

When LIBOR becomes LIEBOR: Reputational penalties and bank contagion

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Online Appendix 1. List of Events

Date	Event
24/03/2011	Barclays emerged as a key focus of the investigation by the US and UK regulators. Bank of America and Citibank also received subpoenas.
26/07/2011	UBS confirmed the LIBOR investigation had widened scope to Yen rates.
09/12/2011	Citigroup and UBS faced TIBOR penalties.
03/02/2012	Swiss authorities launched a probe into 12 banks (Bank of Tokyo-Mitsubishi, Citigroup, Credit Suisse, Deutsche Bank, HSBC, JP Morgan, Mizuho Corporate Bank, Rabobank, RBS, Societe Generale, Sumitomo Mitsui Banking Corporation, and UBS) over claims they have been fixing their interbank lending rates.
10/02/2012	Citigroup forced to write off \$50m after two traders accused of attempting to influence global lending rates left the bank.
20/03/2012	Deutsche Bank received data request in LIBOR probe.
27/06/2012	Barclays admitted to misconduct. The UK's FSA and the US Department of Justice and the CFTC imposed fines worth \$450m in total.
03/07/2012	Crown Office confirmed investigation into Scottish banking sector (Lloyds Banking Group and RBS).
05/07/2012	RBS withdrawn from TIBOR panel. Moody's and S&P lowered their outlook on Barclays from stable to negative amid the LIBOR scandal.
18/07/2012	Investigations focused on Barclays, whose traders were the ringleaders of a circle that included Credit Agricole, HSBC, Deutsche Bank, and Societe Generale.
31/07/2012	Deutsche Bank confirmed that a limited number of staff were involved in the LIBOR scandal.
05/08/2012*	Credit Agricole, Deutsche Bank, HSBC, Rabobank, and Societe Generale linked to the LIBOR probe.
09/08/2012	Bank of Tokyo Mitsubishi became the latest lender to face questions in the widening LIBOR scandal.
16/08/2012	Barclays, Citigroup, Deutsche Bank, HSBC, JP Morgan, RBS, and UBS to be questioned in the US for alleged LIBOR rigging.
23/08/2012	A former Singapore-based trader at RBS opened a new window into how attempts were allegedly made to manipulate LIBOR.
07/09/2012	RBS in talks to settle LIBOR allegations that would cost it £200–300m.
10/09/2012	Trial began of former UBS trader.
15/10/2012	A group of US homeowners sued Barclays, Bank of America, JP Morgan, UBS, RBS, Citigroup, Rabobank, Credit Suisse, Deutsche Bank, HSBC, Lloyds Banking Group, and Royal Bank of Canada, claiming they are liable for their mortgage rates being artificially higher because of illegal LIBOR rigging.
26/10/2012	Subpoenas sent to Bank of America, Bank of Tokyo Mitsubishi, Credit Suisse, Lloyds Banking Group, Rabobank, Royal Bank of Canada, Societe Generale, Norinchukin Bank, and WestLB.
29/10/2012*	First LIBOR damages trial set to proceed, a case brought by a care home operator against Barclays to go ahead.

Date	Event
15/11/2012	Canadian regulators investigated a half-dozen global banks in LIBOR manipulation probe publicly rebuked RBS.
03/12/2012	UBS in global talks to reach a settlement of more than \$450m over the alleged manipulation of LIBOR.
11/12/2012	Three men arrested in connection with investigations into the LIBOR rigging. Hayes (UBS; Citigroup) and Two brokers (RP Martin).
13/12/2012	UBS faced \$1bn fine over LIBOR allegation.
14/12/2012	UBS staff faced LIBOR probe in the UK.
19/12/2012	UBS agreed to pay \$1.5bn to US, UK and Swiss regulators for attempting to manipulate the LIBOR inter-bank lending rate.
20/12/2012	Former UBS trader who faced criminal charges in the probe had been linked to traders at RBS, JP Morgan, Deutsche Bank and Citigroup.
25/01/2013	Ex-Barclays chiefs named in LIBOR case.
06/02/2013	RBS fined \$610m by UK and US authorities for its part in the LIBOR scandal. Japanese banks accused of TIBOR fixing.
19/03/2013	Freddie Mac sued more than a dozen banks (Bank of America, JP Morgan, UBS, Citigroup, Credit Sussie, and Deutsche Bank) and the British Bankers' Association. UBS joined exodus from EURIBOR panel.
11/04/2013	Yen LIBOR probe focused on RBS.
17/06/2013	Former UBS and Citigroup trader Hayes charged by the Serious Fraud Office in connection with its investigation into the LIBOR scandal.
18/06/2013	HSBC probed by Hong Kong regulator over HIBOR.
18/09/2013*	A Japanese investment banking unit of UBS ordered to pay a \$100m criminal fine after pleading guilty to LIBOR manipulation.
23/09/2013	The US credit union regulator filed an anti-trust lawsuit against 13 banks (UBS, RBS, Barclays, Societe Generale, Credit Suisse, JP Morgan, Lloyds Banking Group, WestLB, Raiffeisen Bank, Norinchukin Bank, Bank of Tokyo Mitsubishi, and Royal Bank of Canada) as part of the LIBOR scandal.
21/10/2013	Former employees of Rabobank, RBS, Deutsche Bank, UBS, and ICAP were among 22 names that the UK Serious Fraud Office included as alleged co-conspirators on a draft indictment against Hayes, a former trader at both UBS and Citigroup who is facing criminal charges stemming from a probe into alleged LIBOR rigging.
31/10/2013	Fannie Mae sued 9 banks for \$800m over LIBOR: Barclays, Deutsche Bank, Citigroup, Bank of America, UBS, RBS, Credit Sussie, JP Morgan, and Rabobank.
08/11/2013	Barclays and Deutsche Bank faced LIBOR claims in civil cases.
04/12/2013	The European Commission fined six banks (RBS, Deutsche Bank, Societe Generale, JP Morgan, Citigroup, and RP Martin).

* Event day is on a weekend.

* Hurricane Sandy shuts down the stock market in the US.

Online Appendix 2. List of LIBOR Banks

This table shows the interconnection between the three panels: G-SIBs, G14, and LIBOR. We construct a panel that consists of 30 banks from the three panels and name it “LIBOR Banks.” G-SIBs stands for Global Systemically Important Banks; The “bucket number” developed by the Financial Stability Board to measure the systemic importance of a bank from 1 (lowest) to 5 (highest). G14 includes the 14 largest derivatives dealers.

Contributor Bank	Origin	G-SIBs	G14	LIBOR	USD	EUR	GBP	JPY	CHF	CAD	AUD	NZD	DKK	SEK
Abley National (Santander)	ESP			X		X	X							
Bank of America	USA	2	X	X	X									
Bank of New York Mellon	USA	1		X										
Bank of Nova Scotia	CAN			X						X				
Bank of Tokyo-Mitsubishi UFJ	JPN	2		X	X	X	X	X	X					
Barclays	GBR	3	X	X	X	X	X	X	X	X	X	X	X	X
BBVA	ESP	1		X										
BNP Paribas	FRA	3	X	X	X		X							
Canadian Imperial Bank of Commerce	CAN			X					X	X				
Citigroup	USA	3	X	X	X	X	X							
Credit Agricole	FRA	2	X	X	X	X	X	X						
Credit Suisse	CHE	2	X	X	X	X	X	X	X					
Deutsche Bank	DEU	3	X	X	X	X	X	X	X	X	X	X	X	X
Goldman Sachs	USA	2	X	X	X	X	X	X	X	X	X	X	X	X
HSBC	GBR	4	X	X	X	X	X	X	X	X	X	X	X	X
ING	NLD	1		X										
JP Morgan Chase	USA	4	X	X	X	X	X	X	X	X	X	X	X	X
Lloyds Banking Group	GBR			X	X	X	X	X	X	X	X	X	X	X
Mizuho Bank	JPN	1		X										
Morgan Stanley	USA	2	X	X			X	X	X					
Nordea Bank	SWE	1		X										
Royal Bank of Canada	CAN			X	X	X	X			X				
Royal Bank of Scotland	GBR	2	X	X	X	X	X	X	X	X	X	X	X	X
Societe Generale	FRA	1	X	X	X	X	X	X	X	X	X	X	X	X
Standard Chartered	GBR	1		X										
State Street	USA			X										
Sumitomo Mitsui Banking Corporation	JPN	1		X	X	X	X	X	X					
UBS	CHE	2	X	X	X	X	X	X	X					
UniCredit	ITA	1		X										
Wells Fargo	USA	1	X	X										

Online Appendix 3. Correlation Between Variables

This table reports the strength and direction of correlations between the study variables. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in Appendix A in the paper.

	ER	EVENT	NONEVENT	NONLIBOR	SIZE	DETA	LTA	ADJFINE
EVENT	-0.014	1						
NONEVENT	-0.003	-0.141***	1					
NONLIBOR	-0.018	-0.267***	-0.641***	1				
SIZE	0.011	0.279***	0.471***	-0.868***	1			
DETA	0.01	0.385***	0.079***	-0.580***	0.591***	1		
LTA	-0.017	-0.155***	-0.393***	0.546***	-0.293***	-0.363***	1	
ADJFINE	-0.004	0.156***	-0.022	-0.042*	0.042*	0.096***	-0.03	1
LTB	-0.200***	-0.005	0.042*	-0.034*	0.032	0.035*	-0.003	-0.033
MKT	0.768***	0.005	0.023	-0.046**	0.042*	0.045**	-0.005	-0.011
REIT	0.307***	0.031	0.025	-0.049**	0.048**	0.056***	-0.02	-0.005
CORP	0.163***	0.000	0.001	0.005	-0.008	-0.003	0.003	-0.006
HY	0.018	-0.054**	0.003	0.006	-0.007	-0.007	0.001	-0.033
FOREX	-0.153***	0.031	-0.01	0.032	-0.028	-0.031	0.006	0.027
SOV	-0.275***	0.006	0.025	-0.015	0.02	0.014	-0.006	0.011
COM	0.269***	-0.008	0.013	0.007	-0.011	-0.003	0.004	0.008
PLT	0.046**	-0.042*	0.004	0.004	-0.007	-0.001	0.003	0.027

	LTB	MKT	REIT	CORP	HY	FOREX	SOV	COM
MKT	-0.248***	1						
REIT	0.171***	0.423***	1					
CORP	-0.035*	0.228***	0.145***	1				
HY	0.058***	0.03	0.228***	-0.189***	1			
FOREX	-0.040*	-0.184***	-0.108***	-0.306***	-0.430***	1		
SOV	0.163***	-0.338***	-0.177***	-0.615***	0.026	0.272***	1	
COM	-0.232***	0.307***	0.094***	0.275***	0.070***	-0.240***	-0.222***	1
PLT	-0.015	0.069***	0.039*	0.234***	0.375***	-0.387***	-0.008	0.285***