

# ***Bank Risk during the Financial Crisis: Do business models matter?***

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*The opinions are those of the authors only and do not necessarily involve the views of the European Central Bank*

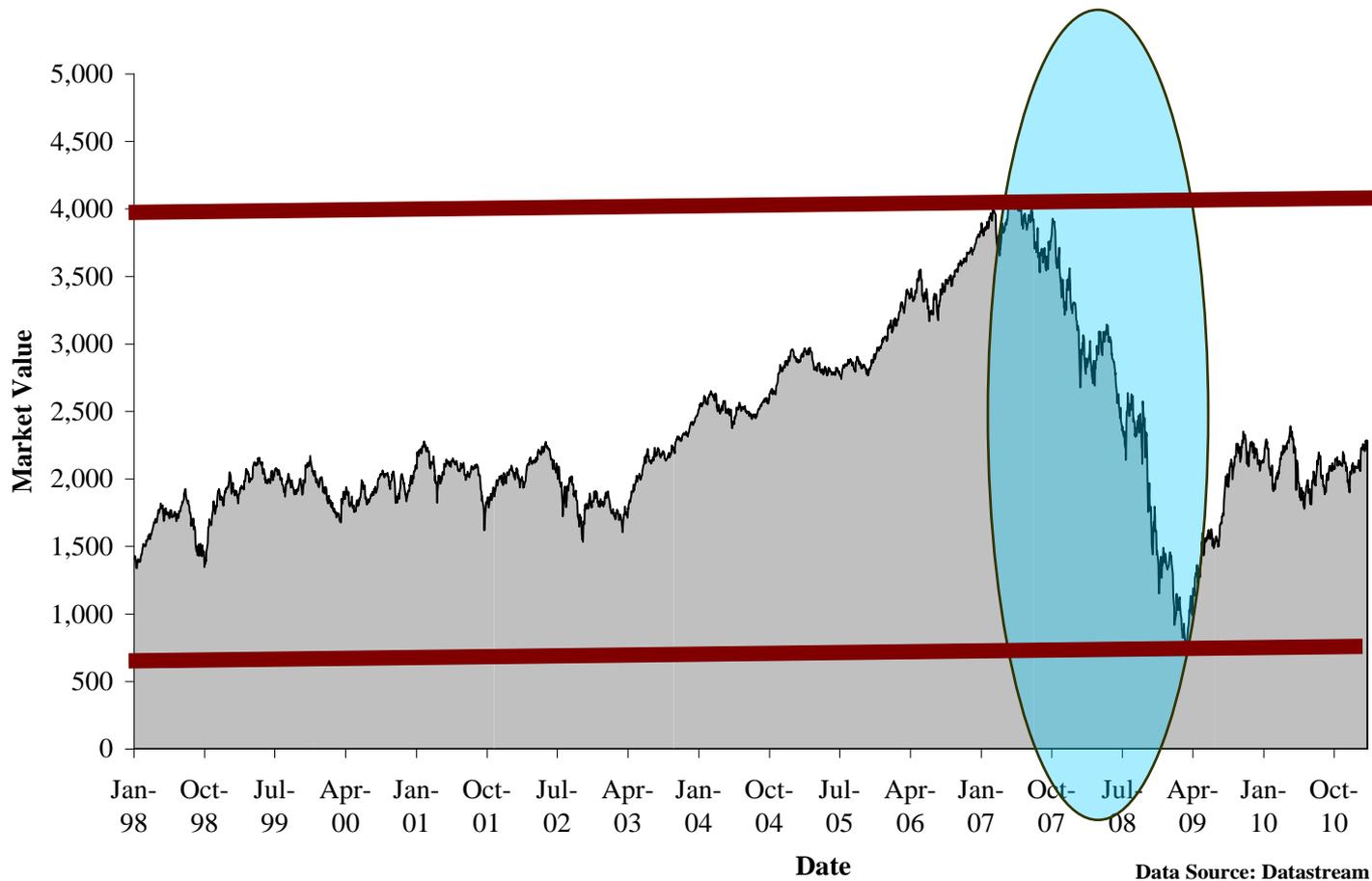
# Road map

1. Motivation of the study,
2. Business models and bank risk,
3. Data and econometric model,
4. Results,
  - Quantiles,
  - Value and risk creation,
5. Conclusions.

# Managing risks is core to banks...

1. One of the core activities of the banking institution is the management and sharing of risks:
  - Delegated monitors (Diamond, 1984): a key reason for the existence of banks is that they are better at screening and managing risks than other institutions, so they can act as delegated monitors for depositors.
  - Compared with financial markets, banks are also better at handling those risks which cannot be diversified away (Allen and Gale, 1997).

...Banks have not done such a good job... Stock-market aggregate valuation of banks  
(EUR bill.)



More than €3 trillion was erased from market capitalisation – a decreased of 82% in stock market value of banks between May 2007 and March 2009.

## The first major structural development: **deregulation**

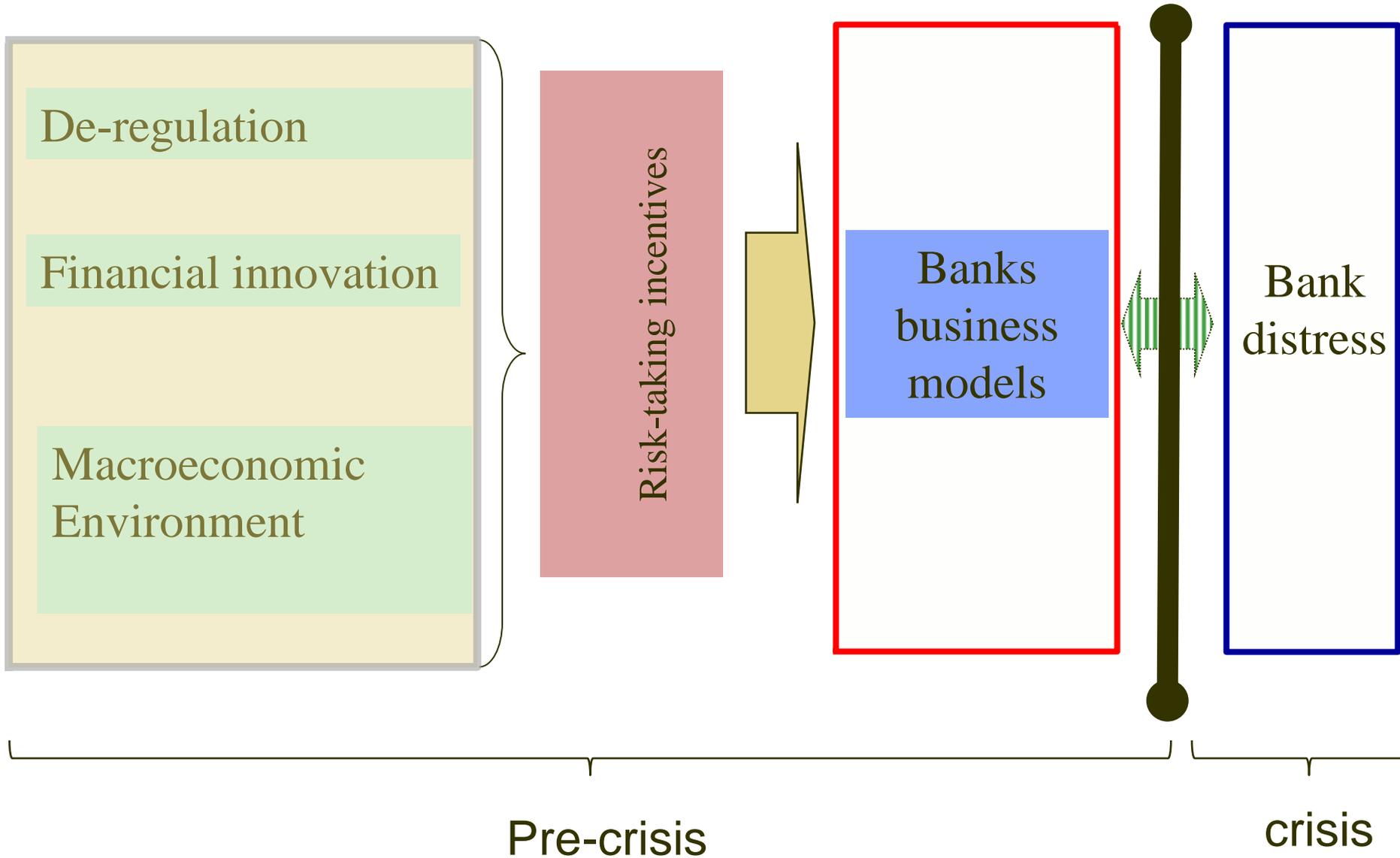
1. Historical liberalization of banking markets over the last 25 years
  - o Altered banks' incentives (risks)
  - o Loosening on regulatory constraints:
    - **Structural** regulations: undertake certain activities (i.e. functional separation),
    - **Conduct** regulations: business practices (i.e. deposit and lending rates).

## The second major structural development: **financial innovation...**

- Use of securitization activity formed part of a wider trend of financial innovation (market funding, NIR),
- Banks became increasingly integrated with financial markets
  - Capital market crisis is more likely to reverberate through the banking system (Boot and Thakor, 2009),

## What do we do?:

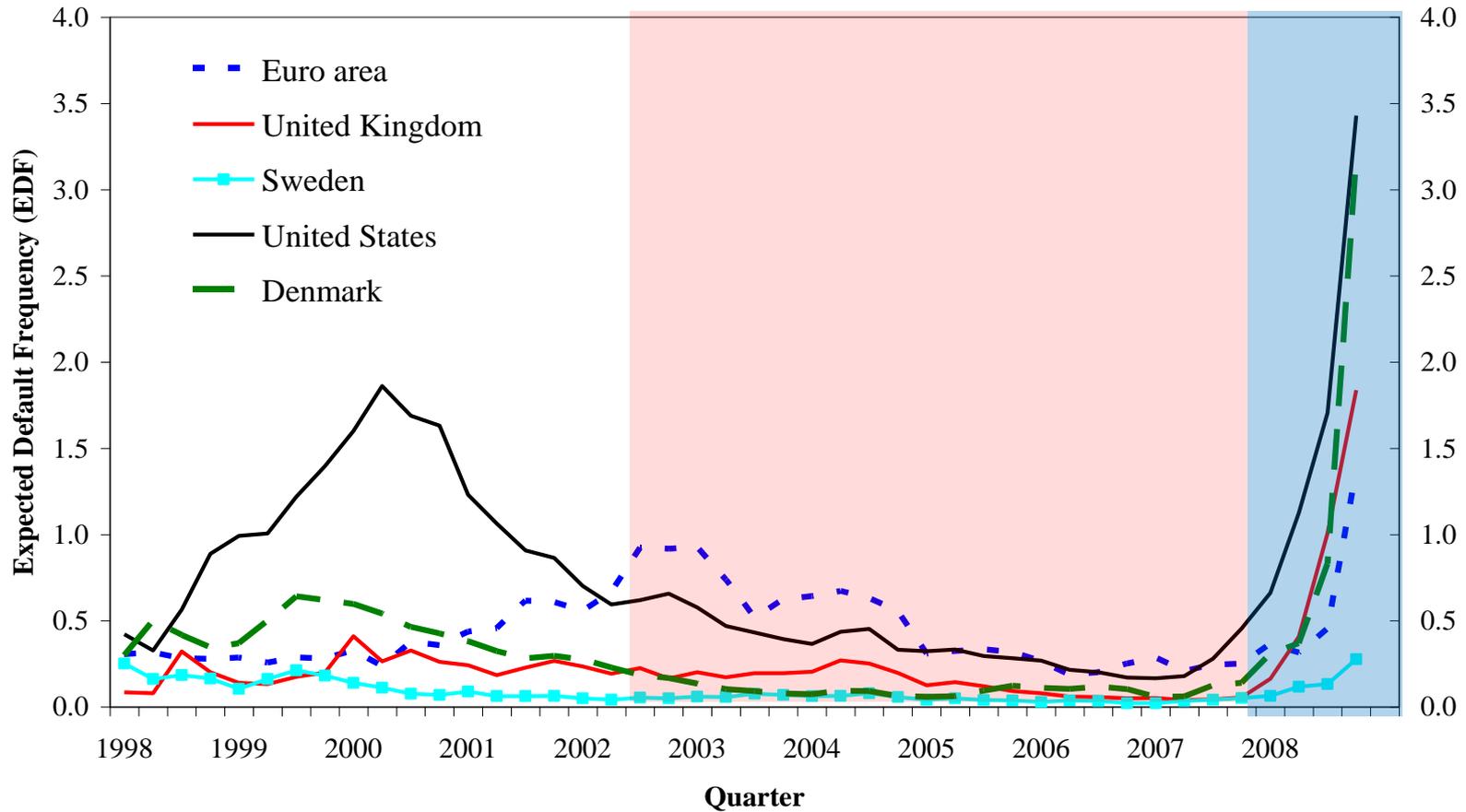
- ❑ Based on existing literature => Does variability in pre-crisis business models explain bank distress during the **crisis**?
- ❑ As risk is elusive => Which business models explain bank distress **for the different dimensions of bank distress**?
- ❑ Given the nature of this crisis => Which business models explain bank distress **for the tail of riskier banks**?
- ❑ **Does** stock market value creation explain bank distress **on top of business models characteristics**? (Rajan, 2006, Barras et al. 2010)



# Some history: Indicators of bank risk...

## Banks' EDFs

*(over 1-year ahead horizon; averages by country and group of countries)*



## While managing risks is core to banks...

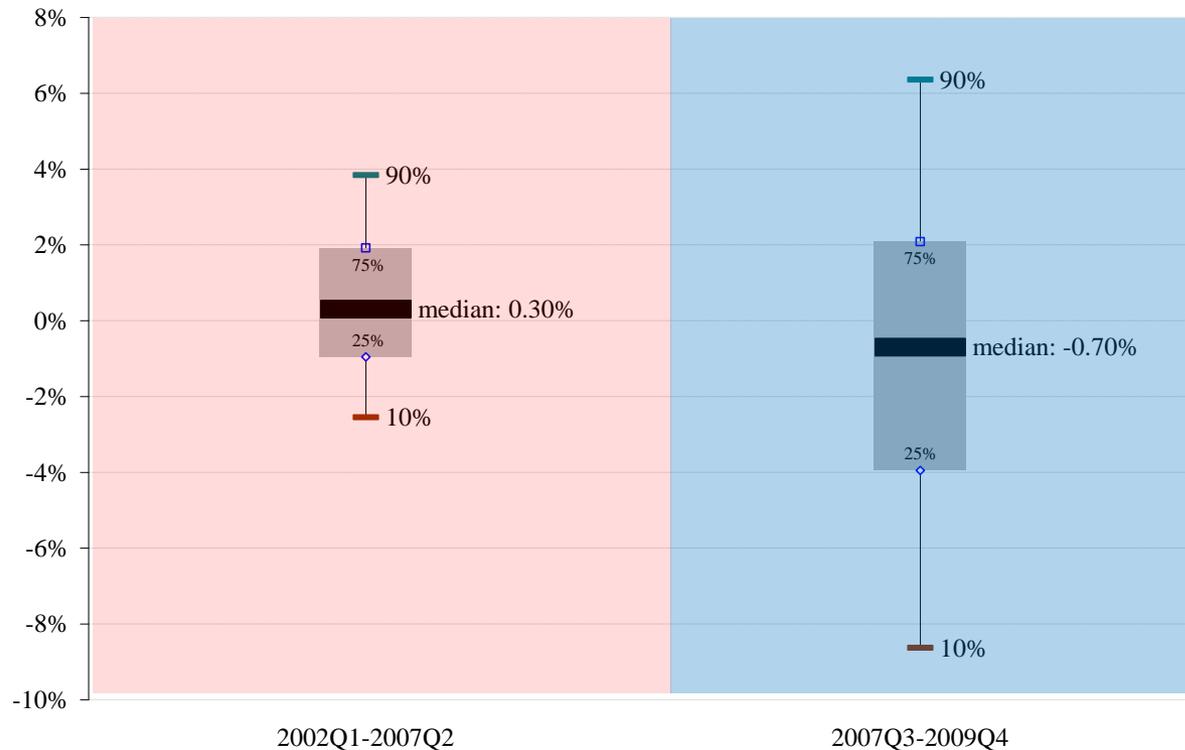
- There was also a huge **variability** in the performance of individual banks during the crisis.

# Tightening and widening of bank risk

**Figure 1.**

Box-plot distribution of individual stock market returns of banks

Figure 1 plots the pre and during crisis cross-sectional distribution of the stock market returns of listed banks operating in the European Union and the United States. Data consists of monthly stock market prices from 2002Q1 to 2009Q4 obtained from Datastream. The charts report the 10%, 25%, 50%, 75% and 90% quantiles before and after the crisis. The “box plot” consists of a “box” which goes from the first to the third quartile (Q1, Q3). Within the box the thick horizontal line represents the median. The bottom whisker goes from 25% to the 10% quantile, while the top goes from the 75% to 90% quantile of the distribution.



Source: Constructed from Datastream data.

# What do we do?:

- 3 measures of materialized bank risk:
  - I. Government support
  - II. Systematic risk
  - III. Liquidity provision
- Matched to pre-crisis business models based on four blocks:
  - I. Capital structure
  - II. Asset structure
  - III. Funding structure
  - IV. Income
- We use several control variables:
  - I. Profitability
  - II. Changes in real housing prices
  - III. Changes in the broad stock market indices for non-financial corporations
  - IV. Governance indicator
  - V. Regulation and competition variable

# Model

$$r_{i,c} = \beta_0 + \underbrace{\beta_1 eta_{i,b} + \beta_2 eta\_reg_{i,b} * k_{i,b}}_{\text{Capital structure}} + \underbrace{\beta_3 size_{i,b} + \beta_4 loan\_ta_{i,b} + \beta_5 abs_{i,b}}_{\text{Asset structure}} + \underbrace{\beta_6 mkt\_assets_{i,b} + \beta_7 stdeb_{i,b}}_{\text{Funding structure}} + \underbrace{\beta_8 niinco_{i,b} + \beta_9 exlend_{i,b}}_{\text{Income}} + \varepsilon_i \rightarrow \text{Other: macro controls}$$

Crisis
Pre-crisis

Bank  $i$ , country  $k$ , time  $c, b$

- Realization of risk during the crisis period (2007Q4-2009Q4),
- Regressors include bank characteristics averaged from the pre-crisis period (2003Q4 to 2007Q3).
- Other control values averaged from the pre-crisis period (2003Q4 to 2007Q3).

# Data

- **Global sample of 16 countries. Initial sample includes over 1,100 listed banks:** Belgium, Denmark, Germany, Greece, Finland, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom and the United States.
- **Quarterly data from 2003:q4 to 2007:q3.** Banks' balance-sheet indicators from Bloomberg, Dealogic (Securitisation), Reuters (corporate governance). Macro variables from BIS, Datastream, world bank, central banks, Thomson
- **Bank risk measures:** 1) Government support measures, 2) Systematic risk measure; 3) Central Bank liquidity.

# I. Government support

- Whether the institution received *financial support*. Information on public rescue of banks via:
  - ✓ Capital injections;
  - ✓ Guaranteed issuance of bonds;
  - ✓ Other government-sponsored programs;
- Sources: European Commission, central banks, BIS, Bloomberg and the WebPages of a number of governmental institutions,
- Dummy variable entitled “financial support” which takes the value of 1 if a bank received government assistance during the crisis period and zero otherwise.

# Probit estimates of the likelihood of being rescued

(only partial results shown)

		(I)	(II)	(III)	(IV)
Capital structure	Tier I capital	-0.0135 *** (0.002)	-0.0207 *** (0.001)	-0.0220 *** (0.000)	-0.0226 *** (0.000)
	Undercapitalized		-0.0415 *** (0.008)	-0.0393 *** (0.006)	-0.0392 *** (0.008)
Asset structure and securitization	Size	0.0344 *** (0.004)	0.0409 *** (0.003)	0.0395 *** (0.001)	0.0379 *** (0.001)
	Loans to total assets	0.0055 *** (0.001)	0.0047 *** (0.001)	0.0044 *** (0.001)	0.0042 *** (0.001)
	Securitization	-0.0123 *** (0.002)	-0.0103 *** (0.001)	-0.0104 *** (0.001)	-0.0169 *** (0.000)
Funding structure	Short-term market funding	0.0080 *** (0.001)	0.0071 *** (0.001)	0.0070 *** (0.001)	0.0066 *** (0.000)
	Deposit funding	-0.0114 *** (0.000)	-0.0103 *** (0.001)	-0.0101 *** (0.001)	-0.0095 *** (0.001)
Loan growth and income	Excessive loan growth	0.0400 *** (0.005)	0.0385 *** (0.005)	0.0379 *** (0.005)	0.0383 *** (0.004)
	Non-interest income	-0.0032 *** (0.000)	-0.0034 *** (0.000)	-0.0037 *** (0.000)	-0.0027 *** (0.000)
Control variables	Profitability			0.0283 (0.018)	0.0125 (0.015)
	GDP growth				0.2373 *** (0.008)
No. of observations		852	852	852	863
Pseudo R2		0.0995	0.1113	0.1121	0.1195

## II. Systematic risk

- Continuous, based on market perceptions. Simplified version of some of the measures of systemic risk based on stock market information as proposed by Acharya et al, (2011) or Brownlees and Engle (2010).

# Systematic risk *(only partial results shown)*

		(I)	(II)	(III)	(IV)
Capital structure	Tier I capital	0.0040 (0.007)	-0.0097 (0.007)	-0.0233 *** (0.008)	-0.0207 *** (0.008)
	Undercapitalized		-0.0811 *** (0.017)	-0.0733 *** (0.017)	-0.0740 *** (0.017)
Asset structure and securitization	Size	0.1039 *** (0.031)	0.1090 *** (0.032)	0.1114 *** (0.033)	0.1041 *** (0.036)
	Loans to total assets	0.0083 *** (0.002)	0.0061 *** (0.002)	0.0058 ** (0.002)	0.0053 ** (0.003)
	Securitization	-0.2073 *** (0.057)	-0.2076 *** (0.054)	-0.1885 *** (0.055)	-0.2055 *** (0.063)
Funding structure	Short-term market funding	0.0119 *** (0.003)	0.0097 *** (0.003)	0.0102 *** (0.003)	0.0097 *** (0.003)
	Deposit funding	-0.0217 *** (0.003)	-0.0201 *** (0.003)	-0.0191 *** (0.003)	-0.0179 *** (0.003)
Loan growth and income	Excessive loan growth	0.1560 *** (0.026)	0.1597 *** (0.027)	0.1554 *** (0.028)	0.1597 *** (0.030)
	Non-interest income	-0.0050 *** (0.002)	-0.0043 ** (0.002)	-0.0064 *** (0.002)	-0.0053 ** (0.002)
Control variables	Profitability			0.1824 *** (0.049)	0.1705 *** (0.049)
	GDP growth				0.2198 ** (0.110)
	No. of observations	483	483	483	483
	R2	0.4953	0.5172	0.532	0.5352

### III. Central bank liquidity

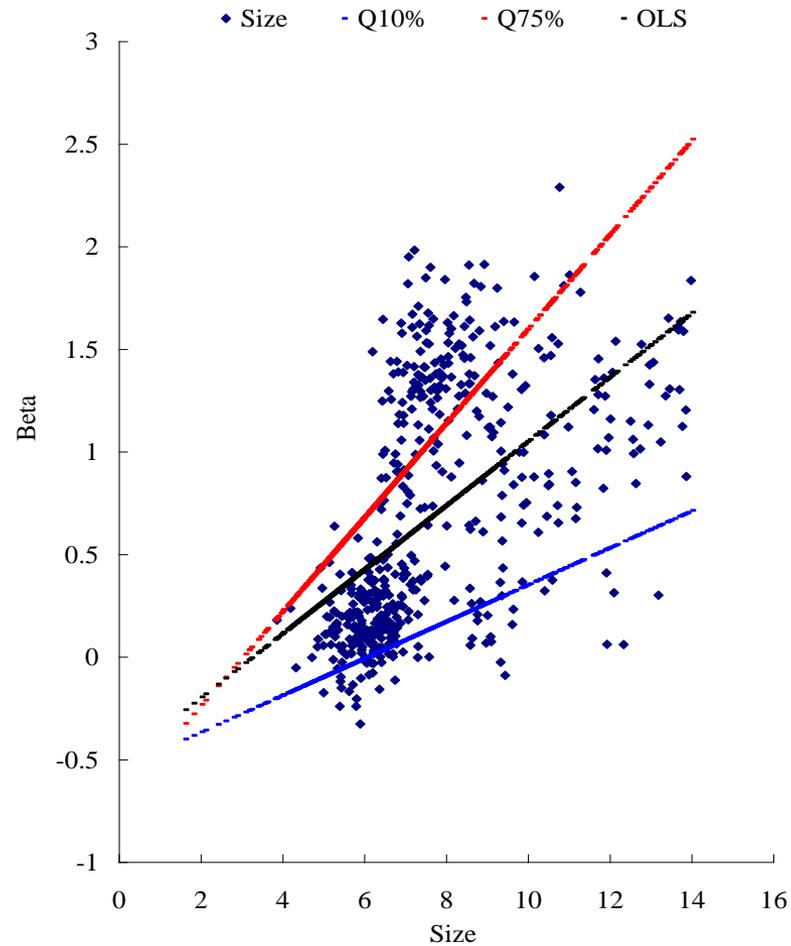
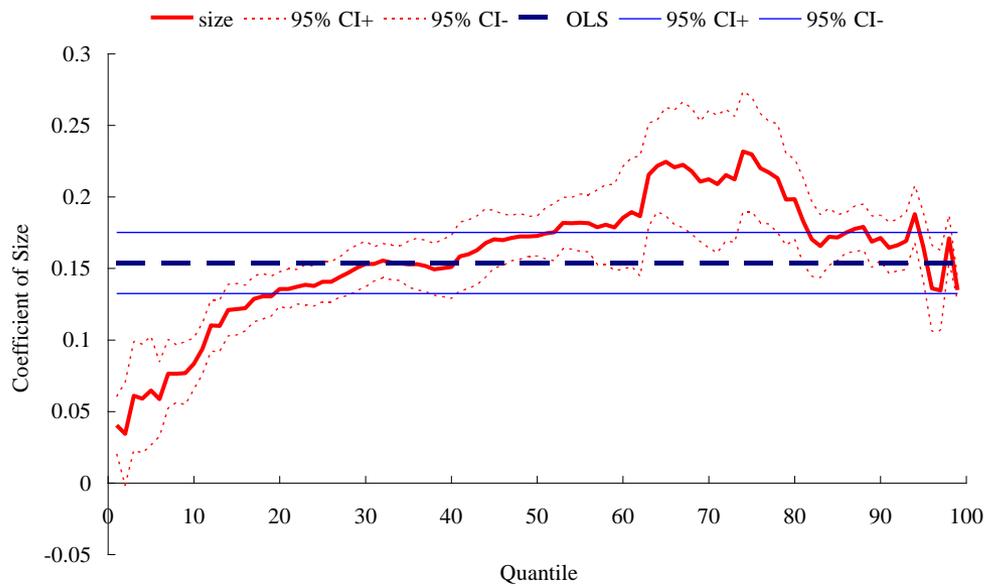
- ❑ Total net liquidity position by each institution within the Eurosystem,
- ❑ Bank distress, in principle transitory in nature,
- ❑ Comparability by dividing data on individual bank net liquidity to total assets of each institution,
- ❑ Restrict our results to full-allotment of liquidity implemented as of October 2008 (to end 2009),
- ❑ Average net position of the consolidated groups:
  - ✓ Listed,
  - ✓ Available financial statements at the consolidated level.

# Liquidity *(only partial results shown)*

		(I)	(II)	(III)	(IV)
Capital structure	Tier I capital	-0.1771 *** (0.062)	-0.1814 *** (0.053)	-0.2978 *** (0.026)	-0.3308 *** (0.043)
	Undercapitalized		-0.0097 (0.020)	-0.0131 (0.016)	-0.1115 *** (0.005)
Asset structure and securitization	Size	-0.2985 *** (0.025)	-0.2979 *** (0.023)	-0.5000 *** (0.042)	-0.5844 *** (0.042)
	Loan to total assets	0.0779 *** (0.004)	0.0781 *** (0.004)	0.0559 *** (0.001)	0.0695 *** (0.004)
	Securitisation	-0.6003 *** (0.140)	-0.6012 *** (0.143)	-0.4397 *** (0.085)	-0.9080 *** (0.096)
Funding structure	Short-term market funding	0.1485 *** (0.005)	0.1483 *** (0.006)	0.1366 *** (0.006)	0.1403 *** (0.009)
	Deposit funding	-0.0759 *** (0.014)	-0.0759 *** (0.014)	-0.0621 *** (0.012)	-0.0628 *** (0.017)
Loan growth and income	Excessive loan growth	0.4462 *** (0.006)	0.4453 *** (0.008)	0.6182 *** (0.015)	0.7737 *** (0.022)
	Non-interest income	-0.2356 *** (0.002)	-0.2350 *** (0.001)	-0.2698 *** (0.005)	-0.2574 *** (0.010)
Control variables	Return on assets			2.0872 *** (0.245)	0.7259 (0.732)
	GDP growth				1.6483 *** (0.487)

- **Size** positively related to most measures of risk,
- **Solid funding structure** => reduces banks' risks during crisis times:
  - I. Reliance on deposit provides funding stability,
  - II. Market funding increases distress.
- Excessive **loan growth**: relaxation of credit standards/deterioration of the asset side of the balance sheet,
- **Non-interest income**, reduces the likelihood of distress / measure of income diversification,
- **Also TIER I capital**, especially for undercapitalized banks, as buffer.

So business models matter, but is the impact the same for all levels of risk?



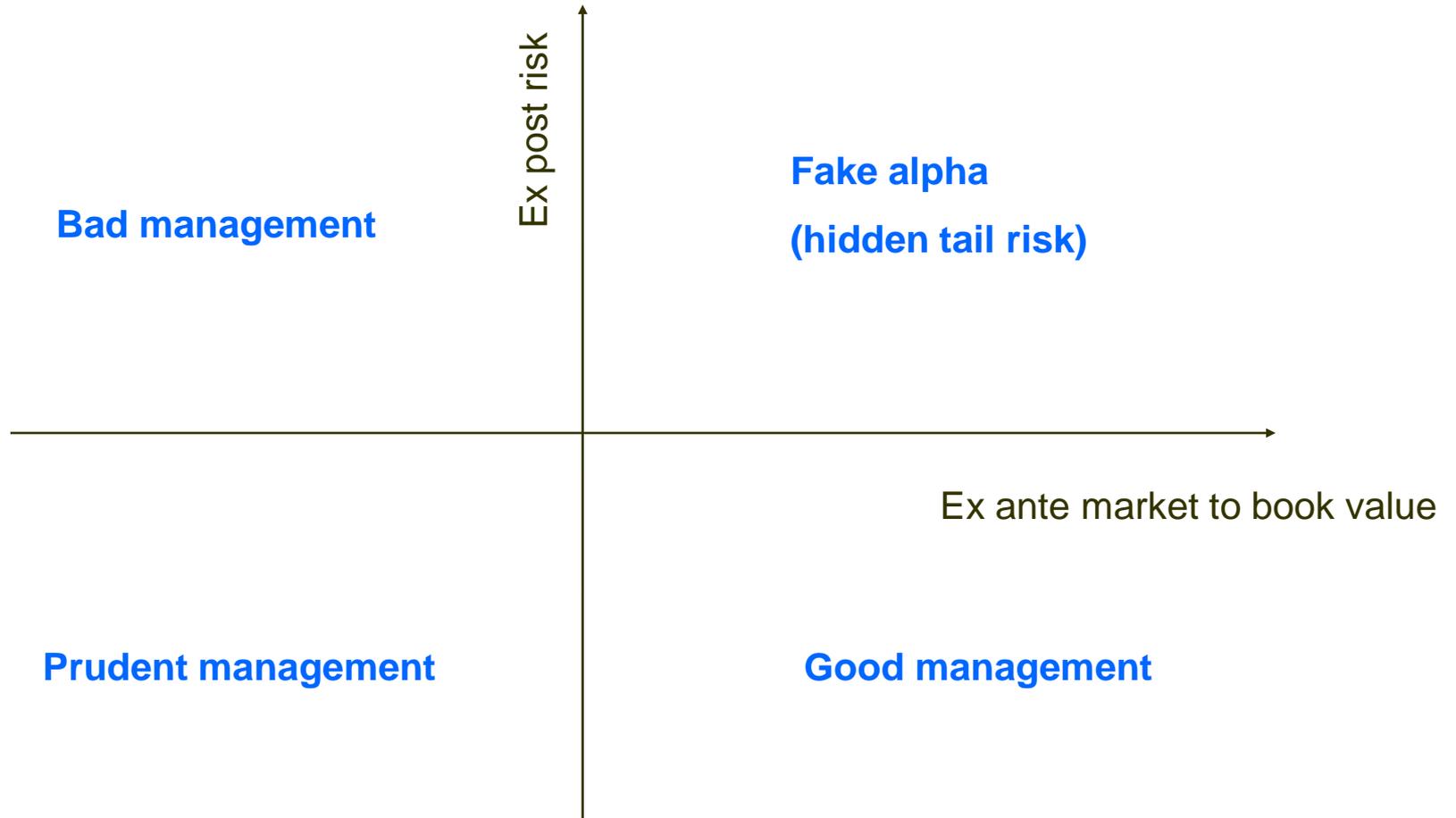
# Quantile regression for systematic risk

		Q10	Q25	Q50	Q75	Q90
Capital structure	Tier I capital	0.0075 (0.005)	-0.0017 (0.004)	-0.0056 (0.010)	-0.0138 * (0.008)	-0.0055 (0.013)
	Undercapitalized	-0.0459 *** (0.015)	-0.0438 *** (0.011)	-0.0491 ** (0.022)	-0.0571 *** (0.018)	-0.0467 ** (0.024)
Asset structure and securitization	Size	0.1516 *** (0.031)	0.1619 *** (0.021)	0.1158 ** (0.050)	0.1086 ** (0.042)	0.0653 (0.064)
	Loans to total assets	0.0005 (0.003)	0.0006 (0.002)	0.0046 (0.004)	0.0089 *** (0.003)	0.0097 * (0.005)
	Securitisation	0.0478 (0.029)	0.0331 (0.031)	-0.0729 (0.081)	-0.1192 ** (0.053)	-0.1742 *** (0.041)
Funding structure	Short-term market funding	0.0029 (0.003)	0.0058 *** (0.002)	0.0103 ** (0.004)	0.0138 *** (0.004)	0.0111 ** (0.005)
	Deposit funding	-0.0158 *** (0.004)	-0.0159 *** (0.002)	-0.0191 *** (0.004)	-0.0289 *** (0.003)	-0.0335 *** (0.004)
Loan growth, income and profitability	Excessive loan growth	0.0371 * (0.022)	0.0621 *** (0.017)	0.1385 *** (0.044)	0.1284 *** (0.038)	0.2054 *** (0.059)
	Non-interest income	0.0012 (0.002)	-0.0052 *** (0.001)	-0.0079 ** (0.003)	-0.0063 ** (0.003)	-0.0002 (0.003)
	Return on assets	0.1038 ** (0.041)	0.2390 *** (0.027)	0.2597 *** (0.057)	0.0869 * (0.049)	0.1012 ** (0.050)

## Only business models?: Value generation or fake alpha?

1. We also find that market to book values *on top of business models* prior to the crisis impacted on ex-post bank risk,
2. As Rajan (2005) pointed out managers able to generate true alpha are extremely rare and in many cases difficult to measure ex-ante. “True alpha can only be measured in the long-run and with the benefit of hindsight”,
3. Given that the building up of hidden systemic (or beta) risks is particularly difficult to measure in real time, we exploit the hindsight provided by the materialization of risks during this period to disentangle between the two,
4. We identify the “true” alpha from the “hidden” beta interacting the ex-ante market to book value of capital with the ex-post risk.

# Rajan: Intuition



## Value generation or fake alpha?

- Proxies for alpha and beta are significant,
- Increase the overall fit of the regression by more than 5 percentage points,
- Ex-ante banks' business models not sufficient to account for the risk generated by the banks.
- A prompt increase in the intensity of supervision for those banks experiencing a large expansion in their stock market valuation is warranted.

Managerial performance	Alpha_edf	-1.7663 ***	-2.2279 ***	-2.2953 ***
		(0.026)	(0.695)	(0.692)
	Beta_edf	0.7409 ***	0.5753	0.5553
		(0.007)	(0.414)	(0.364)

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# Conclusions

1. Ex-ante business models matter: size, market funding, growth....,
2. They matter consistently across measures of risk,
3. Their impact intensifies,
4. They are not enough: We identify the “true” alpha from the “hidden” beta interacting the ex-ante market to book value of capital with the ex-post risk.