When the Rivers Run Dry

Liquidity and the use of Wholesale Funds in the Transmission of the U.S. Subprime Crisis
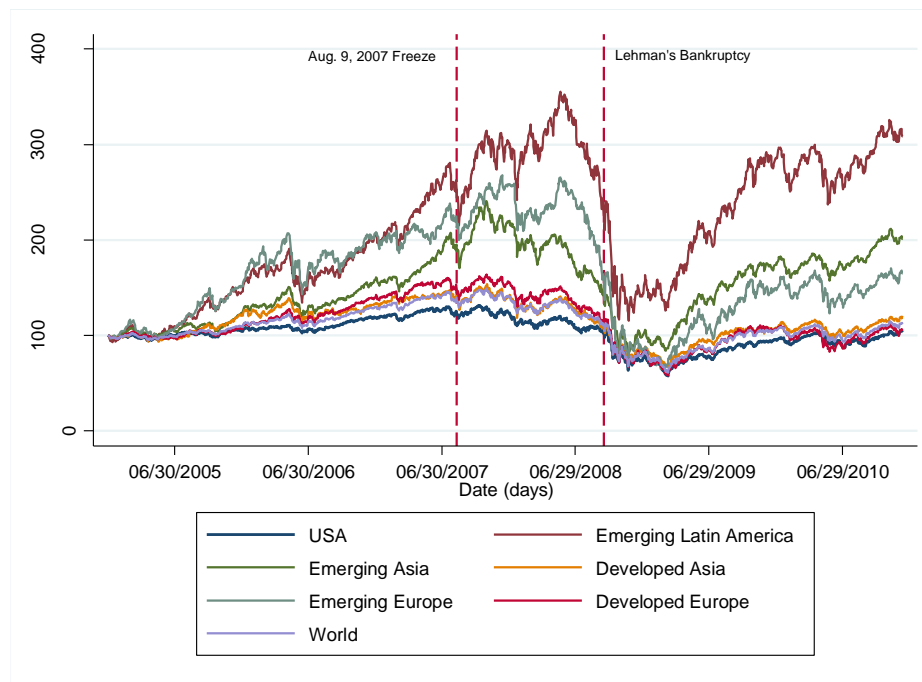
Claudio Raddatz K.

Central Bank of Chile

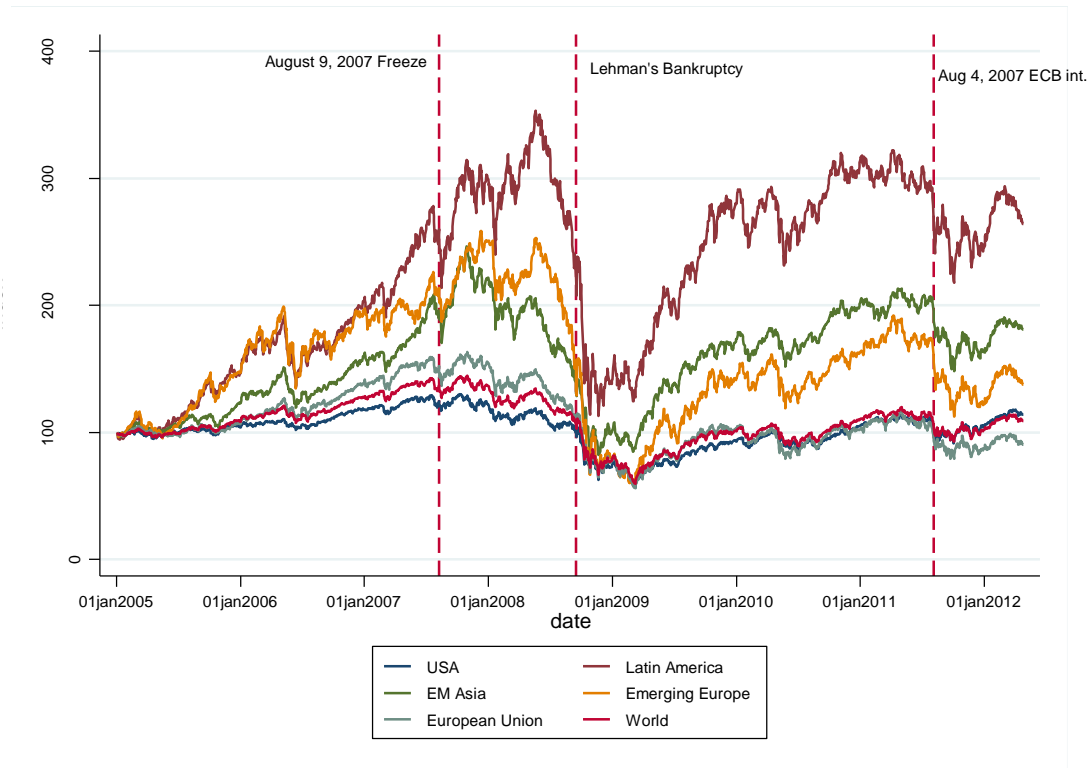3rd BIS CCA Research Conference

April 27, 2012

Motivation

- In mid 2007 problems on the US subprime market started spreading across asset classes and across countries

- The magnitude of the response much larger than the initial shock
  - ..and it was global
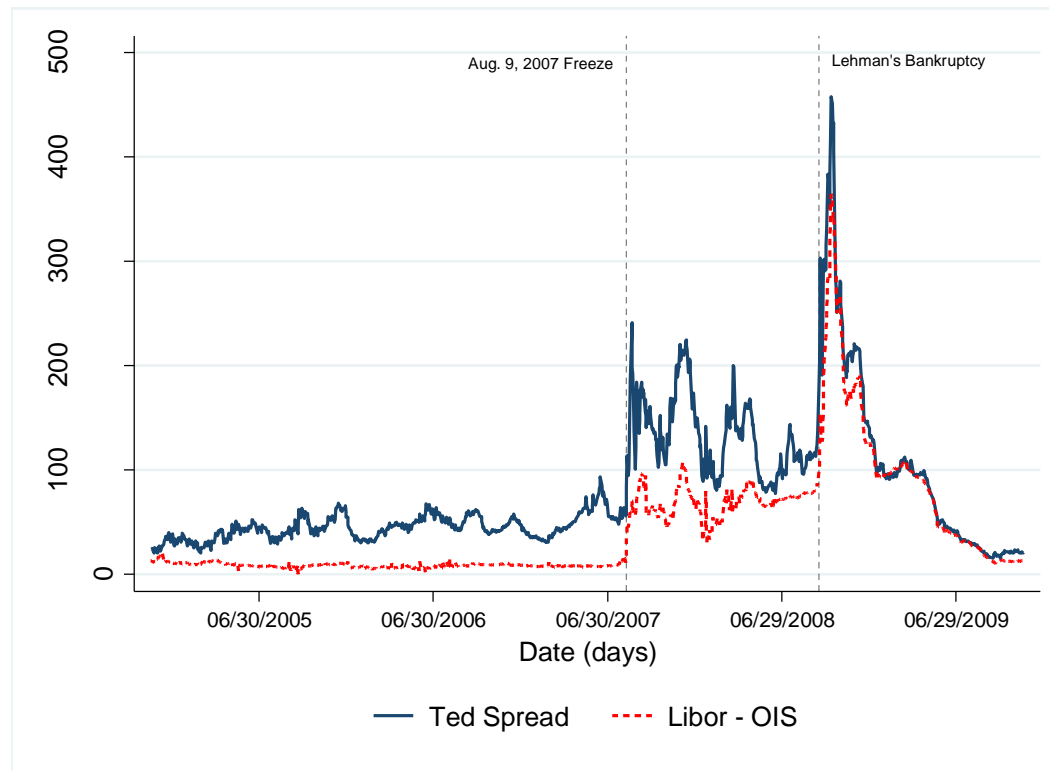
Motivation

- …And very persistent

Motivation

- How did the crisis spread across global markets?

  - Standard real channels

  - Timing: International financial linkages

- This paper studies the financial mechanisms behind the international transmission of the crisis

  - Role of the increasing use of wholesale funds as a source of bank financing.

  - Lots of attention focused on this channel during the crisis
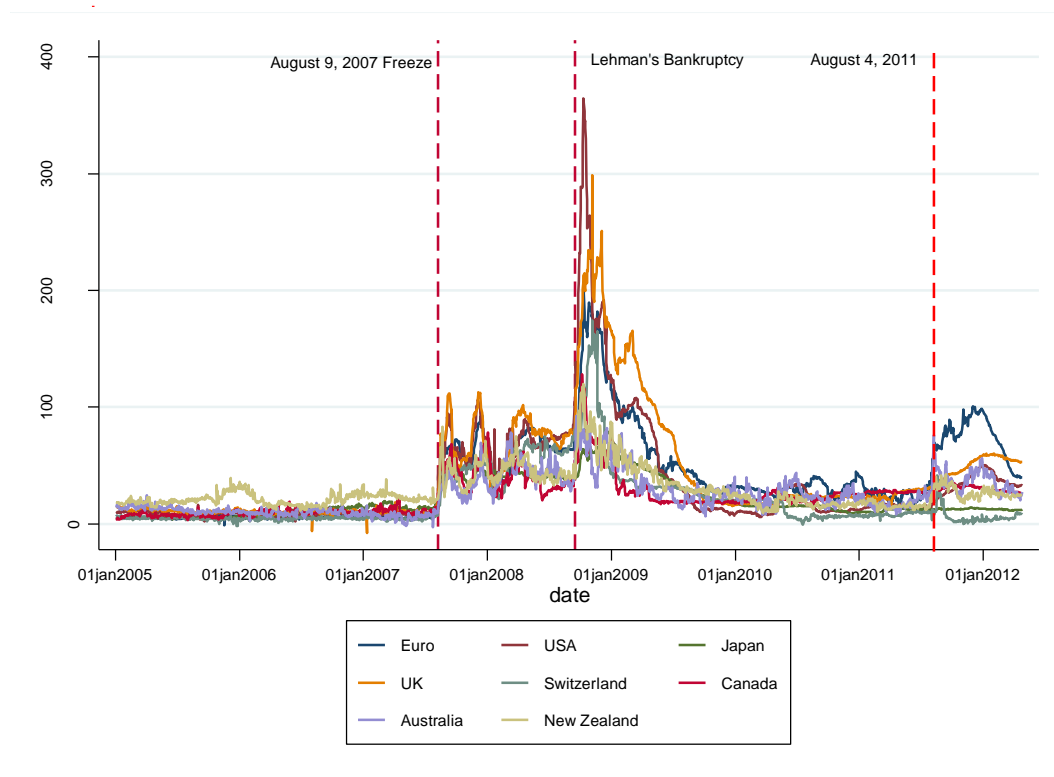
Motivation
Three reasons for the attention focus

Sharp collapse in US interbank and wholesale funds
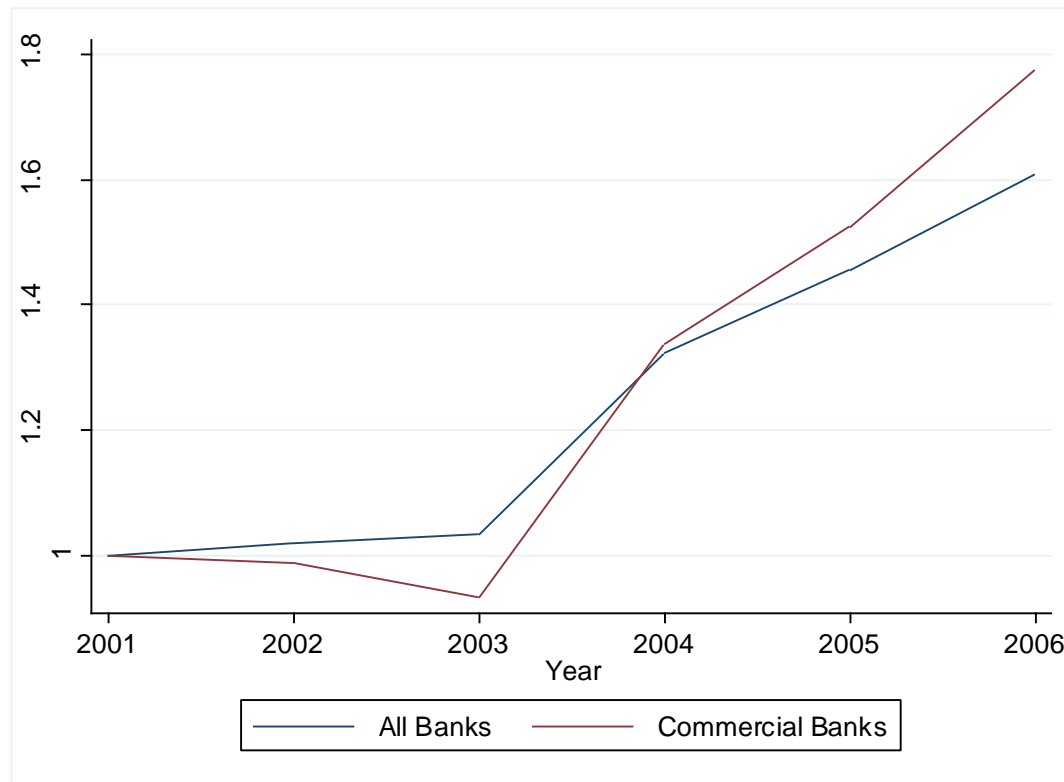
Motivation
Three reasons for the attention focus

International connections in interbank markets made it global

Motivation
Three reasons for the attention focus

Banks worldwide relied much more heavily on these funds

- Evidence of the contribution to the international transmission of the crisis of banks' reliance on wholesale funding.

  – Focuses on the largest episode: Lehman

    • Simultaneous impact on several fronts (liquidity, asset prices, risk appetite)

- Combine ingredients from standard event study and diff-in-diff to:

  – Estimate impact of Lehman on stock price returns of 772 banks in 44 countries

  – Test whether differences in abnormal returns across banks (within a country) are related to their ex-ante use of wholesale funds.

  – Controlling for other bank characteristics (also related to other mechanisms).

If wholesale fund use was material, banks with higher dependence on them should do relatively worse, after controlling for other characteristics.

–   E.g. Purely panic driven transmission should not discriminate.

• Advantages of event study:

–   Exogeneity

–   Isolate shock from responses.

• In addition: quantification, and relation to real outcomes

Outline

- Methodology & Data.

- Results.

- Robustness.

- Extensions

- Conclusions.

Outline

- **Methodology & Data.**

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- Expected returns estimated using the model:

$$R_{i,c,t} = \alpha_{i,c} + \beta_{i,c} \cdot R_{c,t} + \varepsilon_{i,c,t} \quad t \in \left[t_0, t_1 \right],$$

180 days before June 30, 2007

- Abnormal returns:

$$\hat{\varepsilon}_{i,c,t} = R_{i,c,t} - \hat{\alpha}_{i,c} - \hat{\beta}_{i,c} \cdot R_{c,t}, \; t \in \left[t^* - T, t^* + T \right].$$

Various sizes of T around Lehman and August 2007 MF

- Parametric model of differences in abnormal returns

$$\hat{\varepsilon}_{i,c,t} = \sum_{\tau = t^* - T}^{t^* + T} \left(\delta_{0,\tau,c} + \delta_{1,\tau} W_{i,c} + X'_{i,c} \delta_{2,\tau} \right) \cdot D_{\tau,t} + v^c_{i,t},$$

Methodology & Data

- Cumulative Abnormal Differential Returns (CADR)

$$CADR_t = (W^{high} - W^{low}) \times \sum_{\tau=t^*-T}^{t} \hat{\delta}_{1,\tau}, \ \ t \in [t^* - T, t^* + T]$$

- **Relative** Cumulative Abnormal Differential Return (R-CADR)

$$R\text{-}CADR_t = (W^{high} - W^{low}) \times \sum_{\tau=0}^{t} (\hat{\delta}_{1,\tau} - \overline{\delta}_{1,PRE}), \ \ t \in [0, t^* + T],$$

$$\overline{\delta}_{1,PRE} = \frac{1}{T} \sum_{\tau=t^*-T}^{t^*-1} \hat{\delta}_{1,\tau}.$$

Methodology & Data

- Reliance on wholesale funding

  - Ratio of total deposits minus bank deposits over total liabilities $RDEPLIAB$ (inverse)

$$W_{i,c} = -\log(1 + RDEPLIAB_{i,c})$$

- Main data sources:

  - Bloomberg & Datastream (stock price data)

  - Bankscope (banks' balance sheet data)

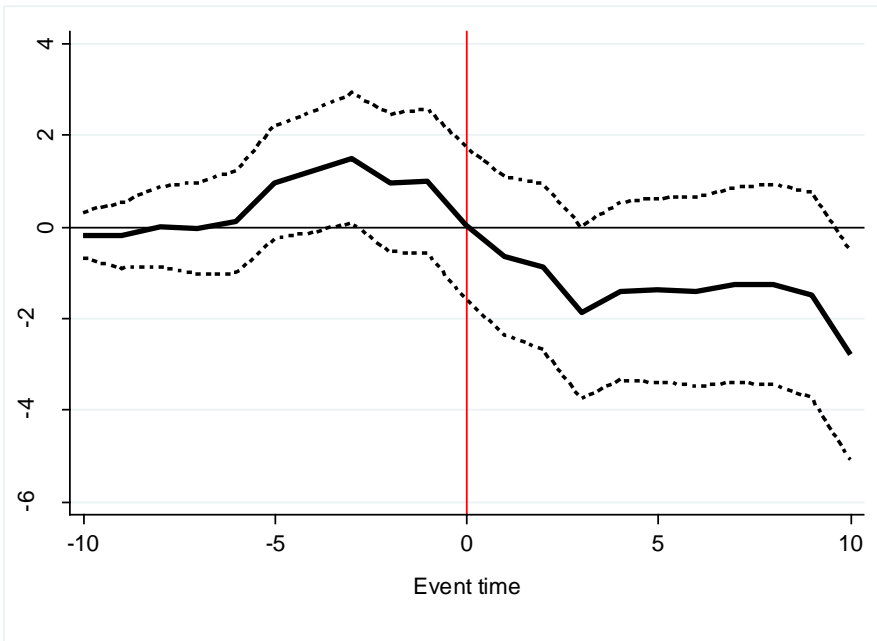 - Other (exposure to Lehman, country-level vars)

Outline

- Wholesale funds markets.

- The liquidity crunch.

- Methodology & Data.

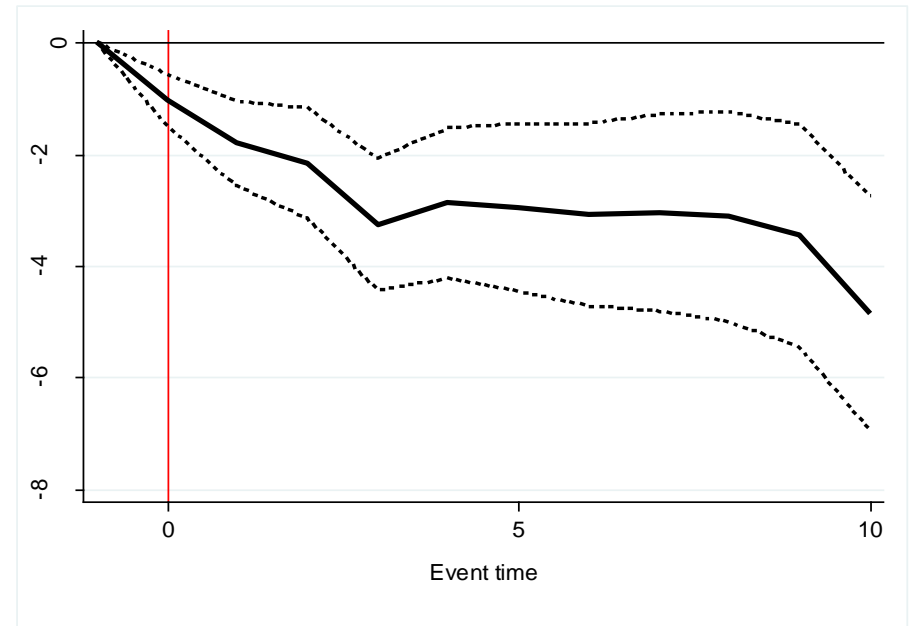- **Results.**

- Robustness.

- Extensions

- Conclusions.

Results
There is an event in the banking sector

Lehman (September 15, 2008)

Cumulative abnormal returns

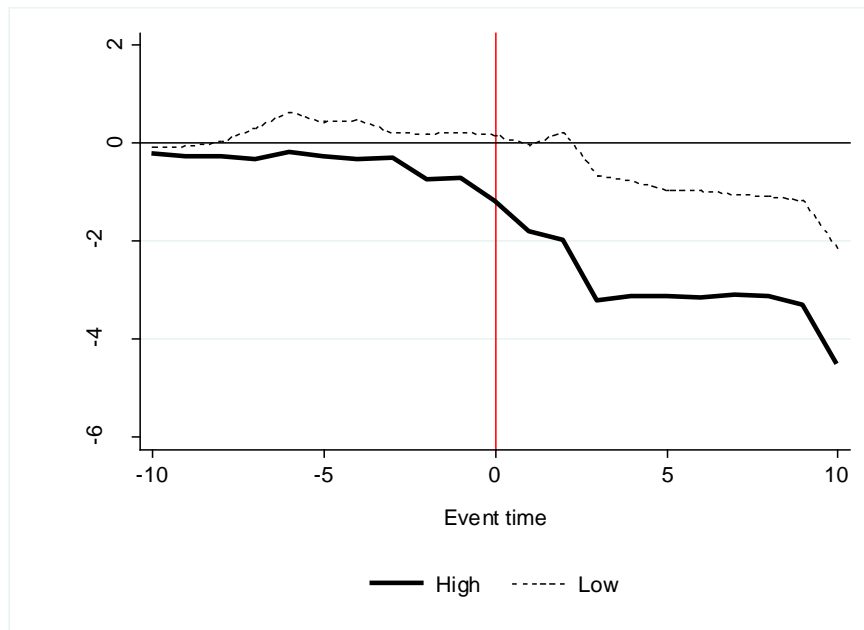Relative cumulative abnormal return, to control for pre-event trends
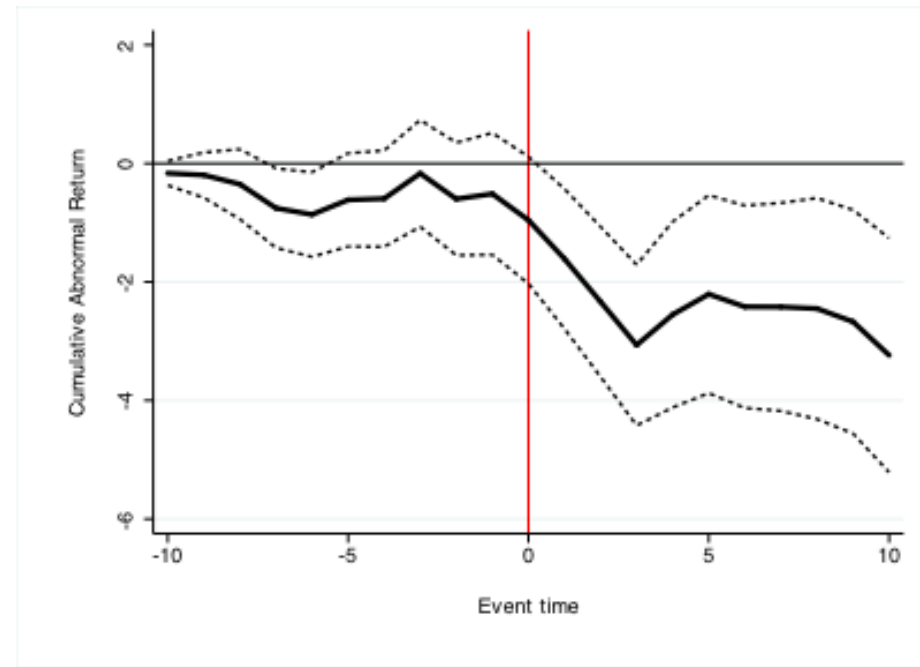
3 % decline (1st 3 days)

Results
Wholesale dependence matters (Unconditional)

- Banks with higher wholesale dependence should be relatively more affected
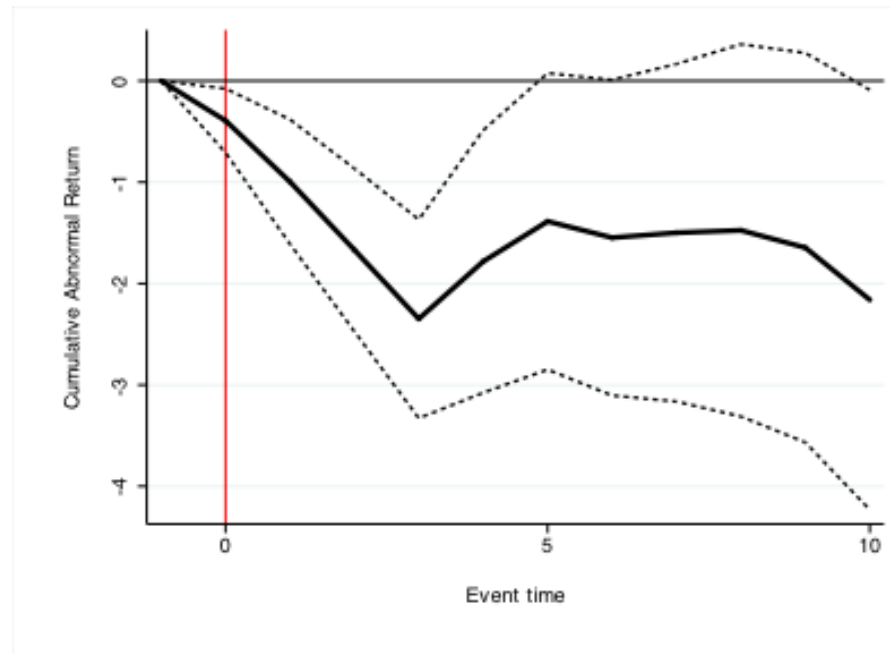

High and low wholesale dependence

Difference (CADR)

Results
Wholesale dependence matters (Unconditional)

Relative difference R-CADR

Magnitude

- 240 bps vs. 330 bps average decline: significant.

- Large (2% loss in 3 days ~ 92% annual basis)

Results
Wholesale dependence matters controlling for bank char.

$$\hat{\varepsilon}_{i,c,t} = \sum_{\tau=t^*-T}^{t^*+T} (\delta_{0,\tau,c} + \delta_{1,\tau} W_{i,c} + X'_{i,c} \delta_{2,\tau}) \cdot D_{\tau,t} + v^c_{i,t},$$

- Bank-specific characteristics:

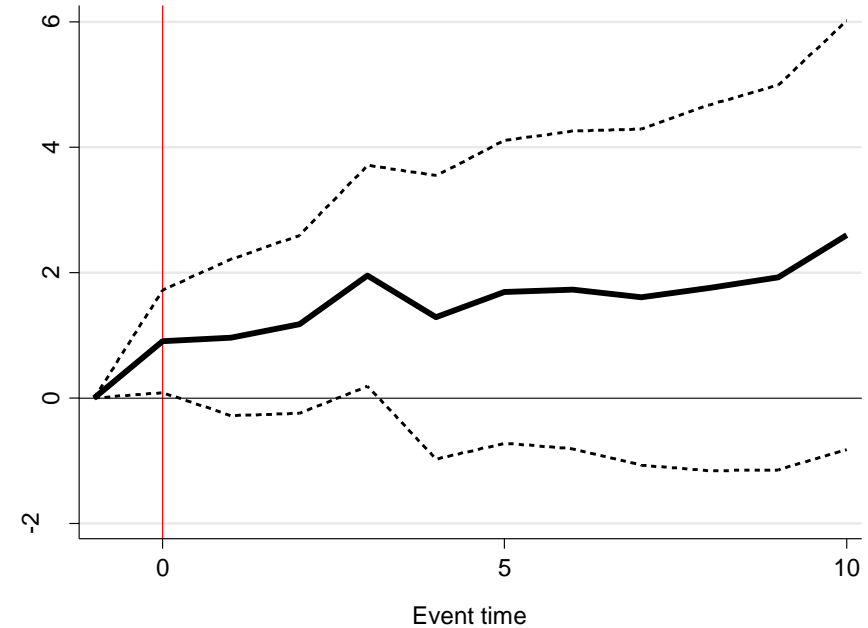| Leverage (E/A): Risk, cushion.	Type (Investment versus commercial)
Size (total assets): access to funds, diversification, opaqueness, TBTF	Declared exposure to Lehman (ex-post)
Profitability (ROAA)	Several other tried (ownership, capital adequacy, etc)

Results
Wholesale dependence matters controlling for bank char.
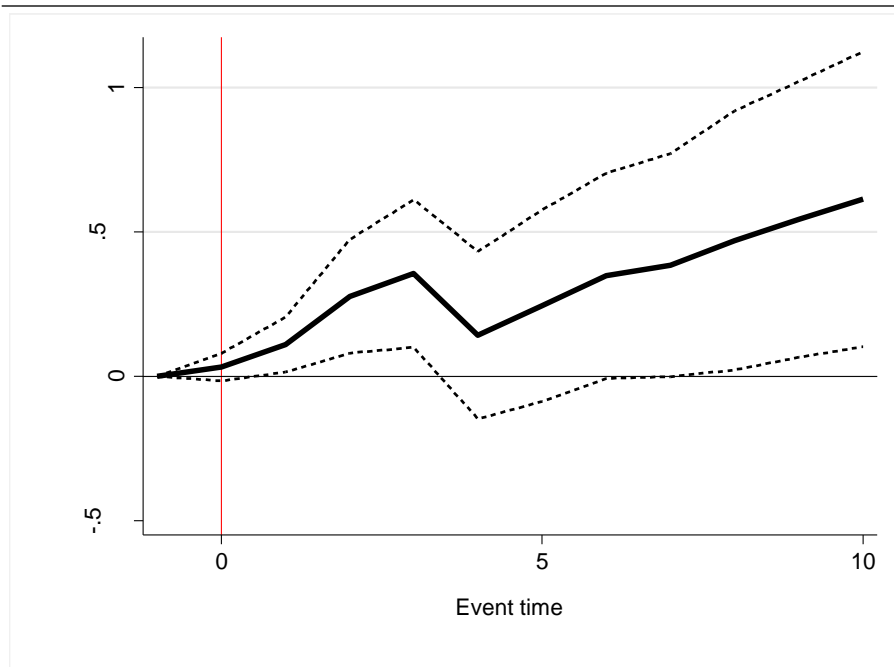
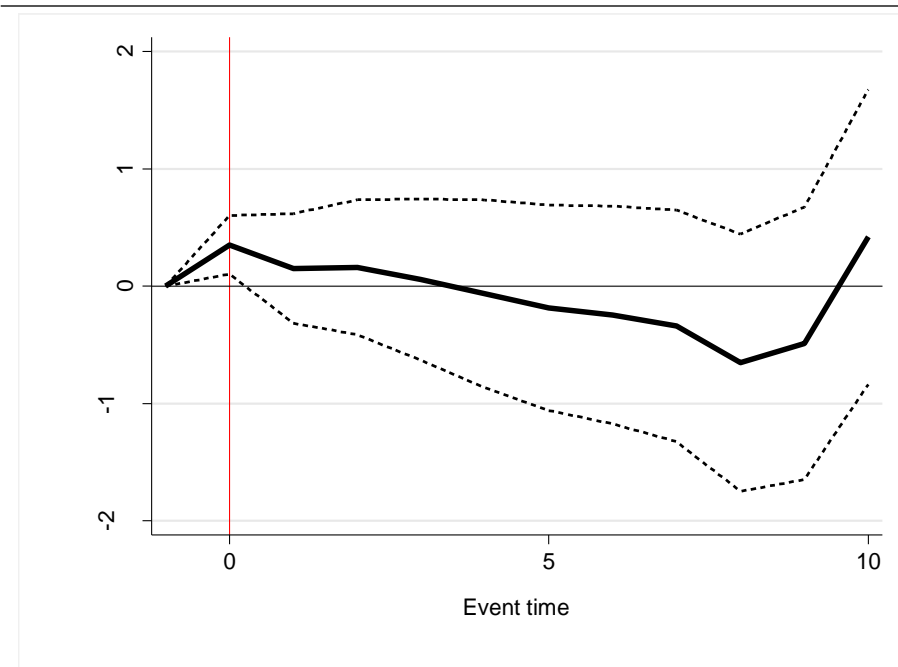**Wholesale funding dependence.**
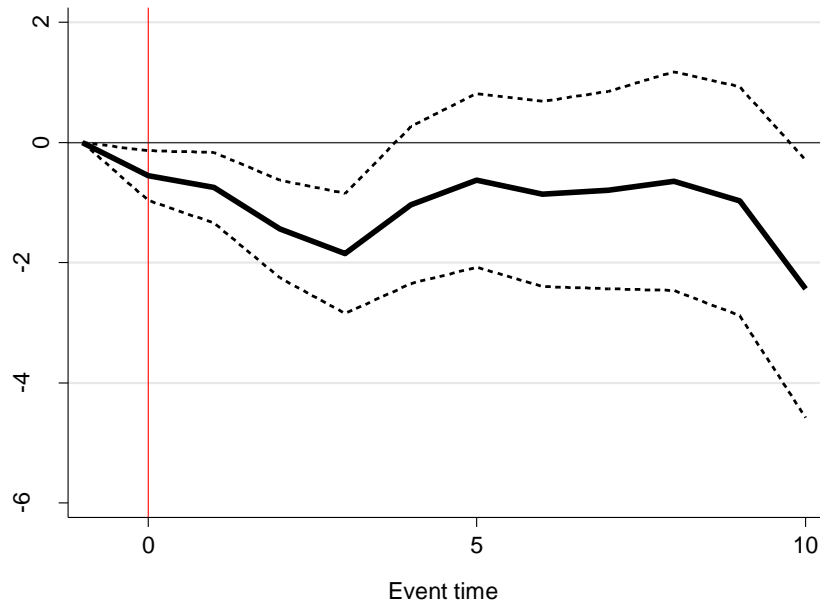
Bank Size (log Assets)

Results
Wholesale dependence matters controlling for bank char.
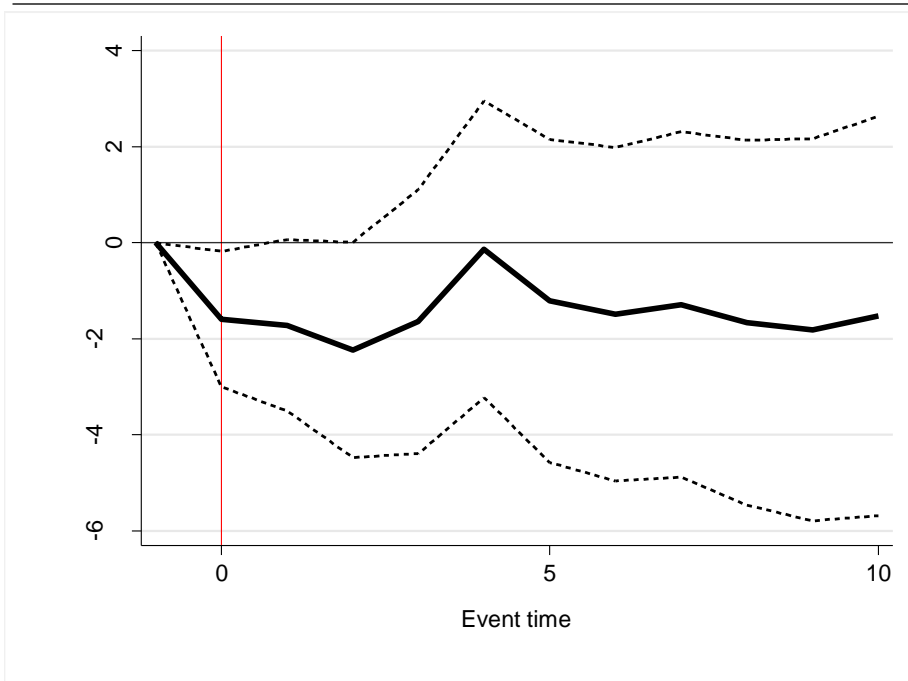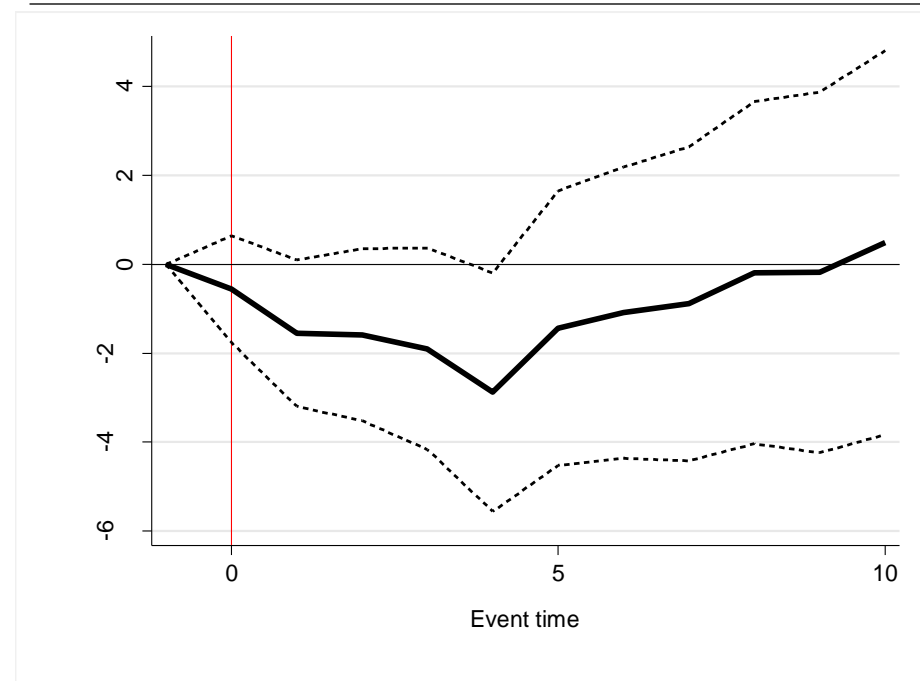
Profitability (log (1+ROA))

Leverage (log(1+E/A))

Results
Wholesale dependence matters controlling for bank char.

Declared exposure

Investment Banks

- Wholesale dependent banks did relatively worst

  - There is a quantitatively important independent mechanism working through wholesale dependence

- Among other bank characteristics

  - Larger banks did relatively better (better diversification or TBTF?)

  - Leverage does not seem to matter much

  - Ex-ante profitable banks did better (but just a little)

    - Controlling for leverage, these are banks with better fundamentals

  - Investment banks and banks that were exposed to Lehman did worst

    - Consistent with counterparty risk (caveat, no direct evidence on spreads). Not purely mechanical.

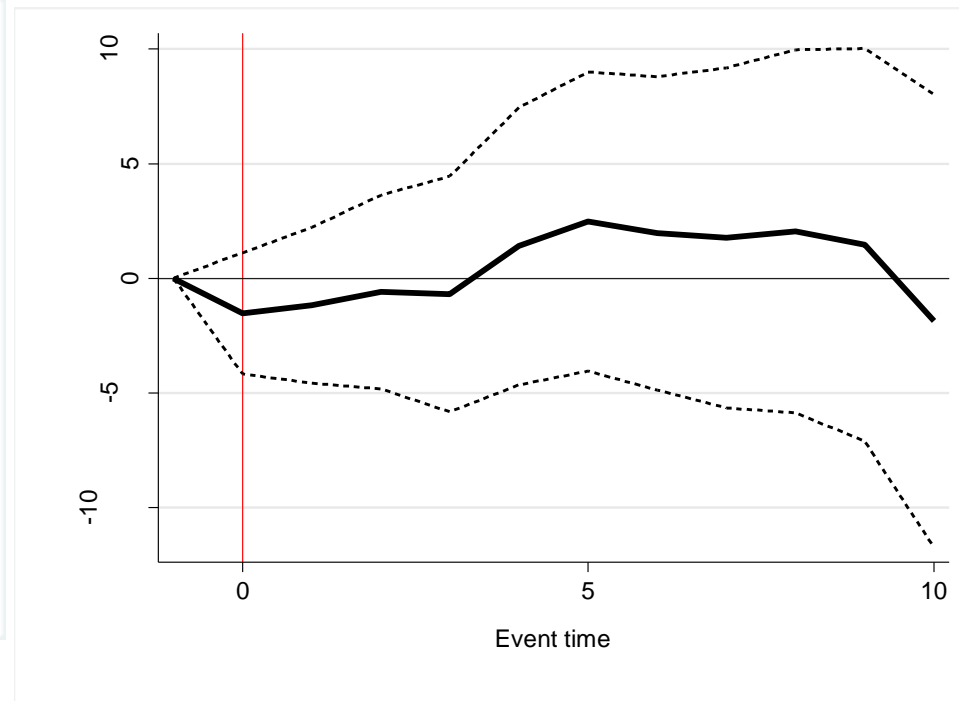# Further Results
Little discrimination among investment banks

Average effect
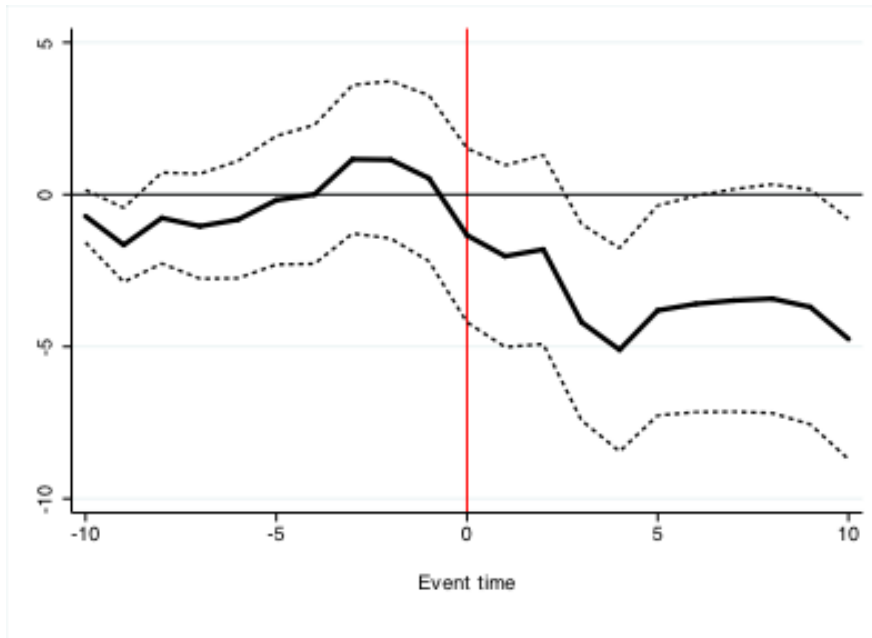
Wholesale

Similar for other bank characteristics:
- Riskier counterparties
- Re-evaluation of the model
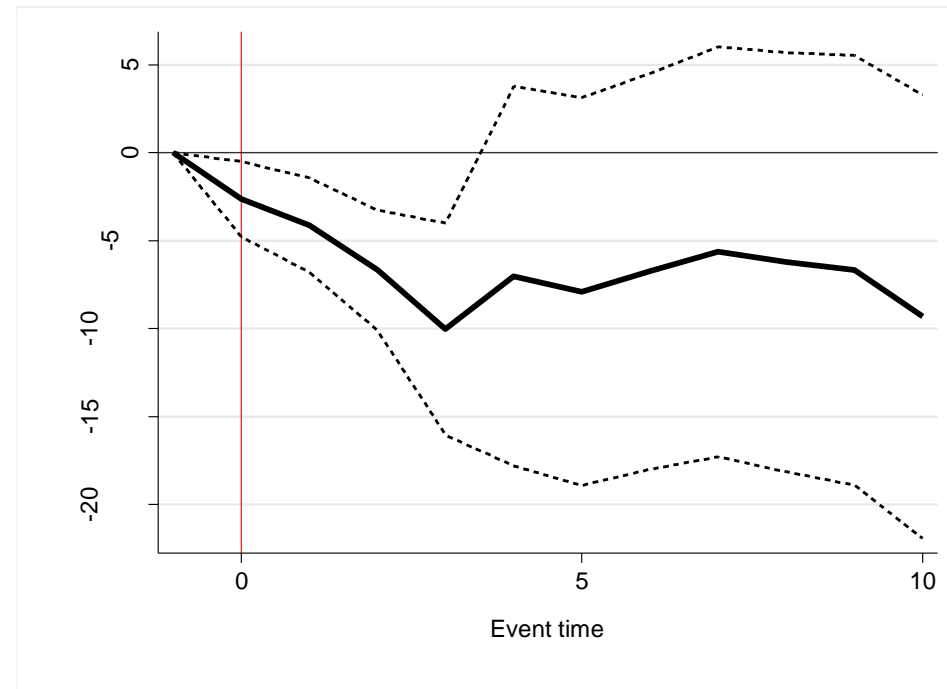
Further Results
But there is discrimination within exposed banks
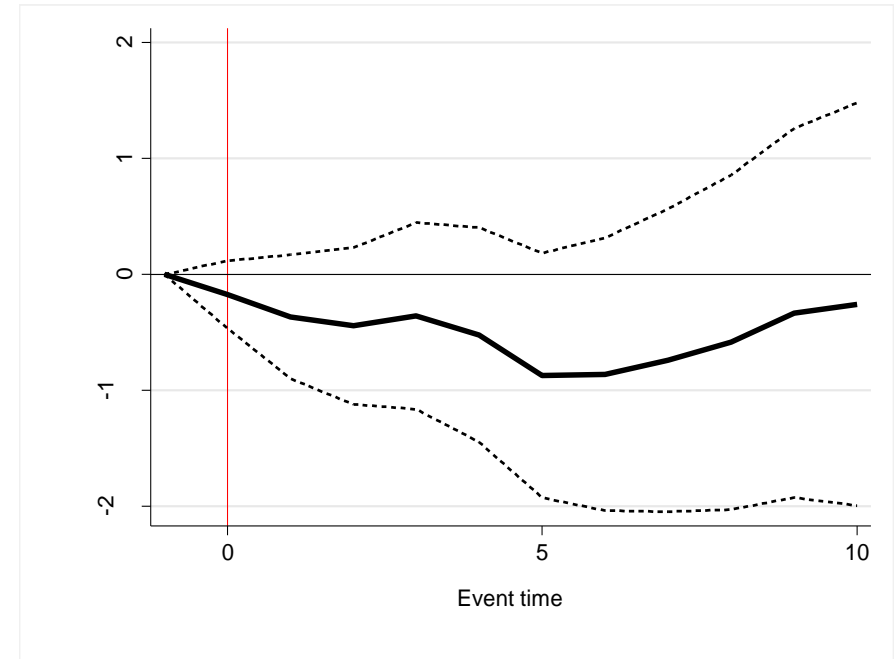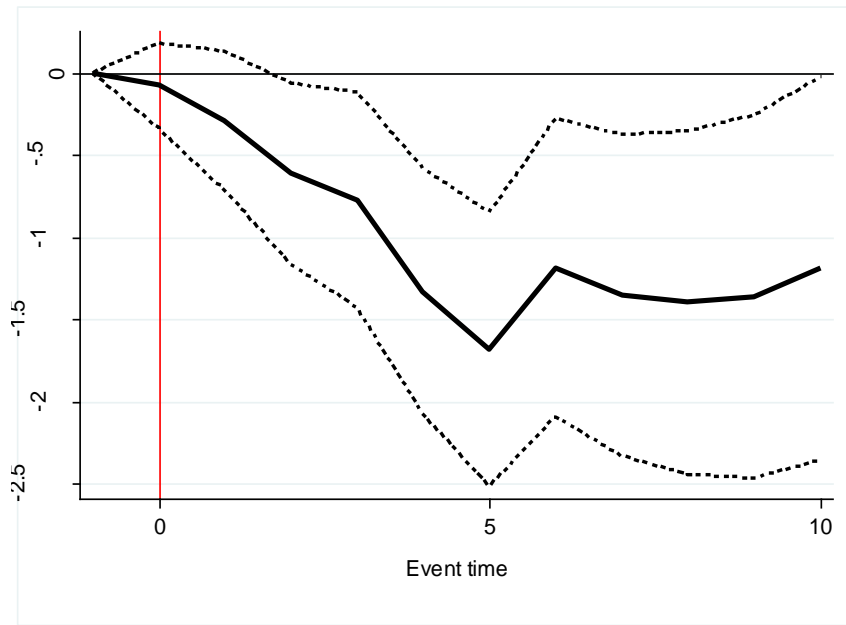
Average effect.
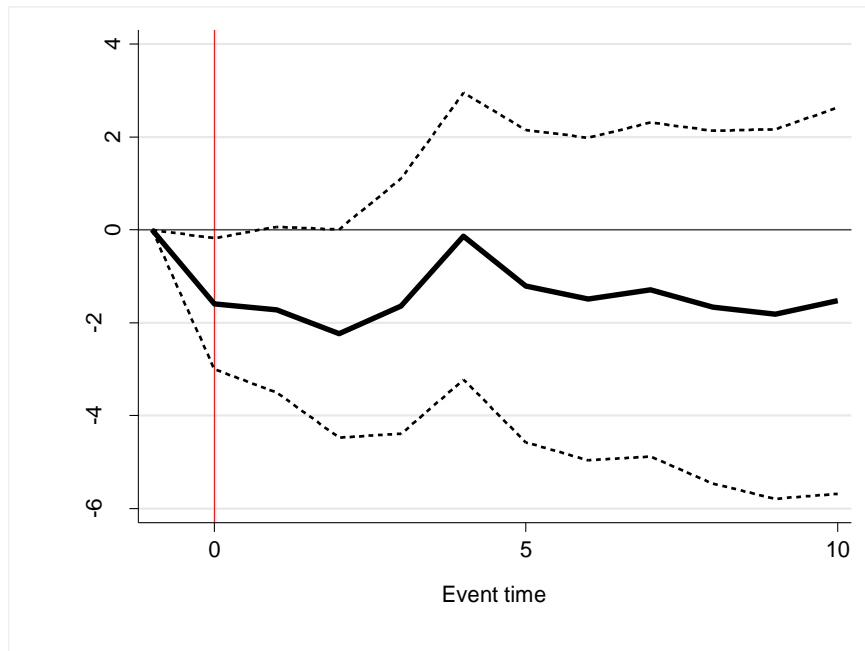
Wholesale dependence within exposed banks

Consistent with these banks perceived as riskier counterparties

Results
Similar results in August 9th, 2007

Magnitude

- 100 bps (150 bps average decline), but not significant differential.

- Smaller impulse, other channels (size matters)

Results
Are there real consequences?

Is wholesale dependence related to changes in lending activity?

$$Growth(Y)_{i,c,t-1,t+1} = \alpha_c + \beta \log(Y_{i,c,t-1}) + \gamma W_{i,c} + \delta X_{i,c,t-1} + \varepsilon_{i,c,t-1,t}$$

	(1) Loans	(2) Assets	(3) Loans to Assets	(4) ΔLoans to Assets
Wholesale Dependence	-2.40**	-0.21***	-2.19**	-0.26*
	(0.94)	(0.07)	(0.94)	(0.15)
Initial loans	-0.62*	-0.03	-0.46	-0.004***
	(0.36)	(0.04)	(0.30)	(0.001)
Size	0.75**	0.04	0.17***	0.02
	(0.34)	(0.03)	(0.06)	(0.01)
Investment Bank	-2.88***	-0.10*	-2.63***	-0.25**
	(0.85)	(0.05)	(0.81)	(0.12)
Other controls	Lev, ROA, Exp	Lev, ROA, Exp	Lev, ROA, Exp	Lev, ROA, Exp
Country Fixed Effect	Yes	Yes	Yes	Yes
Observations	569	582	569	569
Adj. R-squared	0.28	0.30	0.25	0.25

- Important transmission channel related to wholesale dependence

- Other sources of risk also matter

- Amidst the chaos, markets seem to have been able to discriminate!

- There are real consequences

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Robustness

1. Changes in the measures of abnormal returns and wholesale dependence

2. Changes in the event and estimation window

3. Changes in the sample of countries and banks

4. Changes in the event dates

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Extensions
Country characteristics and wholesale dependence

- Differences in wholesale dependence may be less relevant in countries with broader protections or less integrated

$$\hat{\varepsilon}_{i,c,t} = \sum_{\tau=t^*-T}^{t^*+T} (\delta_{0,\tau,c} + (\delta_{1,\tau} + \delta_{2,\tau} \times F_c) \times W_{i,c}) \cdot D_{\tau,t} + v_{i,t}^c,$$

Deposit insurance (% of GDP-per capita; Demriguc-Kunt et al, 2005)	International reserves (% financial assets, IFS).
Quality of financial regulation: Independence of supervisory authority (Barth et al, 2005).	Degree of financial integration: Capital account openness (Ito and Chin, 2005), Exposure to the US (trade weights)

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Conclusions

- Speed and scope of propagation points towards financial linkages

- Many possibilities: Common portfolios, counterparty risk, etc.

- Worldwide reliance on global liquidity markets played an important role

- Other risk factors also mattered (TBTF, type of bank, counterparty risk)

- Markets discriminated!

- Exposure matter, but not robust evidence that policies that could increase liquidity supply mattered

Thank you!