



9TH JACQUES POLAK ANNUAL RESEARCH CONFERENCE

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# **From Subprime Loans to Subprime Growth? Evidence for the Euro Area**

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# **From Subprime Loans to Subprime Growth? Evidence for the Euro Area**

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*Martin Čihák and Petya Koeva*

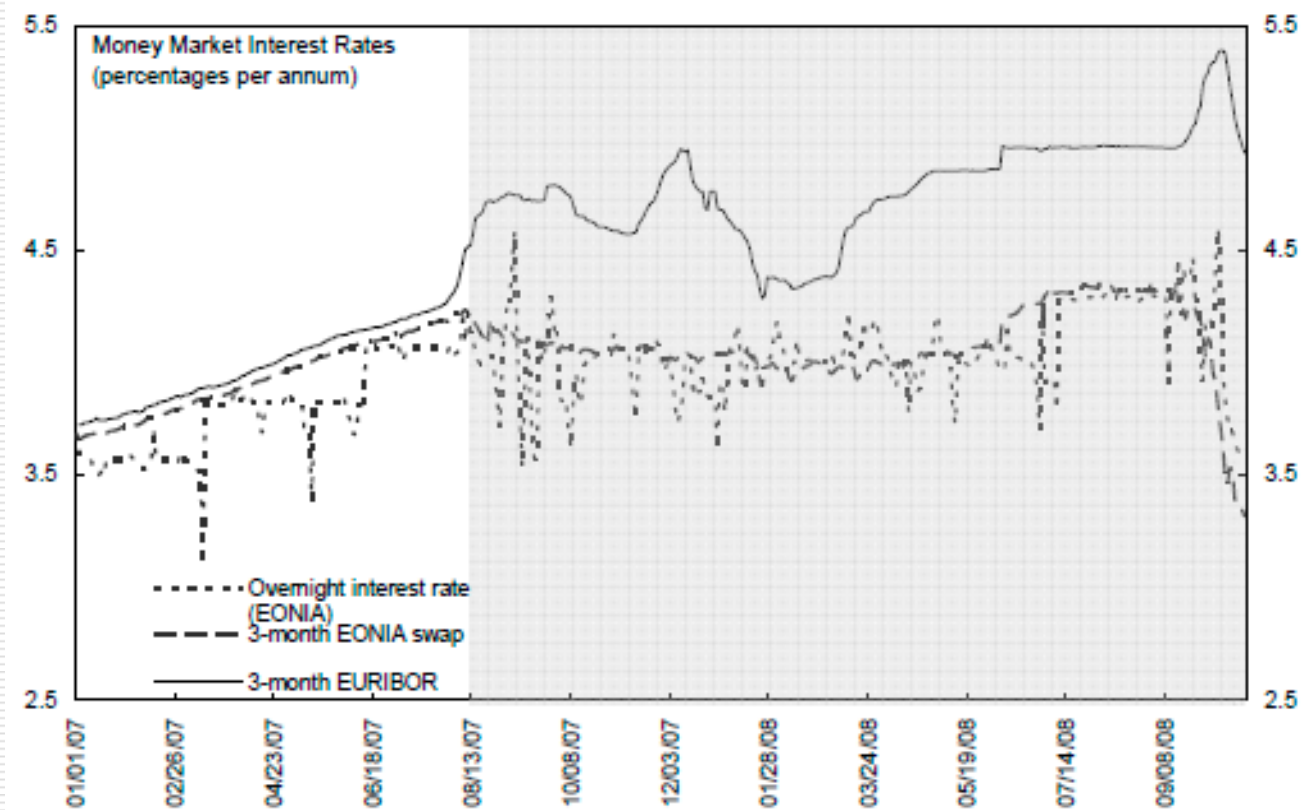
IMF Ninth Jacques Polak Annual Research  
Conference on Macro Financial Linkages

Washington, DC, November 13, 2008

# Motivation

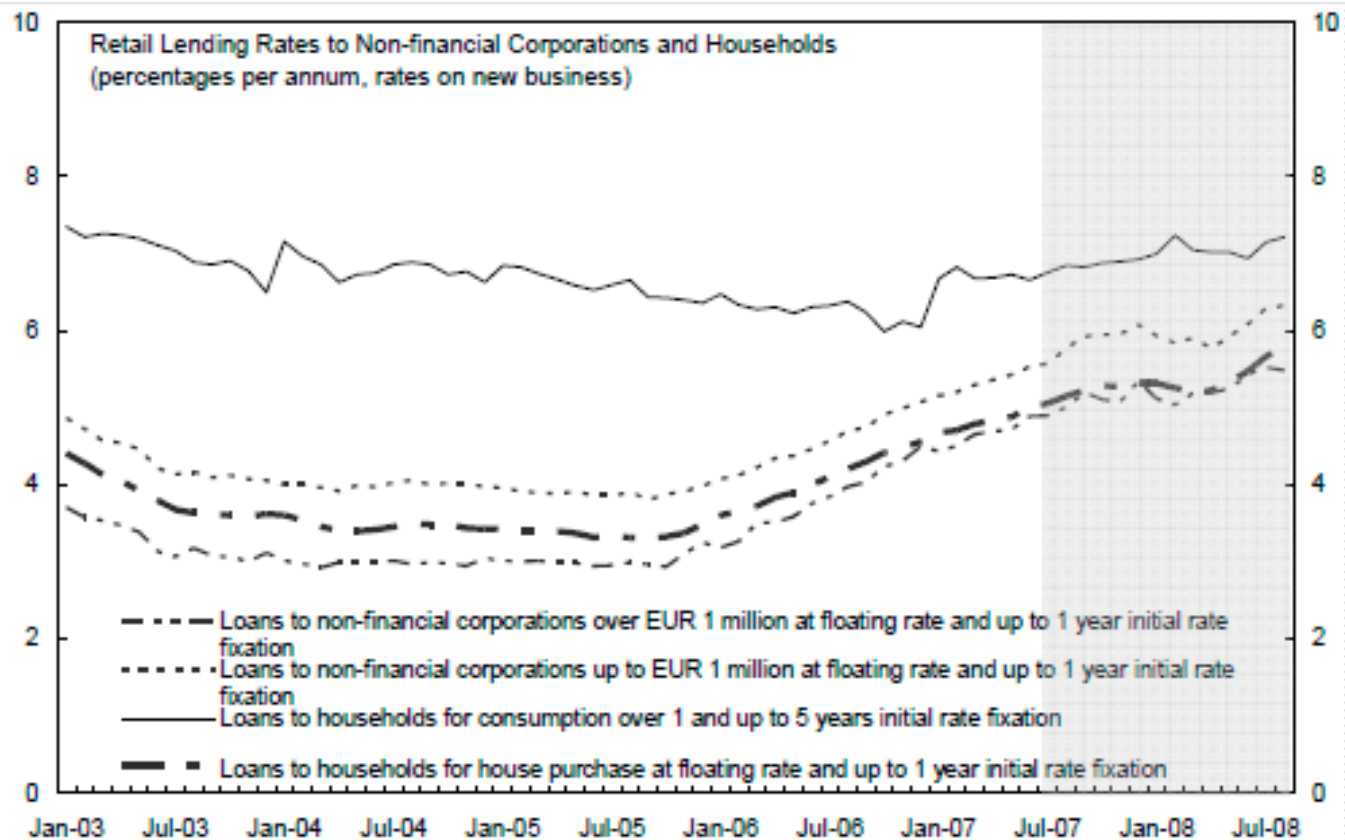
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## Broad reassessment of risk in money and credit markets



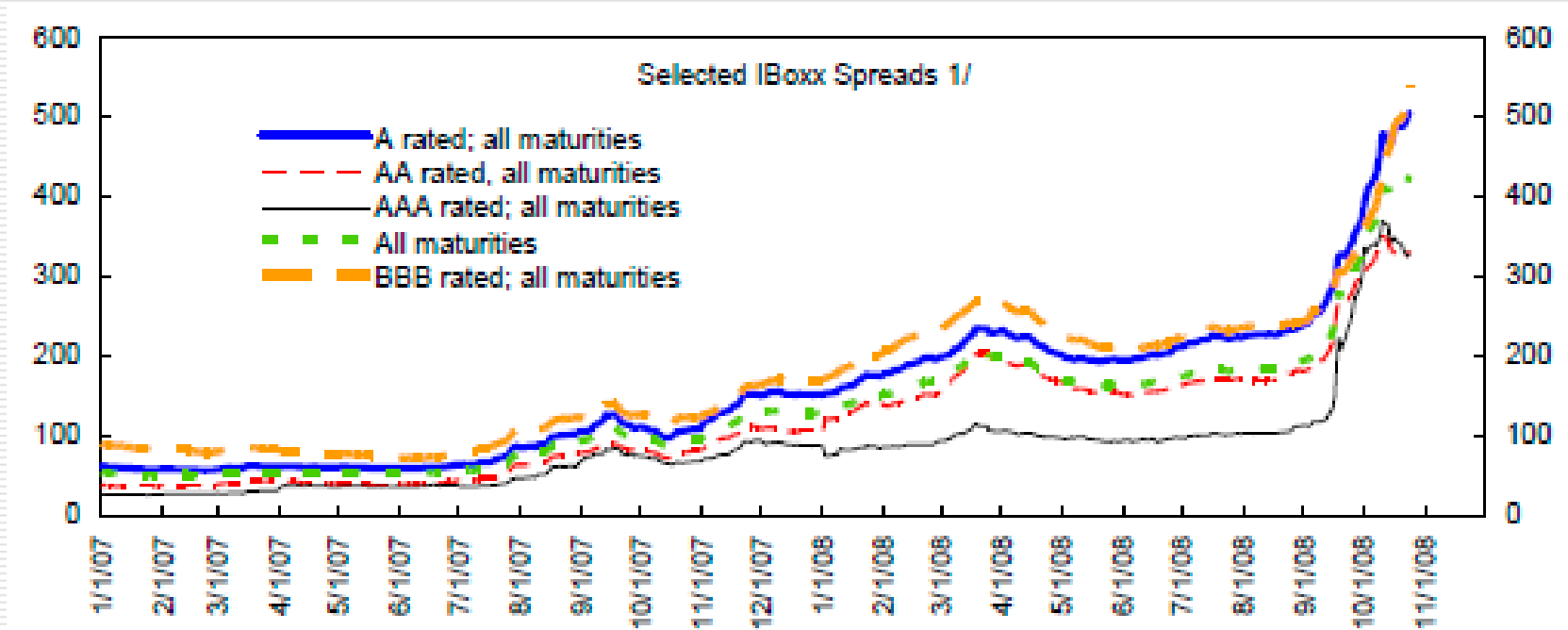
# Motivation

## Increased cost of financing from banks



# Motivation

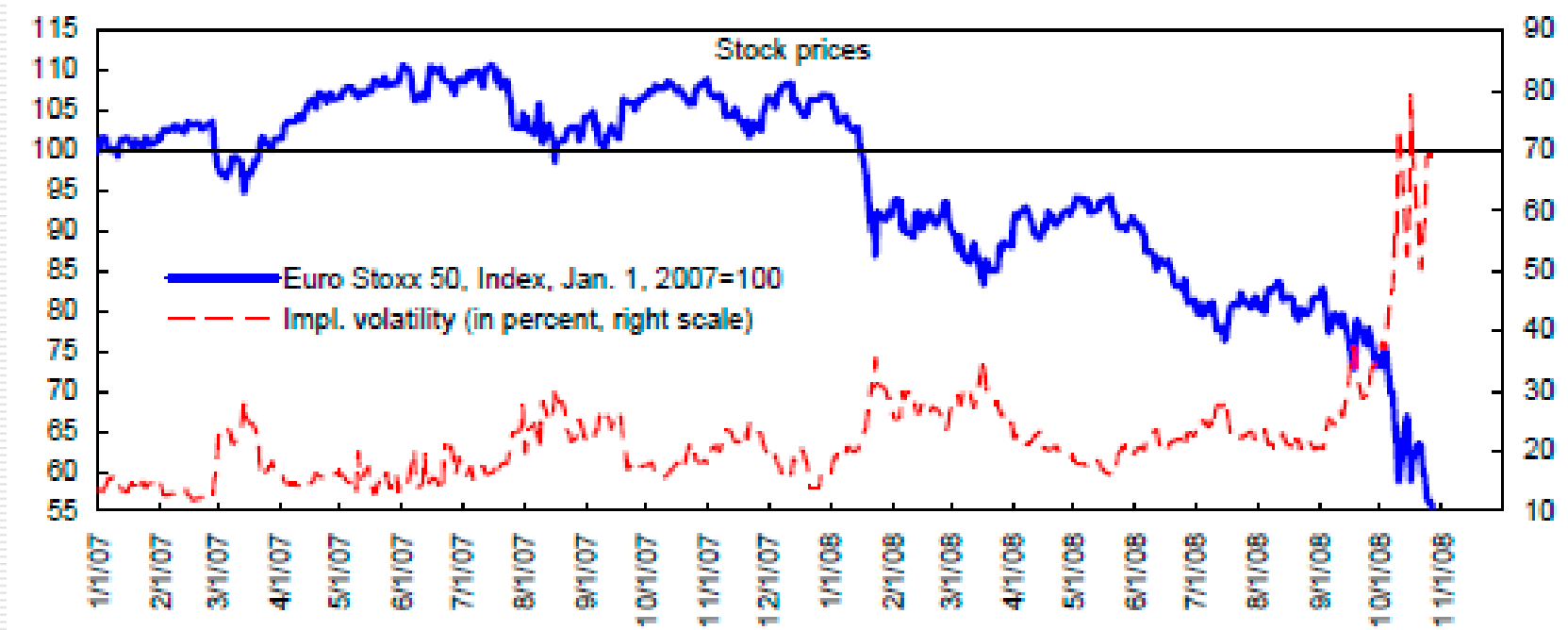
## Increased cost of financing



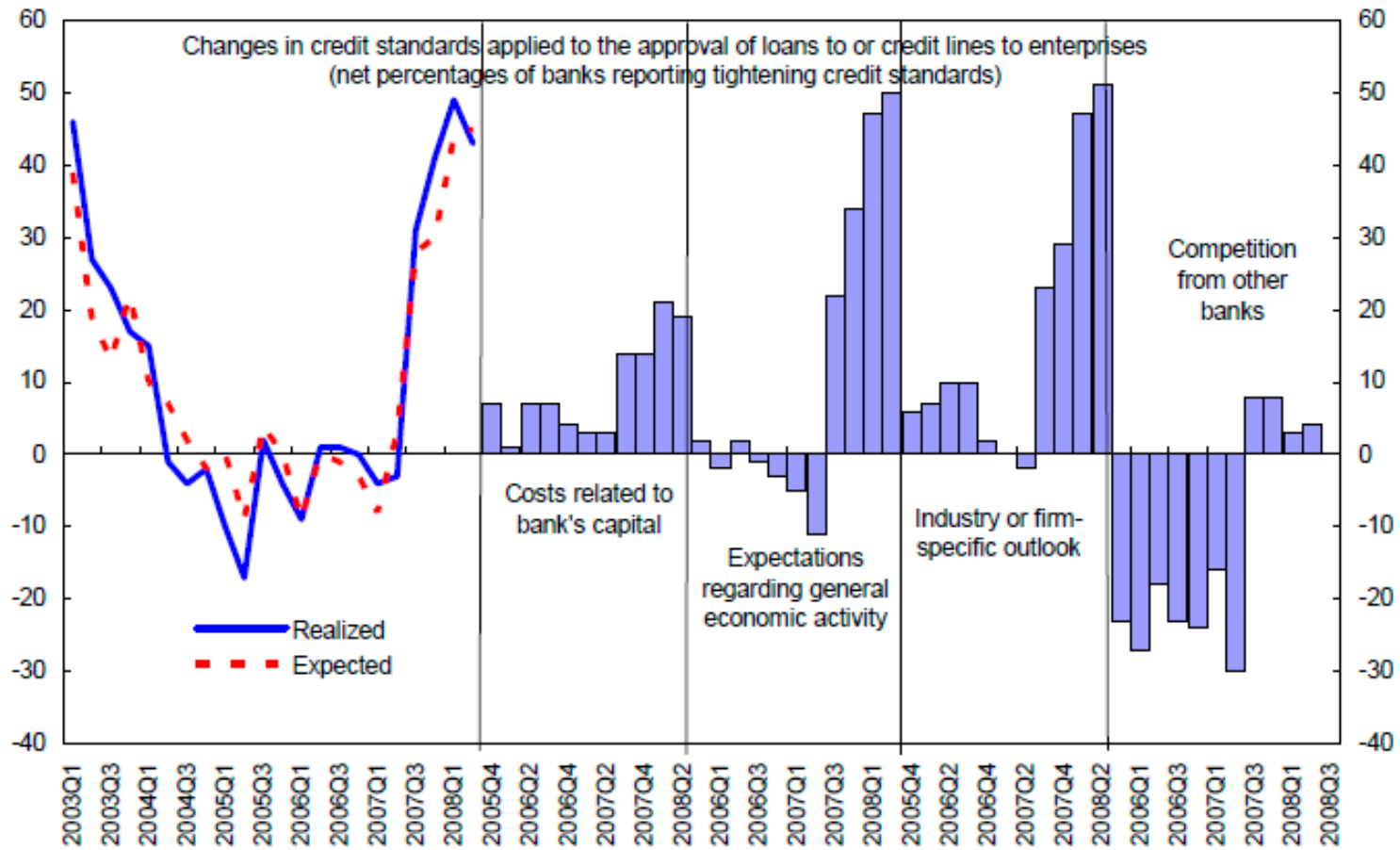
# Motivation

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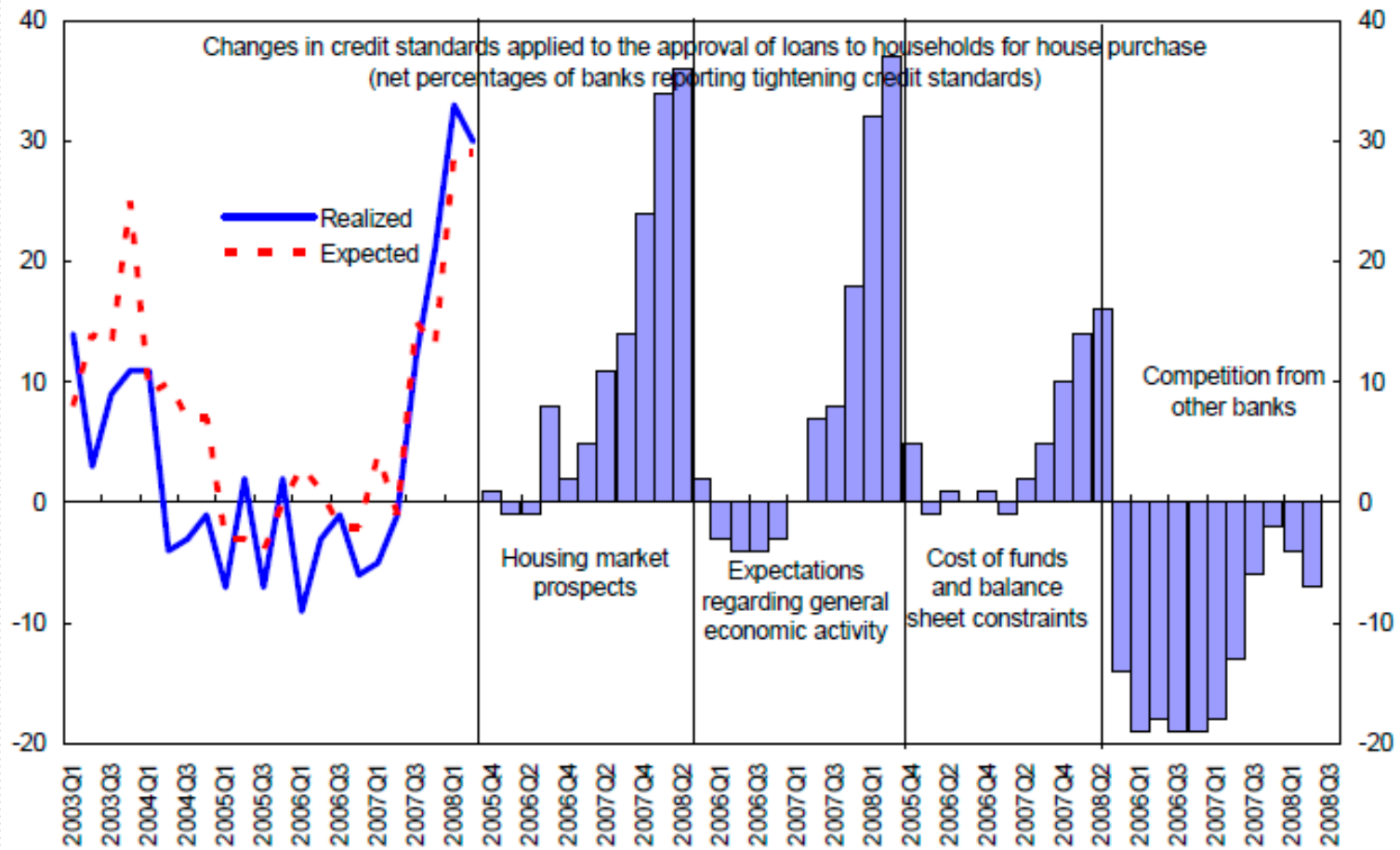
## Equity market decline



# Motivation

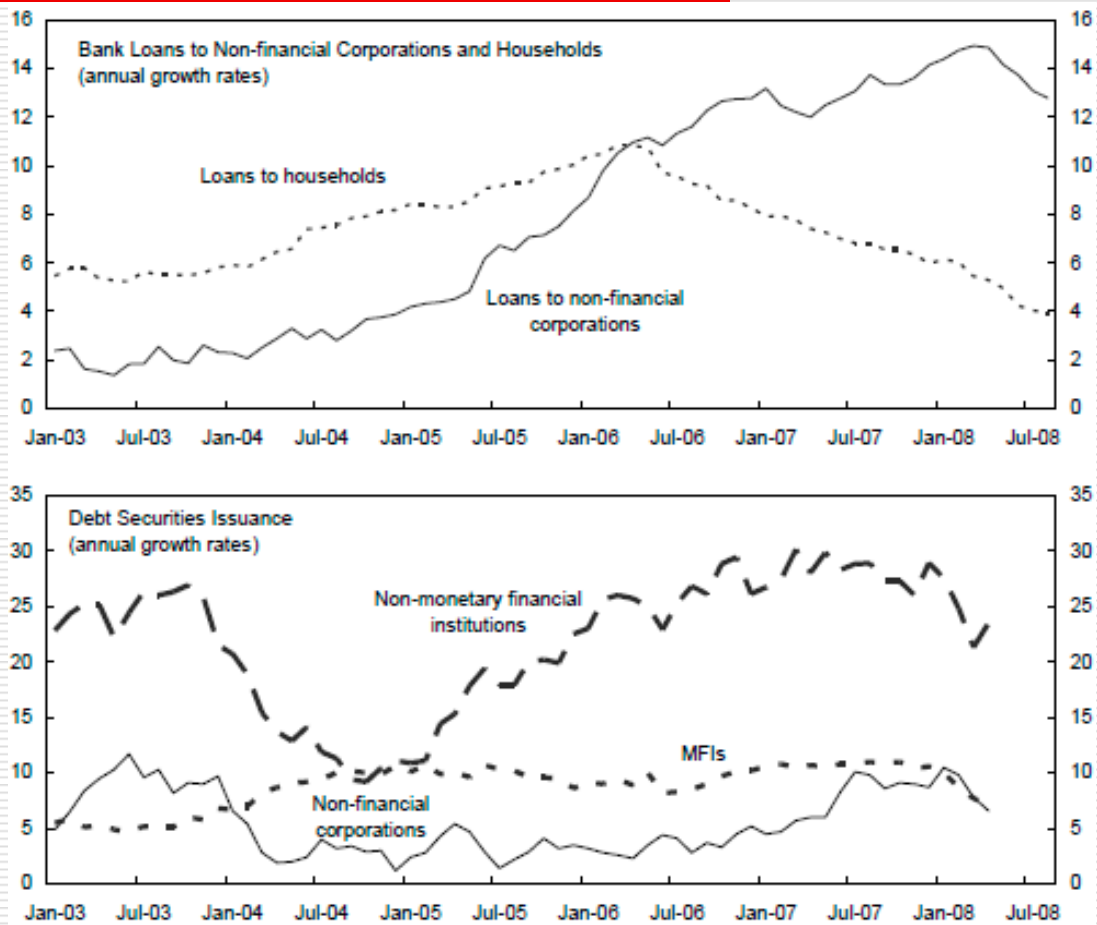


# Motivation





# Motivation



# Motivation

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- Too early to observe full impact of deterioration in financing conditions on euro area economy ...
  - ... but still useful to examine linkages between the financial and real sectors in the Euro Area, using a combination of past and recent data.
  - Likely channels:
    - Higher lending rates
    - Stricter lending standards
    - Higher costs of corporate bond and equity financing
    - “Financial accelerator effects”
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# Outline

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- Empirical evidence
    - Bank characteristics → lending
    - Bank loan supply → output
    - Corporate financing conditions and economic activity
    - Risk transfers between banks and other sectors: contingent claims analysis
  - Quantitative implications of results
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# Bank Characteristics and Lending Behavior

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- Q: Is bank supply affected by deteriorating financing conditions?
  - Analysis of the “bank lending channel”:
    - banks unable to fully shield loan portfolios from changes in financing costs
    - substantial group of borrowers unable to insulate spending from bank credit reduction.
  - The financial turbulence/crisis of 2007-08 provides a natural experiment
    - but we need to look at bank-by-bank variation to isolate supply response from demand shock
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# Bank Characteristics and Lending Behavior

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- Literature: mostly on U.S. data
    - banks (esp. small) decrease loan supply in tighter financing conditions
    - but little evidence of impact on real activity
  - Literature for Europe: inconclusive
    - bank lending channel effective in countries with many small banks, weak capitalization and liquidity, limited non-bank funding
    - studies focus on impact of financing conditions on bank loans (less on impact on output)
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# Bank Characteristics and Lending Behavior

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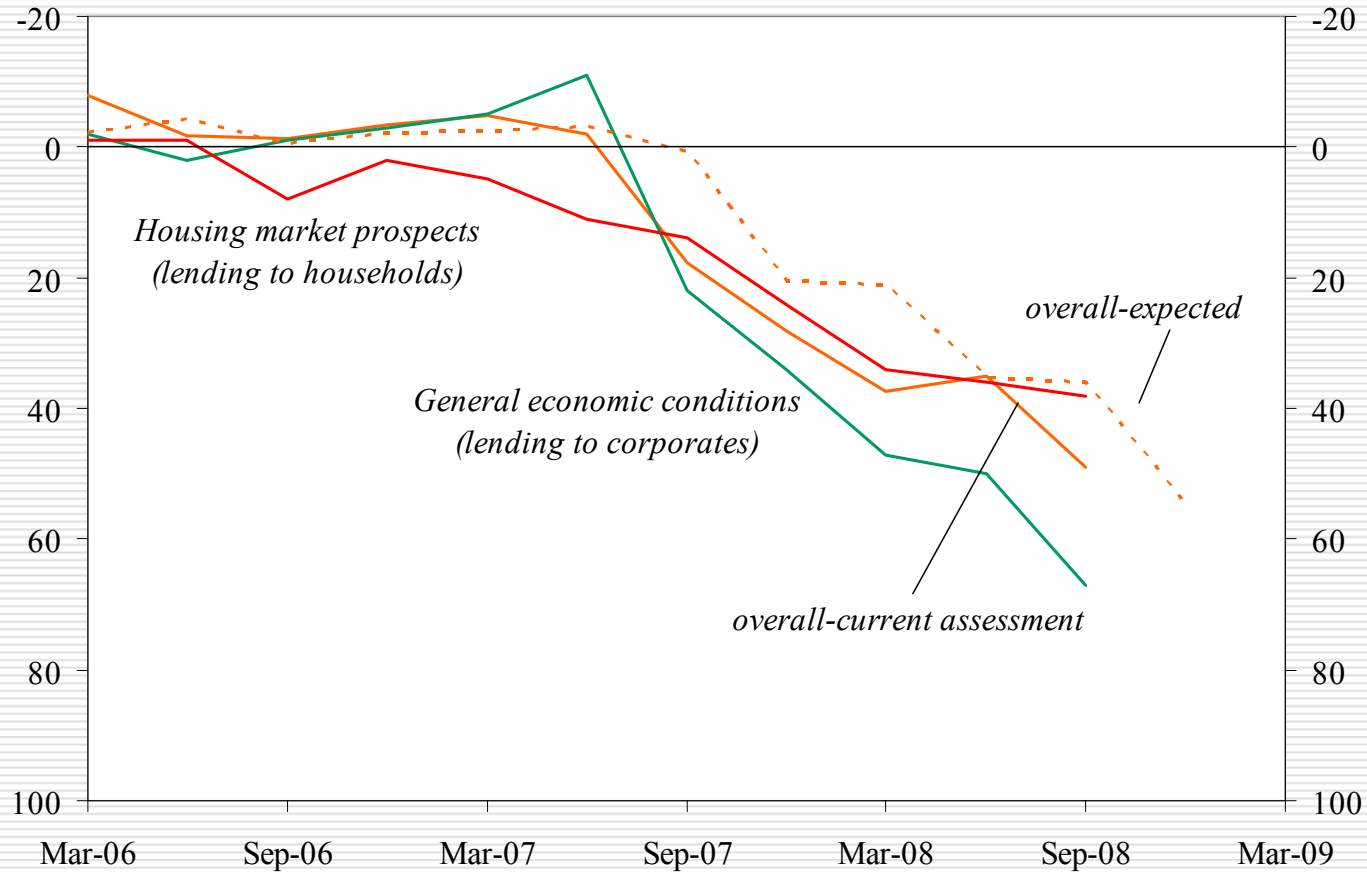
- Correlation between the q/q growth of real GDP and the net percentages from the lending surveys:

	Households	Enterprises
Loan demand	0.41	0.41
Credit std's	-0.40	-0.41

- Both loan demand and credit std's are procyclical.
  - Time series of lending surveys are too short for a more elaborate analysis.
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# Bank Characteristics and Lending Behavior

Euro Area: What Is Causing Banks to Tighten?



# Bank Characteristics and Lending Behavior

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- Econometric estimate:
    - supply-demand disequilibrium model
    - credit determined by the minimum of supply and demand (Pazarbasioglu, 1997; Barajas, Steiner, 2002)
    - this avoids the identification problem of equilibrium models, and allows for credit crunch.
    - Estimated on individual bank data for 50 largest euro area banks in 1997-2007
  - Specification:
    - Demand side: see Bundesbank (2002).
    - Supply side: see Pazarbasioglu (1997), but we add the distance to default among the supply-side variables.
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# Bank Characteristics and Lending Behavior

(Dependent variable: year-on-year real growth rate of a bank's total credit)

Explanatory variables	Demand		Supply	
	Parameter	Std. Error	Parameter	Std. Error
Constant	- 10.24	0.48	-8.32	2.31
Real GDP growth	1.18	0.09		
Lending rate	-0.03	0.01		
Net interest margin	-0.09	0.05		
Distance to default			0.03	0.01
Log (total loans)			-0.02	0.01

Source: Authors' calculations based on data from BankScope and DataStream.

1/ Maximum likelihood estimation. Log likelihood = 125.31.

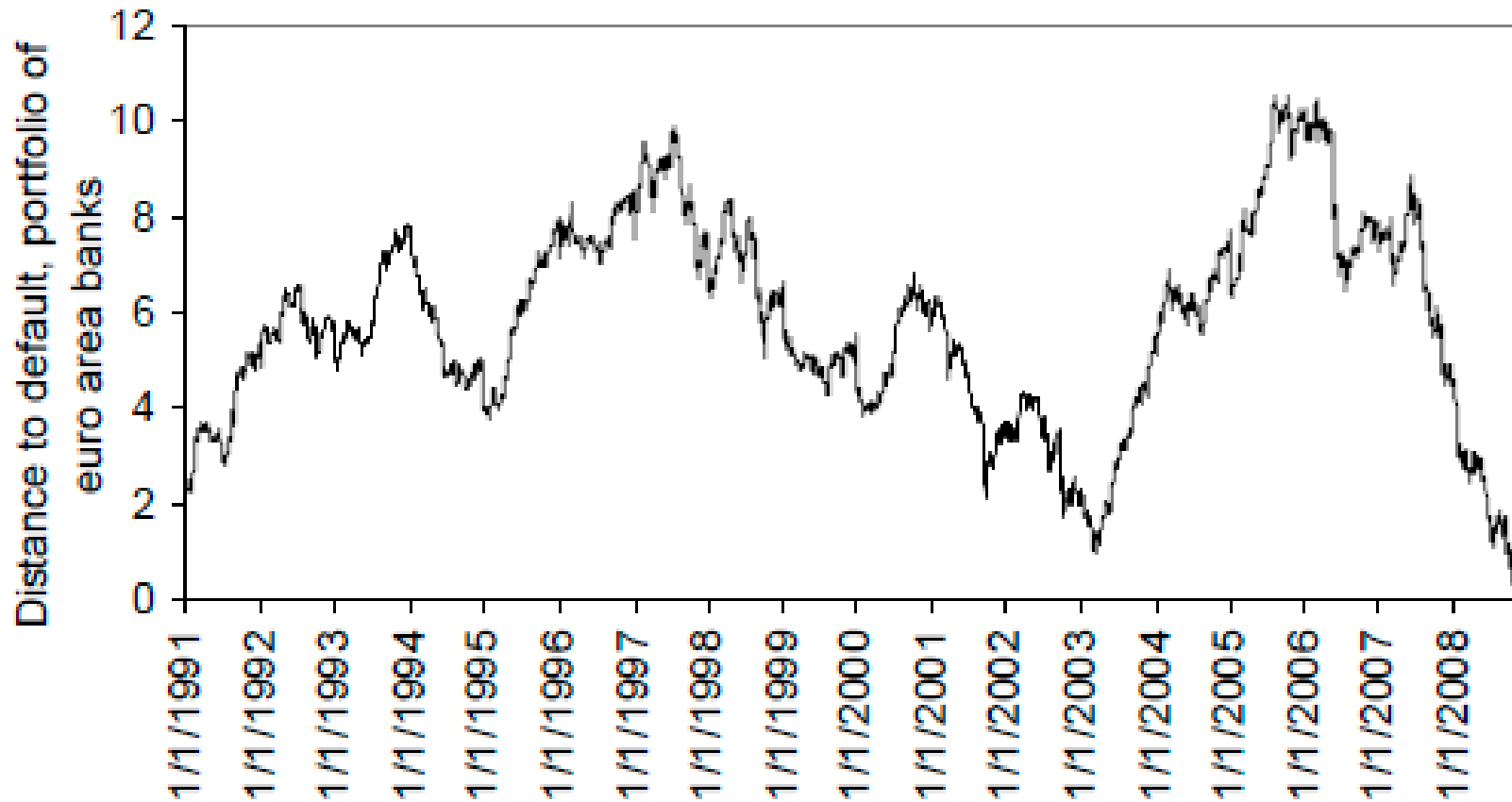
# Bank Characteristics and Lending Behavior

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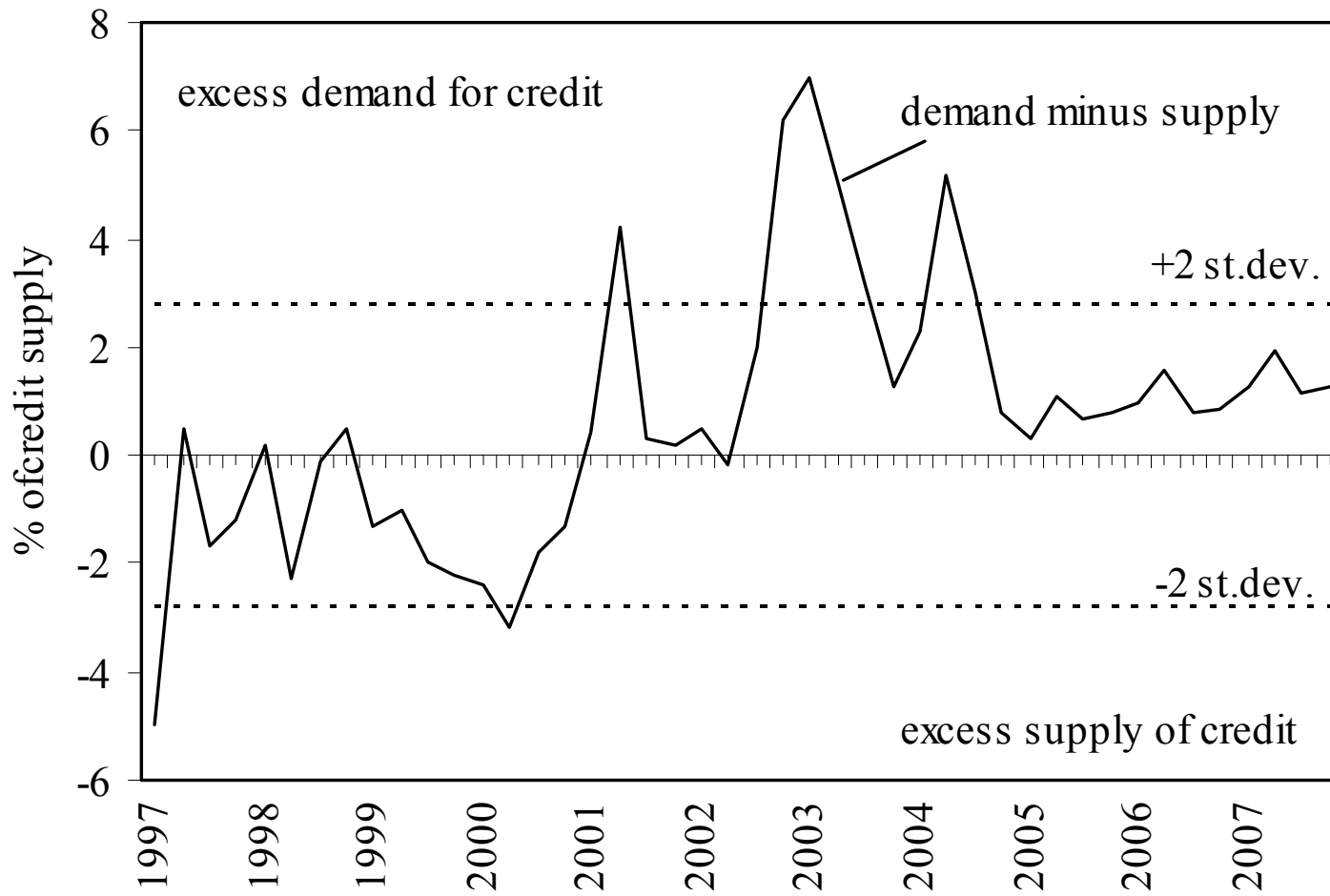
- ❑ Results: all key coefficients have expected signs and are significant.
  - ❑ Explains year-on-year real growth rates of customer loans as a function of a bank's distance to default (+), real GDP growth rate as a proxy for overall economic activity (+), lending rate and net interest margin (-), and bank size approximated by total value of loans (-).
  - ❑ The effect of bank soundness on loan supply is significant, but small. It implies that a 1 st.d. drop in DD is associated with a y/y real growth of credit that is 1.5 percentage points lower than otherwise.
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# Bank Characteristics and Lending Behavior

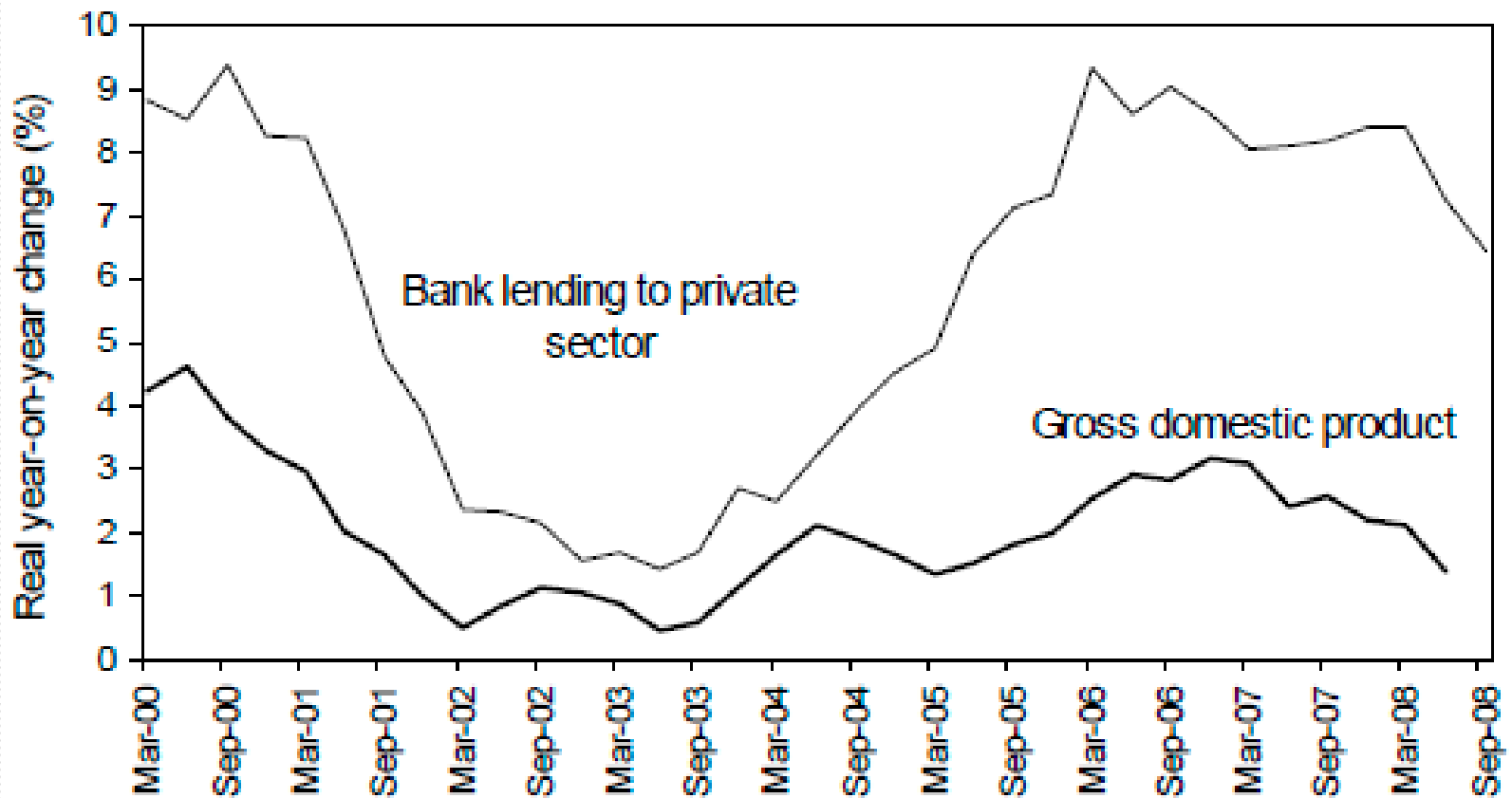
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# Bank Characteristics and Lending Behavior



# Loan Supply and Output



# Loan Supply and Output

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- Examine relationship btw bank loan supply and economic activity
  
  - Econometric problem
  
  - Identification solution
    - Use shocks to country-specific money demand as an instrument for shocks to bank supply
    - First proposed by Driscoll (2004) for the U.S. (using state-level data)
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# Loan Supply and Output

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- Identification scheme:
    - Regress output growth on growth rate of bank loans (and its lagged value), and its own lagged values.
    - Recover shocks to money demand for each euro area country in the sample and regress growth rate of bank loans on its lagged values and the estimated money demand shocks.
    - Re-estimate effect of bank credit on output using the country-specific shocks to money demand as instruments.
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# Loan Supply and Output

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- ❑ Estimated on country-level data for 1999Q1 to 2008Q2 (robustness check: 2003Q1-2008Q2).
  - ❑ Sample includes 11 euro area countries.
  - ❑ Key variables: real GDP, M3, deposit rates, and bank loans to non-financial corporations.
  - ❑ All variables are constructed as deviations from their cross-sectional mean values.
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# Loan Supply and Output

Table 2. OLS Regression of Output on Loans  
Dependent Variable:  $\Delta \tilde{y}_{it}$

Regressors	Coefficient	St. Error
$\Delta \tilde{y}_{it-1}$	-0.2135	(0.1805)
$\Delta \tilde{y}_{it-2}$	-0.0899	(0.1756)
$\Delta \tilde{l}_{it}$	0.1486	(0.0324)***
$\Delta \tilde{l}_{it-1}$	0.0115	(0.0342)
Obs.	232	
R-squared	0.09	

Notes: 1. All variables are demeaned by their cross-sectional averages  
2. Critical values for 1 percent, 5 percent and 10 percent are denoted by (\*\*\*) , (\*\*) and (\*), respectively.

# Loan Supply and Output

Table 3. First Stage IV Regression: Loans on Money Demand Shocks  
 Dependent Variable:  $\Delta \tilde{l}_{it}$

Regressors	Coefficient	St. Error
$\Delta \tilde{y}_{it-1}$	-0.2478	(0.3474)
$\Delta \tilde{y}_{it-2}$	-0.0119	(0.3287)
$\Delta \tilde{\varepsilon}_{it}$	0.0679	(0.0466)
$\Delta \tilde{\varepsilon}_{it-1}$	0.2205	(0.0492)***
Obs.	232	
R-squared	0.08	

Notes: 1. All variables are demeaned by their cross-sectional averages

2. Critical values for 1 percent, 5 percent and 10 percent are denoted by (\*\*\*) , (\*\* ) and (\* ) , respectively. 3. Money demand shocks are denoted by  $\varepsilon_{it}$

# Loan Supply and Output

Table 4. Second Stage IV Regression of Output on Loans  
Dependent Variable:  $\Delta \tilde{y}_{it}$

Regressors	Coefficient	St. Error
$\Delta \tilde{y}_{it-1}$	-0.1514	(0.0582)**
$\Delta \tilde{y}_{it-2}$	-0.0178	(0.0447)
$\Delta \tilde{l}_{it}$	0.0955	(0.0496)**
$\Delta \tilde{l}_{it-1}$	0.0178	(0.0447)
Obs.	232	

Notes: 1. All variables are demeaned by their cross-sectional averages  
2. Critical values for 1 percent, 5 percent and 10 percent are denoted by (\*\*\*) , (\*\*) and (\*), respectively. 3. Country-level money demand shocks are used used as instruments.

# Loan Supply and Output

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- The loan supply effect on output is positive (and statistically significant) but relatively small.
  - An increase in the supply of bank loans by 1 percentage points is likely to lead to an increase in real GDP by about 0.1 percentage point.
  - A cutback in bank loan supply is likely to have a negative impact on economic activity.
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# Corporate Financing and Economic Activity

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- Analyze relationship between corporate bond spread and output in the Euro Area.
  - Corporate bond risk premium is a good predictor of real activity.
  - Can be treated as a proxy for financing conditions.
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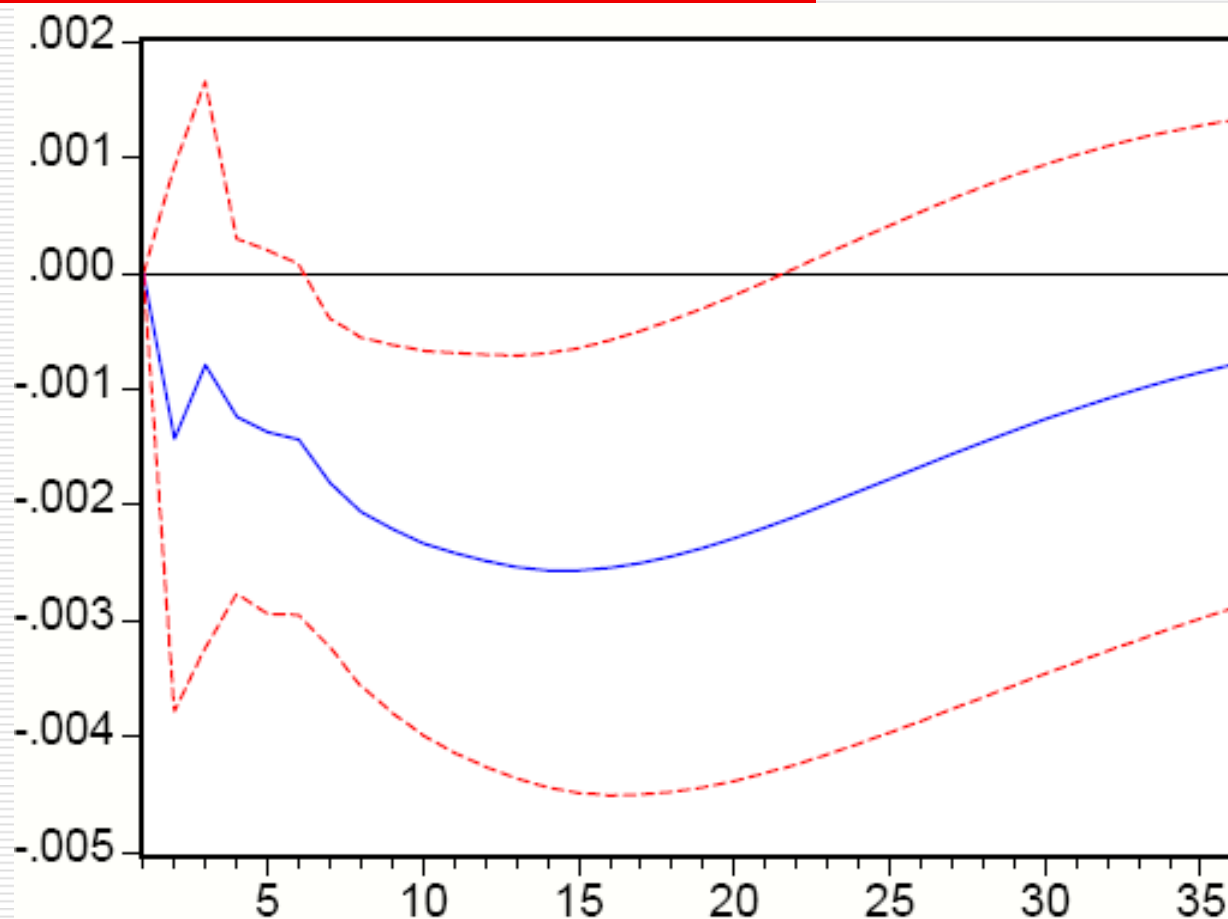
# Corporate Financing and Economic Activity

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- Define corporate bond spread = 7-year BBB-rated corporate bond yield – 7-year government bond yield (robustness check: different bonds)
  - Monthly industrial production ... proxy for real activity.
  - Run VARs for 1999M1:2008M1.
  - Vars: spread, (log) IP, 3M EURIBOR rate, (log) REER.
  - Number of lags = 2 (robustness check: different lags)
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# Corporate Financing and Economic Activity

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Response of annual growth in industrial production to 1 st.d. innovation in corporate spread

# Corporate Financing and Economic Activity

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- ❑ A positive shock to the corporate bond spread leads to a negative response of real activity.
  - ❑ One standard deviation shock (about 60 basis points) has an adverse effect on industrial production, which peaks at about ¼ percent in 8-20 months.
  - ❑ The effect is statistically significant.
  - ❑ Results are fairly robust across alternative specifications.
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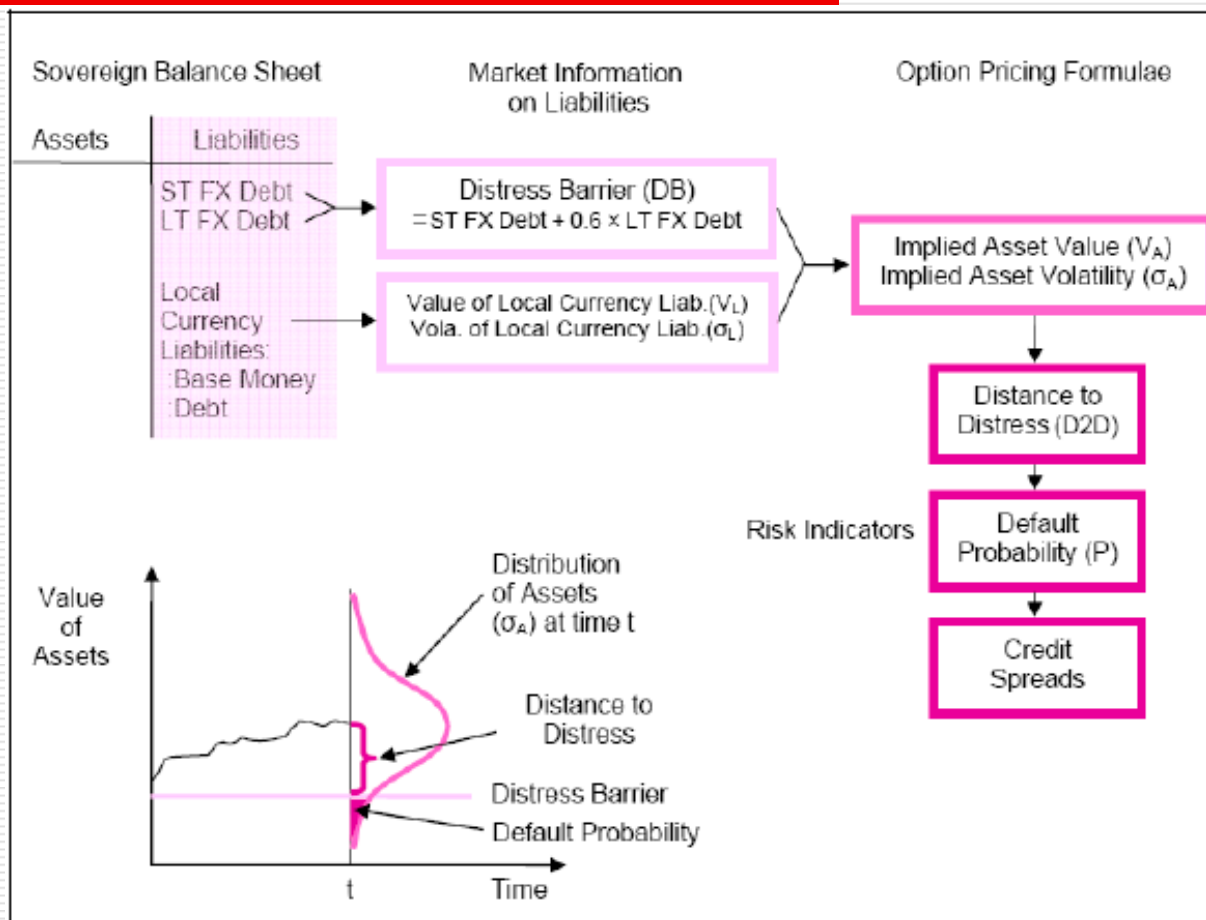


# Risk Transfers: Contingent Claims Analysis

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- CCA: an enhanced version of the balance sheet approach that takes into account market-based data.
    - Basic idea: changes in observed variables used to infer changes in unobserved vars (econ. value of firm, sector).
    - Basic tool: risk-adjusted balance sheet
    - Sectors are viewed as interconnected portfolios of assets, liabilities, and guarantees.
    - Can capture “non-linearities”
  - First time CCA is used to identify vulnerabilities in the corporate, banking, and public sectors in the Euro Area.
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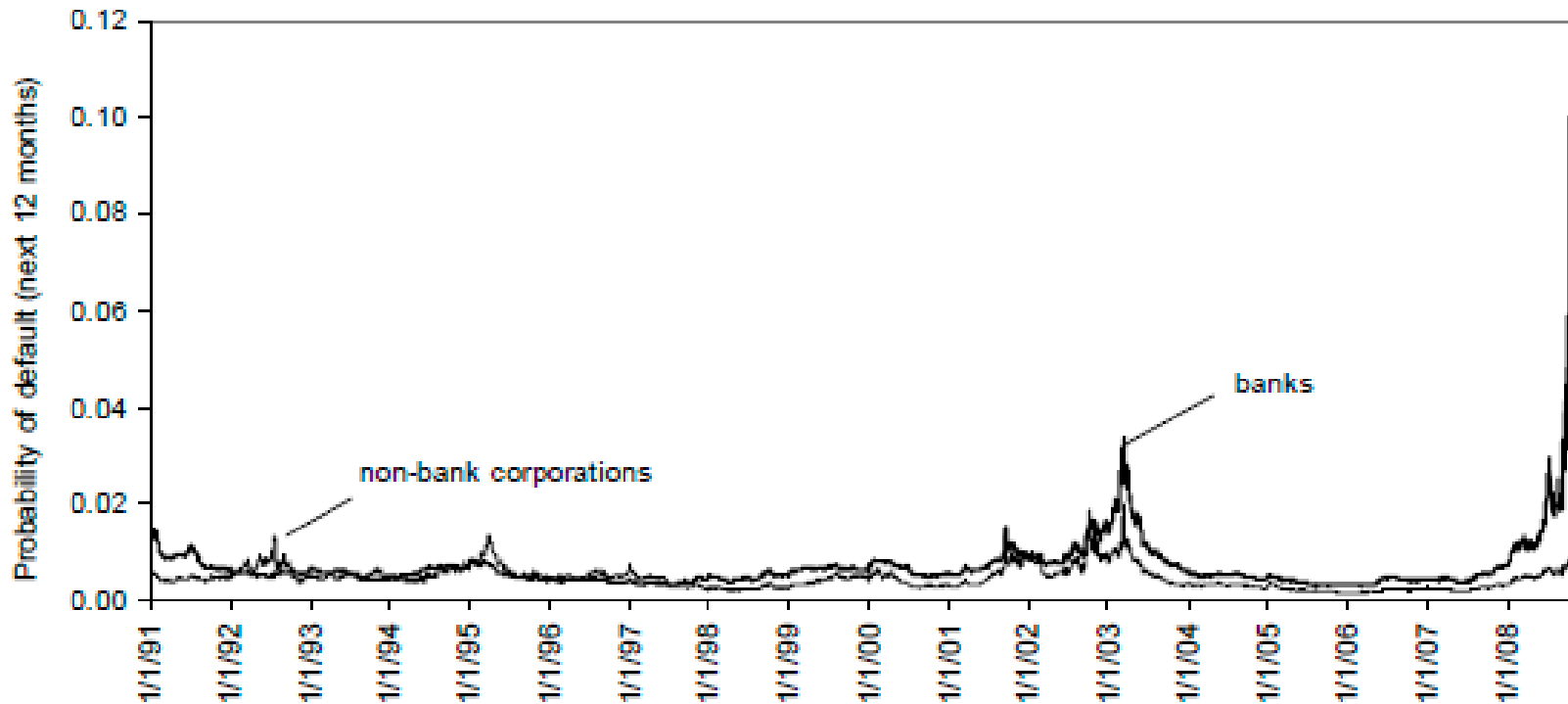
# Risk Transfers: Contingent Claims Analysis



Source: Gray and Jones (2006).

# Risk Transfers: Contingent Claims Analysis

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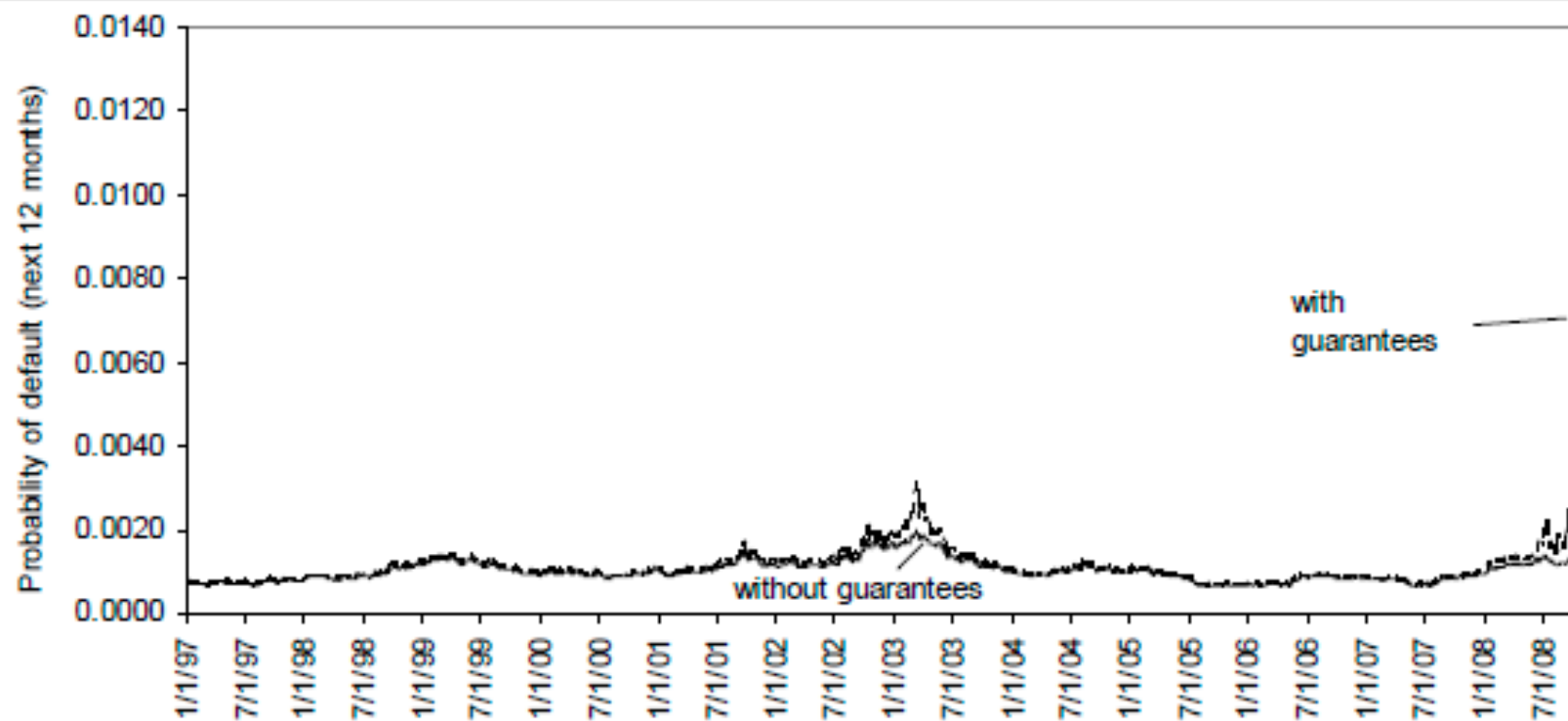


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... shows estimated PDs (next 4 quarters) in banks and corporates

# Risk Transfers: Contingent Claims Analysis

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... shows estimated PDs for sovereigns

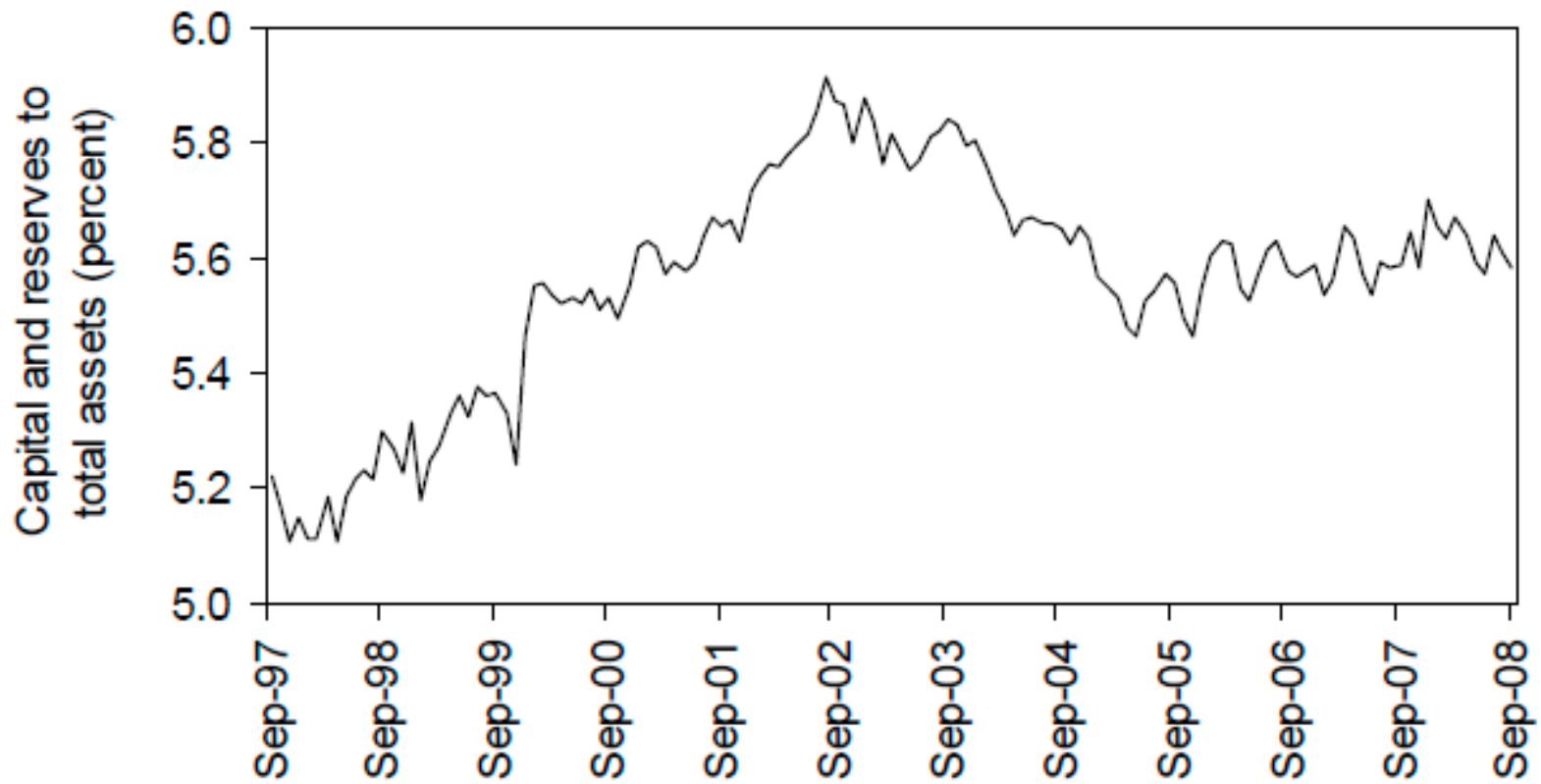
# Quantitative Implications

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- First approach:
    - Estimated losses in euro-area commercial banks: US\$45 bn (sub-prime related losses in euro-area banks as of March 2008; reported in IMF's April 2008 GFSR)
    - Latest estimates of the total exceptional losses in euro-area global banks (=sub-prime related losses plus exceptional part of losses on European assets) may be as large as 10 times that amount.
    - These latest estimates would translate, other things being equal, into a decline in C/A from 5.6 to 4.8 %.
    - To keep C/A unchanged (i.e. no change in leverage), assets would have to shrink by 14 percent.
    - But banks are aiming to deleverage...
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# Quantitative Implications

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# Quantitative Implications

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- First approach (continued):
    - If the banks aim to increase C/A to 5.9 % ( sample maximum), loans would go down by 19 %.
    - If C/A goes up to 7 percent, loans go down 31 %.
    - From the econometric estimate, a decline in the supply of bank loans by 10 percentage points is likely to lead to a decline in real GDP by about 1 percentage point.
    - This means that the above declines in assets would translate to 1.9-3.1 percentage points negative impact on real GDP.
    - The impact can be mitigated by capital injections; exacerbated if massive deleveraging or strong confidence effects (breaking down the relationships).
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# Quantitative Implications

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- Second approach:
    - Average DD:
      - 8.0 in July 2007
      - 0.0 in October 2008
    - Using our estimates, this → negative 19 % pt impact on real credit, which → negative 1.9 % pt real GDP decline.
  
  - All in all, the two approaches suggest an impact on output in the range of 2–3 percentage points.
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# Conclusions

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- ❑ Deterioration in banks' health translates into lower bank loan supply.
  - ❑ Cutback in bank loan supply likely to have a negative impact on economic activity.
  - ❑ Higher costs of corporate bond financing lead to significant decline in industrial production.
  - ❑ Risk indicators for the banking, corporate, and public sectors show an improvement in balance sheets since 2002–03, followed by a deterioration in 2007-2008, reflecting a combination of the increased market volatility and lower capitalization.
  - ❑ Current estimates of bank losses would mean a negative 2-3 % pt impact on GDP.
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