

Lending Standards, Bank Risk-Taking and Monetary Policy

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CEPR Discussing Meeting on

A long-term environment of low nominal interest rates: what are the consequences for the financial sector?

London, 10th of June 2013

Motivation: origins of the current crisis

- Many commentators have suggested that low levels of monetary policy rates induced an excessive softening of lending standards in the run-up to the financial crisis
 - See e.g. Allen and Rogoff (2011), Rajan (2010), Taylor (2008, 2009), Calomiris (2008) and numerous articles since summer 2007 in *the FT*, *WSJ*, and *The Economist*
 - The soft lending standards and real estate bubble are the result of loose monetary policy and global imbalances that led to excessive credit availability. (Also micro factors: financial innovation, weak supervision, regulatory arbitrage of capital...)
- Many others minimize the monetary policy link and argue that the saving glut, global imbalances and low levels of long-term interest rates were the *key* crucial *macro* factors

Motivation: Looking now and forward

- Low monetary rates may increase credit availability (reduce credit crunches in crises), but on the other hand they can create the seeds for the next credit and asset bubble
- New responsibilities for the Fed, BoE and the ECB on financial stability, so a key issue is relationship between monetary policy and macroprudential policy
 - Historically, a dominant concern for central bankers has also been *financial stability* (Bagehot (1873), Goodhart (1988), Stein (QJE 2011))

Credit cycles and systemic risk

- Financial crises are preceded by credit booms
 - Not only in the last crisis, but the highest ex-ante correlate throughout history: Kindleberger (1978), Reinhart & Rogoff (2009), Schularick & Taylor (*AER* 2011), Gourinchas & Obstfeld (*AEJ Macro* 2012), Bordo & Meissner (2012), IMF (2012) ...
 - Systemic risk is endogenous: build-up of financial imbalances
 - Not all credit booms are equal: credit demand (fundamentals) vs. credit supply (volume and compositional changes on risk)
 - Large historical and cross-country studies only use an aggregate credit variable; thus impossible to detect excessive bank risk-taking on credit
- Credit crunches in crises with negative real effects
 - Excessive bank risk materializes, thus bank capital and liquidity problems, thus reduction in the supply of credit

Credit, systemic risk and monetary policy

- For systemic risk (ex-ante and ex-post), credit cycles (especially supply-driven) are crucial
- Monetary policy influences credit (supply) cycles
 - Not only demand, but also supply: Bernanke & Blinder *AER* 1988 & 92; Kashyap and Stein *AER* 2000; Jiménez, Ongena, Peydró & Saurina, *AER* 2012
 - E.g. in the financially fragmented Euro area in the crisis: Ciccarelli, Maddaloni and Peydró *Economic Policy* 2013
 - Also compositional changes of supply on bank risk-taking: Jiménez, Ongena, Peydró & Saurina, *Econometrica* forthcoming
 - It partly depends on financial innovation and prudential policy: Maddaloni and Peydró *RFS* 2011 & *IJCB* 2013
 - Emerging markets externalities: Bolivia (Ioannidou, Ongena & Peydró *WP* 2013) & Czech Republic (Peydró et al 2013)

Benefits and costs of low monetary policy rates?

- Do monetary policy rates influence the supply of credit? Are the effects stronger for weak banks, firms, households and countries? Are there credit crunches? Why is public policy needed?
- Do monetary policy rates influence bank risk-taking in lending? Do low monetary rates cause too soft lending standards? Which banks are more affected?
- Do too low monetary rates for too long followed by high monetary hikes cause the highest credit risk for banks?
- Macroprudential and monetary policy: is the impact of monetary rates on soft lending standards reduced by stronger prudential policy? Should only macropru target excessive bank risk-taking?

Outline for the rest of the talk

- Theory
- Identification problems and empirical strategy
- Results (and data)
 - Risk-taking channel (*Econometrica*)
 - Highest credit risk (new research)
 - Monetary and macro-prudential policy (*RFS* & *IJCB*)
 - Euro area fragmentation (*EP* & *IJCB*)
 - Credit supply (*AER*)
- Conclusions

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Theory on the credit channel

- Credit cycles driven by financial frictions in:
 - Banks (credit supply): Rajan (*QJE*, 1994), Holmström & Tirole (*QJE*, 1997), Allen & Gale (2007), Diamond & Rajan (*JPE*, 2001, *AER*, 2006 & *QJE*, 2012), Adrian & Shin (*ME Handbook*, 2011), ...
 - Non-financial sector (credit demand): Bernanke & Gertler (*AER*, 1989), Kiyotaki & Moore (*JPE*, 1997), ...
- Credit channel of monetary policy: bank lending channel, firm and household balance sheet channel (Bernanke and Gertler, *JEP* 1995; Kashayp & Stein *AER* 2000)

Theory on risk-taking channel

- Risk-taking channel of monetary: expansive monetary policy through the increase in funding provided by households and other agents to banks may cause an increase in risk-shifting in lending, as banks face strong moral hazard problems – especially banks with lower capital at stake who do not fully internalize loan defaults
 - See Diamond and Rajan (*JPE* 2012), Allen-Gale models in Allen and Rogoff (2011), Borio and Zhu (2008), Dell’Ariccia, Laeven & Suarez (2013), Acharya & Naqvi (*JFE* 2012), among others
 - Adrian and Shin (2011) in the latest *Handbook of Monetary Economics* discuss the risk-taking channel of monetary policy. They show that a lower monetary policy rate increases risk-taking in lending by relaxing the bank capital constraint that is present due to bank moral hazard
 - A low short-term interest rate makes riskless assets less attractive and may lead to a search-for-yield by financial intermediaries with short-term time horizons (Rajan, *NBER* 2005)

Though not a new idea

- “*Speculative manias gather speed through expansion of money and credit or perhaps, in some cases, get started because of an initial expansion of money and credit*”
(Kindleberger (1978), p.54)

Identification problems and strategy

- How to disentangle credit supply from demand (fundamentals)?
 - Only 1/3 of credit booms end with a financial crisis (IMF 2012)
 - What are the lending opportunities?
 - Which banks should be more affected by policy?
 - Credit register data: all loans, including loan applications, matched with firm and bank balance sheet data
 - Applications from the same firm to different (affected) banks at the same time
- How to construct the counterfactuals?
 - Monetary policy is endogenous to economic fundamentals
 - Euro area: same monetary policy rate but very different conditions in the cycle: say Spain vs. Germany in 2002-06 and in 2009-...
 - Lending surveys in Euro area countries (and US)

First experimental setting: Spain

- Data: Exhaustive credit register from a bank dominated economy
 - Loan applications from non-current borrowers for 2002:M2-2008:M12 with borrower and lender identity (extensive margin of new lending capturing screening)
 - All granted individual loans matched for 1984:Q3-2008:Q4 (intensive margin and terminated loans capturing monitoring)
- Shocks: Monetary policy mainly decided in Frankfurt since mid 1988 (Spain enters the European ERM; afterwards the Euro since 1999)
 - Not highly correlated monetary rates with local CPI (0.1) and GDP (0.25). Gives exogenous variation of monetary policy conditions

Credit register: *Central de Información de Riesgos*

- Credit registry of Spain managed by the Bank of Spain (supervisor). All banks have to participate accordingly to the law
- Detailed loan information on *all* outstanding loans granted by *all* banks operating in the country from 1984:Q3-2008:Q4 matched with bank balance-sheet characteristics
- Loan applications: 241,052 applications on file for 110.545 firm-time dummies in 2002:M02 – 2008:M12. Mean and median of 3 applications per loan granted
- We use all business loans:
 - All loans above 6,000 euros. Random sample of 20%
 - Select firms with more than 1 bank per borrower for the firm*time fixed effects (86% of credit and coefficient on whole sample does not change)
 - Start in 1988:Q3 given Spain enters the ERM and use data since 1984 to construct the credit history of the borrower (our main credit risk variable)
 - 6,564,964 loans (loans are aggregated at *firm-bank-time* triplet), 294 Banks, 131,222 firms, (average) banks per firm is 3.2

Identification strategy of risk-taking

- The credit demand channel of monetary policy works at the *firm level*
- The bank lending channel works at the *bank level*
- The risk-taking channel works at the *bank-firm level*

Identification strategy of risk-taking

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- ➔ Loan (bank-firm) application level data needed for identification:
- Loan-level data (also applications) from the credit register of Spain
 - Firm*time fixed effects to control for the firm fundamentals (demand)
 - Identification comes from multiple borrowing of the same firm at the same time in loan applications (or in existing loans)
 - Changes in key firm characteristics are largely unobserved. We control in this way for *both observed and unobserved time-varying firm heterogeneity*
 - Empirical test: does higher credit risk-taking when monetary rates are low come from banks with lower capital ratios?
 - Bank*time fixed effects to control for the bank lending channel

Equation with loan level data

$$1(Granted_{b,i,t}) = \alpha + \beta \Delta IR_{t-1} + \gamma \Delta IR_{t-1} \cdot FirmRisk_{i,t} + \delta \Delta IR_{t-1} \cdot FirmRisk_{i,t} \cdot BankCap_{b,t-1} + \dots$$

- *Granted* is a dummy variable that equals 1 if loan application from firm *i* to bank *b* at month *t* was granted
 - Alternatively it is the difference of log credit volume
- *IR* are the overnight interest rates (EONIA)
- *FirmRisk* measures firm credit risk. Main specification defined as dummy variable that equals 1 if the firm has had a default in the previous years
 - -5, -4-, -3, -2, -1. Also future loan defaults
- *BankCap* is book value of total equity over total assets (no risk adjusted)

Equation and hypotheses

$$1(Granted_{b,i,t}) = \alpha + \beta \Delta IR_{t-1} + \gamma \Delta IR_{t-1} \cdot FirmRisk_{i,t} + \delta \Delta IR_{t-1} \cdot FirmRisk_{i,t} \cdot BankCap_{b,t-1} + \dots$$

- If lower monetary policy rates increase risk-taking, then $\gamma < 0$ & $\beta < 0$
- **Problem: $\gamma < 0$ & $\beta < 0$ consistent with the firm balance-sheet channel**
 - E.g. riskier firms could have a higher increase in net worth, collateral value or investment opportunities
 - These firm characteristics are largely unobserved

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 - E.g. riskier firms could have a higher increase in net worth, collateral value or investment opportunities
 - These firm characteristics are largely unobserved
- Banks with lower capital ratio should engage more in risk-taking when rates are lower: $\delta > 0$

Equation with our identification strategy

$$1(Granted_{b,i,t}) = \alpha(i,t) + \delta \Delta IR_{t-1} \cdot FirmRisk_{i,t} \cdot BankCap_{b,t-1} + Controls_{b,i,t-1} + \varepsilon_{b,i,t}$$

- To control for the demand channel, we use loan applications at the monthly level and a full set of time dummies for each firm ($\alpha(i,t) = \alpha(i) * \alpha(t)$)
- Control for bank*time fixed effects ($\beta(b,t) = \beta(b) * \beta(t)$) (bank lending channel)
- Control for triple interactions of bank capital and firm risk with:
 - GPDG and inflation as the main drivers of monetary policy
 - Long term rate changes as demand reacts more to long rates
 - Securitization and current account deficits (capital inflows)
 - Short and long term US rate changes
 - Bank variables as size, NPL, ROA, type and liquidity interacted with firm risk & rates
 - All the triple interactions together, including firm*time and bank*time FE
- Multi-cluster standard errors at bank, firm, time
- Time-varying and/or time-invariant bank-firm relationship for existing loans

Our main regressions: Extensive and intensive margin together

1st stage regression: Loan applications to non-current banks – extensive margin of lending

$$1(Granted_{b,i,t}) = \alpha(i,t) + \delta \Delta IR_{t-1} \cdot FirmRisk_{i,t} \cdot BankCap_{b,t-1} + Controls_{b,i,t-1} + \varepsilon_{b,i,t}$$

2nd stage regression: Conditioning on loan application granting, we analyze log credit commitment volume granted – intensive margin of lending

$$LogGranted_{b,i,t} = \alpha'(i,t) + \delta' \Delta IR_{t-1} \cdot FirmRisk_{i,t} \cdot BankCap_{b,t-1} + Controls_{b,i,t-1} + \varepsilon_{b,i,t}$$

Other 2nd stage regression outcomes: Collateral requirements and Future loan default by the firm

- *Firm Risk* is ex-ante credit risk (credit history)
- Two-step estimation procedure for Tobit 2 selection models outlined by Kyriazidou (ECMA 1997) and Wooldridge (JoE 1995)
- Also analyze the 2nd stage regression without the 1st to analyze the potential bias

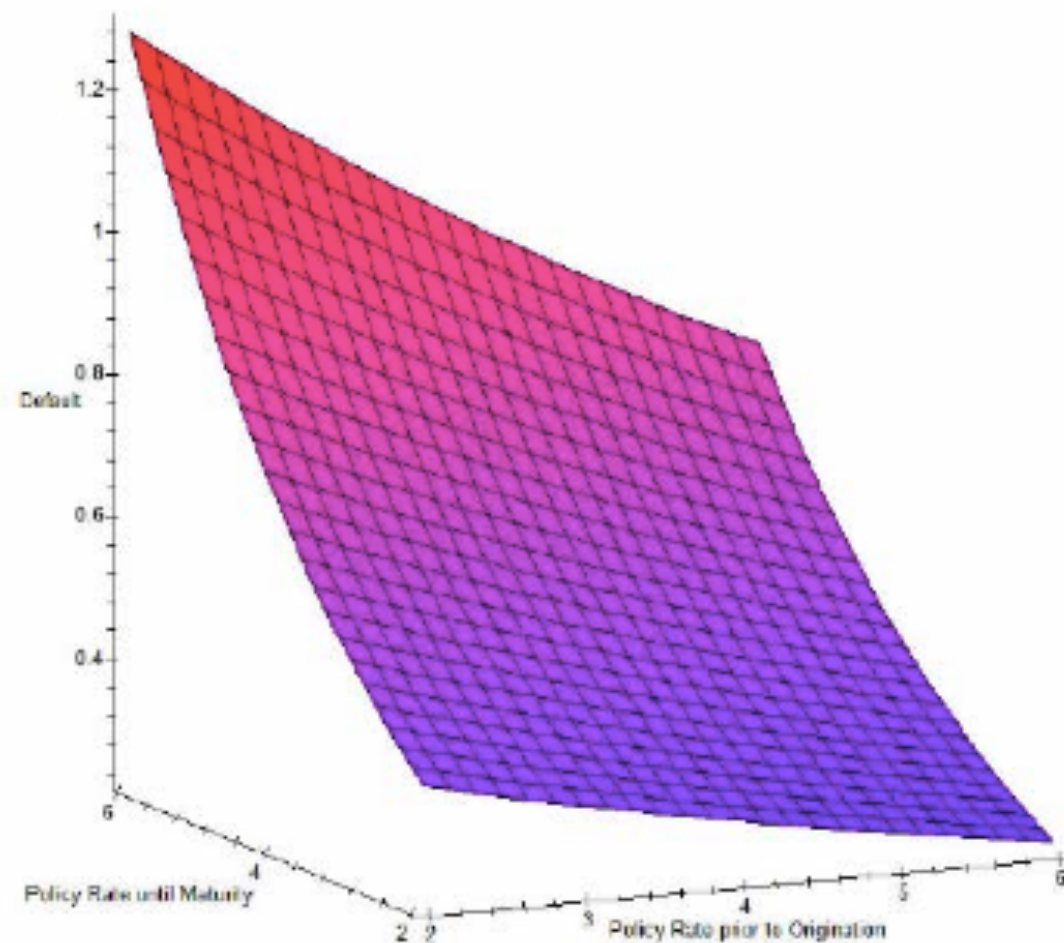
Summary of results and economic effects

- A 1 p.p. lower overnight rate induces lower capitalized banks to:
 - Increase granting applications to ex-ante riskier firms (semi-elasticity of 8%)
 - condition on granting applications, granted loans are larger in volume (semi-elasticity of 18%), with more ex-post defaults (by 5%) and with less collateral requirements (by 7%)
 - In “dollarized” Bolivia, we have loan prices, and even prices are softened
 - A lower long-term rate and other key aggregate factors as higher securitization and current account deficit (capital inflows) and low US short and long term rates, however, have no such effects
 - none of these factors are robust statistically (and when stat significant, they are not economically more important than Euro area short-term rates)
 - one p.p. decrease in the overnight rate on firms with vs. firms without doubtful loans engaged by one standard deviation of bank capital
- All banks take higher credit risk when lower monetary rates (19%)

Other countries: external validity

- Ongoing empirical work documents the robust existence and potency of a bank risk-taking channel of monetary policy across many countries and time periods (due to data limitations, none of the papers estimate a selection model on loan applications):
 - See e.g. for the U.S. (Altunbas, Gambacorta and Marquez-Ibañez (2010), Buch, Eickmeier and Prieto (2010), Buch, Eickmeier and Prieto (2011), Delis, Hasan and Mylonidis (2011), Paligorova and Santos (2012), Dell’Ariccia, Laeven and Suarez (2013)), Austria (Gaggl and Valderrama (2010)), Colombia (López, Tenjo and Zárate (2010a), López, Tenjo and Zárate (2010b)), the Czech Republic (Geršl, Jakubík, Kowalczyk, Ongena and Peydró (2012)), and Sweden (Apel and Claussen (2012))
 - In Ioannidou, Ongena and Peydró (2013) we find similar results for Bolivia, but loan pricing decreases despite of higher risk-taking
 - Bolivia: loans are dollarized (strong identification strategy)

New paper: duration analysis



- Higher default risk when loans are granted with too low monetary policy rates for too long followed by monetary hikes during the life of the loan
 - Current crisis, the Great Depression, the Japanese crisis...

Second experimental setting: Euro Area

- Geographical focus: Euro area
 - common monetary policy rate with big cross-country differences in GDP growth and inflation (Taylor, 2008; Rajan, 2010) – different monetary stance in same quarter (time fixed effects)
 - national authorities responsible for banking supervision, while monetary policy is decided by the Eurosystem
 - institutional differences in market regulations: For example in mortgage markets (LTVs) and some in supervision of capital
- Data: the euro area Bank Lending Survey
 - complete source of information on credit conditions, factors affecting changes and specific terms for borrowers
 - panel dimension (12 countries)

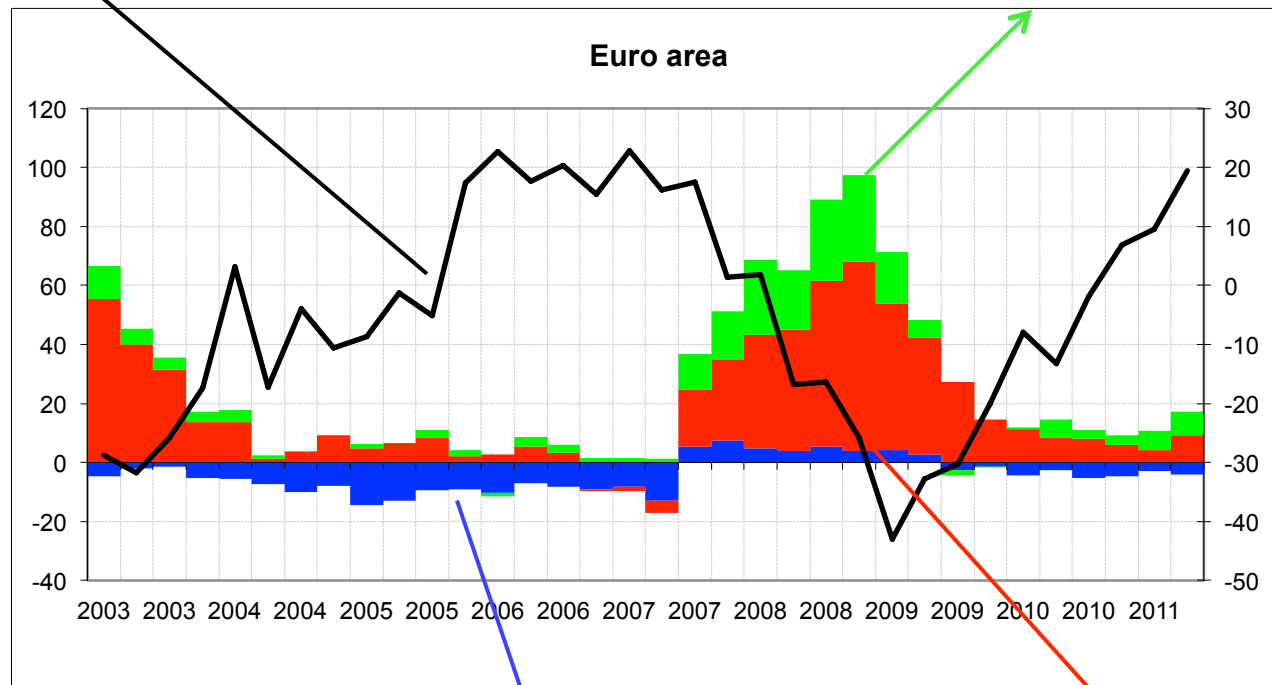
Euro Area Lending Survey: identification

- “Over the past three months, how have your bank’s credit standards as applied to the approval of loans or credit lines to enterprises changed?”
 - (overall, to SMEs, to large enterprises, short-term, long-term)
 - to households for house purchase
 - to households for consumer credit
 - Net percentage of banks reporting a tightening of standards = the difference between the banks reporting a tightening and the banks reporting a softening of lending standards
- The BLS report on the factors affecting banks’ lending conditions. The factors can be grouped in two categories:
 - bank balance sheet capacity and competition pressures
 - quality and risk of loan applicants (net worth, collateral and credit risk)
 - also loan demand info

Lending standards in the euro area

Demand for loans

Bank balance sheet capacity

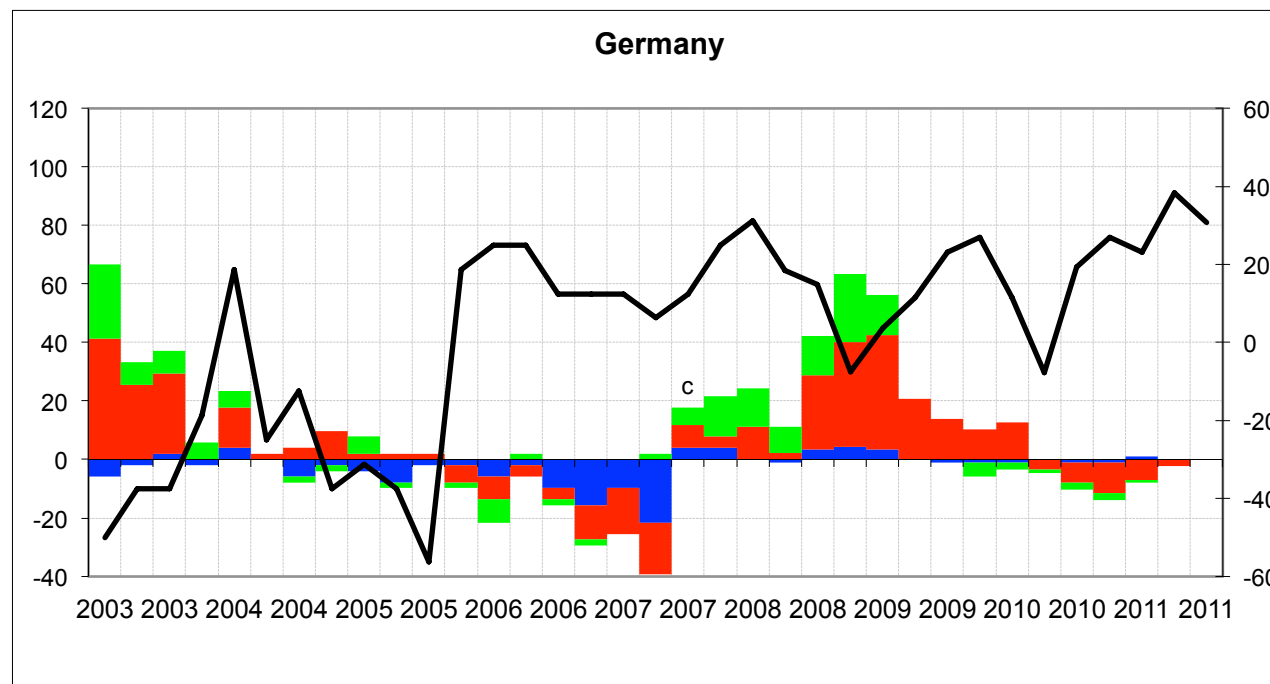


Source: ECB

Competition from other banks

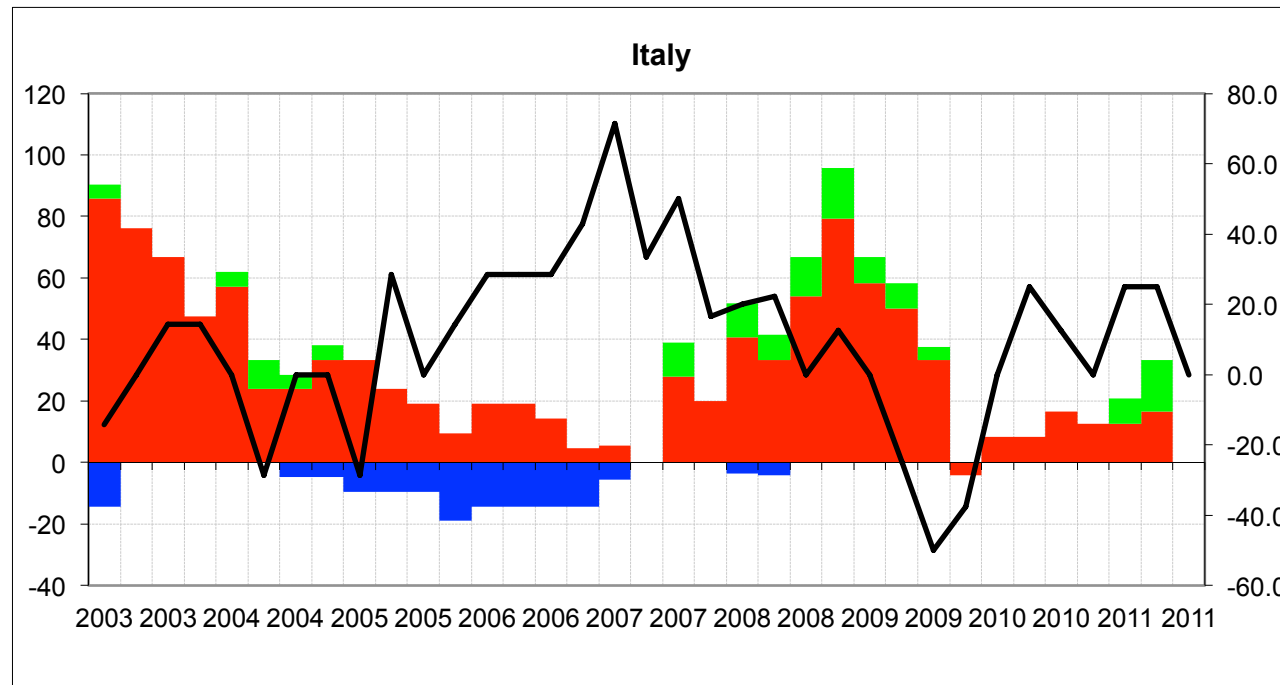
Quality and risk of loan applicants

Lending standards in Germany



Source: Bundesbank

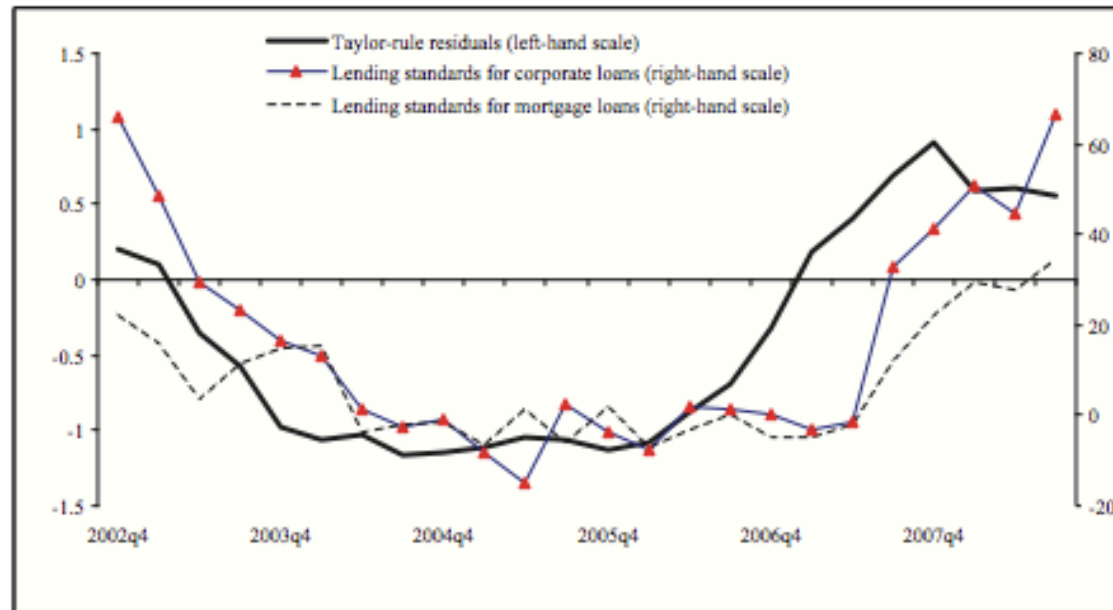
Lending standards in Italy



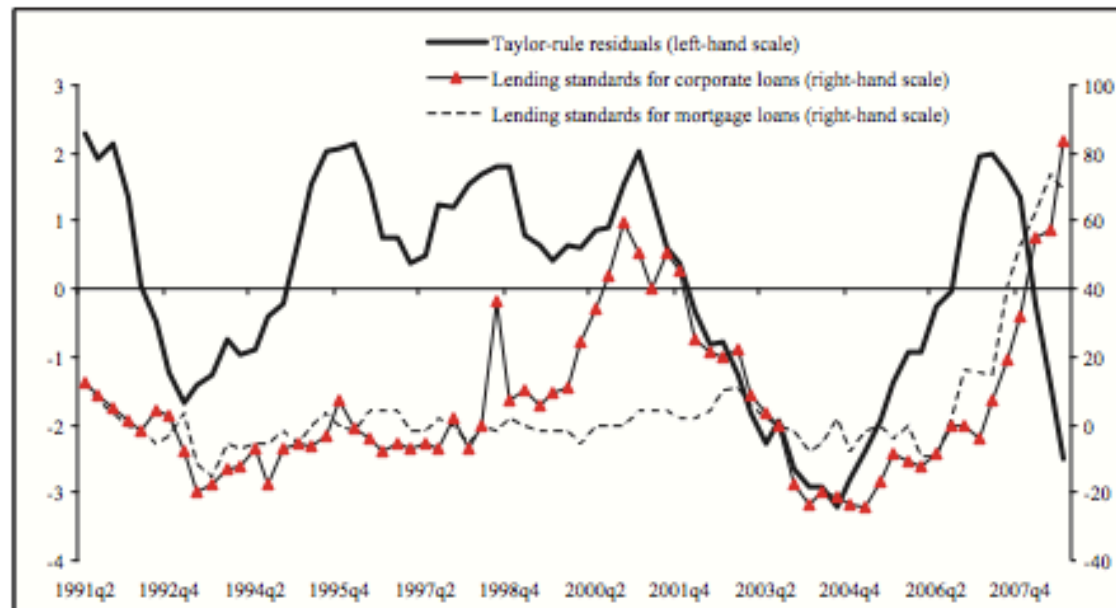
Source: Banca d'Italia

Figure 1: Taylor-rule residuals and lending standards

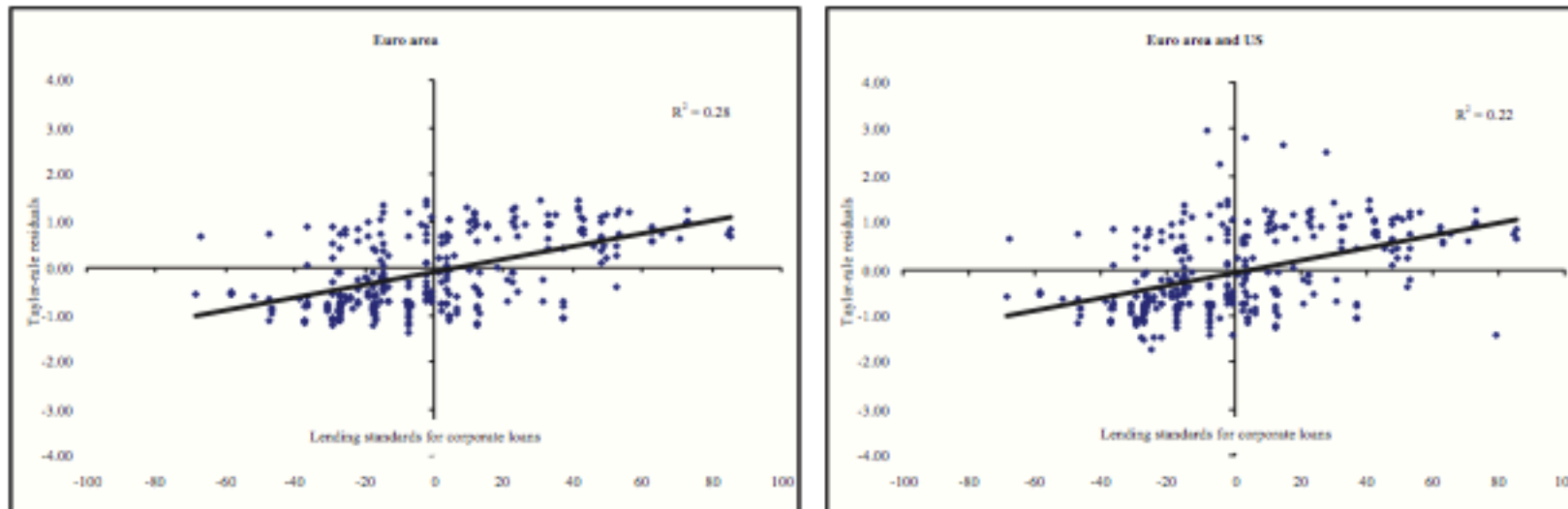
Panel A: Euro area



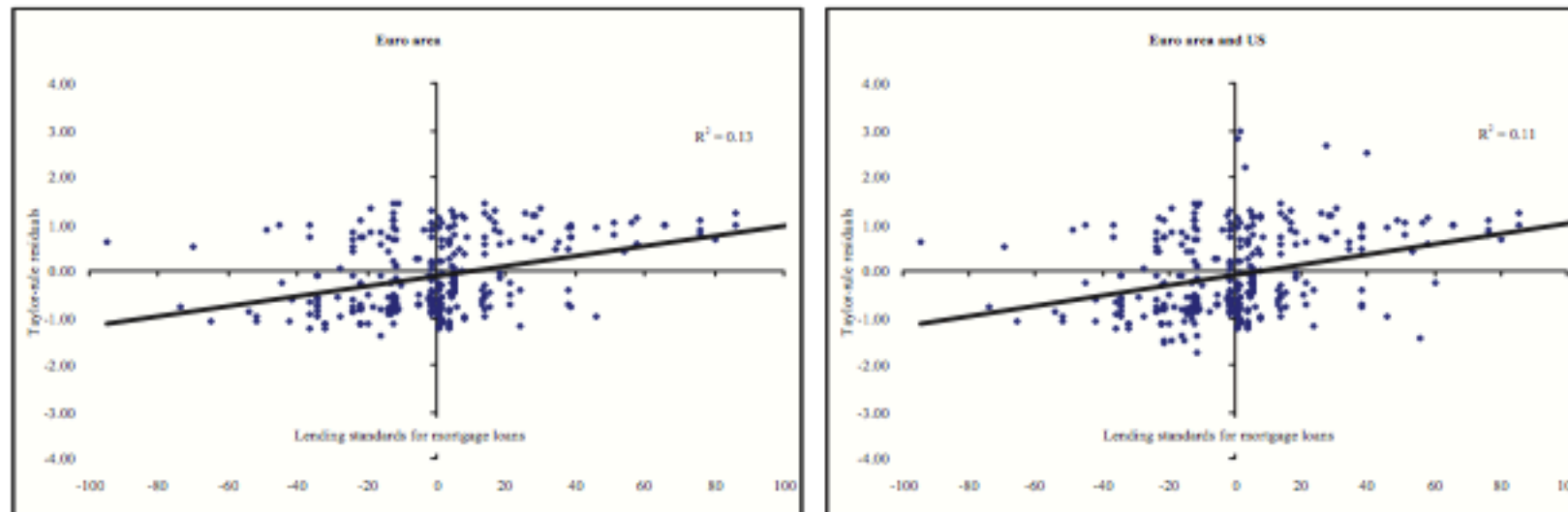
Panel B: US



Panel A: corporate loans



Panel B: mortgage loans



Summary of results: Monetary policy

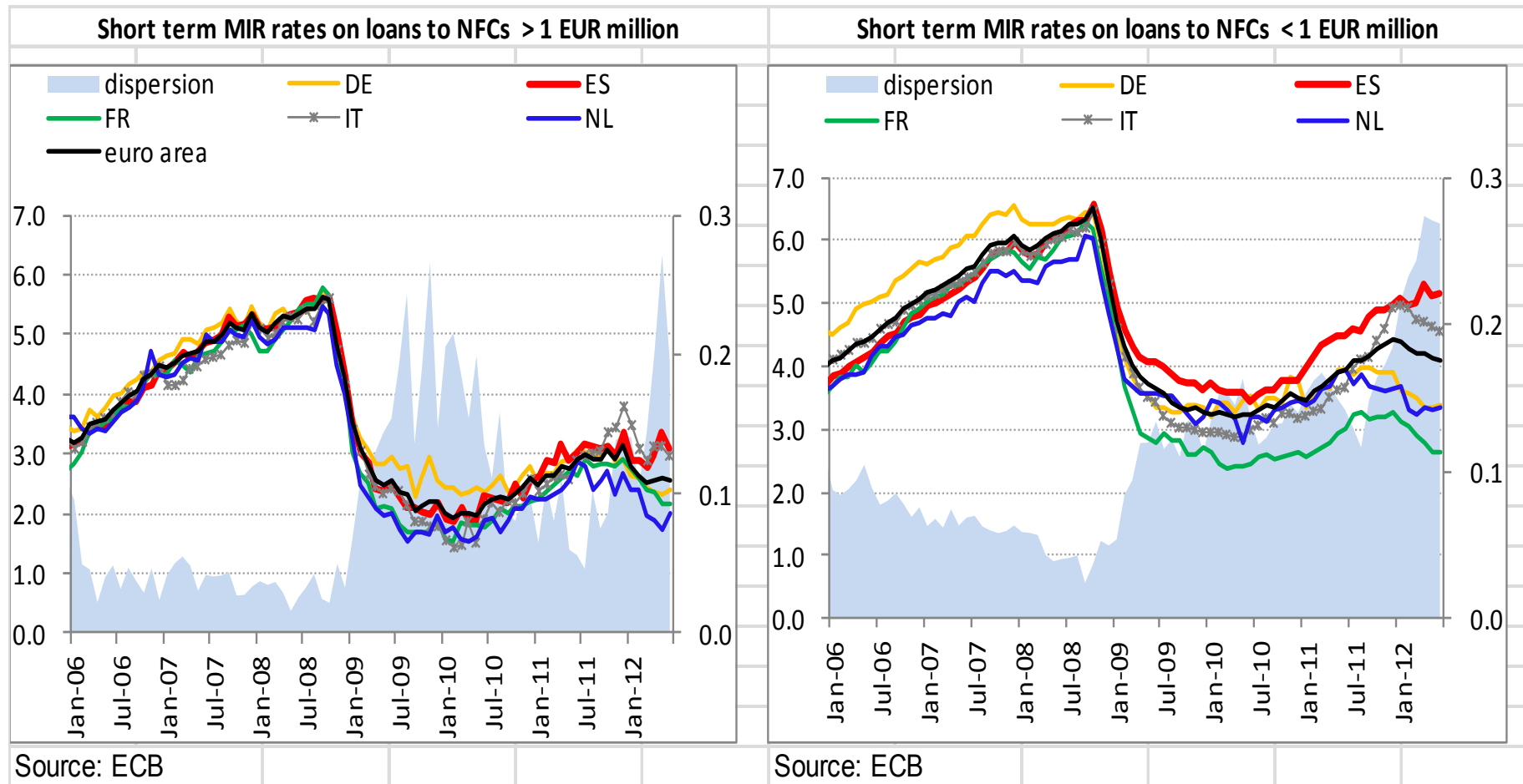
- Low short-term (monetary policy) rates soften lending conditions for firms and households
 - over and above firm risk and the balance sheet position of banks
 - all lending conditions are softened (e.g. collateral, maturity...)
 - evidence of “excessive” risk-taking in mortgage loans as all the supply factors affect more the non-prime borrowers
 - the effect of low interest rates is statistically and economically more significant than low long-term rates and current account deficits

Summary of results (2): Monetary and Macropru policy

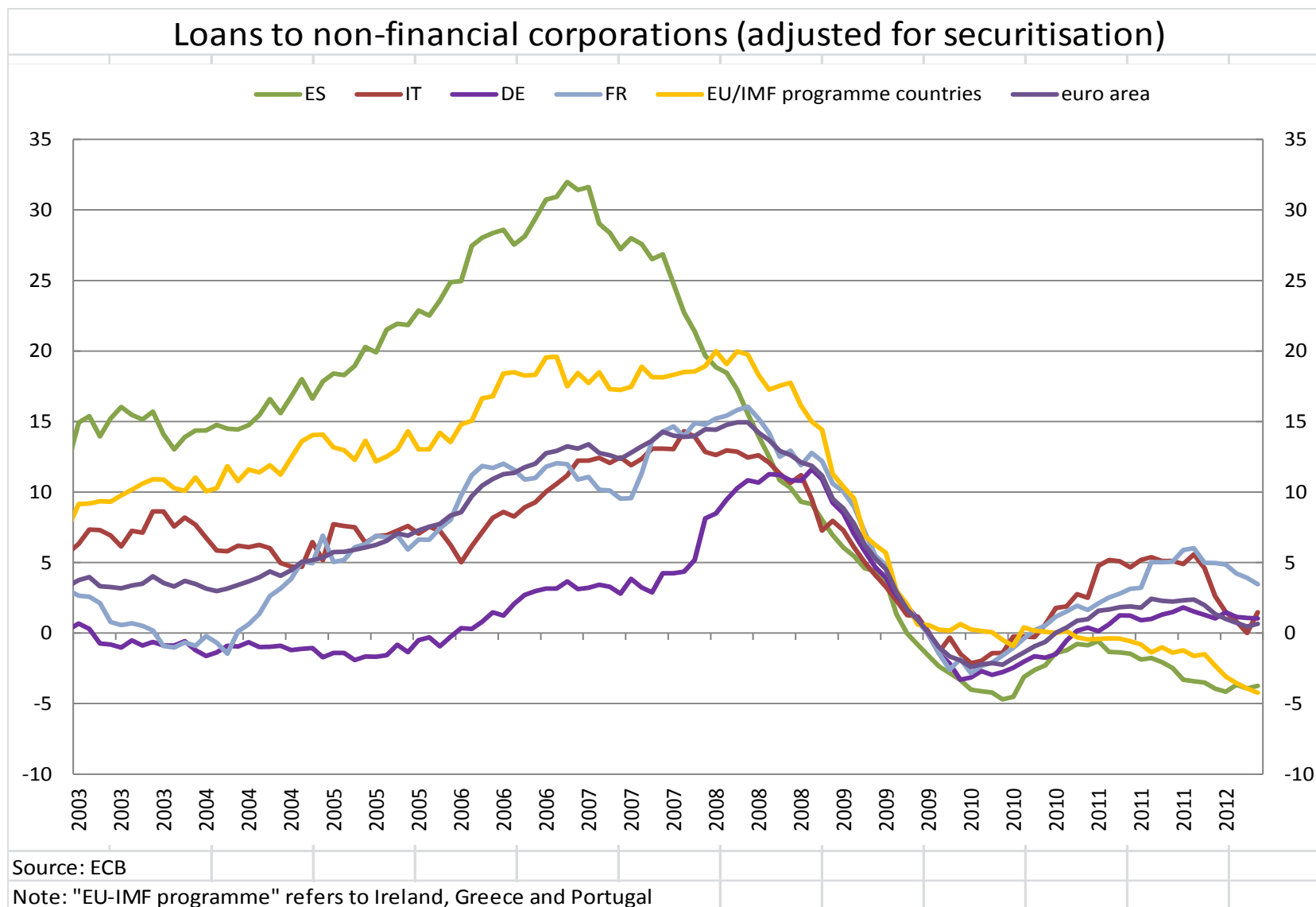
- The softening effects of low monetary interest rates is reduced by more stringent prudential policy on bank capital and Loan-to-Value ratio (LTV)
 - In another paper we analyze the unique macropru policy in Spain on dynamic provisioning and find very strong effects of dynamic provisioning to alleviate the ex-post credit crunch in crisis, but limited preventive role to combat ex-ante the credit boom
- Implications:
 - Monetary policy needs less to target financial stability when strong and effective macro (and micro) prudential policy
 - But there are limits on macroprudential policies: new policies and can be arbitrated...
 - Hence, there is a role for monetary policy to target financial stability

Credit crunch, Euro area financial fragmentation and monetary policy

Heterogeneity in loan rates for firms



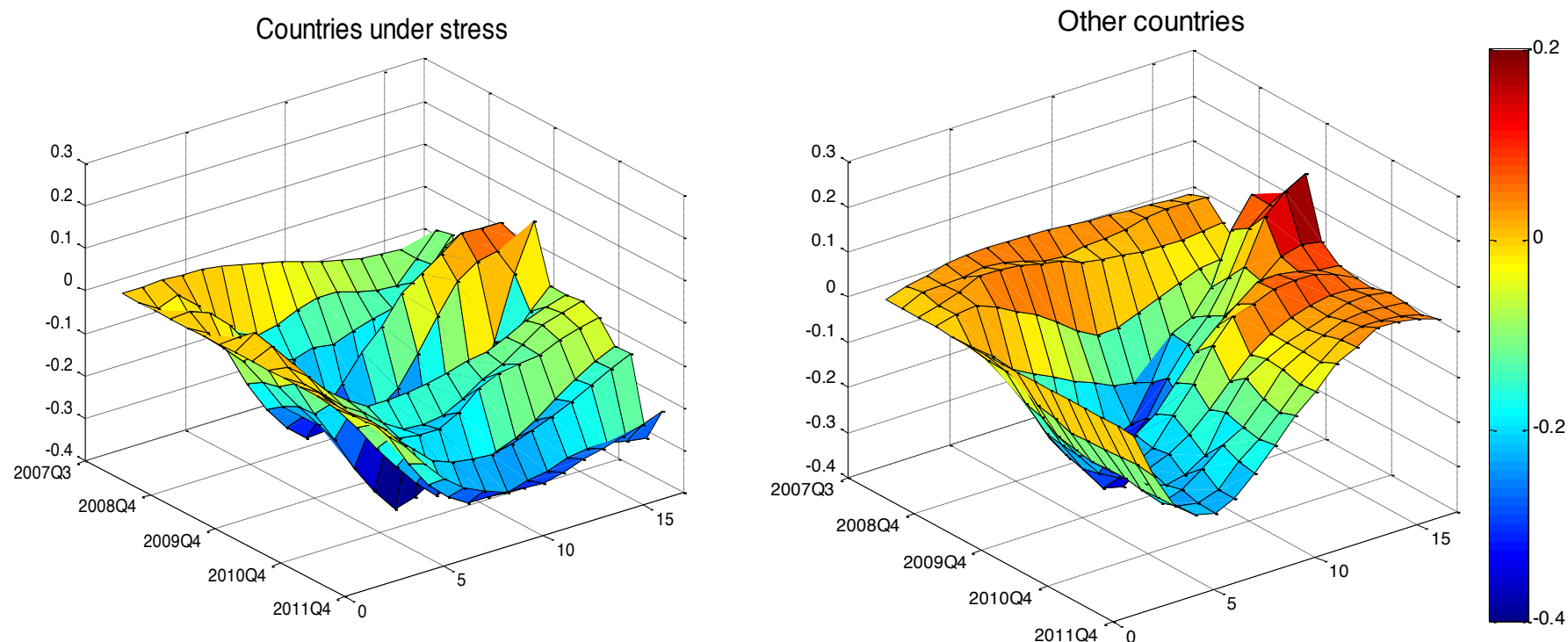
Heterogeneity in loan volumes for firms



VAR model with BLS loan data

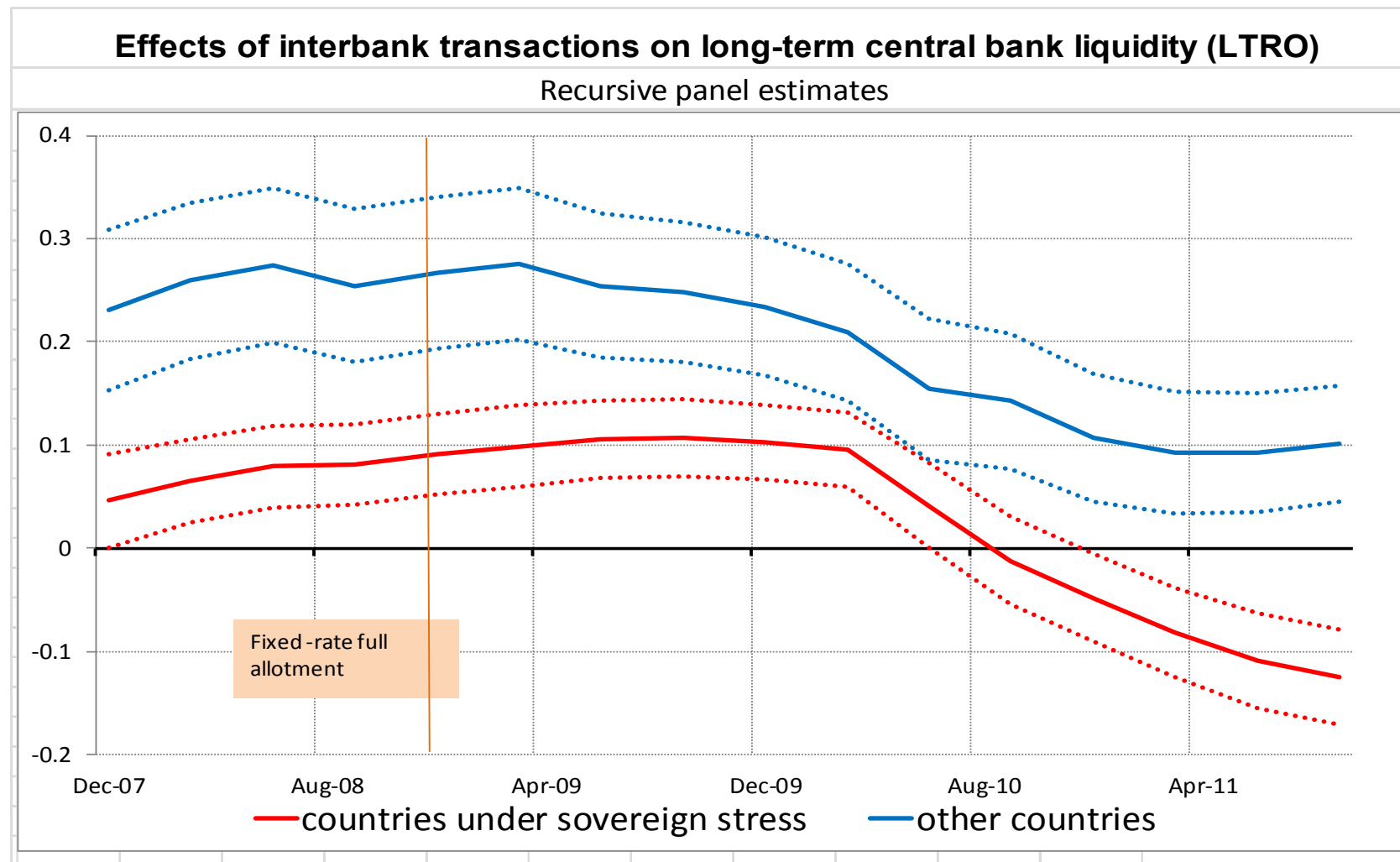
- Standard VAR model estimated recursively on a panel of 12 euro area countries separated in PIIGS and non-PIIGS with data on credit conditions and standards, monetary policy, macro and other financial data
- Responses by country of the Bank Lending Survey (BLS):
 - BLS reports loan conditions for all the applicants (also rejected borrowers)
 - Disentangle sub-credit channels: changes in credit conditions due to
 - bank balance sheet strength (bank-lending channel)
 - net worth, risk & collateral of firms & households (balance sheet channel)
 - We analyse for PIIGS and non-PIIGS:
 - Impact of monetary policy (MP) on GDP (or prices)
 - Impact of MP on GDP through changes in loan conditions due to bank or borrower balance sheet strength (mapped into BLS observables)
- MP both through EONIA rates and long-term public (Eurosystem) liquidity; identification with Cholesky or sign restrictions

Effectiveness of monetary policy on GDP growth

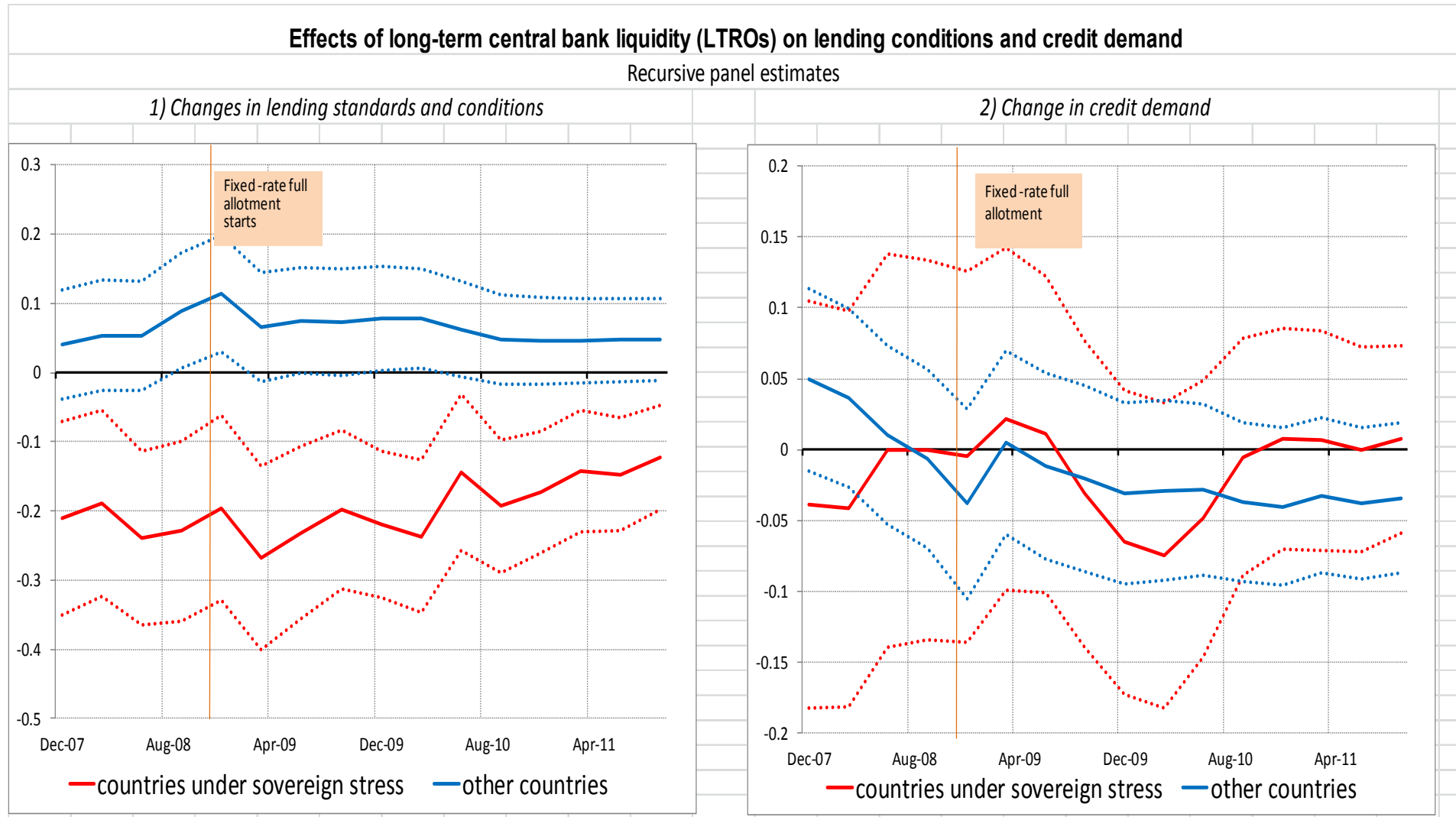


- The impact of a monetary policy shock is stronger during the crisis and has stronger effects in countries under stress, which is good
 - Recursive impulse responses of GDP growth to a monetary policy shock

Banks in countries with sovereign debt problems, which get less funding from the private interbank market, increase the long term borrowing from the Eurosysteem in the next period



In turn, the recourse to LTRO soften credit conditions in the next period



Summary of the results from EP paper

- The transmission mechanism of the single monetary policy has changed over 2007-2011 and the impact is stronger during the crisis, especially for PIIGS
- A significant amplification through the credit channel in PIIGS: the bank-lending channel is strong in 2008-09; the non-financial borrower balance sheet channel is strong in all years!
- Current policy framework is still insufficient to reduce credit availability problems stemming from deteriorated firm net worth and risk conditions, especially for small firms in distressed countries
- The bank-lending channel is mitigated by ECB non standard measures. The latter replaces the interbank market providing better liquidity conditions for banks, in turn softening lending conditions for firms

AER paper on credit supply

- We analyze the impact of monetary policy on bank credit supply
- Accounting for time-varying firm heterogeneity in loan demand, we find that tighter monetary and worse economic conditions substantially reduce loan granting, especially from banks with lower capital or liquidity ratios
- Credit crunch: responding to applications for the same loan, weak banks are less likely to grant the loan
- Firms cannot offset the resultant credit restriction by applying to other banks

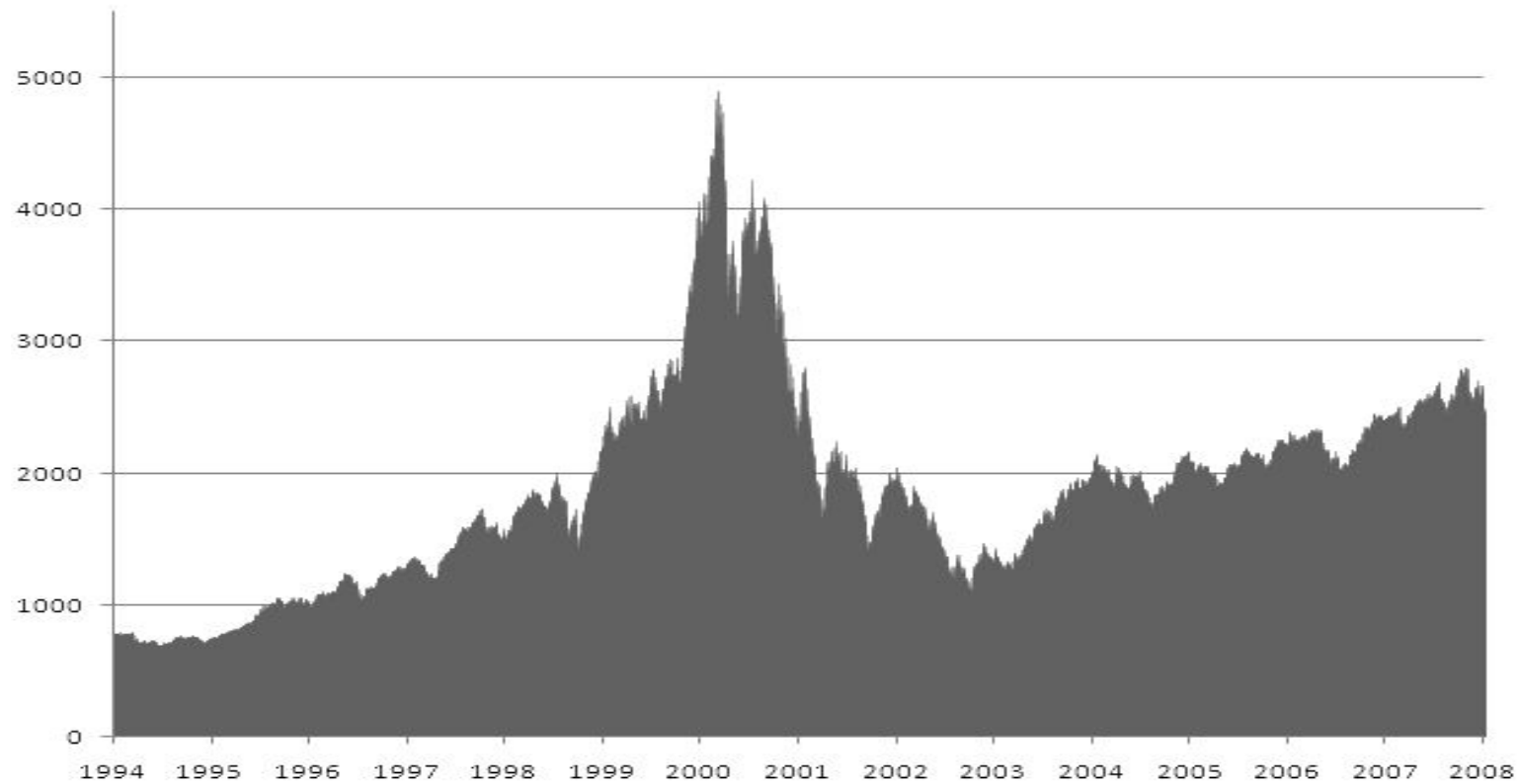
Conclusions

- Credit cycles are crucial for systemic risk
- Monetary policy is a powerful tool to impact credit supply cycles, both average and compositional effects (risk-taking)
- Effects depend on bank-firm-household-country-time fundamentals, but also on securitization and macropru policy
- Need of monetary rates “to lean against the wind” is lower with better prudential policy, but limits on macropru
- In crisis’ moments, low monetary policy rates are necessary, but negative externalities (new bubbles – emerging countries)
 - Though in emerging countries high monetary rates can bring excessive capital inflows (need also on combination with macropru policies)
- Credit vs. asset bubbles on real-time: Indicators of too soft lending standards (Jiménez, Mian, Peydró and Saurina, 2013; Maddaloni and Peydró *IJCB* 2013) → detailed credit data

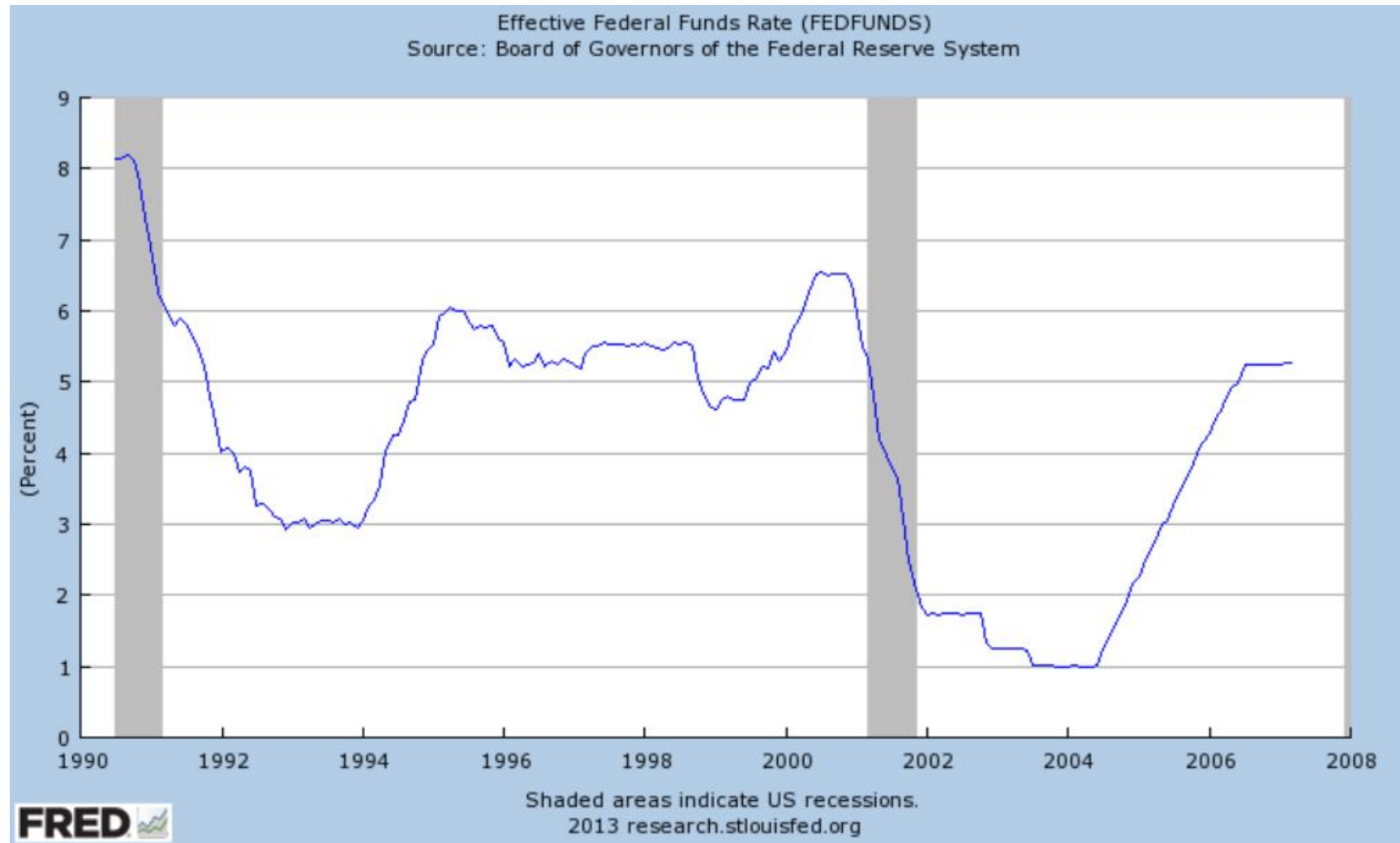
Thank you

Dot-Com bubble

- ‘technology-heavy NASDAQ composite index’



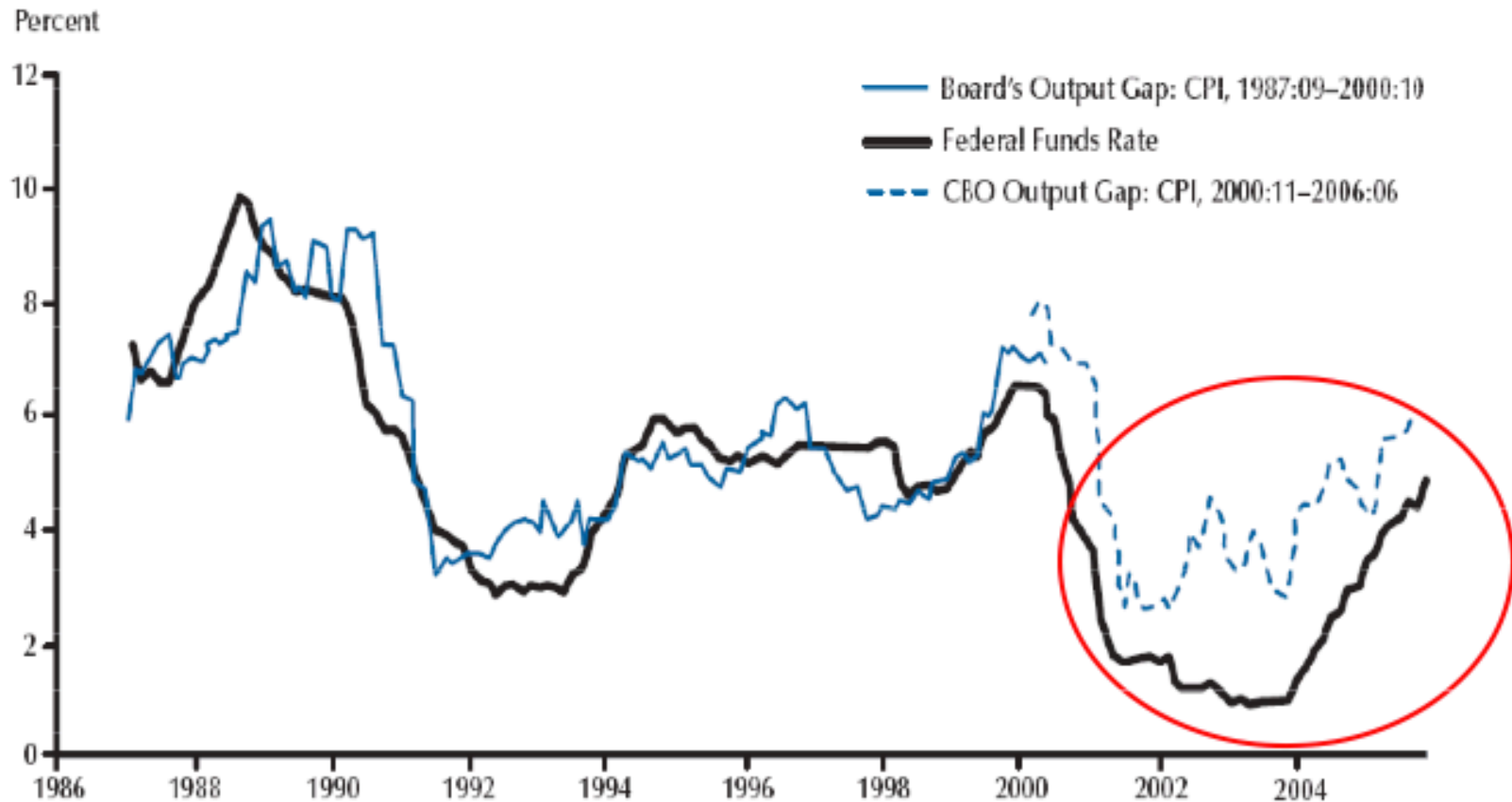
Low monetary rates and Greenspan put



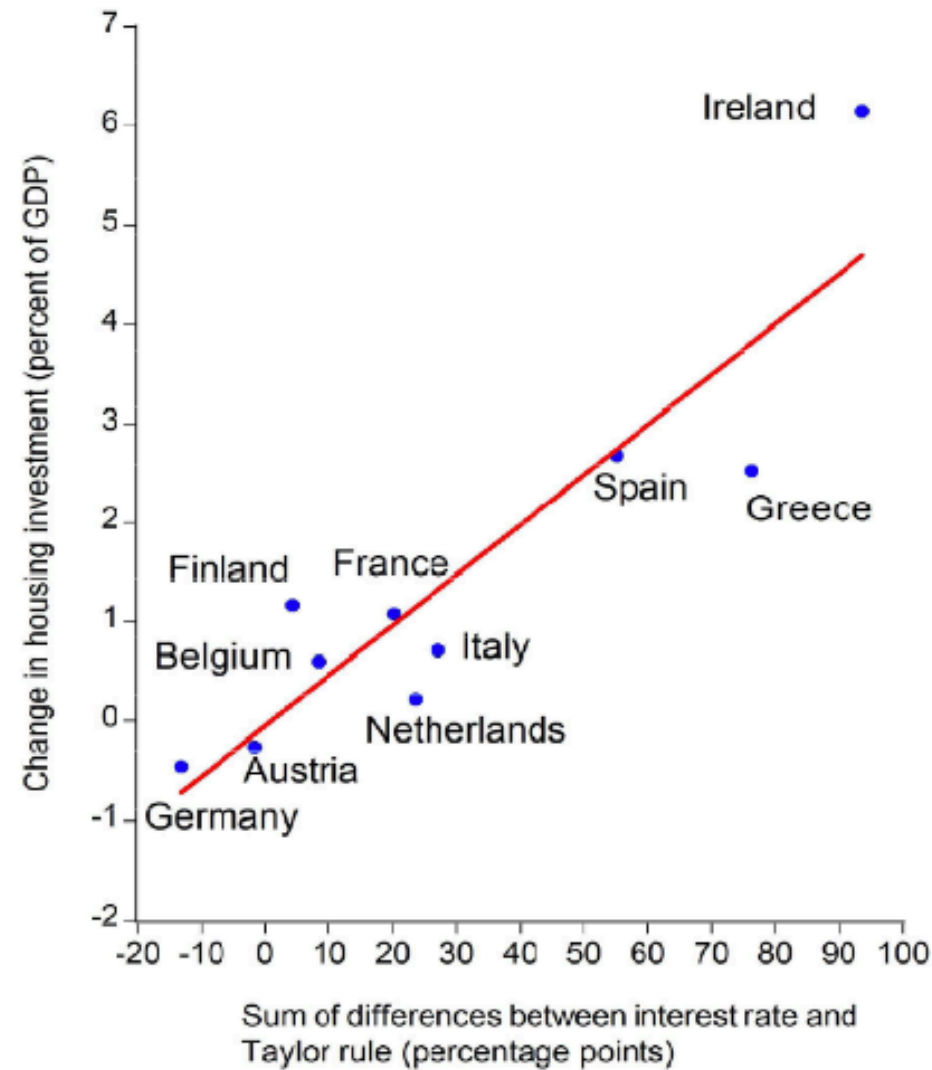
Monetary policy before the crisis: USA

Greenspan Years: Federal Funds Rate and Taylor Rule

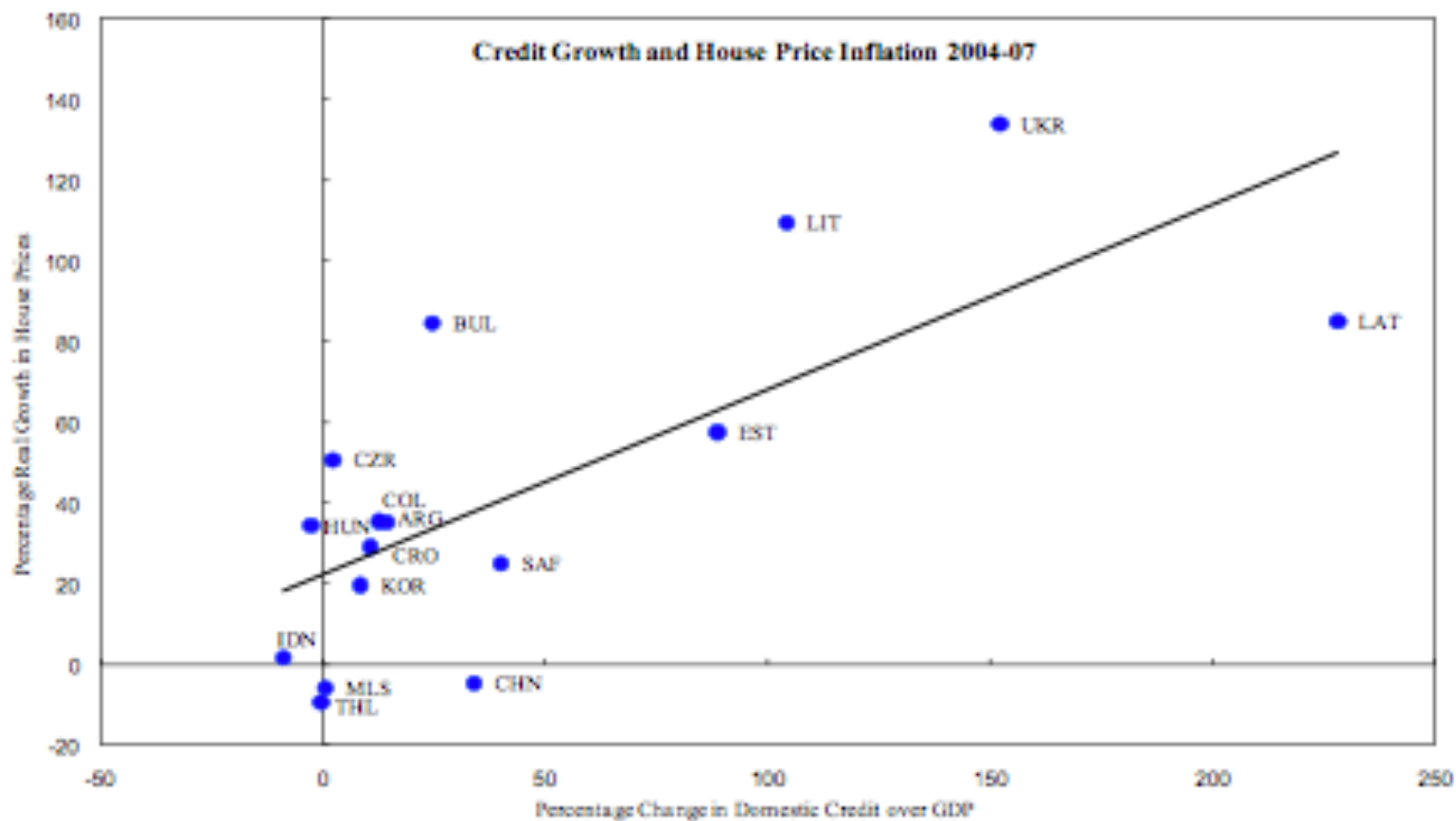
(CPI $p^* = 2.0$, $r^* = 2.0$) $a = 1.5$, $b = 0.5$



Monetary policy before the crisis



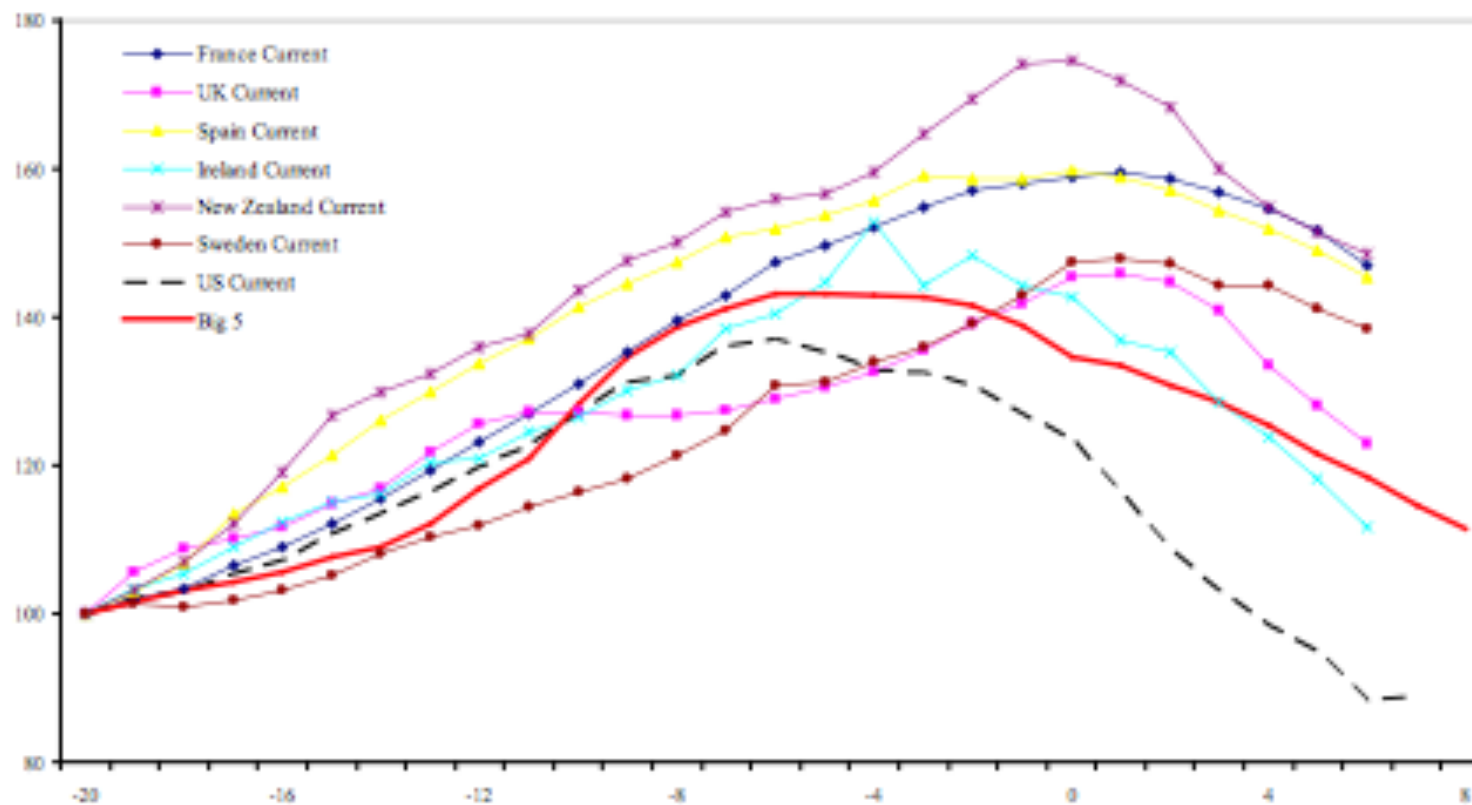
House prices and credit



Source: IMF International Financial Statistics, Global Property Guide.

House prices

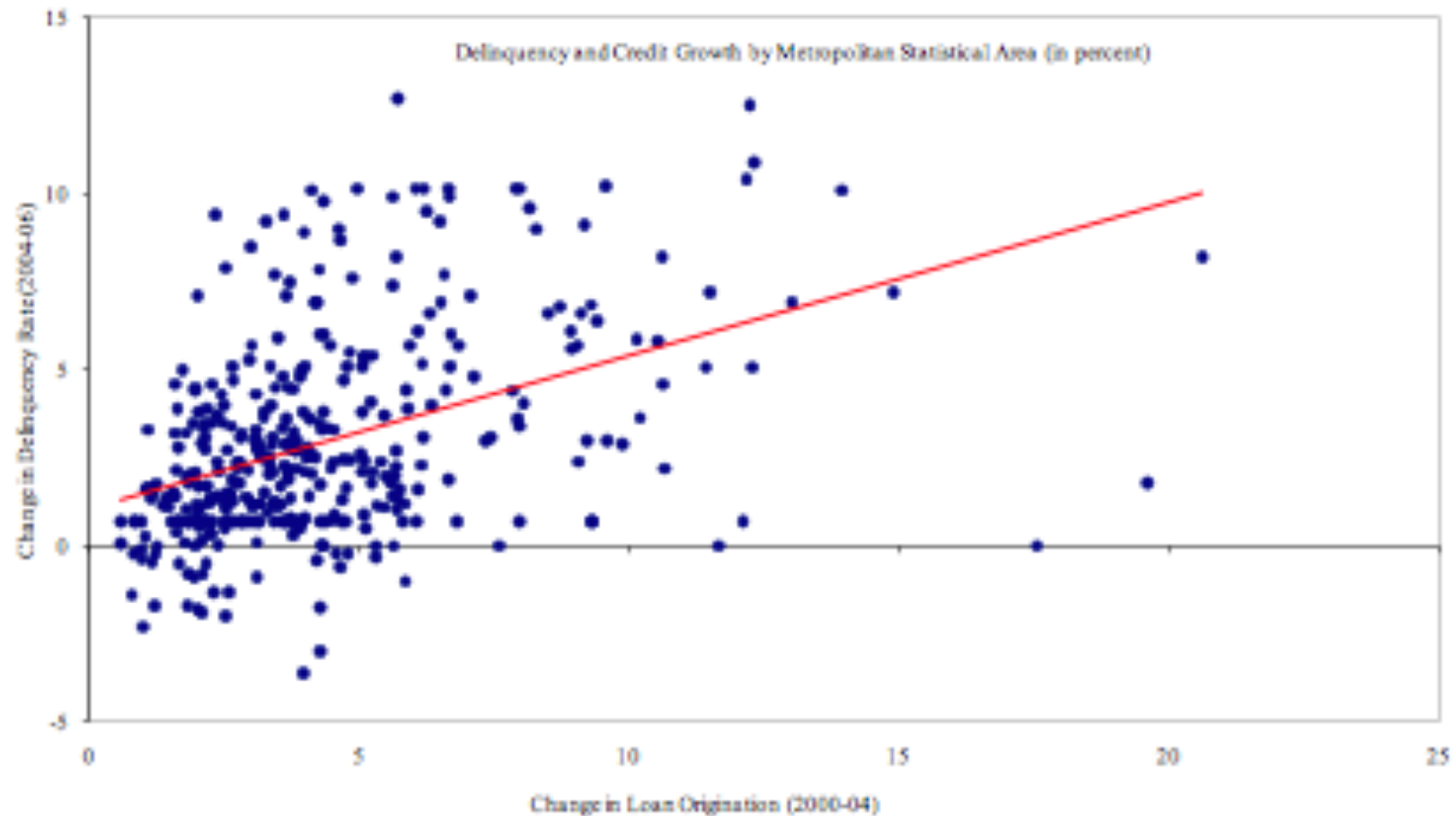
Asset price bubble this time: Sharply rising housing prices preceded the crash, typical of banking crises.



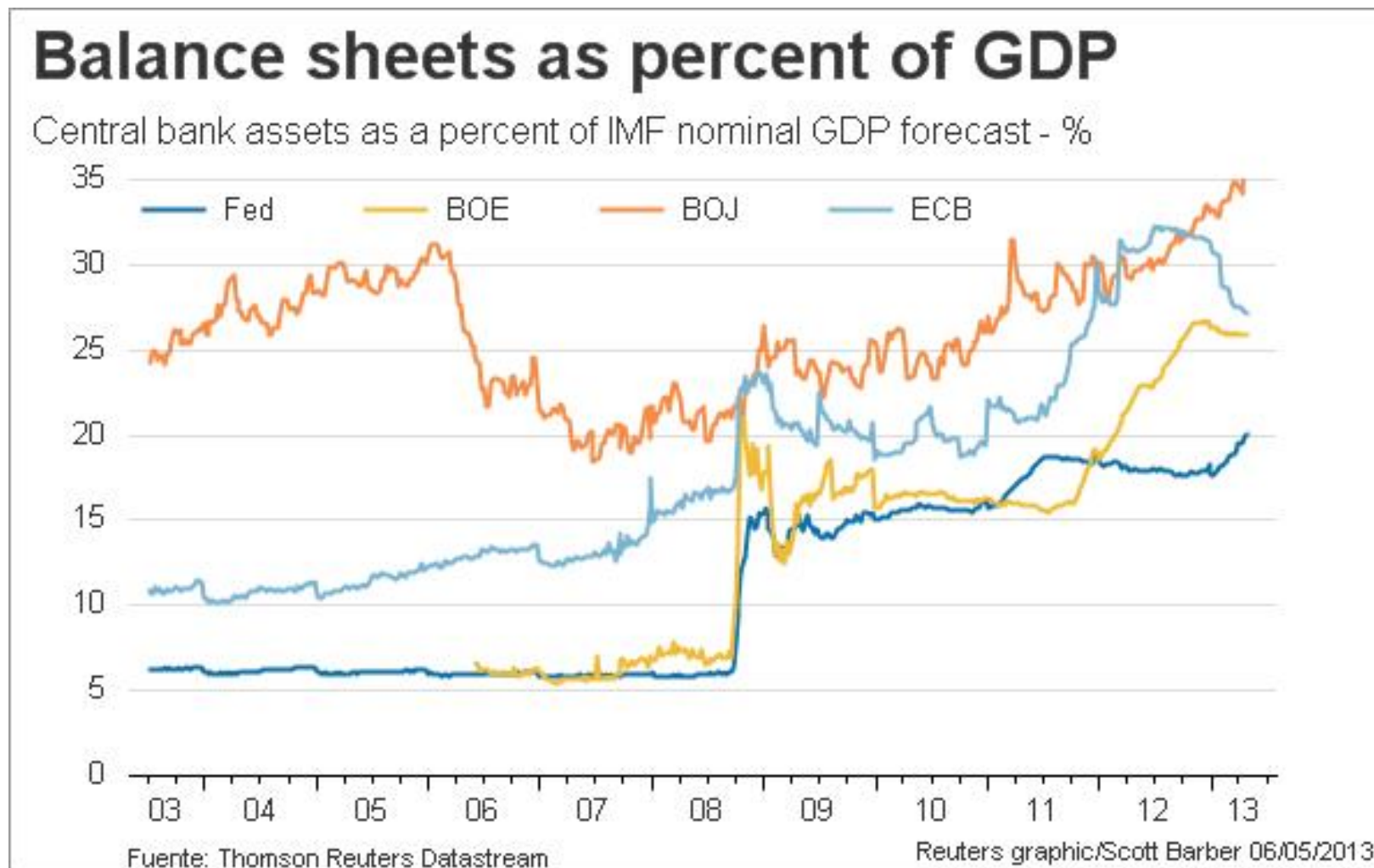
Sources: BIS, OECD, and Hiver Analytics.

Note: Real house price index is equal to 100 five years prior to the banking crises. Big 5 refers to the average of indices for the five major banking crises (Spain - 1977, Norway - 1987, Finland - 1991, Sweden - 1991, and Japan - 1992). For the current crisis, the beginning date is assumed to be 2007Q3. House price series for the US is the S&P Case-Shiller National Home Price Index.

Credit booms, standards & defaults



Monetary policy during the crisis



The example of Spain: Eurosystem liquidity to Spanish banks

