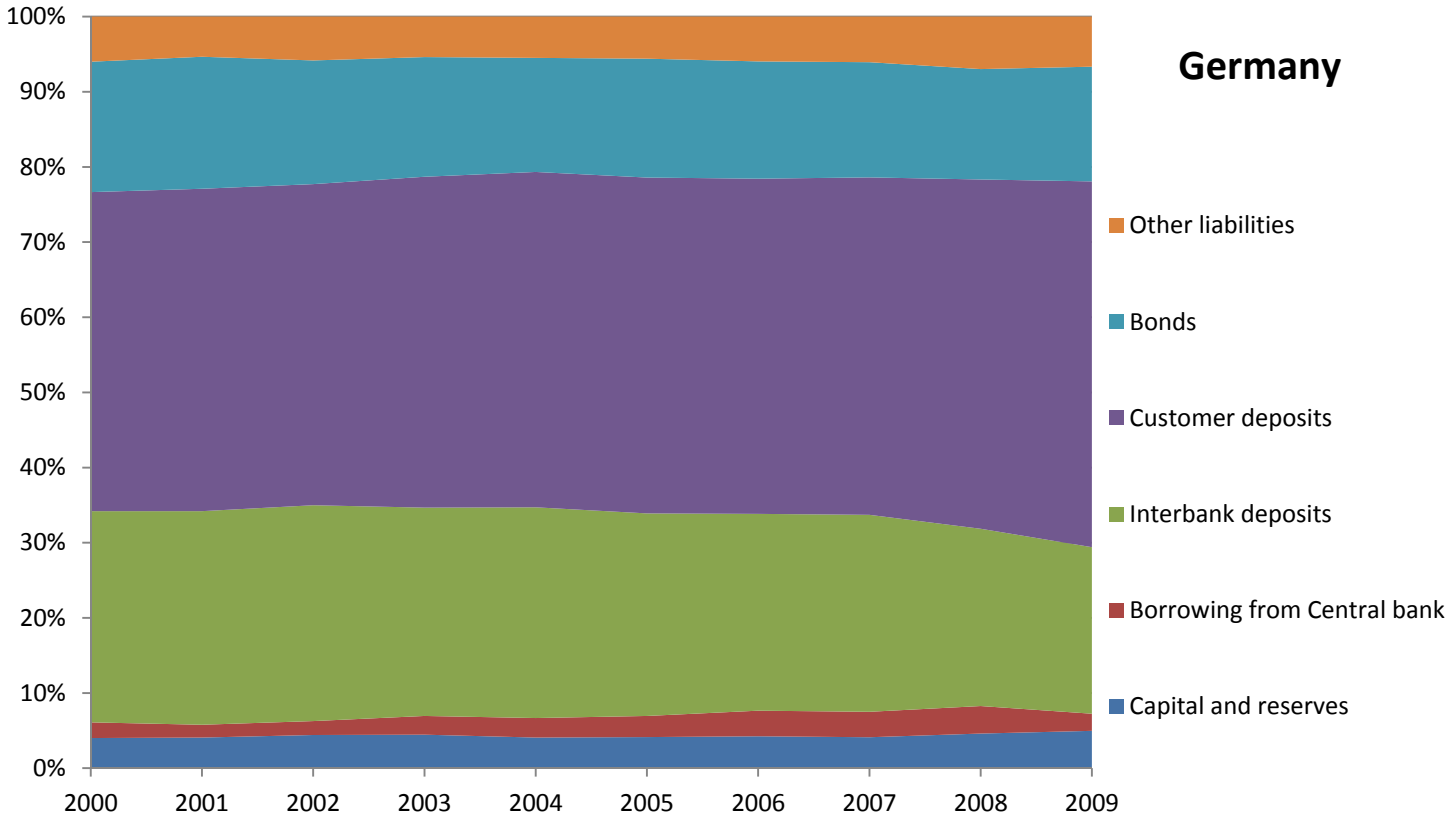
France - Liabilities



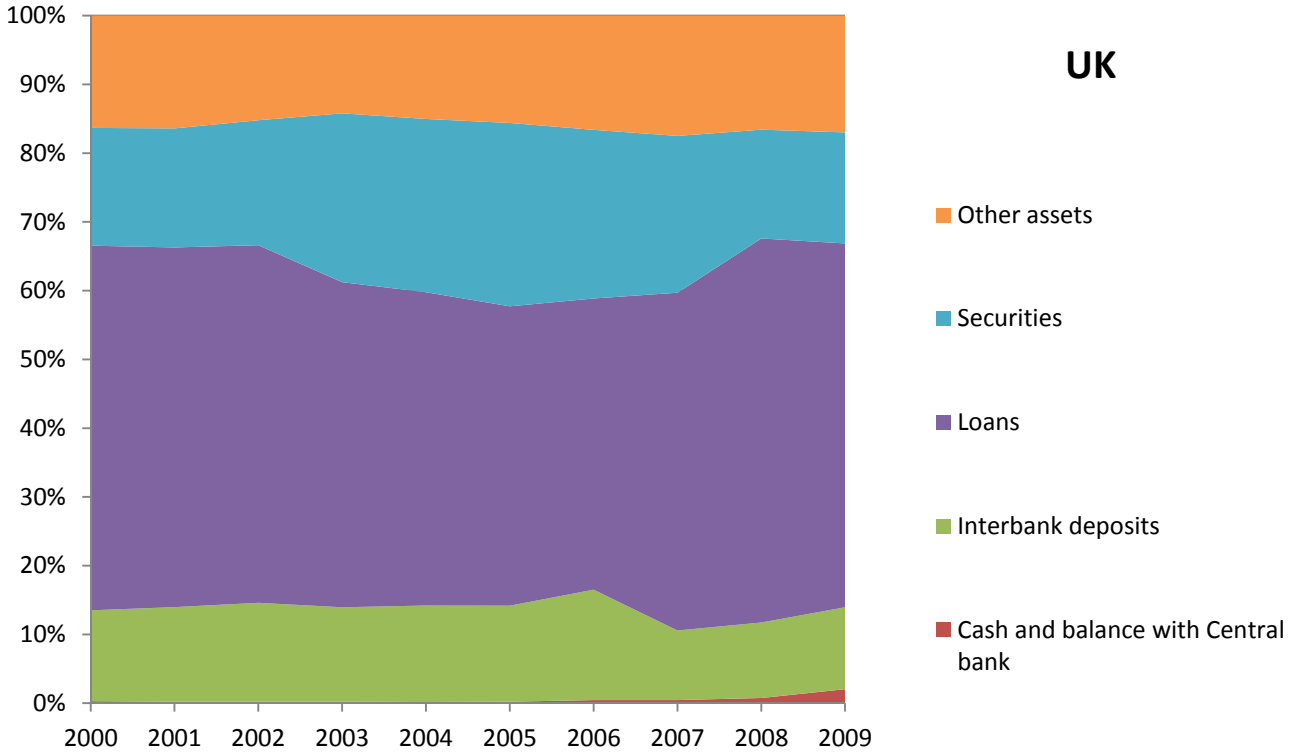
Germany - Assets



Germany - Liabilities



UK - Assets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UK
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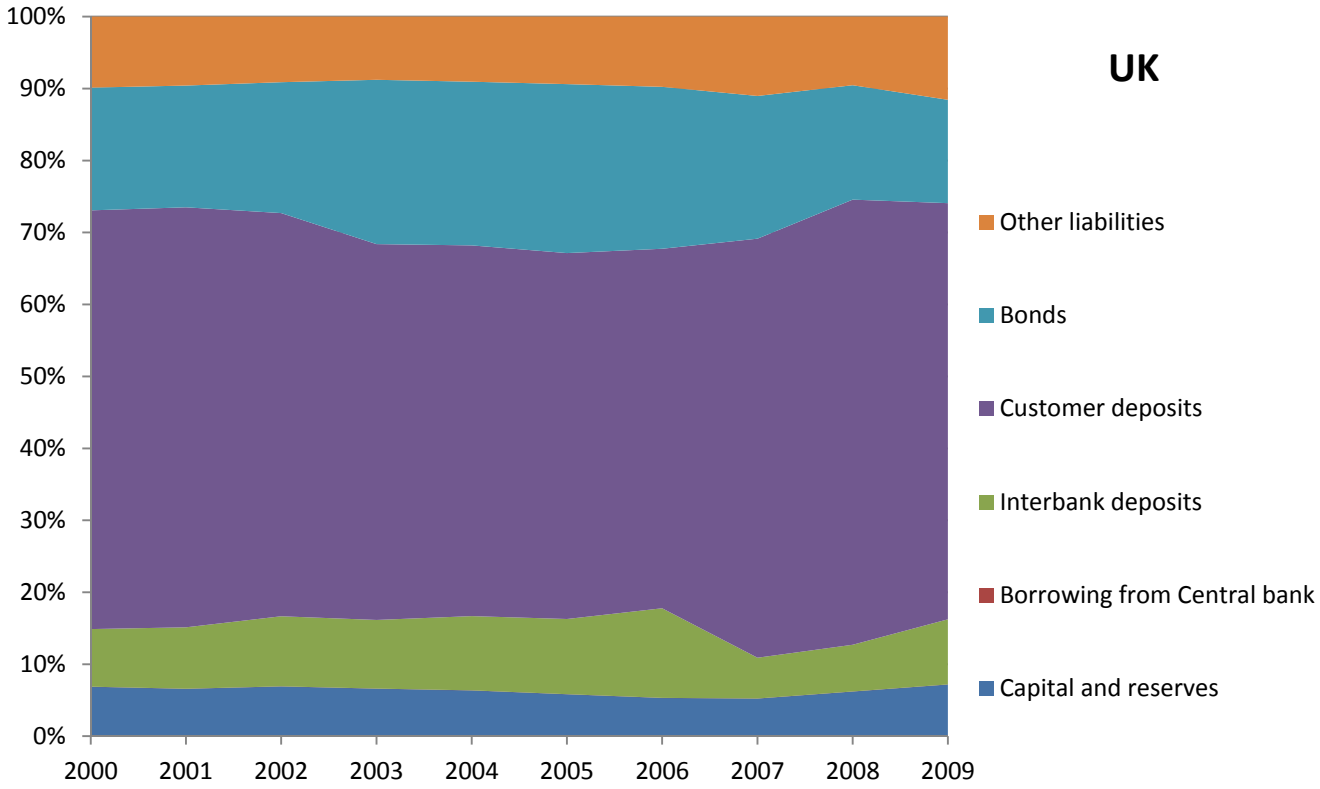
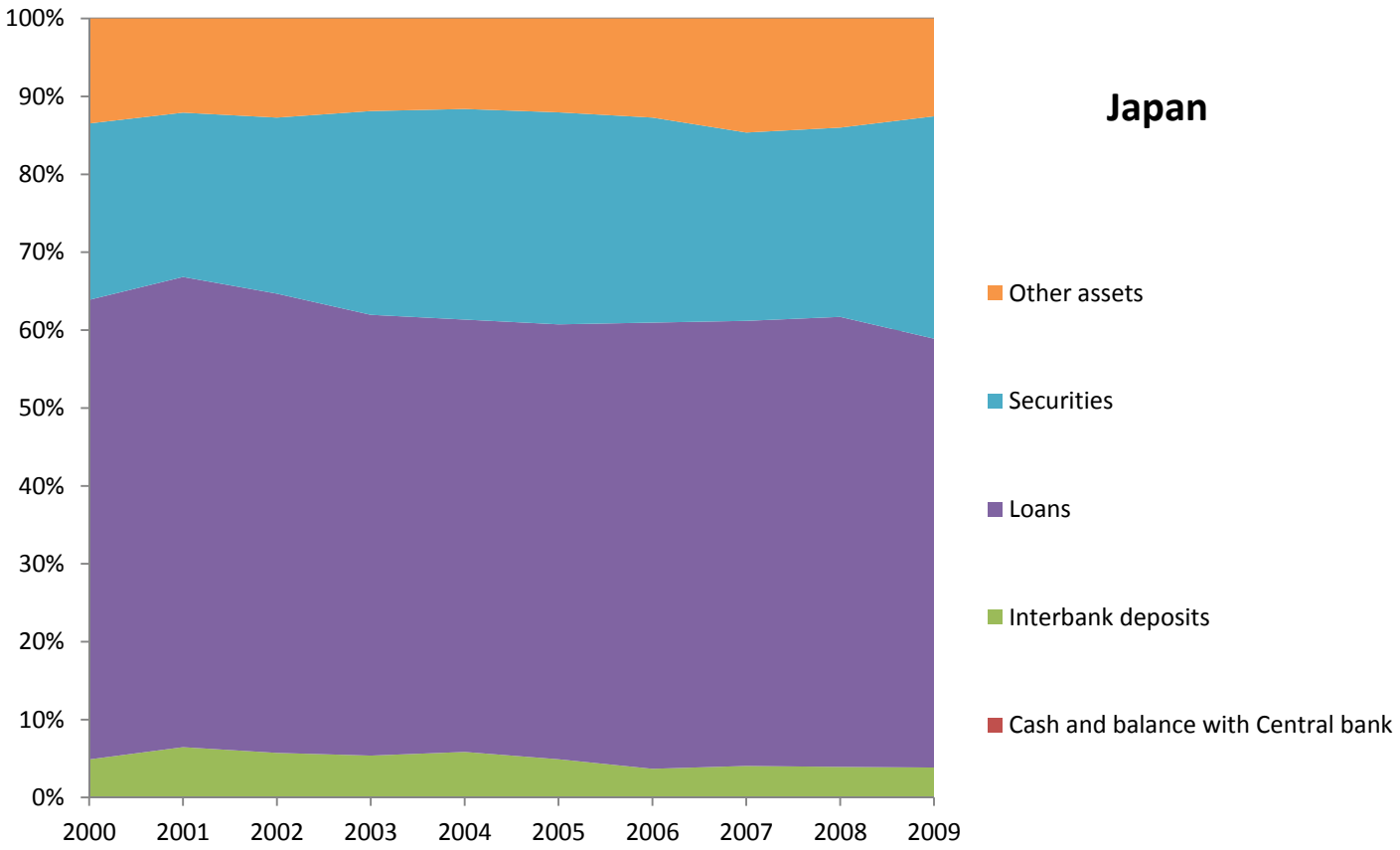
Loans
Interbank deposits
Cash and balance with Central bank

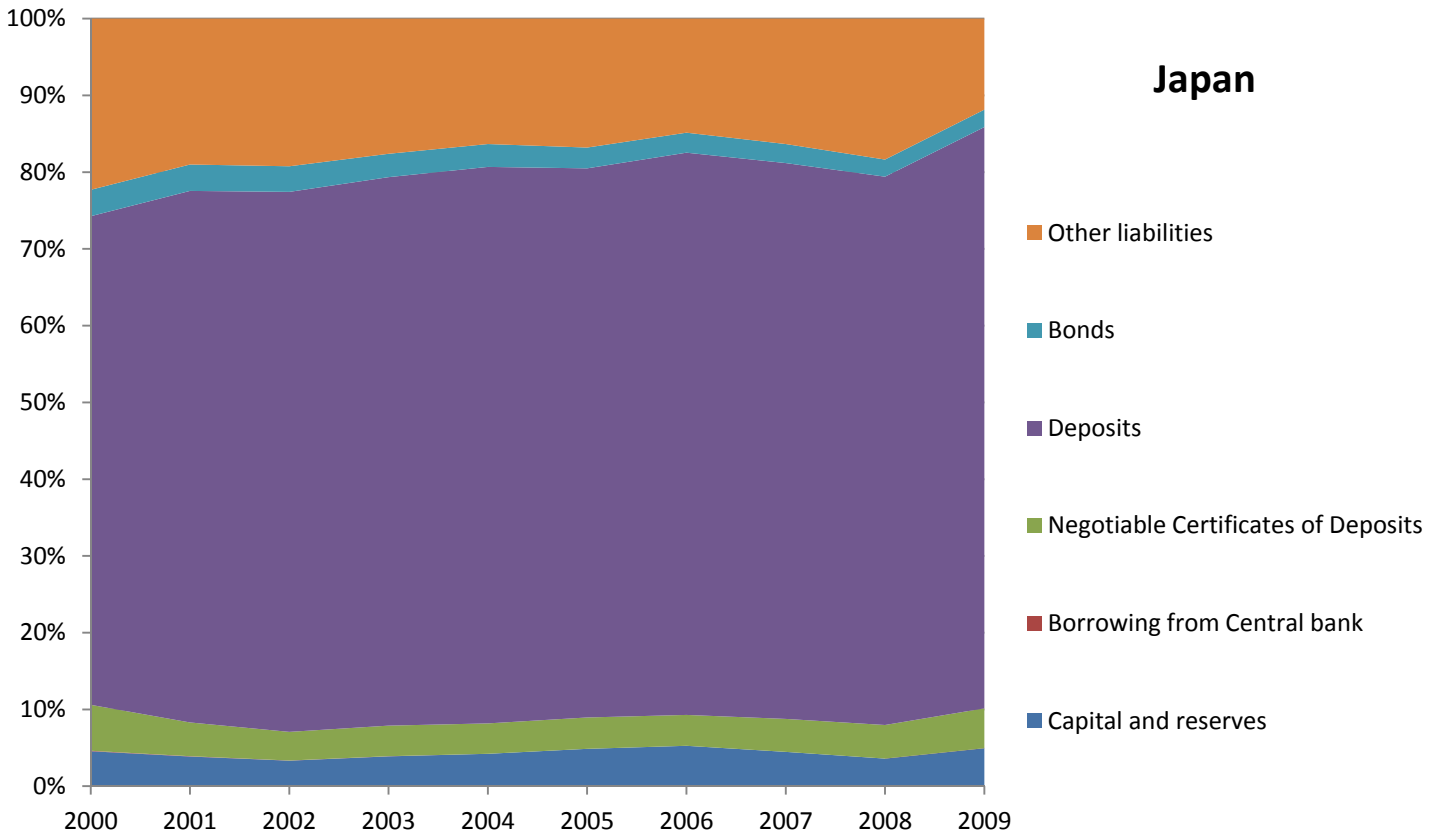
UK - Liabilities



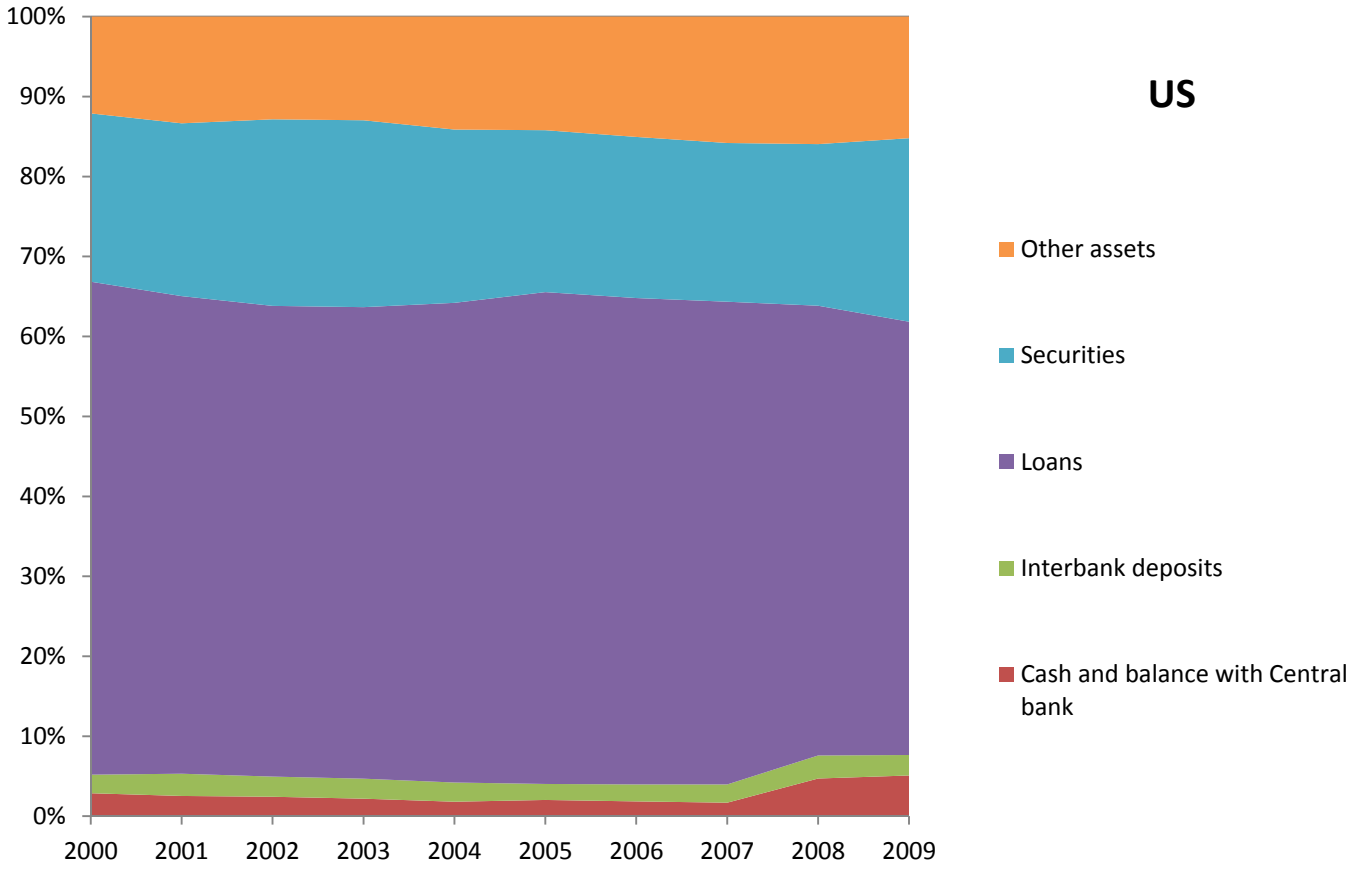
Japan - Assets



Japan - Liabilities



US - Assets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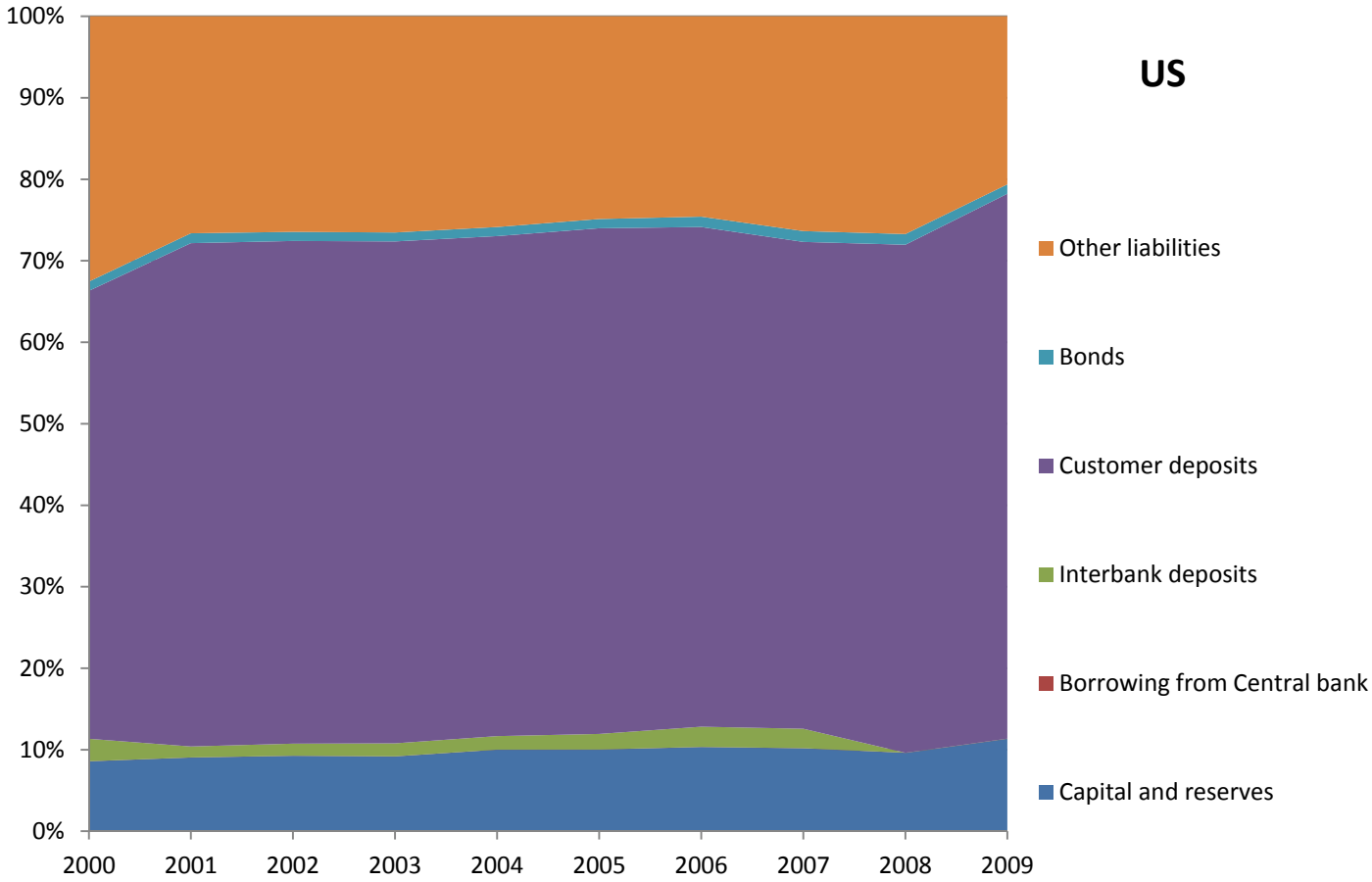
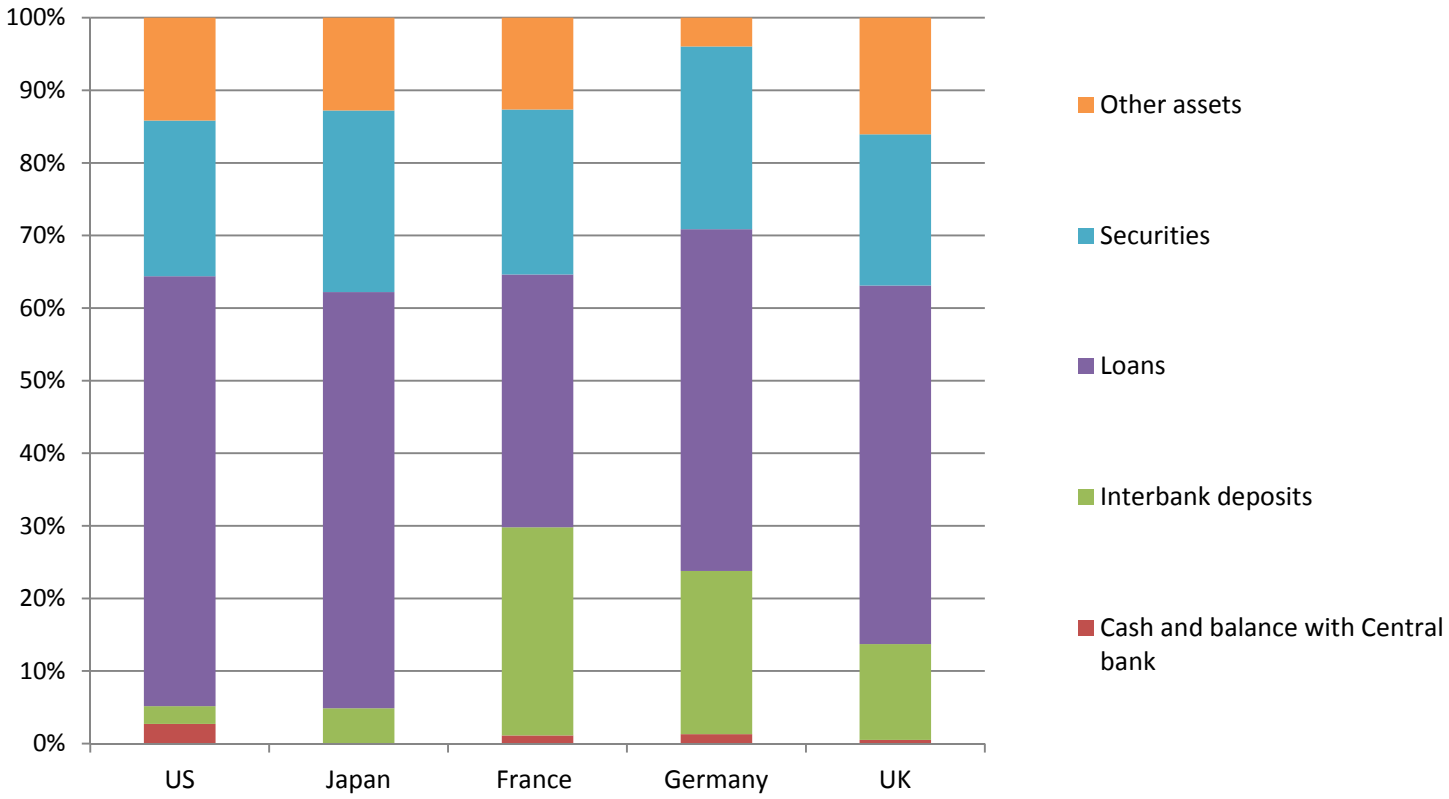
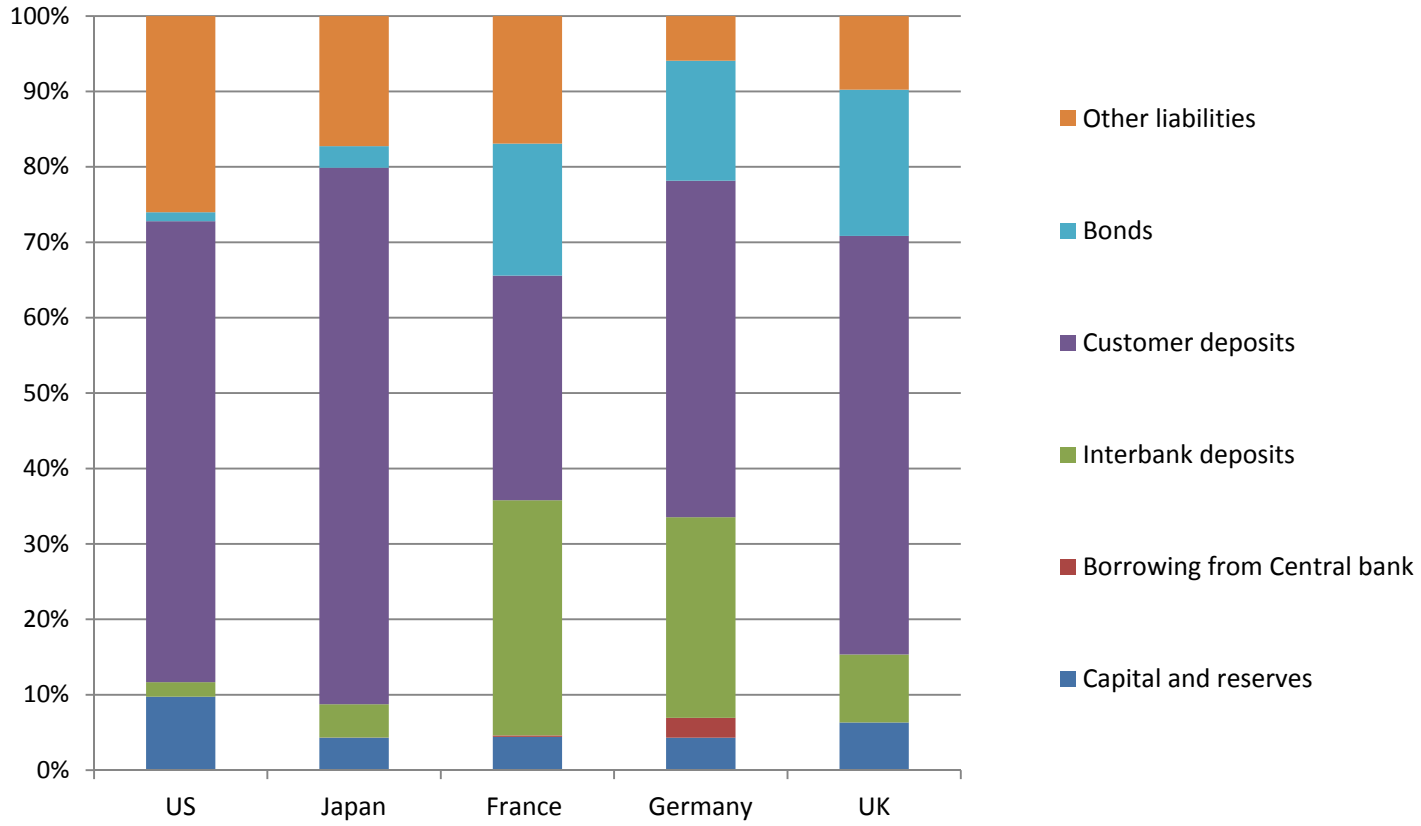
US - Liabilities



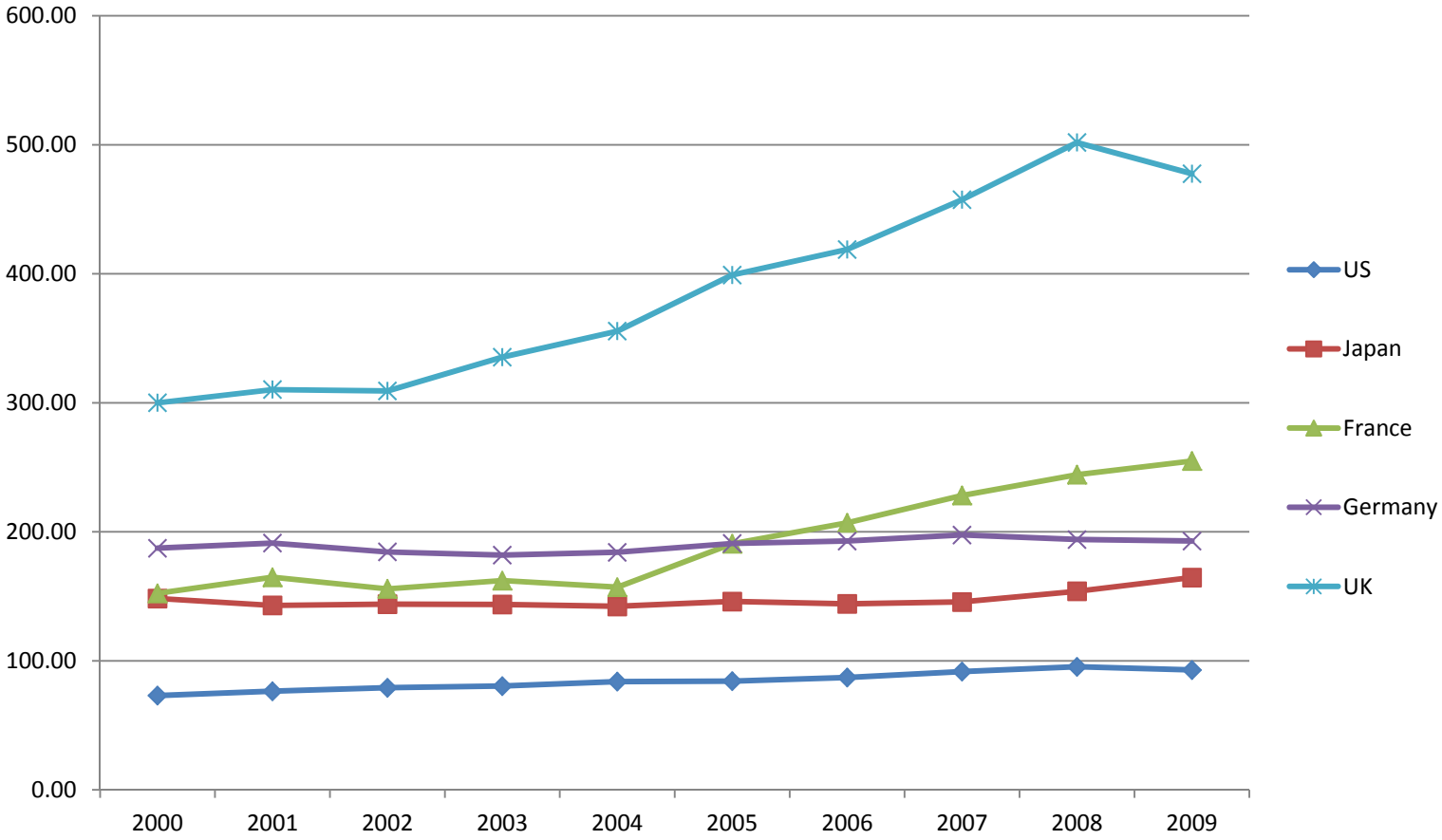
Assets: 10-year average (2000-2009)



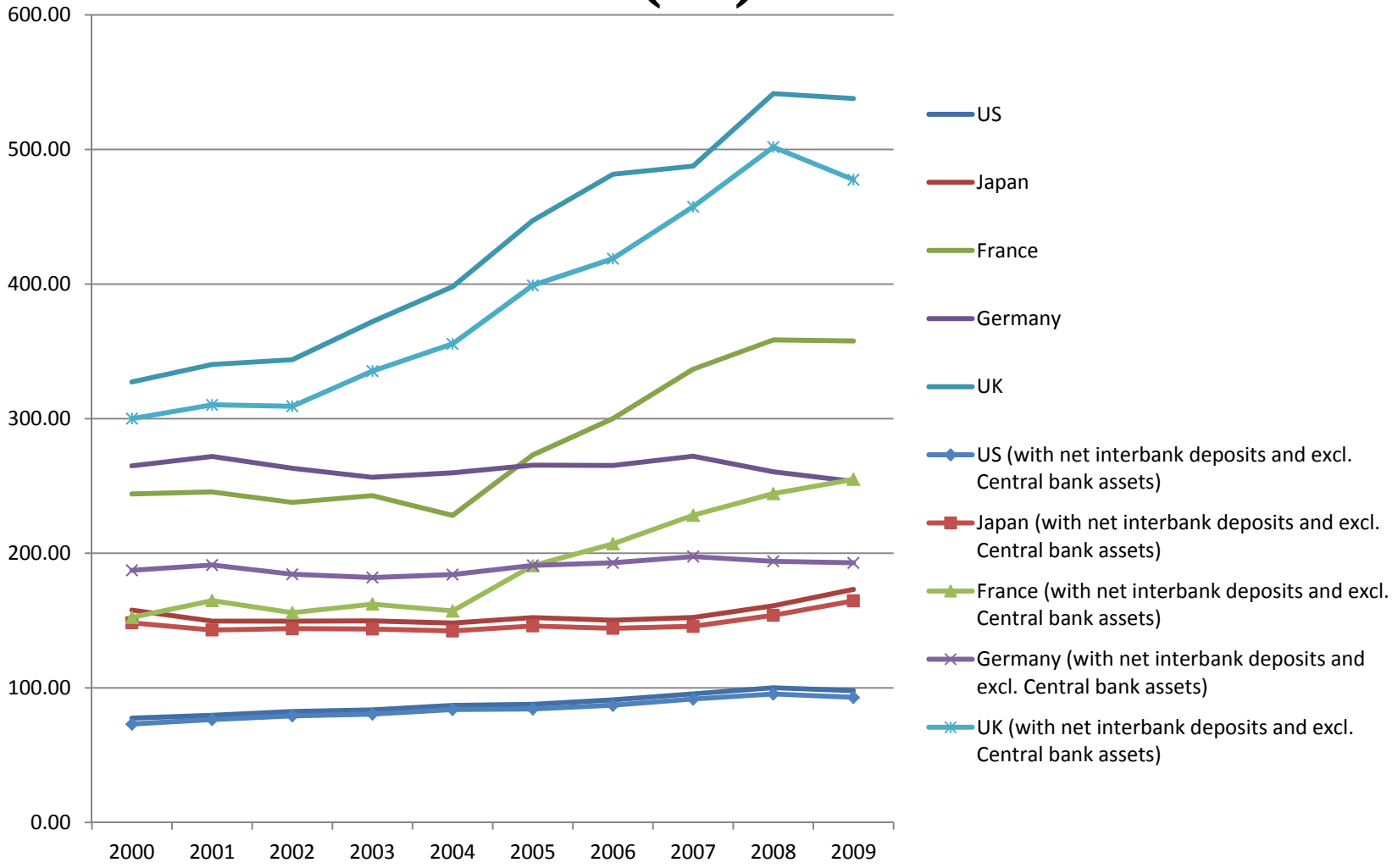
Liabilities: 10-year average (2000-2009)



Assets (with net interbank deposits and excl. central bank assets) to GDP (%)



Comparison of Gross and Net Assets to GDP (%)



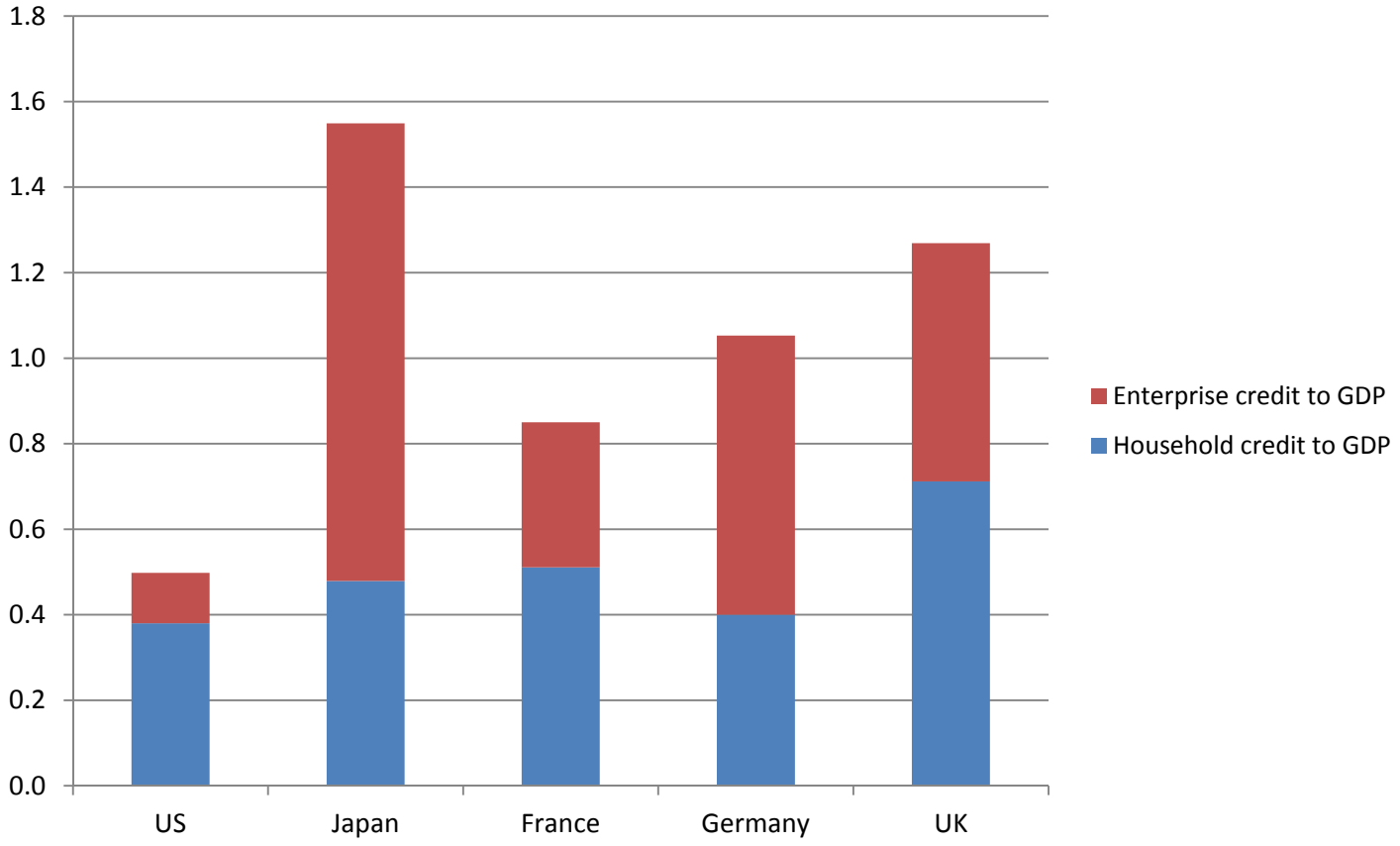
Issues Raised

- Size of banking systems in France, Germany and UK on a net basis are smaller than on a gross basis so it is important to be careful in comparing different financial systems to work in net terms for many issues
- We have focused on interbank markets as these are the easiest to measure but there is the same issue with regard to netting of securities and other assets and liabilities held within the banking system
- Cross country studies that do not do a careful job of working with net figures for the size of the banking system can be misspecified
- A related issue is how much local and central government financing is done through the banking system as opposed to bond markets

Issues Raised (cont.)

- Why are the interbank markets in France, Germany and UK significant in size while in Japan and the US they are less so?
- Theoretical work suggests interbank markets allow risk sharing (e.g. Bhattacharya and Gale (1987))
- Is risk sharing better in France, Germany and UK than in Japan and the US or are there other mechanisms such as derivatives at work?
- More research is needed to understand these differences

Household versus Corporate Lending (1994-2005)

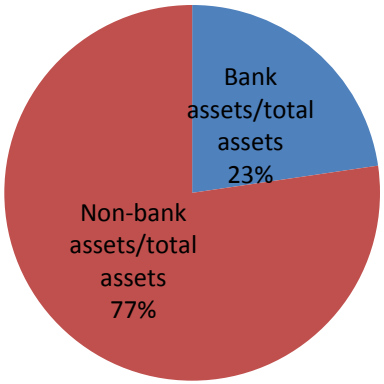


Non-bank Finance

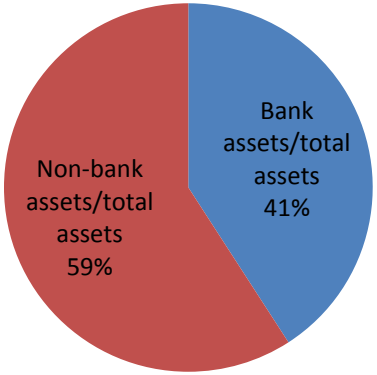
- We now turn to non-bank finance
- Initially we consider the size of the non-bank financing sector relative to the banking sector and see this varies substantially
- Next we consider the structure of the non-bank sector and see that it also differs substantially across countries
- It is again an interesting question why this is the case

Banking assets versus Non-banking assets in 2009

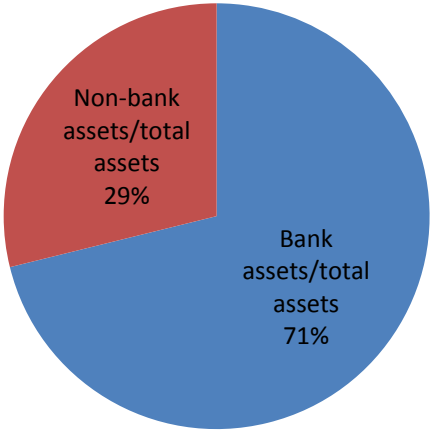
US



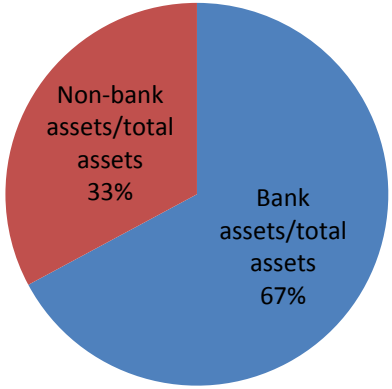
Japan



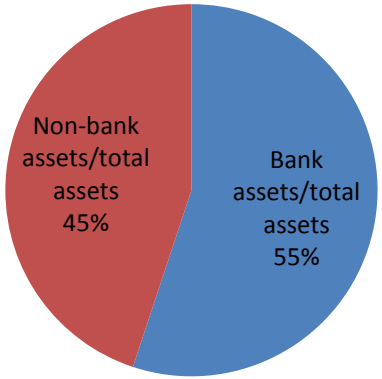
UK



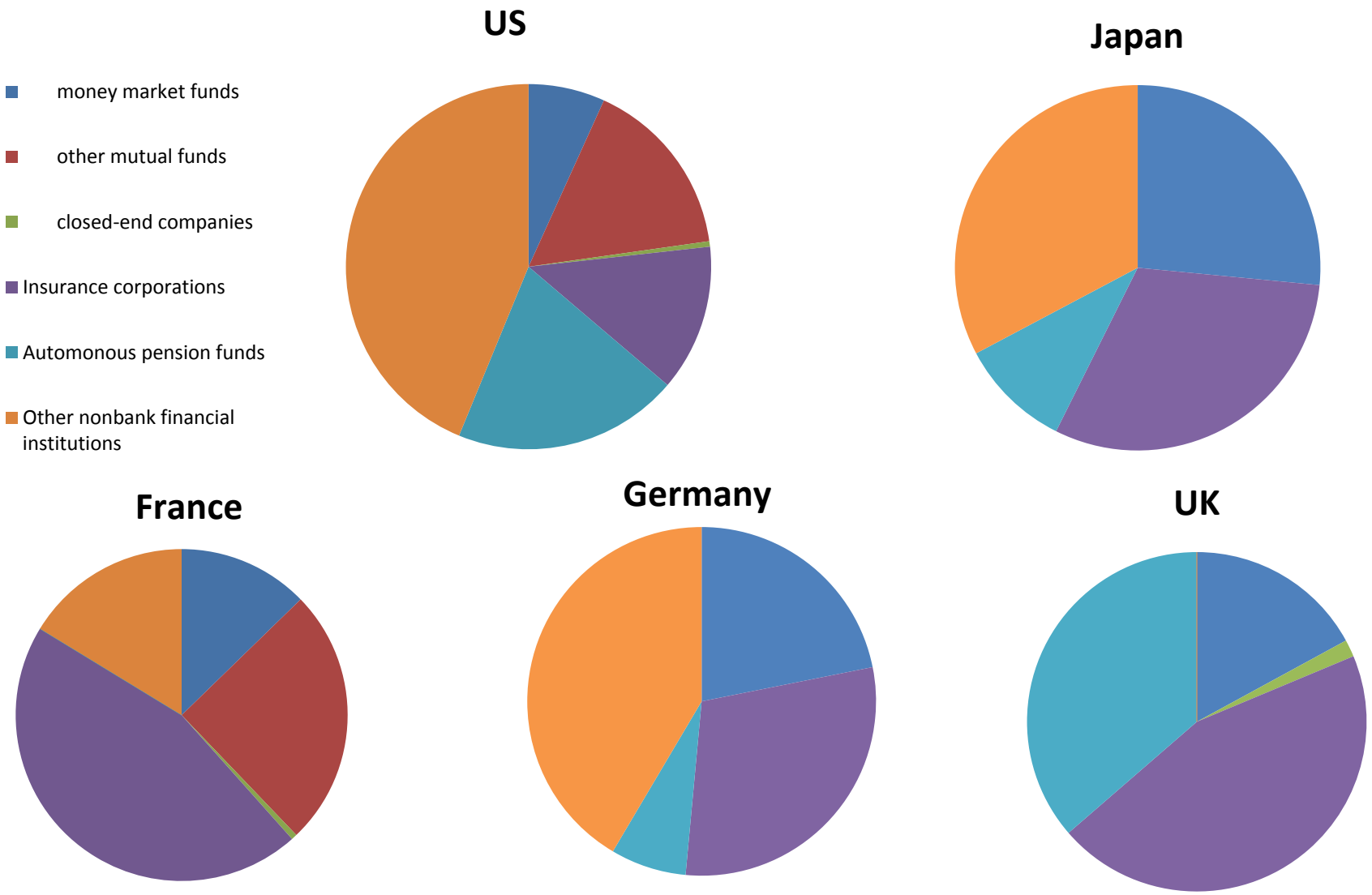
France



Germany



Structure of non-banking sector in 2009

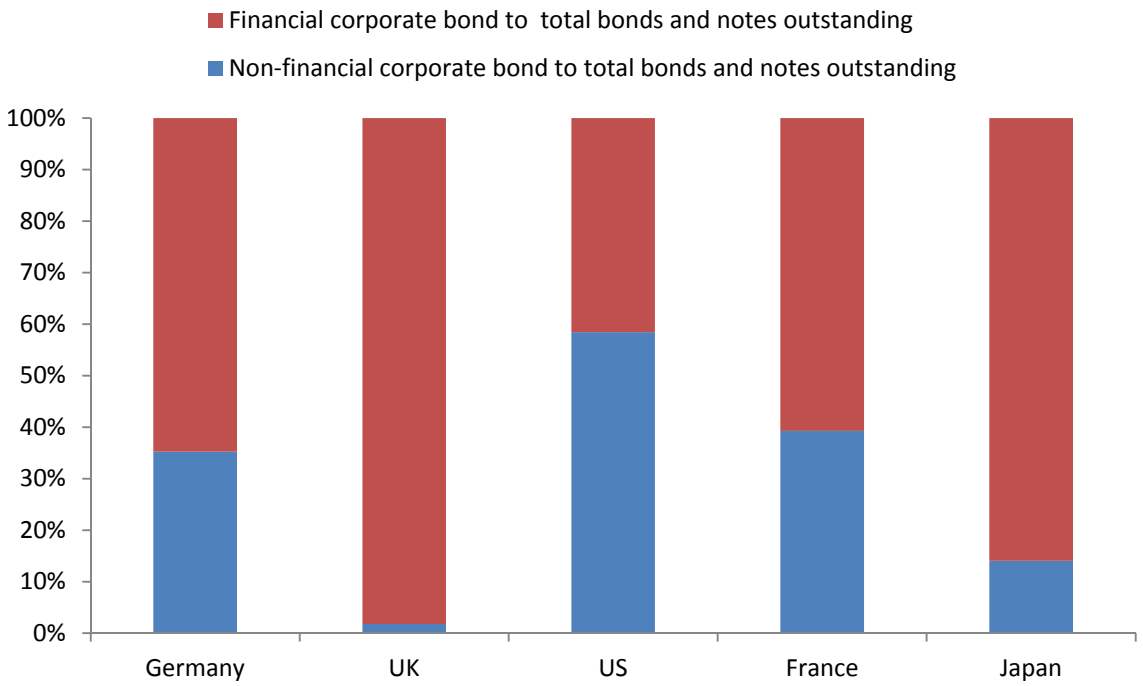


Note: For Japan and Germany, money market funds, other mutual funds and closed-end companies are aggregated together; for the UK, money market funds and other mutual funds are aggregated together.

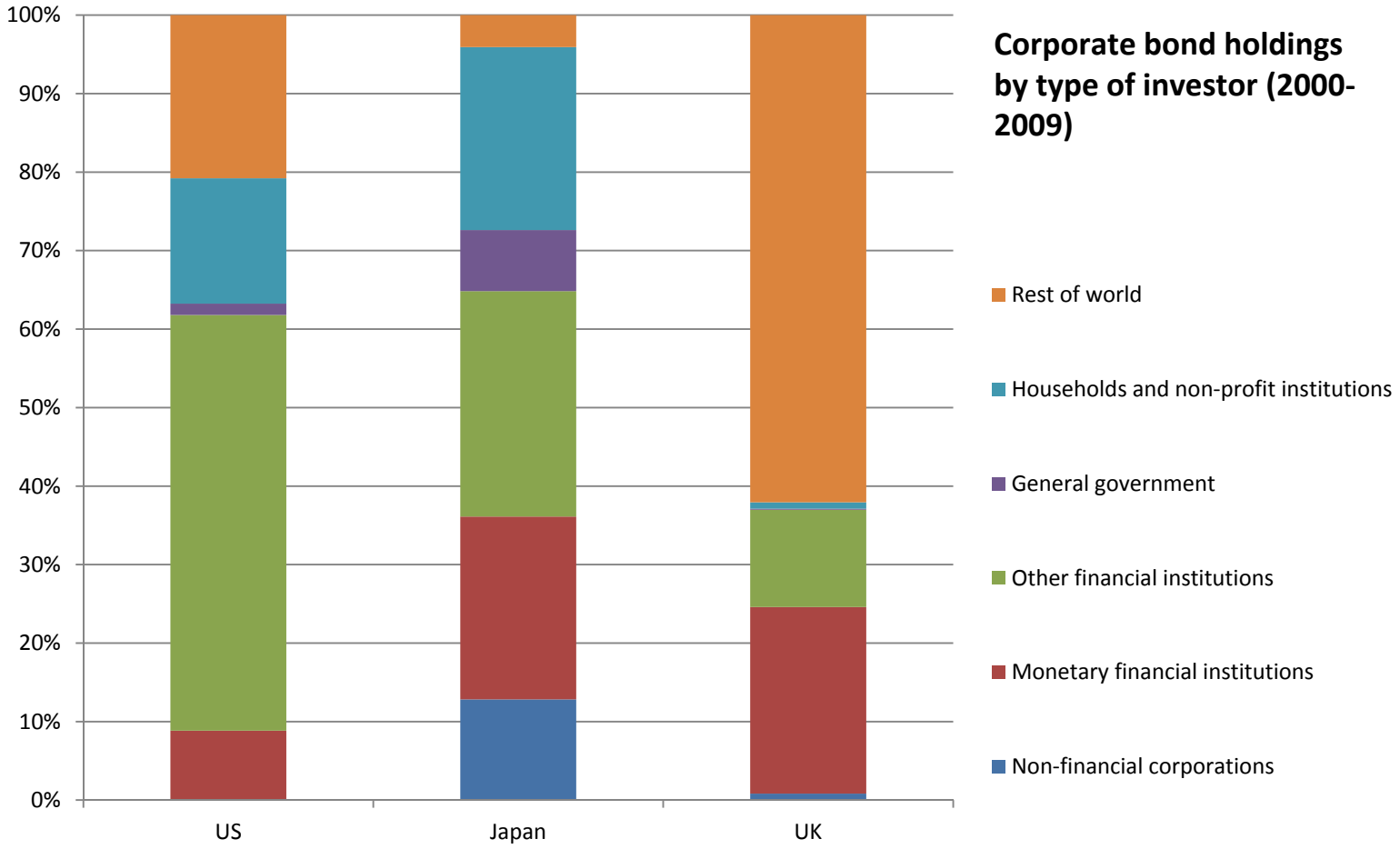
What about Bond Markets?

- In many countries such as the US, UK, and France household finance is the majority of banks' activities
- What about loans to enterprises? In this case bond markets may be able to substitute for banks' in lending
- But are bond markets for financial institutions or non-financial corporations?

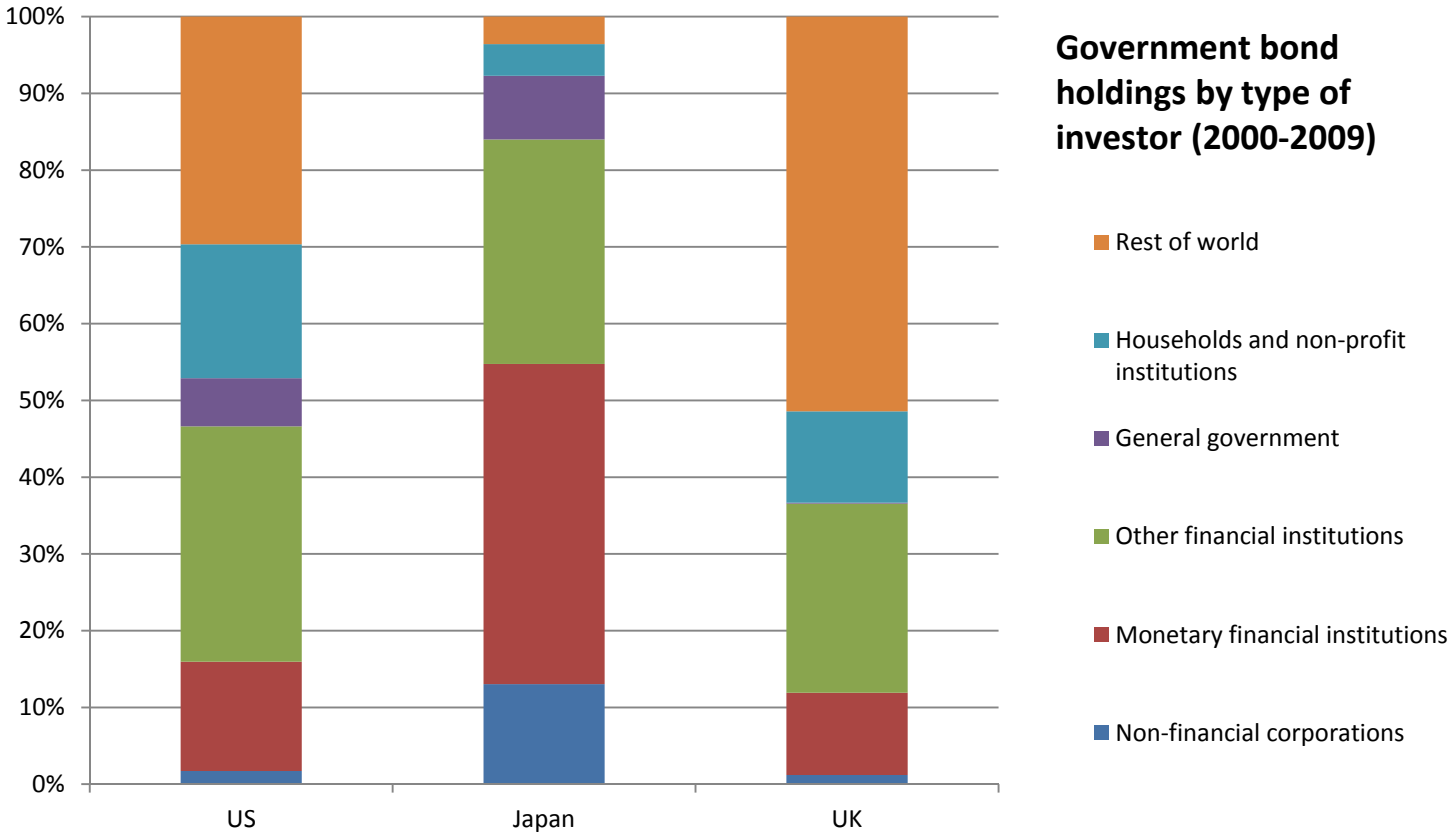
Bond Markets Use by Financial Institutions and Non-financial Corporations



Who Holds Corporate Bonds?



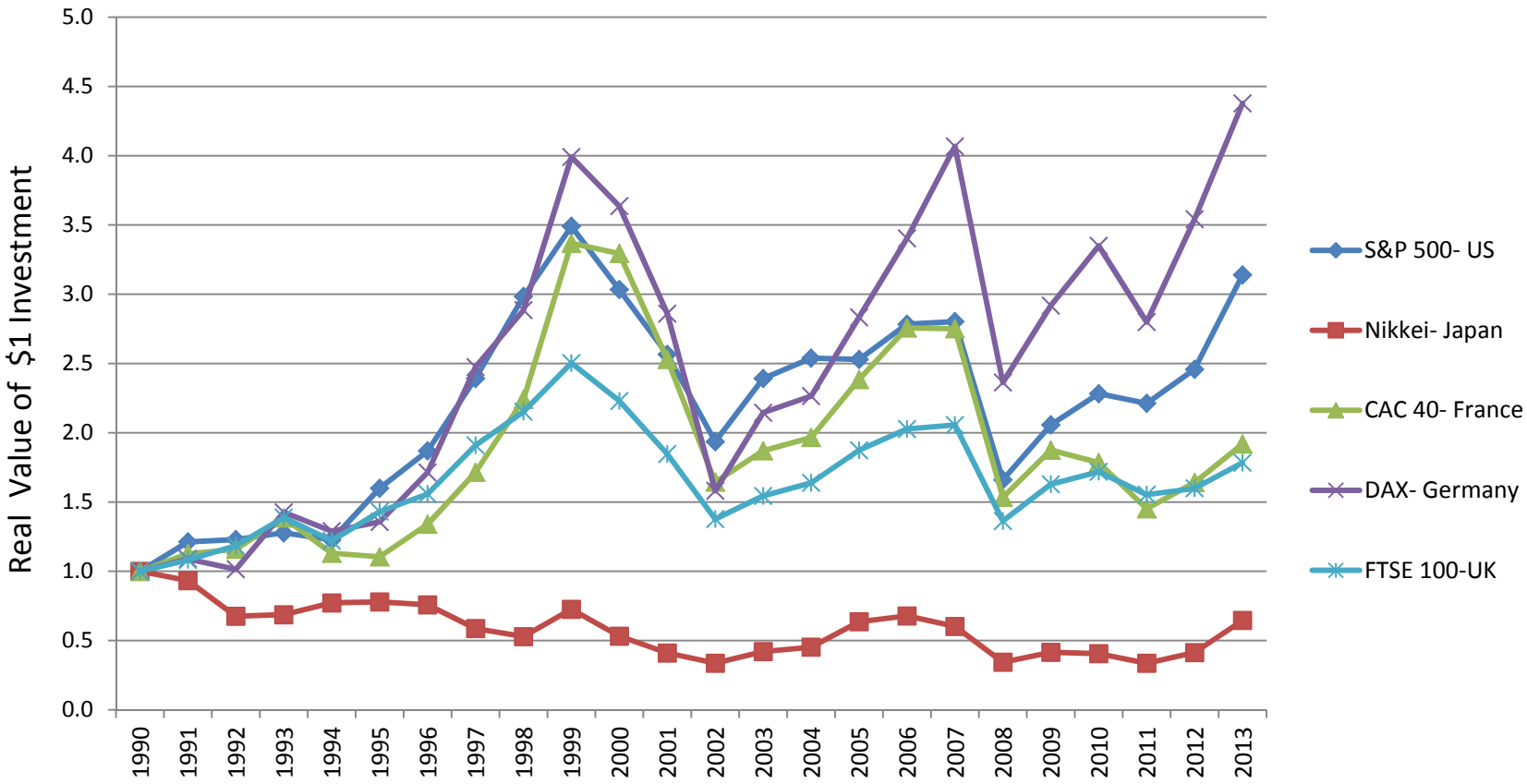
Who Holds Government Bonds?



What about Equity Markets

- Equity markets are sizable particularly in the US and UK
- They are mainly important as savings vehicles rather than to provide funds as the primary market is quite small
- The problem with equities is that they are very volatile

Stock Market Volatility



What are the Implications for Corporate Finance Theory?

- In the US banks are not very important for corporate finance and as a result theories based on bond finance are relevant

- At the other end of the spectrum, in the UK bond markets are not important at all for corporate finance of non-financial firms and as a result theories based on bank finance are relevant

- The other countries considered lie somewhere in between these two extremes

What are the Implications for Corporate Finance Theory? (Continued)

- Why are there such important differences between the funding of corporations in different countries?
- The other important observation is that banks and other financial institutions compete with non-financial corporations for funds
- We need theories that take these factors into account
- We turn next to an illustration

Deposits and Bank Capital Structure

Franklin Allen, Elena Carletti and Robert Marquez

(Forthcoming JFE)

Introduction

- Growing literature on the role of equity in bank capital structure focusing on equity as a buffer, liquidity, agency costs, etc. (e.g., Diamond and Rajan (2000), Hellmann, Murdock and Stiglitz (2000), Gale (2004), Morrison and White (2005), Allen, Carletti and Marquez (2011))
- Typically, partial equilibrium models that take the cost of equity capital as given and higher than for other types of finance
- Some papers have questioned whether this is justified and have suggested Modigliani-Miller is relevant instead (Miller (1995), Brealey (2006), Admati, DeMarzo, Hellwig and Pfleiderer (2010))
- We develop a general equilibrium model of bank and firm financing where the cost of capital is endogenized

Our contribution

- We base our analysis on three main elements
  1. Only banks raise funds from deposits
  2. The markets for deposit and equity finance are segmented
  3. Banks and firms incur bankruptcy costs
- The aim is to determine the optimal bank and firm capital structures depending on what the banks can invest in (risky investments, loans to traded firms, one or two sectors) and the implications of these for the pricing of equity, deposits and loans, and the optimality of diversification

Market segmentation and bankruptcy costs

- Deposit market is segmented from the equity market for households because of participation costs (e.g., Guiso and Sodini (2013)) and for businesses because these markets provide different services
- Bankruptcy costs are significant for both banks (James (1991) finds 30%) and firms (Andrade and Kaplan (1998) and Korteweg (2010) find 10-23% and 15-30%, respectively)
- These results underestimate the real cost of bankruptcy (e.g., Almeida and Philippon (2007), Acharya, Bharath and Srinivasan (2007), Glover (2012))

The model with one risky technology

- One-period model where limited-liability banks raise capital k_B and deposits $1 - k_B$, and invest in a risky technology with return $r \sim U[0, R]$ at date 1, with $Er = \frac{R}{2} > 1$
- There are two groups of risk neutral investors (each with endowment of 1):
  - Shareholders supply capital to banks with opportunity cost ρ. They can also invest directly in the risky technology so that $\rho \geq R/2$
  - Depositors supply deposits to the banks for the promised per unit rate r_D. Depositors have an opportunity cost u and their alternative is to store so that $u \geq 1$
- The markets are segmented

- The total supply of capital is K and of deposits is D with

$$\frac{K}{D} = \eta > 0$$

- Since banks invest with risky return r, they repay depositors r_D if $r \geq \bar{r}_B$, where

$$\bar{r}_B = r_D(1 - k_B),$$

and go bankrupt otherwise. Liquidation proceeds are $h_B r$, with $h_B \in [0, 1]$, and are distributed pro rata to depositors

The equilibrium with a single productive sector

1. Banks choose k_B and r_D to maximize expected profits
2. Capital providers maximize expected utility
3. Depositors maximize expected utility
4. Banks make zero expected profits in equilibrium
5. The equity market clears
6. The deposit market clears

Each bank's optimization problem

$$\max_{k_B, r_D} E\Pi_B = \int_{\bar{r}_B}^{R} \left(r - r_D(1 - k_B)\right) \frac{1}{R} dr - \rho k_B$$

subject to

$$EU_D = \int_0^{\bar{r}_B} \frac{h_B r}{1 - k_B} \frac{1}{R} dr + \int_{\bar{r}_B}^{R} r_D \frac{1}{R} dr \geq u$$

$$E\Pi_B \geq 0$$

$$0 \leq k_B \leq 1$$

Proposition

In the unique equilibrium with $h_B = 0$, $k_B \in (0,1), \rho > \frac{R}{2}$, $E\Pi = 0$ *and:*

i) For $R < \overline{R} = \frac{4(1+\eta)}{1+2\eta}$, $EU = u = 1$

ii) For $R \geq \overline{R}$, $EU = u \in [1, \frac{R}{2})$

- The opportunity cost ρ is bid up above $\frac{R}{2}$ because capital allows bankruptcy costs to be reduced and is scarce
- Similar results hold for $0 < h_B < 1$ but with more complicated expressions. Only with $h_B = 1$ does an MM-type result hold

A single publicly traded productive sector

- Now a continuum of publicly traded firms hold the risky technology with return $r \sim U[0, R]$ and all firms' returns are perfectly correlated
- Each firm raises 1 unit with equity k_F at cost ρ and loans $1 - k_F$ from banks at promised rate r_L. The firm is solvent if

$$r \geq \bar{r}_F$$

- If $r < \bar{r}_F$, the firm goes bankrupt and each bank obtains $\frac{h_F r}{1-k_F}$. The bank then goes bankrupt for

$$r < \bar{r}_B \leq \bar{r}_F$$

Proposition

In the unique equilibrium with $0 \leq h_B, h_F < 1$, $k_B = 0, r_D = r_L$ *and* $k_F > 0$. *The equilibrium is similar to before with the difference that firms hold the same capital as banks there.*

- In equilibrium banks are a conduit between depositors and firms and hold no capital. This minimizes the bankruptcy costs because it aligns bank and firm bankruptcies with $\overline{r}_B = \overline{r}_F$

Two independent risky technologies

- We consider two sectors with independent returns r_1 and r_2, each uniformly distributed on the support $[0, R]$

Proposition

When $h_B = 0$, two-sector banks dominate one-sector banks

- Diversification allows the bank to remain solvent in more states than if it invested in one sector only

Two publicly traded sectors

- Banks can make loans to firms in two publicly traded sectors with independent returns
- Main insights
  - For low firm bankruptcy costs (h_F high enough), banks diversify and lend to both sectors, and both banks and firms use equity capital
  - For high firm bankruptcy costs (h_F low enough), banks specialize in lending to one sector of publicly traded firms and use zero capital as in the single publicly traded case. All equity capital is held by firms
  - For intermediate firm bankruptcy costs, both diversified and undiversified banks coexist in equilibrium

Concluding remarks

We have provided a theory of the corporate finance of banks and firms based on

- Segmentation of deposit and equity markets
- Bankruptcy costs for banks and firms
  This provides
- A theory of "expensive" equity capital relative to deposits
- A theory of when banks should diversify and when not

There is a very large literature on bank capital regulation. In our model there is no benefit from regulation. There are many potential extensions where such regulation would be optimal that are possible in this model.