

Peer monitoring or contagion?

Interbank market exposures and bank risk

Banking in Emerging Economies - Bank of Finland/CEPR
conference

Helsinki, 7-8th October, 2010

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This paper represents the authors' opinions and not necessarily those of DNB.

Agenda

- Introduction
- Theory
- Methodology
- Data
- Results
- Conclusion

Introduction

- Interbank market is important for liquidity
- Well-functioning interbank market connects all banks
(Allen & Gale, Pröpper et al.)
- Implies danger of contagion
(Upper & Worms, Summer, Degryse & Nguyen, Furfine, Lelyveld & Liedorp, etc.)
- Hence:
What is the impact of interbank exposures on bank risk?

Theory

- Effect of interbank market on bank risk
 - Positive effect from bank monitoring (Rochet & Tirole, 1996)
→ Peer-monitoring hypothesis
 - Negative effect since exposures can amplify shocks (Allen & Gale, 2000)
→ Contagion hypothesis

Methodology

- Bank risk (y_{it}) depends on (vectors):
 - x_{it-1} bank-specific variables
 - z_t macro-economic/time-specific fixed effects
 - q_{it-1} interbank activities

$$y_{it} = \alpha_i + \beta_1 x_{it-1} + \beta_2 z_t + \beta_3 q_{it-1} + \varepsilon_{it}$$

Methodology - input data

- y_{it} : bank risk (actually, bank stability) =

$$z - score = \frac{ROA + \frac{Equity}{Totalassets}}{sd(ROA)}$$

- x_{it-1} : bank-specifics = reflect bank activities, i.e. interest income ratio, profitability, capitalisation, off-balance sheet exposures (based on CAMEL variables)
- z_t : macro-economic/time-specific fixed effects

Methodology - input data

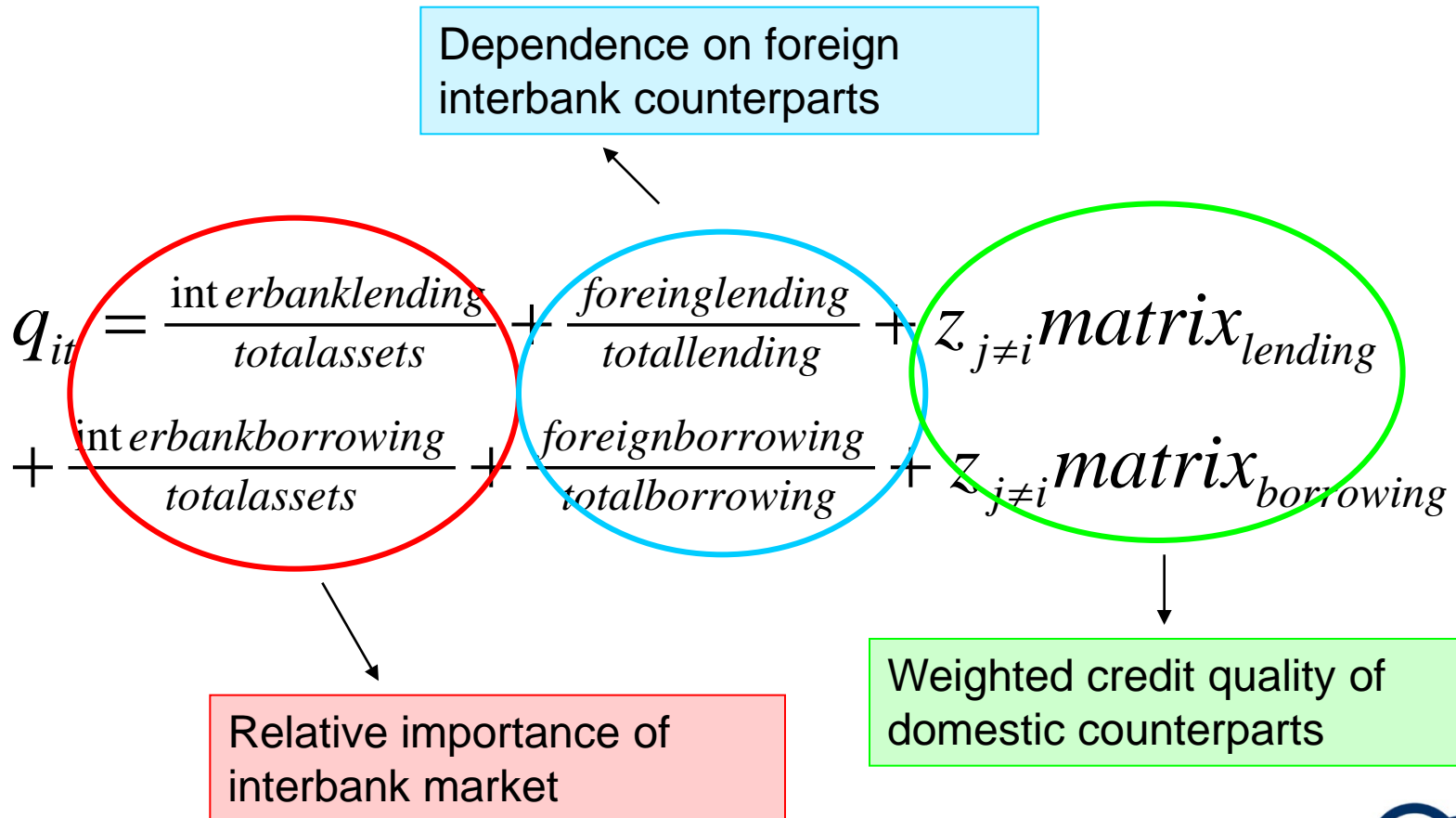
- Interbank lending and borrowing are important for bank risk (3 factors):
 - Interbank lending (borrowing) to total assets
 - Foreign banks are important source of risk (Van Lelyveld & Liedorp, 2006)
 - Indirect effects: riskiness of neighbouring banks

Methodology - input data

- Indirect effects:
 - Riskiness of neighbouring banks
 - `distance` measured by interbank exposures
- weighted risk of all banks to which (from which) a bank lends (borrows)

Methodology - input data

- q_{it-1} : Interbank market effects:



Interbank matrix

- Both for interbank lending (credit risk) as well as for interbank borrowing (liquidity risk)

$$\mathbf{X} = \left(\begin{array}{ccc|c}
 \mathbf{x}_{11} & \mathbf{x}_{1j} & \mathbf{x}_{1N} & \Sigma_j \\
 \mathbf{x}_{i1} & \mathbf{x}_{ij} & \mathbf{x}_{iN} & l_i \\
 \mathbf{x}_{N1} & \mathbf{x}_{Nj} & \mathbf{x}_{NN} & l_N \\
 \hline
 \Sigma_i & a_1 & a_j & a_N
 \end{array} \right)$$

Source: Upper and Worms (2002)

Variables

<i>Variable</i>	<i>Definition</i>	<i>Expected sign</i>
size	$\ln(\text{total assets})$	+
CAP	Total equity / total assets	+
GRWTH	Quarterly asset growth	+/-
LLR	Loan loss reserve / (total equity + loan loss reserve)	-
MGT	Total cost / total income	-
ROA	Return on assets	+
II	Net interest income / total revenues	+/-
LIQ	Liquid liabilities / total assets	+
LOANS	Total loans / total assets	+/-
OBS	Off-balance sheet exposures / total assets	+/-
Exposure_lending	Interbank lending total assets	-
Exposure_borrowing	Interbank borrowing total assets	-
Foreign_lending	Foreign interbank lending / interbank lending	-
Foreign_borrowing	Foreign interbank borrowing / interbank borrowing	-
wzl	Weighted risk of all banks to which a bank lends	+
wzb	Weighted risk of all banks from which a bank borrows	+

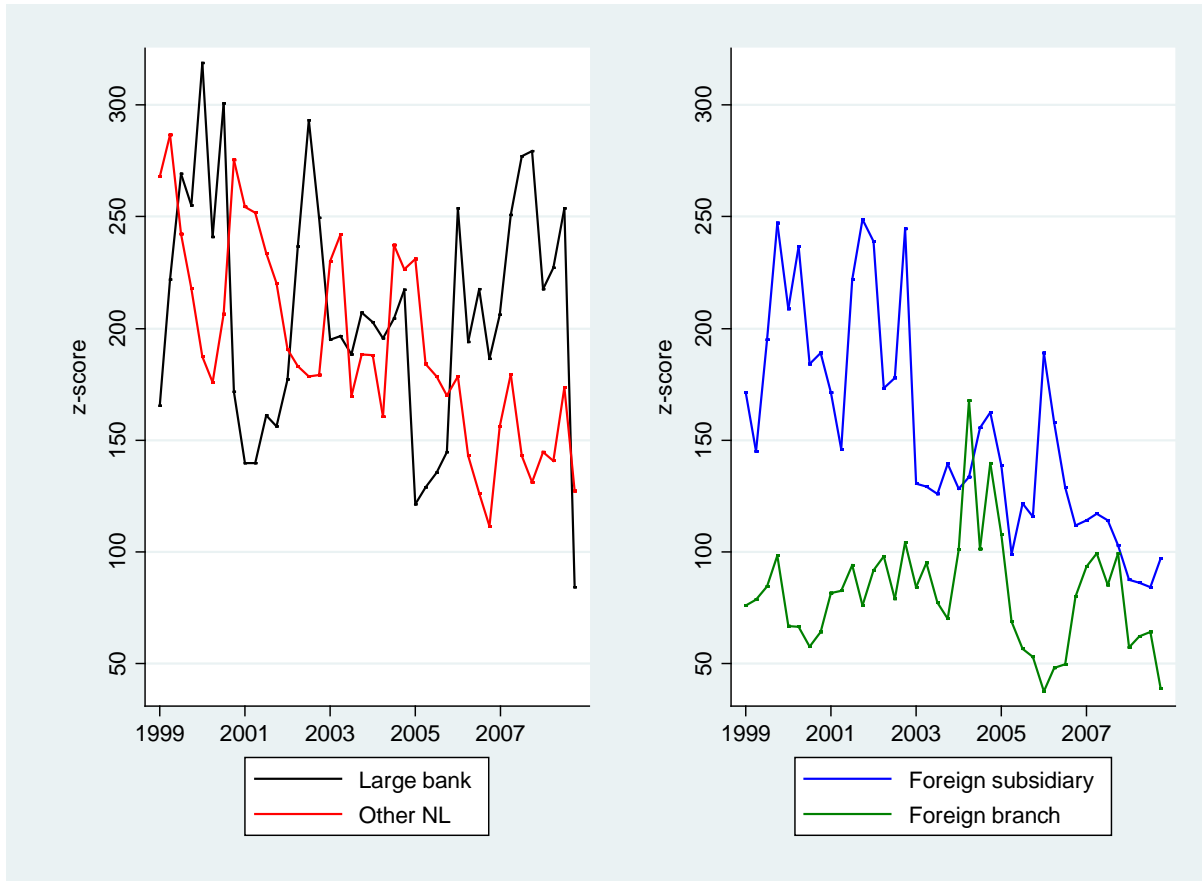
Data

- Bank's reports to DNB (1998 Q1 – 2008 Q4)
 - Balance sheet data
 - Large exposures data
 - (unbalanced) Panel

Table x: Number of observations per quarter, 1998 Q1 – 2008 Q4

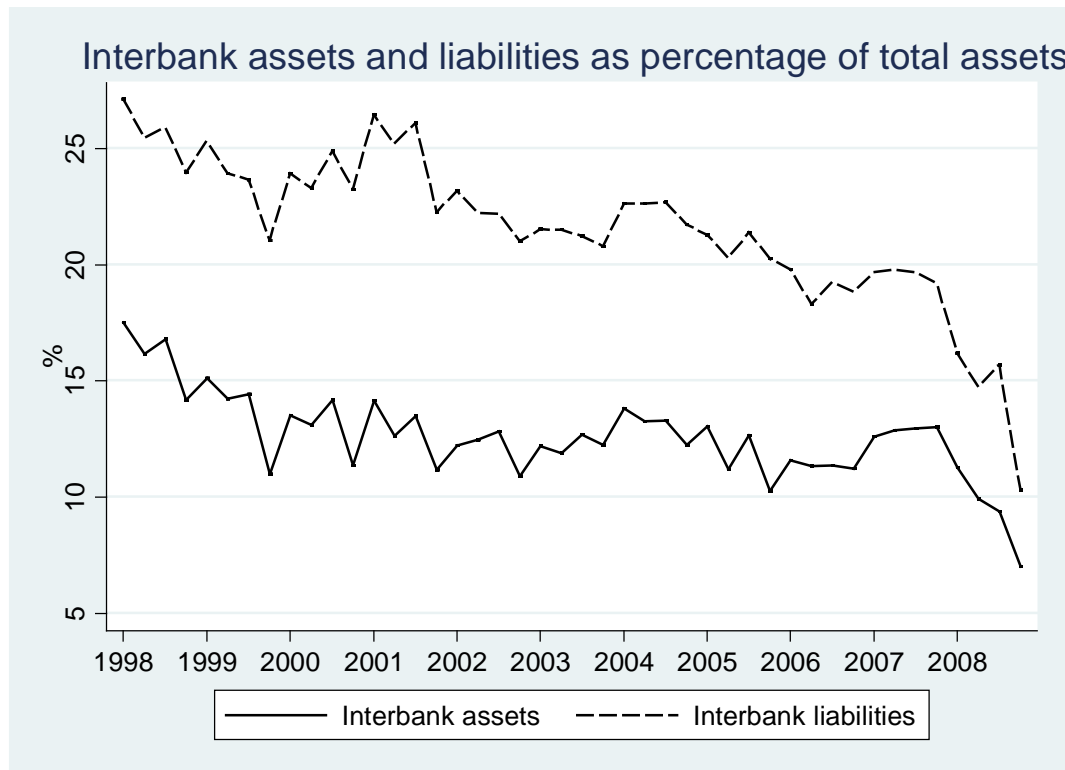
	Large bank	Other NL	Foreign subsidiary	Foreign branch	Investment firm	Total
Number of observations (range)	5	28-36	23-33	20-34	3-8	91-102

Bank stability



Network variables

Relative importance interbank market



Results

Models with

- bank specific variables
- time fixed effects

and:

1. Lending risk
2. Lending risk + interaction with bank type
3. Borrowing risk
4. Borrowing risk + interaction with bank type
5. Lending risk + borrowing risk
6. Lending risk + borrowing risk + interaction with bank type

Results (1)

VARIABLES	(1) wzl	(2) wzl*type	(3) wzb	(4) wzb*type	(5) wz	(6) wz*type
size	-7.1901	-7.1189	-1.6490	-2.4744	-7.0804	-7.6291
CAP	3.7276***	3.7547***	3.3184***	3.3514***	3.5995***	3.6167***
GRWTH	-0.2639**	-0.2700**	-0.3225***	-0.3301***	-0.2756**	-0.2934**
LLR	-1.5814*	-1.6123*	-1.4054*	-1.3337	-1.4914*	-1.4645*
MGT	-0.0632**	-0.0616**	-0.0633**	-0.0663**	-0.0649**	-0.0662**
ROA	-5.8687*	-5.8162*	-6.5829*	-6.6042*	-6.0971*	-6.1486*
II	0.2660**	0.2642**	0.2698**	0.2738**	0.2834**	0.2880***
LIQ	2.6995***	2.7107***	3.0113***	3.0061***	2.9154***	2.9382***
LOANS	0.5769	0.6058	-0.1293	-0.1174	0.5637	0.5784
OBS	-0.0047	-0.0047	-0.0668	-0.0678	0.0164	0.0151

Results (2)

VARIABLES	(1) wzl	(2) wzl*type	(3) wzb	(4) wzb*type	(5) wz	(6) wz*type
exposure_lending	-1.3845***	-1.4006***			-1.3934***	-1.3720***
foreign_lending	-0.0543	-0.0723			0.0335	0.0080
wzl	-0.0488	0.3058			-0.0509	0.1842
type2_wzl		-0.3520				-0.2455
type3_wzl		-0.3971				-0.2770
type4_wzl		-0.3543				-0.2256
type5_wzl		-0.2612				-0.1337
exposure_borrowing			-0.5125*	-0.4938*	-0.5604**	-0.5843**
foreign_borrowing			-0.2423	-0.1797	-0.2377	-0.1634
wzb			0.0264	2.0248*	0.0308	1.7743*
type2_wzb				-1.8694		-1.6115
type3_wzb				-2.1603*		-1.8631*
type4_wzb				-2.1466*		-1.9056*
type5_wzb				-1.5827		-1.3969

Relative importance interbank market

Foreign

Weighted credit quality domestic counterparts

Robustness checks

- Dependent variable (BIS-ratio, credit spreads)
- Business cycles (dummy, macro-vars)
- Impact 2008
- Subsamples (type, origin, full panel)
- Endogeneity weighted bank risk matrix
- Casual acquaintances

Conclusion

- Larger interbank lending and borrowing increase riskiness
 - supports contagion hypothesis
- No relation between riskiness of banks to which a bank lends and bank risk
- Interbank borrowing from more stable banks improves a bank's risk profile
 - Importance of funding risk
 - Especially from casual acquaintances