

***Too Big to Fail: Some Empirical Evidence on
the Causes and Consequences of Public
Banking Interventions in the UK***

By Andrew K Rose (UC Berkeley) and Tomasz
Wieladek (LBS)

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Motivation

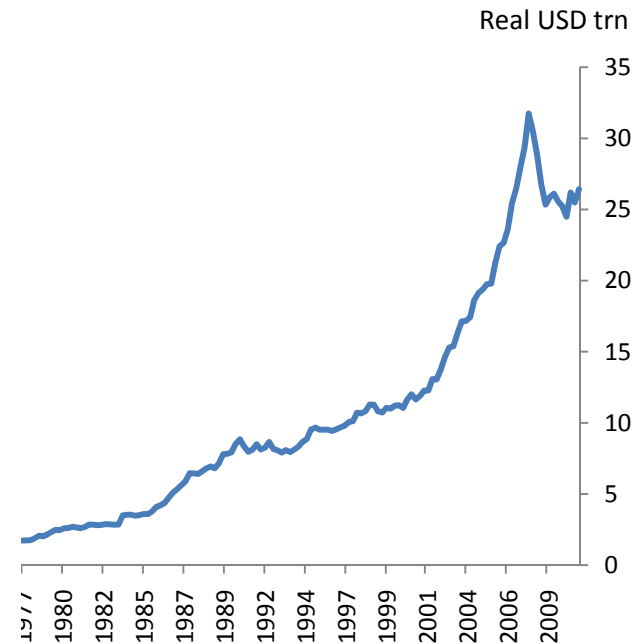
- Great recession originated as Financial Crisis
- Early victim → Northern Rock
 - Failure due to Wholesale funding, rather than retail, run (Shin, 2009)



Motivation (II)

- Indeed, Banks experienced a run on their liabilities globally...

Real BIS bank external liabilities

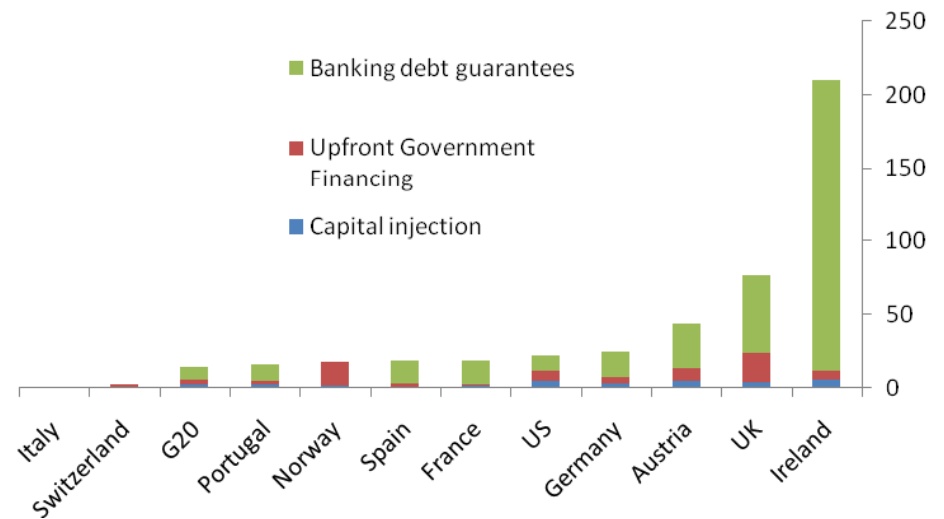


Source: BIS

Motivation (III)

- ... And governments tried to stop it through direct banking system interventions.

Government interventions as a fraction of 2008 GDP



Source: IMF

Motivation (IV)

- In this paper we examine *the causes...*
 - What determines the probability of receiving government support?
- *And consequences of government interventions.*
 - How effective were interventions in stopping wholesale bank runs?

Previous work – Causes

- Macro studies of Banking crisis:
 - Demirguc-Kunt et al (1998); Eichengreen and Rose (2001)
→ Macro variables at home & abroad important
 - Hahm et al (2011) → Wholesale funding matters
- Micro studies bank failure/survival/aquisition
 - Whalen (1991); Wilson et al (2000) → capital/asset;
loan/asset ratios are good predictors
- *We are the first to study to determinants of UK government intervention in this crisis*

Previous work - Consequences

- Studies examining effectiveness of TAF
 - Taylor and Williams (2009) → no effect
 - Christensen et al (2010); Wu (2010) → effect on interbank rates & liquidity risk premia
- Event studies of policy announcements
 - Aït-Sahalia et al (2009) ; Tong et al (2011)
- *no previous work looks at the direct effect of intervention*
 - Probably due to non-trivial endogeneity problem
 - We use IV to solve this problem

Preview of Results

- Size is the most robust ex-ante determinant of any type of intervention
- Following intervention, wholesale funding ratio increased by 38%



Data

- We use a *confidential* Bank of England dataset to answer these questions
- The data provides comprehensive balance sheet information for all banks operating in the UK at quarterly horizon (1997Q3 – 2010Q4)
- We focus on the UK, since:
 - First Bank run occurred there
 - Government used wide variety of Interventions

Data (II)

- Public sector interventions data collected by conducting bank-by-bank google searches for ‘ “bank name” nationalisation nationalise privatise’
- Constructed suitable binary dummies for: *privatisation, nationalisation, public capital injection, liquidity support*

Empirical approach

- 1) Use multi-nominal logit model to study determinants of government intervention
 - General to specific testing strategy
- 2) Estimate effect of intervention on individual banks whole-sale funding with IV
 - Use results from (1) to show validity of Instrument

Empirical approach - 1

- Multi-nomial logit model
- $\{\alpha\}$ - constant
- Variables averaged over 1997Q2-2007Q2
- X_i Includes:
 - Wholesale funding ratio:
 - (Total Liabilities – capital – retail deposits) / (Total Liabilities – capital)
 - Commercial Real Estate loans / total Loans
 - Loans/Assets
 - Capital/Assets
 - Relative size & Relative size²
 - NPL/Assets & Profits/Assets
- ε is a well-behaved disturbance term;

Empirical model

$$P(\text{event}_i) = \alpha + \beta X_i + \varepsilon_i \quad (1)$$

- Definition of event_i
 - = 1 if UK bank received Liquidity
 - = 2 if UK bank received public capital
 - = 3 if UK bank nationalised
 - = 4 if foreign bank received Liquidity
 - = 5 if foreign bank received public capital
 - = 6 if foreign bank nationalised

Results – 1

Intervention:	Liquidity Support	Capital Injection	Nationalization	Liquidity Support	Capital Injection	Nationalization
Banks:	British	British	British	Foreign	Foreign	Foreign
Wholesale	-0.01	-0.01	-0.03**	-0.00	-0.00	-0.01
Funding	(.02)	(.02)	(.01)	(.01)	(.01)	(.01)
Commercial	-0.01	.02	.05**	-0.01	.00	.03**
Real Estate	(.02)	(.02)	(.02)	(.02)	(.01)	(.01)
Loans/Assets	.00	.06**	.05**	-0.02	.005	.01
	(.02)	(.02)	(.01)	(.02)	(.007)	(.01)
Capital/Assets	.062**	-0.000	-0.006	-0.01	.011	.001
	(.016)	(.003)	(.005)	(.006)	(.012)	(.015)
Size	1.3*	3.0**	2.7**	14	1.2**	11.3
	(.61)	(.9)	(.6)	(10)	(.4)	(9)
Size ²	-0.07	-.30*	-.20**	-30	-.11*	-31.
	(.06)	(.12)	(.05)	(22.1)	(.05)	(21.4)
% Correct Predictions	30	45	40	0	24	33

Notes: 372 bank observations; McFadden's $R^2=.19$. robust standard errors in parenthesis. Coefficients significantly differently from zero at .05 (.01) confidence level marked with one (two) asterisk(s). "Correct predictions" tabulated for $p(\text{event})>.2$.

Results – 1 (II)

Tests of Model Equivalence across Cells

<u>Null - Hypothesis</u>	<u>Chi-Square Test Statistic</u>
EQUALITY AMONG FOREIGN & BRITISH INTERVENTIONS	
Liquidity Support	15.6**
Capital Injection	15.6**
Nationalization	14.5**
Liquidity Support, Capital Injection, and Nationalization simultaneously	85.4***
EQUALITY AMONG BRITISH INTERVENTIONS	
Liquidity Support = Capital Injection	24.8***
Capital Injection = Nationalization	4.9
Liquidity Support = Nationalization	34.36***
Liquidity Support = Capital Injection = Nationalization	41.2***
EQUALITY AMONG FOREIGN INTERVENTIONS	
Liquidity Support = Capital Injection	6.25
Capital Injection = Nationalization	8.41
Liquidity Support = Nationalization	9.58
Liquidity Support = Capital Injection = Nationalization	23**

Results – 1 (III)

Tests of Model Equivalence across Coefficients

Chi-Square Test Statistics	Wholesale Funding	Comm. RE	Loans/ Assets	Capital/ Assets	Size	Size ²
BRITISH INTERVENTIONS						
Liquidity = Nationalization = Capital Injection	3.0	7.2***	7.55**	16.9***	4.33	3.66
Liquidity = Nationalization	1.8	7.1***	6.2**	13.8***	4.2**	3.4*
Liquidity = Public Capital Injection	.1	3*	5.9**	11.9***	2.8*	2.7*
Nationalization = Public Capital Injection	2.2	1.3	.19	2.2	.17	.9
FOREIGN INTERVENTIONS						
Liquidity = Nationalization = Capital Injection	.28	4.73*	2.29	3.39	2.83	3.91
Liquidity = Nationalization	.0	.49	2.04	1.34	.04	.8
Liquidity = Public Capital Injection	.18	.14	1.1	2.5	1.62	1.83
Nationalization = Public Capital Injection	.21	4.73**	.81	.01	1.23	2.1
BRITISH & FOREIGN INTERVENTIONS						
Nationalization = Capital Injection = Liquidity (British = Foreign Simultaneously)	5.9	11.5**	18.5***	16.97***	12.7**	8.8

Results – 1 (IV)

- Tests across Cells suggest
 - Reject Null that foreign & UK interventions equal
 - Can not reject equality between UK Nat & Pub Inject
 - Equality among foreign interventions ambiguous
- Test across coefficients
 - confirm UK results & suggest foreign interventions equal
- → Treat UK Liquidity; UK Pub Inject & Nat; Foreign intervention as separate cells

Results – 1 (V)

- Specific Model suggests that size is the *only statistically significant determinant* across interventions
- → ‘Too big to fail’
- Interesting non-linearity (Size²)

Intervention:	Liquidity Support	Capital Injection/ Nationalization	Any Intervention
Banks:	British	British	Foreign
Wholesale Funding	-.006 (.02)	-.02 (.01)	-.003 (.007)
Commercial Real Estate	-.01 (.02)	.03* (.01)	.012* (.006)
Loans/Assets	.004 (.02)	.06** (.01)	.006 (.005)
Capital/Assets	.055** (.02)	-.001 (.003)	.007 (.008)
Size	1.26** (.6)	2.7** (.6)	1.0** (.3)
Size ²	-.07 (.06)	-.22** (.07)	-.09* (.04)
% Correct Predictions	30	62.5	50

Empirical approach - 2

- Standard Panel-data model
- $Y_{i,t}$ is the dependent variable
 - Wholesale funding ratio
- $\{\alpha_i\}$ - bank-specific fixed effects
- $\{\beta_t\}$ - time fixed effects
- $\text{Event}_{i,t}$
 - = 1 British bank i receives public capital injection or is nationalised at or before time t
 - =0 otherwise
- $\text{Controls}_{i,t}$ Includes:
 - Capital/Assets
 - NPL/Assets & Profits/Assets
- ϑ is a well-behaved disturbance term;

Empirical model

$$Y_{i,t} = \alpha_i + \beta_t + \varphi \text{Event}_{i,t} + \theta \text{Controls}_{i,t} + \vartheta_{i,t} \quad (2)$$

Empirical approach – 2 (II)

- Empirical model (2) subject to reverse causality
- Our Identifying assumption is that $\sigma=0$
 - \rightarrow Relative Size² does not affect WHL ratio
- Estimates of (A) pre-crisis support this assumption

Consider Simultaneous Equations System:

$$Y_{i,t} = \alpha_i + \beta_t + \mu \text{Event}_{i,t} + \sigma \text{Size}_{i,t}^2 + \vartheta_{i,t} \quad (\text{A})$$

$$\text{Event}_{i,t} = \alpha_i + \beta_t + \chi Y_{i,t} + \varsigma \text{Size}_{i,t}^2 + \varepsilon_{i,t} \quad (\text{B})$$

Results – 2

Estimates of Model (2) – IV and OLS

	OLS	IV	IV	IV	IV
British Intervention	9.8* (4.1)	37.9** (8.9)	37.5** (8.9)	-3.8 (2.0)	-3.8 (2.0)
Capital/ Assets			-.02 (.01)	-.09** (.03)	-.01 (.01)
Profits/ Assets				.16* (.06)	
NPL/ Assets				.39** (.08)	
Observations	17,501	17,501	17,501	7,678	7,678
# Banks	611	611	611	366	366
Hausman Test		22.0**	21.5**	11.9**	13.1**
Weak IV Test		24.7**	24.7**	27.9**	27.9**

Results – 2 (II)

- OLS estimate suggests that WHL ratio rises by 10% following intervention
 - But this is subject to reverse causality
 - Decline in WHL could be causing intervention
- Using relative size² as an IV , the estimate of the effect increases by a magnitude of 4
 - Weak IV/Hausman test confirms validity of the IV

Conclusion

- We study the ex-ante determinants of government intervention in banks in the UK
 - Relative size is the most robust determinant of intervention
- We then examine direct effect of government intervention on wholesale funding
 - Use relative size² as an IV
 - Government Interventions increased wholesale funding by 38%

Thank you for
listening/comments