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The 2008 GFC: Savings or Banking Glut?

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This study analyses two hypotheses that ascribe the US financial crisis of 2008 to capital inflows. The Asian savings glut posits that net inflows into high-grade US public bonds from countries running current account surpluses led to the housing boom and bust. In sum, an excess of savings over investment abroad led to an excess of US investment over savings. The (European) banking glut holds that gross inflows into private bonds led to the boom. Leveraging up by European banks enabled the leveraging up of US households. This paper puts the spotlight on European banks as producers of, not just investors in, US mortgage-backed securities. Gross flows from

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Europe better matched US mortgage market developments: private credit risk, floating interest rates and narrow spreads. European banks leveraging up also provided credit that enabled housing booms in Ireland and Spain. These findings favour the European banking glut hypothesis.

Large international capital inflows seem to cause or at least enable credit booms and asset price inflation. Aliber and Kindleberger (2015) emphasise how cross-currency positions play in this nexus.

Such positions can take the form of borrowing or investing. If domestic residents borrow in foreign currency and convert the proceeds into domestic currency under a flexible exchange rate regime, they put upward pressure on the currency. A stronger domestic currency in turn flatters the balance sheet of the foreign-currency borrower: liabilities in foreign currency fall relative to equity in domestic currency. This can in turn make lenders willing to lend more to the borrowers (Bruno and Shin 2015).

By the same token, foreign investors who exchange foreign currency for domestic currency and buy domestic bonds push up the exchange rate. Exchange rate appreciation, in turn, produces valuation gains for foreign investors that induce further inflows into bonds. In the mid-2000s, so-called carry traders borrowed dollars or euros and invested in Icelandic kroner, setting in train this self-reinforcing dynamic. Clearly, such dynamics were at work not just in Iceland, but in many other cases in which large international capital flows accompanied domestic credit booms and asset price inflation.

The interpretation of Dooley (2019) is that the significance of foreign funding lies not in any behavioural difference between resident and nonresident investors or lenders, such as that arising from this currency effect. Rather, a larger pool of potential international sources of funding simply increases the elasticity of the supply of bank funding. This more elastic supply makes it feasible to leverage up a risky strategy. With sufficient leverage, near-term profits from the risky strategy may promise enough to lead a rational bank manager to go for it. "The problem with international investors is that there are so many of them", summarises Dooley.

In the Great Financial Crisis (GFC), the key role of the exchange rate in Iceland was the exception, and the global elasticity of dollar (and euro) funding was more relevant elsewhere. Dollars flowed into the

United States to buy dollar-denominated US Treasury bonds or bonds backed by highly leveraged mortgages. Non-US banks borrowed dollars to invest in mortgage-backed securities (MBS) with borrowed dollars. For their part, capital flows to Ireland and Spain were almost entirely euro-denominated.[1] In none of these cases did the foreign exchange valuations feed back to encourage inflows, as described above. In fact, the US dollar actually trended downward from 2002 to 2007, so that unhedged dollar investments gave rise not to valuation gains, as kroner investments initially did in Iceland, but rather to losses. But this dollar depreciation exerted no first-order effect on the returns to European banks who borrowed US dollars to invest in risky US securities. It did allow them to borrow more dollars for given leverage, however.[2]

In the 2000s the United States received two big capital flows from abroad. Debate continues over which one deserves more credit for the boom in US credit and house prices. Was it the savings glut flows or the banking glut flows?

Before the crisis, Bernanke (2005) and others had implicated a set of countries running current account surpluses in the US boom.[3] They argued that a savings glut in Asia (better a dearth of investment in countries hit by the Asian financial crisis in 1997–1998) and among some commodity exporters had led to a strong bid for safe US bonds. This one-way investment put downward pressure on US bond yields and stimulated US investment, especially in homes. As a result, US spending rose relative to US output, widening the US current account deficit. An Asian excess of saving over investment thus led to an excess of US investment over saving. On this view, these "trans-Pacific" imbalances ultimately caused the GFC (Ferguson 2008; Wolf 2014).

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[1]While Irish banks sourced funding in dollars and sterling, they swapped for euros. See Lane (2015).

[2]However, a second-order effect of the dollar depreciation on leverage actually encouraged European banks' to expand their dollar books. In particular, dollar depreciation allowed such banks to borrow and lend more dollars for a given degree of leverage of their stock of capital, which was mostly held in European currencies. See Fukao (1991).

[3]Bernanke et al. (2011) recognised the domestic vulnerabilities that contributed to the crisis; Bernanke (2018) has emphasised the role of financial panic, recalling the "run on repo" of Gorton and Metrick (2012). Several prominent economists in the 2000s worried about current account imbalances and their accumulation into net external debt that would prove

Others have pointed instead to two-way transAtlantic flows. In the 2000s, European banks leveraged up their equity with dollars borrowed from United States and other investors and ploughed them into US private debt. More than anything else, they bought private label MBS, or complex bonds based on them. Their eager buying of such private securities enabled their issuance to surpass that of government agency MBS in 2005. Leveraging up by European banks begat unsustainable leveraging by US households: the transAtlantic crisis (Bayoumi 2017). In support of this view, Borio and Disyatat (2011) found that gross capital flows from Europe to the United States dominated the net capital flows from surplus countries; they denied the link between global imbalances and the GFC. Acharya and Schnabl (2010) showed that banks from both surplus and deficit countries, mostly in Europe, set up conduits to hold risky US MBS. Shin (2012) dubbed the alternative hypothesis the banking glut.

This chapter argues that, as an account of key features of the GFC, the savings glut story comes up short and the banking glut story gives more satisfaction. While the flows into US bonds from surplus countries may well have exceeded those from European banks, the latter better match developments in the US mortgage market. There European banks manned the production line of the private label MBS, as well as investing in them. Moreover, the more violent property booms in Ireland and Spain drew on relatively larger capital inflows from European banks.

The rest of this chapter analyses the two capital inflows, their imprint on the US mortgage market, the role of European banks' US securities affiliates, the skew of the European portfolio to risky US bonds and the motivations of European banks. A box sketches the larger but more traditional capital flows into Ireland and Spain. A final section concludes that European bank leverage enabled US, Irish and Spanish booms.

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unsustainable. Summers (2004), Edwards (2005), Obstfeld and Rogoff (2005), and Setser and Roubini (2005), warned of an impending sudden stop of financing that would lead the dollar to plunge and the US economy to enter a recession. Krugman (2007) memorably pictured the dollar reaching a Wile E. Coyote moment and then falling.

Comparing and Contrasting the Two Gluts

Let us first compare and contrast the capital flows associated with the savings and banking gluts and then pose three questions. Which flow better matches the big changes seen in the US mortgage market? How did the role of European banks' US securities affiliate as producers of private label MBS enlarge the European footprint in this market? And why did the European banks do it?

The differences between the two stories bear emphasis (Table 5.1). Twice as much money flowed into US public bonds from Asian official investors as flowed into US private asset-backed securities (ABS) from European investors. In the first, official reserve managers purchased safe, longer-term US government obligations, generally funding themselves with domestic currency liabilities. In the second, banks purchased riskier, shorter term bonds backed by US mortgages, commercial real estate and other assets, mostly funded by short-term dollar debt. Asian reserve managers took duration risk. European banks took credit and maturity risk, buying risky so-called "spread product" to earn a margin over the cost of short-term funding.

Table 5.1 Asian savings glut vs European banking glut

	Asian savings glut	European banking glut
Size of inflow	$1.7 trillion or 10% of US GDP	$0.7 trillion or 5% of US GDP
Direction	One-way	Two-way; European banks borrow dollars
Protagonists	Official reserve managers	Commercial banks
Demand for safe assets	Positive	Negative: supply to US money market funds
Duration of target bond	Medium to long term	Short to medium term
Leverage	Most foreign exchange reserves funded with short-term domestic currency instruments	Short-term dollars borrowed from US money market funds and others
Capital gains/losses	Gains on US Treasury bonds; little private MBS	Huge losses on private label MBS

Sources US Treasury et al. (2002, 2008, 2009); Table 5.4; author's elaboration

The first story presents itself as a current account story, although some countries built foreign exchange reserves despite running current account deficits and some surplus countries did not build up foreign exchange reserves (Borio and Disyatat 2011). The flow was one-way. The second story is a capital account story, with gross capital flow running in two directions.

Current accounts drive long-term changes in countries' net international investment positions, albeit with important valuation effects (Gourinchas and Rey 2014). The evolution of these positions lends itself to an analysis of sustainability that led to dire predictions of dollar crisis, as cited above. By contrast, the current account of the euro area, and of Europe as a whole, approximated balance, and few fretted about a sudden stop of European bank intermediation between US investors and highly leveraged US households. European banks funded portfolios of US assets by "round-tripping" dollar funds from the United States and back again (McGuire and von Peter 2009; Shin 2012; Avdjiev et al. 2016). In particular, dollars raised from US money market funds (Baba et al. 2009) flowed back Stateside through purchases of private MBS and other assets (Fig. 5.1). Outflows to Europe matched the inflows from Europe, leaving *net* flows negligible. As a result, someone who looked only at the current account balance overlooked these accumulating flows and their risks.

The flows differed in their demand for safe assets. Focusing on the official inflow, Caballero et al. (2008) saw it as chasing safe assets that Wall Street had a comparative advantage in producing. In fact, official reserve managers steered clear of risky private MBS, however rated (Ma and McCauley 2014). Instead they hugged the shore of US Treasury bonds and US government supported agency bonds. Those developing this thesis overlooked European banks' *provision* of safe assets to US money market funds. These banks invested the proceeds in pseudo-safe MBS, many rated AAA, in so-called "credit arbitrage" which proved far riskier than expected. Official reserve managers demanded dollar safe assets; European banks supplied them, ultimately, in many cases, thanks to their home government support.

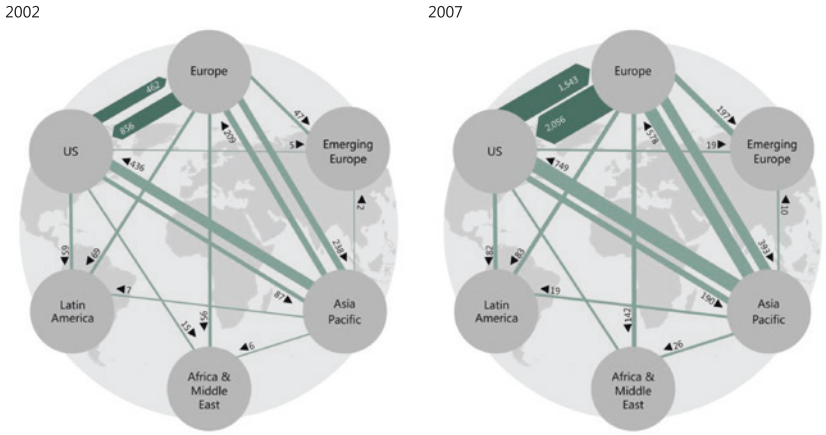

Fig. 5.1 US dollar-denominated cross-border claims: the transatlantic round-trip (In billions of US dollars) (*Note* The thickness of the arrows indicates the size of the outstanding stock of claims. The direction of the arrows indicates the direction of the claims: arrows directed from region A to region B indicate lending from banks located in region A to borrowers located in region B. *Source* Avdjiev et al. (2016), based on BIS locational banking statistics)

Official reserve managers had long since extended maturities from Treasury bills to Treasury and agency notes. Their sweet spot on the yield curve was at medium-term maturities (McCauley 2018; Fig. 5.2), which provided extra yield to cover the cost of domestic liabilities and dollar depreciation. By contrast, European banks preferred to match their mostly short-term dollar funding with floating rate MBS. Below we discuss how the US mortgage market reshaped itself around their demand, shifting from Treasury bills to Libor as the benchmark reference rate for adjustable-rate mortgages (ARMs).

The portfolios performed very differently in the crisis. Official reserve managers enjoyed capital gains as US Treasury bond yields fell and the dollar rose (Gourinchas et al. 2012; Bénétrix et al. 2015). European banks, along with US securities firms and some large US banks, suffered massive losses. The European banks responded by reducing exposures in Europe (Cecchetti et al. 2012) and elsewhere (McCauley et al. 2019).

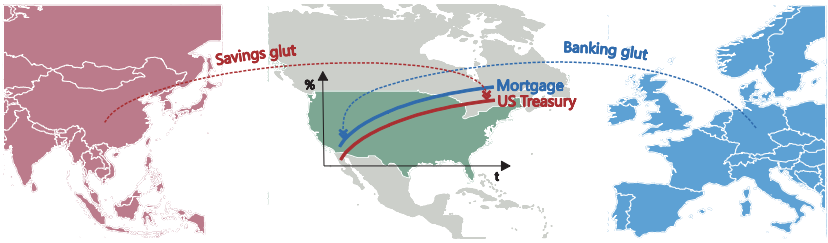

Fig. 5.2 Competing hypotheses: capital flows and the US housing boom (*Note* The boundaries shown on this map do not imply official endorsement or acceptance by the author or the BIS. *Source* Author's elaboration) (colour figure online)

Which Capital Flow Matches US Mortgage Market Trends?

Considerable evidence links inflows of bank or more broadly debt capital to credit growth within an economy (Avdjiev et al. 2012; Hahm et al. 2013; Lane and McQuade 2014; BIS 2015, pp. 92–93). In the lead-up to the GFC, however, two very different capital inflows accompanied the boom in private credit, especially in the mortgage market, in the 2000s. One way of assessing their relative contributions is to compare the expected impact of each flow to the stylised facts of the evolution of the US bond market in those years.

The Asian savings glut story predicted flows into Treasuries and agencies, lower Treasury yields, higher mortgage spreads, and more fixed-rate mortgages (Fig. 5.2, red arrow). Risk-averse reserve foreign exchange managers typically prefer safe assets, including US Treasury and agency securities (McCauley and Rigaudy 2011). Given their preference for intermediate-term notes, this inflow should have depressed Treasury yields at such maturity. US Treasury rates should have fallen by more than MBS yields (even with the diversification of reserve managers into agency securities). And the decline in fixed-rate mortgage yields should have biased mortgage lending towards those carrying fixed rates.

The banking glut story focuses on the effect of banks as buyers of risky private mortgage debts. Banks favoured the wider spread over US Treasury obligations that unguaranteed mortgages promised.

This preference favoured shifting mortgage finance from publicly guaranteed to private label MBS. Since banks' readiest funding source is short term, a banking glut also favoured floating-rate debt. It would tend to narrow the gap between private yields (especially short to medium term) and US Treasury yields, and mortgage spreads in particular (Fig. 5.2, blue arrow).

The first two predicted effects of the Asian savings glut—inflows into US Treasuries and lower Treasury yields—did indeed hold. As noted, officials invested $1.7 trillion in US Treasury and agency bonds in 2000–2007. This amounted to about 10% of GDP. Warnock and Warnock (2009) found 10-year yields were 80 basis points lower in 2005 as a result.

However, predictions regarding mortgage flows and yields did not pan out. The left-hand panel of Fig. 5.3 shows that the spreads on fixed-rate agency and private jumbo MBS actually *narrowed* in the 2000s. Furthermore, rather than this being the heyday of fixed-rate mortgages as long promoted by the US agencies, ARMs bulked large among the new mortgages securitised without agency guarantees. As a result, fixed-rate mortgages declined from an estimated 78% of MBS issues in 2001 to just 60% in mid-2007 (Goodman et al. 2008, Exhibits 1.2 and 1.5). Thus, the fixed-rate bonds that reserve managers favoured lost share in the boom.

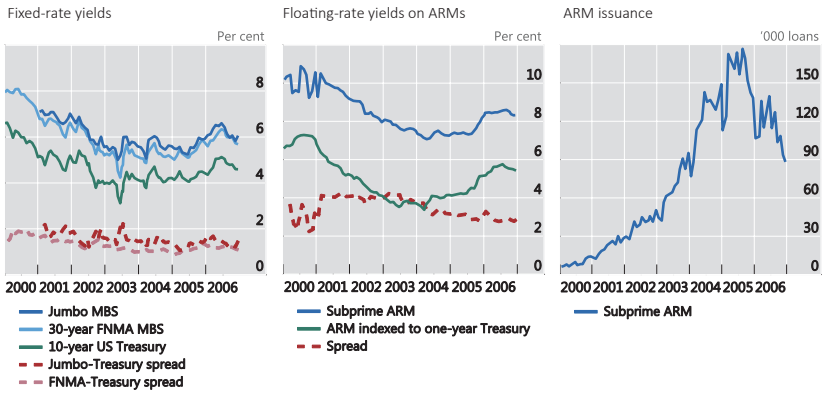

Fig. 5.3 Mortgage spreads and issuance, 2000–2006 (*Sources* Bertaut et al. 2012, p. 227, citing CoreLogic; Bloomberg)

In sum, key mortgage-market developments in the 2000s did not match what might have been expected from a big official flow into safe government bonds. Risky private label MBS with adjustable rates gained share and spreads narrowed.

The predictions of the banking glut story perform better. First, European banks' demand drove US mortgage finance away from government guarantees to private credit risk. Non-agency mortgages reached 55% of all gross issuance in 2005 and 2006 (Goodman et al. 2008, p. 6; see also Frankel 2006). In stock terms, non-agency securitisations reached one-third the total (Goodman et al. 2008, pp. 3–4). Second, ARMs predominated in private label MBS at 62% of private issues (Goodman et al. 2008, pp. 6, 10), conveniently allowing banks to match their short-term funding. In 2006 ARMs amounted to 40% of all (private and agency) MBS issued. In terms of rates, long-term spreads actually narrowed (Fig. 5.3, left-hand panel). Spreads also narrowed for non-agency ARMs relative to agency issues. The centre panel of Fig. 5.3 shows that the spread between sub-prime ARMs and "conforming", agency ARMs declined by 100 basis points between 2002 and 2006, even as issuance exploded (right-hand panel). One can infer *very* strong demand.

European Banks as Producers of MBS

The usual image of European banks as hapless investors in US MBS in the mid-2000s needs thorough revision. In Zuckerman (2009), Lewis (2010), and Dunbar (2011) and US court cases, banks from Dusseldorf or Kiel play the role of sophisticated investors in name only, serving as, in market parlance, "stuffees". However, certain European banks played quite a different role (Bank of England 2007, p. 37).

Six European banks produced private label MBS out of their US securities affiliates. They ranked among the top 15 underwriters of sub-prime MBS (Table 5.2). RBS's Greenwich ranked first, with a 12% share, above that of Lehman Brothers, Bear Stearns and Morgan Stanley. Collectively, Greenwich, Credit Suisse (ranked fifth). Deutsche Bank (ranked seventh), UBS, Barclays and HSBC claimed a 35–40%

Table 5.2 Non-US banks' US securities affiliates' underwriting of sub-prime MBS deals[a]

	1997–2001	2002	2003	2004	2005	2006	2007	Total
Greenwich (RBS)[b]	17	10	16	28	30	30	17	148
Lehman Brothers	10	8	16	20	31	31	14	130
Bear Stearns	5	1	6	23	34	27	16	112
Morgan Stanley	3	4	12	29	29	20	13	110
Credit Suisse	10	10	13	23	25	13	6	100
Merrill Lynch	3	0	4	12	31	34	9	93
Deutsche Bank	4	7	13	15	20	24	8	91
Goldman Sachs	0	3	5	17	20	22	9	76
Bank of America	5	8	14	18	11	6	5	67
Citigroup	0	2	6	9	16	17	14	64
JPMorgan	5	7	7	4	8	21	8	60
UBS	0	1	8	13	15	20	3	60
Barclays	0	0	0	8	15	19	8	50
Countrywide	0	4	8	14	5	0	0	31
HSBC	0	0	0	0	4	13	6	23
Others	13	5	6	2	10	27	2	65
Total	**75**	**70**	**134**	**235**	**304**	**324**	**138**	**1280**
Memo:								
Of which: foreign bank	*31*	*28*	*50*	*87*	*109*	*119*	*48*	*472*
foreign bank %	*41.3*	*40.0*	*37.3*	*37.0*	*35.9*	*36.7*	*34.8*	*36.9*
Of which: US sec firm	*21*	*16*	*43*	*101*	*145*	*134*	*61*	*521*
US sec firm %	*28.0*	*22.9*	*32.1*	*43.0*	*47.7*	*41.4*	*44.2*	*40.7*
Of which: US bank etc	*23*	*26*	*41*	*47*	*50*	*71*	*29*	*287*
US bank etc %	*30.7*	*37.1*	*30.6*	*20.0*	*16.4*	*21.9*	*21.0*	*22.4*

Sources Nadauld and Sherlund (2013, p. 457), based on ABSnet; author's calculations

[a]Shaded rows indicate European bank ownership

[b]Listed separately in the source, Greenwich Capital and RBS Greenwich are combined

share. Crucially, they retained that share as the US securities firms grabbed market share from the big US banks and others in 2004–2005 (Table 5.2, memorandum items).

By 2007, banks' business model of underwriting private MBS had evolved to include holding a substantial fraction of the product on their balance sheets. What Dunbar (2011) and Goldstein and Fligstein (2017) liken to a Henry Ford-type production line started with a "warehouse" of mortgages that underwriters would assemble into MBS. They then sliced and diced these into collateralised debt obligations (CDOs) and booked them as trading assets. By 2007, underwriters could sell

lower-rated, wider-spread securities, but mostly ended up holding the "super senior" tranches in their trading books.[4,5]

Contemporary observation and subsequent research confirmed the nexus between underwriting and MBS holdings. The Swiss Federal Banking Commission commented (2008, p. 7): "At least towards the end of the mortgage boom, the CDO securitization business functioned only to the extent that market players such as UBS, Merrill Lynch and Citigroup were willing and able to retain 'unattractive' low-yield Super Senior CDO tranches of individual securitizations on the own (trading) books" (see also Zuckerman 2009, p. 176). In a study of the holdings of highly rated securitisation tranches across US-owned bank holding companies, MBS underwriting strongly predicted holdings (Erel et al. 2014). For UBS, the Commission (p. 5) reported that "the CDO Desk had not only securitized CDOs and sold such CDOs to investors, but had retained the Super Senior CDOs… on its own (trading) books".

The six European banks had $251 billion of private MBS at end-2007 (Table 5.3). A seventh, ING, held a further $46 billion in its US internet banking thrift. No doubt, the data from 2008 annual reports and official or officially mandated reports are not consistent across banks, with Credit Suisse in particular reporting on a net trading positions basis.[6]

[4]By contrast, Cayman Island entities owned MBS held in asset-backed commercial paper (ABCP) conduits, designed to keep the assets off the sponsor's balance sheet. US Treasury et al. (2008, 2009) should have captured these holdings in mid-2007 as foreign. In 2007, European banks sponsored ABCP conduits holding at least $100 billion in US MBS (Moody's 2007; Acharya and Schnabl 2010, p. 56; Acharya et al. 2013, p. 522). The last column of Table 5.3 thus understates European exposures.

[5]Greg Lippmann at Deutsche Bank emailed about the buyers of MBS tranches in February 2007 (US Senate 2011, p. 349): "[T]he other side is all cdos so it is the cdo investors who r on the other side who buys cdos: aaa-reinsurance, ws [Wall Street] conduits, European and Asian banks, aa-high grade cdos, European and Asian banks and insurers….some US insurers, bbb other mezz [mezzanine] abs [asset-backed security] cdos (i.e. ponzi scheme), European banks and insurers, equity some US hedge funds, Asian insurance companies, Australian and Japanese retail investors through mutual funds".

[6]A position could be short over a certain range of prices, but long thereafter. Lewis (2010, Chapter 9) describes how Morgan Stanley took a short position in BBB tranches "netted" against multiple long positions in AAA tranches (sold in part to UBS), with disastrous results.

Table 5.3 Holdings of US non-agency MBS by European banks with US broker-dealers (In billions of dollars at end-2007)

	Non-agency mortgage-backed bonds			Total assets	Share of total assets (%)
	Residential	Commercial	Total		
Barclays	31	1[a]	32	2458	1.3
Credit Suisse[b]	…	…	9	1208	0.7
Deutsche Bank	20	…	20	2840	0.7
HSBC	26	10[a]	36	2354	1.5
RBS	…	…	84	3645[c]	2.3
UBS	…	…	68	2055	3.3
Total	…	…	251	…	…
Memo: ING	*46*	*…*	*46*	*1930*	*2.4*

[a]Estimated from annual reports
[b]Trading book concept; net of hedges
[c]Assets of RBS before merger with ABN AMRO
Sources Barclays (2009, pp. 106, 113), Credit Suisse (2009, p. 71), Deutsche Bank (2009, pp. 19–21), FSA (2011, p. 52), HSBC (2009, pp. 152–7), ING (2009, p. 140), Netherlands House of Representatives (2013), RBS (2009, p. 35), UBS (2008, pp. 6–7)

Moreover, some of the exposures of the other five banks were hedged, though it is not possible to say how much.[7]

There are good reasons to suppose that these six European banks held this quarter of a trillion dollars' worth of US MBS in mid-2007 on the balance sheets of their US securities affiliates. As described above, their business models involved holding such securities on the US book, and contemporary observation placed them there. In addition, the ex post aggregate profitability of foreign-owned securities firms in 2008 suggest they did.

In particular, European-owned broker-dealers racked up large losses in 2008 from write-downs of assets, consistent with their having retained ultimately toxic bonds on their US books. The US Bureau of Economic Analysis (BEA) reports that European-owned non-banking finance and insurance firms took capital losses from "widespread write-downs of financial assets" (Ibarra and Koncz 2009, p. 29) of

[7]Deutsche Bank's CDO desk famously put on a multi-billion dollar short (Zuckerman 2009; Lewis 2010; Dunbar 2011), but US Senate (2011) found that overall the bank remained long and took losses.

no less than $110.8 billion in that crisis year (Lowe 2011, p. 98).[8] The large holdings by European banks of private MBS on their US books deserve recognition and change the profile of European banks as holders of MBS.

Did European Banks Hog Private US MBS?

A key element of the banking glut view is the drive by European banks to load up on risky US mortgages. However, Bertaut et al. (2012) report that European investors, including banks, put a weight on private label ABS of 23%, much the same as US investors, at 20% (Table 5.4, fourth column). ABS includes residential and commercial MBS, and bonds backed by car loans and other assets.

These data represent holdings by residence but the more telling observation requires data compiled on a nationality basis. As noted, European banks' balance sheets sprawled well outside European national borders.

If the exposures discussed above were held in their US books, then European banks did indeed take on more than their share of the risk arising from leveraged US mortgages. From a nationality perspective, such holdings add to European investors' holdings and subtract from US investors' holdings. This is shown in the last two columns of Table 5.4, which add to the figures reported by Bertaut et al. (2012) on a residency basis the exposures booked in US affiliates from Table 5.3.

[8]The presumption is that UBS's US affiliate took losses on the $25 billion in US ABS transferred at appraised prices by UBS to the SNB-funded Stabilisation Fund in September 2008 (Swiss National Bank 2010, pp. 83–85). In the BEA data, foreign-owned non-banking finance and insurance firms reported overall losses of $60 billion in 2008. This sum exceeded the net losses of $40 billion recorded by the rest of foreign-owned firms in the financial sector, including depository institutions. Foreign-owned depository institutions reported capital losses of $41 billion (Lowe 2011, p. 98). Much of this loss was presumably accounted for by ING Direct USA, which had boosted returns at its US internet banking thrift, ING Direct, by switching its assets from agency paper to risky Alt-A MBS (Kalse 2009). Asian- and Canadian-owned non-banking affiliates, absent from Tables 5.2 and 5.3, reported capital losses of only $1.7 billion and $5.7 billion, respectively.

Table 5.4 Holdings of bonds issued in the United States by European and US investors at end-2002 and June 2007

	End-2002		June 2007			
			Residence-based		Nationality-based	
	USD bn	Share (%)[a]	USD bn	Share (%)[a]	USD bn	Share (%)[a]
European investors						
Treasuries and agencies	575	57	704	30	704	26
Corporate excluding ABS	340	34	1119	47	1119	42
ABS	93	9	558	23	855	32
Total	1008	100	2381	100	2678	100
US investors						
Treasuries and agencies	7324	54	8194	45	8194	46
Corporate excluding ABS	4349	32	6324	35	6324	35
ABS	1807	13	3621	20	3324	19
Total	13,480	100	18,138	100	17,842	100
Memo: ABS outstanding	*1978*	*12*	*4523*	*19*	*4423*	*19*

[a]Share of the investors' portfolio of US bonds that is devoted to the instrument in the row heading

Sources Adapted from Bertaut et al. (2012, Table 3); author's calculations

On this showing, European investors, including banks, loaded up on risky US MBS. At end-2002, their US bond portfolio resembled that of US investors. Their portfolio consisted of mostly safe Treasury and agency securities, with about a third of it in plain vanilla US corporate bonds. By mid-2007, the profile of European investors' US bonds had veered away from that of US investors towards riskier bonds. Even on a residence basis (Table 5.4, centre columns), European investors had shifted out of safe Treasury and agency securities into corporate bonds, while US resident portfolios kept Treasury and agency securities in first place. On a nationality basis (right two columns in Table 5.4),

including holdings at US affiliates, European investors had promoted ABS to second place, above safe assets in third place.[9]

The US mortgage market reshaped its pricing around the needs of foreign banks in the 2000s, highlighting their importance as investors. Historically, ARMs were priced off of national reference rates, mostly one-year Treasury bills. As securitisation picked up with non-US banks as big investors, US mortgage bankers shifted to using offshore Libor as the reference rate. Thus, researchers at the Federal Reserve Bank of Cleveland analysing the stock of outstanding Ohio mortgages in July 2008 found that later vintages of ARMs more and more used Libor as the reference rate (Schweitzer and Venkatu 2009). The Libor-linked share of sub-prime rose from less than 60% in 2003 to reach practically 100% in 2008. The Libor-share of prime ARMs also rose from less than 20% in the turn of the century vintages to 60% by 2008.[10] The benchmark was not "Changed by Wall Street, for Wall Street" as Morgenson (2012) headlined, but rather for Lombard Street (London) and for Taunusanlage (Frankfurt).

In sum, European banks claimed a market share of a third or more in the production of highly leveraged MBS. Like the US securities firms analysed by Nadauld and Sherlund (2013), as these underwriters ramped up production, they sent a signal to mortgage bankers to extend more credit. Moreover, European investors, especially European banks, bulked large as ultimate holders of such paper as well. The influence of European banks in the market helped to propel Libor to displace US Treasury bills as the preferred reference rate in floating-rate US mortgages.

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[9]Within ABS, foreign investors had more than their share of ultimately risky mortgage bonds. Beltran et al. (2008, Table 6) estimate that non-US investors held 29% of $2.2 trillion in securitised non-agency home mortgages. Including amounts in Table 5.5 on the assumption that they were held on balance sheets in the United States takes this share above 40%. This share is well above private foreign investors' 14% of US Treasury bonds outstanding or 9% of agency bonds outstanding.

[10]"'It was all about securitization, especially subprime loans,' said Guy D. Cecala, publisher of *Inside Mortgage Finance*, an industry authority. 'You had Wall Street saying, 'If we want to sell this overseas, we have to pick a more international-flavoured index.' Subprime lenders just started using it overnight, and then it started to spill out into any loan you wanted to securitize'" (Morgenson 2012).

Why Did European Banks Bet the Bank on US Mortgages?

Why did European banks bet the bank on US mortgages? Nadauld and Sherlund (2013) and Bayoumi (2017) highlight the role of regulation and easy access to repo finance. In the former view, the application of the international rules known as Basel II allowed big banks to use their own models to evaluate the riskiness of their assets and permitted US securities firms and European banks to pile 50 or more dollars or euros on every dollar or euro of equity. Dunbar (2011, pp. 138–139), reports that a bank did not include super senior CDO tranches in stress tests, on the grounds that their prices flat-lined at par. Bayoumi (2017) emphasises an SEC rule change that allowed private label MBS to be used to raise cash in the repo market. However, while regulation and repo finance allowed risky strategies, they do not provide an account of why bank managers chose them.

This sudden increase in the availability of funding through the repo market resonates with Dooley's story that such elasticity alone can lead bank managers to take on too much risk. But this story misses the competitive push for market share and size as important goals. One encounters the aspiration for market share and size as leitmotifs in various accounts of European banks that bet their future on US mortgages.

At the top of some big European banks, decisions reportedly presumed that the endgame would be a narrow "bulge bracket" of universal banks. Big clients would reward scale with scale. On such reasoning, Barclays board is reported to have set as a strategic objective being one of the top 5 global universal banks (Augar 2018, p. 153). The CEO of RBS, which had acquired Natwest and would acquire much of ABN-AMRO, is said to have spoken of growing larger than not only JP Morgan but also Barclays (Martin 2013, p. 194). Martin (2013) relates that the acquisition of ABN-AMRO attracted RBS management precisely because it would increase the bank's capital market footprint. Zaki (2008, p. 11), describes the UBS chairman as dreaming of rivalling Goldman Sachs and Merrill Lynch.

Institutional investors on both sides of the Atlantic failed to constrain such boards and top management at a key moment. No less than 94.5% of voting RBS shareholders approved the acquisition of ABN-Amro on 10 August 2007. This was the day *after* BNP Paribas suspended redemptions from three funds (Martin 2013, Chapter 12). Arguably, this was the Minskian moment of distress that well preceded the panic of September 2008.

Senior management and the board signed off on growth proposals at the securities firms. Thus, UBS' *Shareholder report on write-downs* of mid-April 2008[11] describes how, after his appointment effective July 2005, the new CEO of Investment Banking hired consultants that identified a widening gap between UBS and the top 3 competitors in fixed income, credit and commodities. The consultants recommended that UBS grow its structured credit business, with no reference to the associated risks (UBS 2008, pp. 10–11; Zaki 2008, p. 19). Board approval did not include any specification of sub-prime as part of the strategy, and the US affiliate operated without a budget for the growth of assets or risk-weighted assets (UBS 2008, pp. 26, 34).[12] RBS management is said to have taken on a 12-man team of mortgage securitisation bankers from Citigroup after the team had approached its securities affiliate, Greenwich Capital, in mid-2006.[13] FSA (2011, p. 140), begins its analysis of RBS's losses in credit trading activities with precisely this

[11]Lewis (2010, p. 216), describes the report as "semi-frank" but it is a remarkable document. Management had to assess what went wrong in April 2008, before Lehman's collapse in September 2008 and the subsequent Swiss government rescue.

[12]One symptom of the impulse to growth is that UBS not only kept portions of its own securitisations, as did other underwriters Erel et al. (2014). In addition, it bought the super-senior tranches that other banks underwrote (UBS 2008, pp. 14–15). Lewis (2010, p. 216), reports that UBS bought $2 billion of Morgan Stanley's long postion super-senior tranches packaged with a "couple of hundred millions dollars' worth" short position in mezzanine tranches.

[13]Martin (2013, p. 197) also reports that RBS doubled its market share in 2006. Perhaps the Citigroup team sought to move because it had already loaded up Citi's balance sheet. Erel et al. (2014, pp. 405–406) note that "Citigroup recorded the largest amount of write-downs among [US] bank holding companies and its holdings of highly rated tranches, including off-balance sheet holdings, amounted to 10.7% of assets, or roughly $201 billion at the end of 2006". See Crotty (2013) on risk-taking and bonus-making "rainmakers".

"strategic decision [by RBS] to expand aggressively its structured credit and leveraged finance business".

While ING differs from the others in having been more a buyer than producer of MBS, the impulse to grow its US internet banking operation ultimately caused the losses that, in turn, led to a government rescue. When it entered the US market with its proven internet banking product, it chose to establish its subsidiary as a thrift. This required that mortgage assets form the bulk of its assets. The bank is reported to have originally met the requirement by holding agency MBS. Then it backed into US private label MBS—to be sure, Alt-A, rather than sub-prime—as a means to offer higher returns to its internet depositors (Kalse 2009).

Growth had other, more defensive, strategic attractions to managers of big banks. It could ward off takeover and help the credit rating.

It is easy to forget how real the threat of takeover by rivals was at the time. In 2005, Deutsche Bank and Citicorp seriously considered a merger. Barclays' bid for ABN-AMRO was topped by the consortium of RBS, Santander and Fortis. Among medium-sized banks, a refusal to engage in seemingly profitable "credit arbitrage" risked making the bank a target for acquisition.

Size was also a consideration in the rating agencies reckoning of the likelihood of government support in extremis (Hau et al. 2013; King et al. 2016). So getting bigger could help raise or at least maintain the rating.

In sum, it is easy to understate the role of market share and growth as motivation for European banks. Consultants helped managements to benchmark their businesses and encouraged the view that a handful of firms would end up with the lion's share of activity. To paraphrase Kindleberger, "There is nothing so disturbing to one's well-being and judgment as to see a competitor get bigger overnight".

Certainly, European banks did not confine their expansion to US assets or securitised assets. They played a leading role in funding the Spanish and Irish real estate and credit booms as well. There, they did not take on the ultimate risk by buying securitised mortgages. But they still provided even larger inflows of capital that enabled even larger expansions of domestic credit and even larger run-ups in property prices (Box).

The Spanish and Irish Cases: Larger Inflows from European Banks, Bigger Booms

The Irish and Spanish cases resembled the US case in several salient respects. Both featured a large increase in private credit, big run-ups in house prices and, one way or another, a huge inflow of bank capital. The securitisation of mortgages in the United States should not obscure the role of banks as buyers of the bonds (Connor et al. 2012). And rather than just a heavy reliance on floating-rate mortgage at the margin, these European economies relied entirely on floating-rate mortgages.

The Spanish and Irish booms differed from the US case in important respects, however: the monetary policy background, the role of Asian savings and the importance of securitisation. In the United States monetary economists continue to debate whether the Federal Reserve set interest rates too low or responded appropriately to the observation that bond yields hardly responded to higher policy rates (the "conundrum"). Since both Spain and Ireland were part of the euro area, short-term interest rate setting looked to a broader economic domain than these two booming countries in the periphery. As a consequence, Regling and Watson (2010, p. 24) find that real short-term rates were lower in Ireland and Spain than they were in Germany (see also Bank of Spain 2017, p. 30).

The investment of official reserves likely exerted less downward pressure on long-term yields in the euro area than such investment put on US Treasury yields. Dollars attracted about two-thirds of reserves in the 2000s and euros only 20–25%. Add the thoroughgoing reliance on floating-rate mortgages in these European countries and it is hard to pin much of their booms on the Asian savings glut.

The role of securitisation, the focus of many analyses of the US case, was much reduced in Spain and basically absent in Ireland. In Spain, the regional *cajas* depended heavily on so-called covered bonds to fund their mortgages; and 75% of these were held by foreign investors (Berges et al. 2012), notably German banks. These do not remove the risk of the mortgages from the originator, so they are better viewed as long-term secured funding rather than as securitisation proper. Other forms of securitisation did not qualify for removal of the assets from the balance sheet owing to limited risk transfer (Almazan et al. 2015).

With little risk transfer of real estate credit, the Irish and Spanish banks only shared their boom exposures to the extent that foreign banks participated in the credit booms directly. In Ireland's case, the RBS subsidiary, Ulster Bank, did manage to run up significant losses, for which the UK rather than the Irish taxpayers ended up paying. In Spain, the foreign bank role was limited. The international diversification of the two largest Spanish banks did stand them in good stead as earnings abroad stabilised their profitability.

One aspect that differs in the Irish and Spanish cases from the US case is the exposure of banks to property companies. They brought exposure not only to commercial real estate, but also to the construction of houses. On close inspection, the profitability of the latter in a boom frequently turns on speculation in raw land. This reinforced the banks' exposures to the feedback loop among capital inflows, credit growth and real estate prices.

House prices, household indebtedness and associated capital inflows all traced more extreme trajectories in Ireland and Spain than in the United States. By the lights of the OECD, at least, house prices boomed more in Spain and Ireland than in the United States (Fig. 5.4, left-hand panel). However, the US index conceals significant regional variation: the Case-Schiller 20-city index for the United States more than doubled between 2000 and the peak in mid-2006.

Ireland takes the prize for the largest run up in household debt as a share of GDP (Fig. 5.4, right-hand panel). It rose by 50% of GDP through 2008, even before the ratio surged as the denominator fell. But Spain was not far behind. On this measure, the US experience was again relatively mild.[1]

However, the Irish and Spanish cases distinguish themselves from the US case in the scale of the capital inflow. Figure 5.5, left-hand panel shows the net foreign liabilities of the banks in Ireland with local lending business.[2] It shows a net inflow of over 50% of GDP (Everett 2017). Recall that the inflow of official reserves into US Treasuries from end-2000 to mid-2007 amounted to 10% of 2007 GDP, and the change in European investors' holdings of US ABS in the same period amounted to about half that. In other words, even stripping out offshore activity in Ireland, and counting both the trans-pacific and transatlantic flows to the United States, the inflow of external funding into the Irish banking system was triple that of the United States.

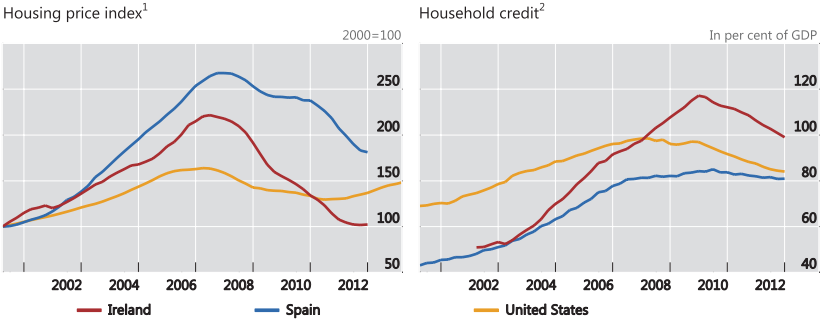
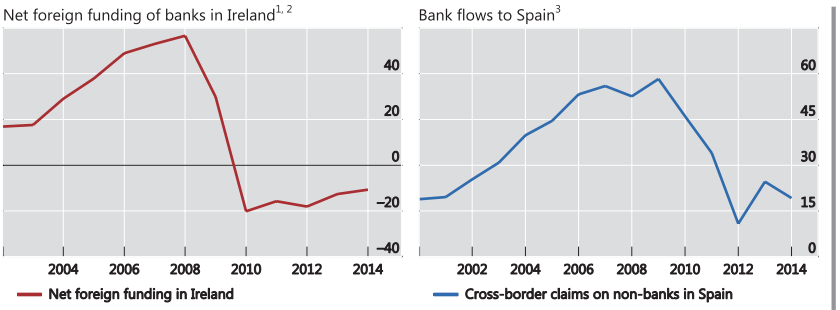


Fig. 5.4 Housing price and household credit (*Sources* OECD; BIS)



[1] Sum of all non-residents' deposit liabilities, debt securities issued and remaining liabilities less all non-residents' loan claims, holdings of securities and remaining assets by credit institutions (domestic market group). [2] Data in January 2003 used as a proxy for December 2002. [3] Includes net interbank claims on banks in Spain.

Fig. 5.5 Massive bank flows to the euro periphery (In per cent of GDP) (*Source* Central Bank of Ireland; IMF; BIS locational banking statistics)

The inflow of bank credit to Spain also reached staggering proportions (Fig. 5.5, right-hand panel). Since Spain does not have a large presence of "offshore" banking, we simply sum the stock of BIS cross-border bank claims on nonbanks in Spain with the net claims of banks outside of Spain on banks in Spain (see Avdjiev et al. [2012] for further discussion). This aggregate rose from 15% of Spanish GDP to almost 60%.

Despite the differences, a similarity stands out. European banks enabled credit booms in the United States, Ireland and Spain. US losses crippled many European banks and sapped their defences against strains in Europe.

[1]The US figures include credit to non-profits. [2]This focus on net liabilities of certain banks incorporated in Ireland seeks to exclude the large "offshore" banking presence in Ireland. See Honohan (2006), Central Bank of Ireland (2010), and Lane (2015).

Conclusions

The GFC was, in Delong's (2009) phrase, the "wrong crisis" that struck the wrong part of the US bond market (Tooze 2018). Official reserve managers *could* have staged a sudden stop or even reversal of their purchase of US Treasury bonds. This *could* have imposed a dollar depreciation and a costly adjustment on the US economy. Instead, in

2007–2008, highly leveraged European banks scrambled to secure dollar funding as they experienced credit losses—and the dollar appreciated sharply (McCauley and McGuire 2009). European banks' vulnerability arose from their role as *producers* of the ultimately toxic assets as well as from their role as *investors*. As a result, their affiliates' US balance sheets required massive write-downs in 2008.

The banking glut better than the savings glut accounts for US mortgage market developments of the 2000s. Large official inflows into US Treasury and agency notes should have reinforced a US mortgage market dominated by fixed-rate mortgages that enjoyed government agency guarantees. Instead, we observe a big shift to mortgages priced with floating ("adjustable") interest rates and to more risky, leveraged mortgages that agencies could not guarantee. The dominance of the savings glut with its demand for safe assets should have manifested itself in wider spreads but the spread of the riskiest mortgages over normal mortgages actually narrowed.

The banking glut also better accounts for the parallel real estate booms and busts in Spain and Ireland. True, official reserve managers did invest in euro-denominated government bonds. But the Irish and Spanish mortgage markets work on floating rates closely tied to the policy rates set by the ECB. Again, expansion-minded European banks provide a more compelling account of these banking systems' remarkable ease of external financing. In fact, the Irish and Spanish banking systems experienced capital inflows that were huge in relation to the inflows into the United States in the same years.

The Irish and Spanish credit and real estate booms did not require features much emphasised in the US case (e.g. FCIC 2011): securitisation with (or without) risk transfer (Connor et al. 2012; Carbo-Valverde 2012; Almazan et al. 2015; Acharya et al. 2013), or reliance on faulty, conflicted ratings (UBS 2008), or a big government role in the housing market (Rajan 2010; Morgenson and Rosner 2011). But banks in Ireland and Spain did depend on credit from European banks that were working their equity harder. Occam's razor opts for one account for such similar and simultaneous phenomena.

European banks grew at breakneck rates in the pursuit of market share, spurred by consultants who foresaw a narrow circle of global

universal banks. Greater size also reduced the risk of takeover, a far from imaginary risk. Greater size also improved credit ratings if it increased the prospect of government support. Bank managers chose growth and several factors, including regulation, low volatility and access to short-term repo finance all conspired to permit it. In addition to being the much-reported and hapless investors in bespoke mortgage securities produced by US securities firms, European banks also manned the production line and, like their US competitors, kept unsalable "safe assets" on their balance sheets.

References

Acharya, V., & Schnabl, P. (2010). Do Global Banks Spread Global Imbalances? Asset-Backed Commercial Paper During the Financial Crisis of 2007–09. *IMF Economic Review, 58*(1), 37–73.

Acharya, V., Schnabl, P., & Suarez, G. (2013). Securitization Without Risk Transfer. *Journal of Financial Economics, 107*(3), 515–536.

Aliber, R., & Kindleberger, C. (2015). *Manias, Panics and Crashes* (7th ed.). Basingstoke, Hampshire: Palgrave.

Almazan, A., Martin-Oliver, A., & Saurina, J. (2015). Securitization and Banks' Capital Structure. *Review of Corporate Finance Studies, 4*(2), 206–238.

Augar, P. (2018). *The Bank That Lived a Little: Barclays in the Age of the Very Free Market*. London: Allen Lane.

Avdjiev, S., McCauley, R., & McGuire, P. (2012, April). *Rapid Credit Growth and International Credit: Challenges for Asia* (BIS Working Papers No. 377).

Avdjiev, S., McCauley, R., & Shin, H.-S. (2016, July). Breaking Free of the Triple Coincidence in International Finance. *Economic Policy, 31*(87), 409–451.

Baba, N., McCauley, R., & Ramaswamy, S. (2009, March). US Dollar Money Market Funds and Non-US Banks. *BIS Quarterly Review*, pp. 65–81.

Bank of England. (2007, October). *Financial Stability Report* (Issue No. 22).

Bank for International Settlements. (2015, June). *85th Annual Report*.

Bank of Spain. (2017). *Report on the Financial and Banking Crisis in Spain, 2008–14.*

Barclays Bank PLC. (2009). *Annual Report 2008*.

Bayoumi, T. (2017). *Unfinished Business: The Unexplored Causes of the Financial Crisis and the Lessons Yet to Be Learned*. New Haven: Yale University Press.

Beltran, D., Pounder, L., & Thomas, C. (2008, August). *Foreign Exposure to Asset-Backed Securities of U.S. Origin* (International Finance Discussion Papers No. 939). Board of Governors of the Federal Reserve System.

Bénétrix, A., Lane, P., & Shambaugh, J. (2015). International Currency Exposures, Valuation Effects and the Global Financial Crisis. *Journal of International Economics, 100*(1), 518–540.

Berges, A., Ontiveros, E., & Valero, F. (2012). The Internationalization of the Spanish Financial System. In J. L. Malo de Molina & P. Martin-Acena (Eds.), *The Spanish Financial System* (pp. 347–381). Basingstoke, Hampshire: Palgrave.

Bernanke, B. (2005, March 10). *The Global Saving Glut and the U.S. Current Account*. Sandridge Lecture, Virginia Association of Economics, Richmond, VA.

Bernanke, B. (2018). The Real Effects of the Financial Crisis. *Brookings Papers on Economic Activity* (Fall). https://www.brookings.edu/bpea-articles/the-real-effects-of-the-financial-crisis/.

Bernanke, B., Bertaut, C., Pounder DeMarco, L., & Kamin, S. (2011, February). *International Capital Flows and the Returns to Safe Assets in the United States, Global Imbalances and Financial Stability* (Bank of France Financial Stability Review No. 15).

Bertaut, C., Pounder DeMarco, L., Kamin, S., & Tryon, R. (2012). ABS inflows to the United States and the Global Financial Crisis. *Journal of International Economics, 88*(2), 219–234.

Borio, C., & Disyatat, P. (2011, May). *Global Imbalances and the Financial Crisis: Link or No Link?* (BIS Working Papers No. 346).

Bruno, V., & Shin, H. (2015, April). Capital Flows and the Risk-Taking Channel of Monetary Policy. *Journal of Monetary Economics, 71,* 119–132.

Caballero, R., Farhi, E., & Gourinchas, P.-O. (2008). An Equilibrium Model of 'Global Imbalances' and Low Interest Rates. *American Economic Review, 98,* 358–393.

Carbo-Valverde, S., Marques-Ibanex, D., & Rodriguez-Fernandez, F. (2012). Securitization, Risk-Transferring and Financial Instability: The Case of Spain. *Journal of International Money and Finance, 31,* 80–101.

Cecchetti, S., McCauley, R., & McGuire, P. (2012, December). *Interpreting TARGET2 Balances* (BIS Working Papers No. 393).

Central Bank of Ireland. (2010, May 31). *The Irish Banking Crisis: Regulatory and Financial Stability Policy, 2003–2008*. A Report to the Minister for Finance by the Governor of the Central Bank.

Connor, G., Flavin, T., & O'Kelly, B. (2012). The U.S. and Irish Credit Crises: Their Distinctive Differences and Common Features. *Journal of International Money and Finance, 31,* 60–79.

Credit Suisse. (2009). *Annual Report 2008*.

Crotty, J. (2013). How Bonus-Driven 'Rainmaker' Financial Firms Enrich Top Employees, Destroy Shareholder Value and Create Systemic Financial Instability. In B. Cynamon, S. Fazzari, & M. Setterfield (Eds.), *After the Great Recession: Keynesian Perspectives on Prospects for Recovery and Growth* (pp. 104–128). Cambridge: Cambridge University Press.

Delong, B. (2009, October 10). *The Wrong Financial Crisis*. VoxEU.

Deutsche Bank. (2009). *Annual Review 2008*.

Dooley, M. (2019, this volume). Prudential Regulation and Capital Controls. In R. Z. Aliber & G. Zoega (Eds.), *The 2008 Global Financial Crisis in Retrospect*. Basingstoke, Hampshire: Palgrave.

Dunbar, N. (2011). *The Devil's Derivatives.* Brighton: Harvard Business Review Press.

Edwards, S. (2005). Is the US Current Account Deficit Sustainable? *Brookings Papers on Economic Activity, 1,* 211–271.

Erel, I., Nadauld, T., & Stulz, R. (2014). Why Did Holdings of Highly Rated Securitization Tranches Differ so Much Across Banks? *Review of Financial Studies, 27*(2), 404–453.

Everett, M. (2017). Blowing the Bubble: The Global Funding of the Irish Credit Boom. *The Economic and Social Review, 46*(3, Autumn), 339–365.

Ferguson, N. (2008). *The Ascent of Money*. New York: Penguin.

Financial Crisis Inquiry Commission. (2011, January). *The Financial Crisis Inquiry Report.*

Financial Services Authority. (2011, December). *The Failure of the Royal Bank of Scotland, Financial Services Authority Board Report*.

Frankel, A. (2006, March). Prime or Not so Prime? An Exploration of US Housing Finance in the New Century. *BIS Quarterly Review*, pp. 67–78.

Fukao, M. (1991, September). Exchange Rate Movements and Capital-Asset Ratio of Banks: On the Concept of Structural Positions. *Monetary and Economic Studies*, Institute for Monetary and Economic Studies, Bank of Japan, *9*(2), 91–104.

Goldstein, A., & Fligstein, N. (2017). Financial Markets as Production Markets. *Socio-Economic Review, 15*(3), 483–510.

Goodman, L., Li, S., Lucas, D., Zimmerman, T., & Fabozzi, F. (2008). *Subprime Mortgage Credit Derivatives*. Hoboken: John Wiley.

Gorton, G., & Metrick, A. (2012, June). Securitized Banking and the Run on Repo. *Journal of Financial Economics, 104*(3), 425–451.

Gourinchas, P.-O., & Rey, H. (2014). External Adjustment, Global Imbalances, Valuation Effects. In G. Gopinath, E. Helpman, & K. Rogoff (Eds.), *Handbook of International Economics* (Vol. 4, pp. 585–646). Amsterdam: North Holland Publishing.

Gourinchas, P.-O., Rey, H., & Truempler, K. (2012). The Financial Crisis and the Geography of Wealth Transfers. *Journal of International Economics, 88*(2), 266–285.

Hahm, J.-H., Shin, H. S., & Shin, K. (2013, April). Noncore Bank Liabilities and Financial Vulnerability. *Journal of Money, Credit and Banking, 45*(1), 3–36.

Hau, H., Langfield, S., & Marques-Ibanez, D. (2013). Bank Ratings: What Determines Their Quality? *Economic Policy, 28*(74), 289–333.

Honohan, P. (2006, Winter). To What Extent Has Finance Been a Driver of Ireland's Economic Success? *ESRI Quarterly Economic Commentary*, pp. 59–72.

HSBC Holdings PLC. (2009). *Annual Report and Accounts 2008*.

Ibarra, M., & Koncz, J. (2009, July). Direct Investment Positions for 2008: Country and Industry Detail. *Survey of Current Business, 89,* 20–34.

ING. (2009). *2008 Annual Report*.

Kalse, E. (2009, October 30). ING Direct Was Source of Success and Problems for Dutch Bank. *NRC Handelsblad*.

King, M., Ongena, S., & Tarashev, N. (2016, February). *Bank Standalone Credit Ratings* (BIS Working Papers No. 542).

Krugman, P. (2007). Will There Be a dollar Crisis? *Economic Policy, 22*(51), 436–467.

Lane, P. (2015, January 15). *The Funding of the Irish Domestic Banking System During the Boom*. Paper Presented to Statistical and Social Inquiry Society of Ireland, revised February.

Lane, P., & McQuade, P. (2014, January). Domestic Credit Growth and International Capital Flows. *Scandinavian Journal of Economics, 116*(1), 218–252.

Lowe, J. (2011, November). Direct Investment for 2007–10: Detailed Historical-Cost Positions and Related Financial and Income Flows. *Survey of Current Business, 91,* 50–137.

Lewis, M. (2010). *The Big Short.* London: Penguin.

Ma, G., & McCauley, R. (2014). Global Imbalances: China and Germany. *China and World Economy, 22*(1), 1–29.

Martin, I. (2013). *Making It Happen: Fred Goodwin, RBS and the Men Who Blew Up the British economy*. London: Simon & Schuster.

McCauley, R. (2018, December). The 2008 Crisis: Transpacific or Transatlantic? *BIS Quarterly* Review.

McCauley, R., Bénétrix, A., McGuire, P., & von Peter, G. (2019, June). Deglobalisation in Banking? *Journal of International Money and Finance, 94*, 116–131.

McCauley, R., & McGuire, P. (2009, December). Dollar Appreciation in 2008: Safe Haven, Carry Trades, Dollar Shortage and Overhedging. *BIS Quarterly Review*, pp. 85–93.

McCauley, R., & Rigaudy, J.-F. (2011, October). Managing Foreign Exchange Reserves in the Crisis and After. In *Portfolio and Risk Management for Central Banks and Sovereign Wealth Funds* (BIS Papers No. 58), pp. 19–47.

McGuire, P., & von Peter, G. (2009, March). The US Dollar Shortage in Global Banking. *BIS Quarterly Review*, pp. 47–63.

Moody's Investors Services. (2007, August 31). *ABCP Market at a Glance: ABCP Credit Arbitrage Snapshot*. Structure Finance Special Report.

Morgenson, G. (2012, July 28). Changed by Wall Street, for Wall Street. *New York Times*, p. BU1.

Morgenson, G., & Rosner, J. (2011). *Reckless Endangerment*. New York: Henry Holt and Company.

Nadauld, T., & Sherlund, S. (2013, October). The Impact of Securitization on the Extension of Subprime Credit. *Journal of Financial Economics, 107*(2), 454–476.

Netherlands House of Representatives, Committee of Parliamentary Inquiry into the Financial System. (2013). *Credit Lost II—Taking Stock*, 19 April 2012.

Obstfeld, M., & Rogoff, K. (2005). Global Current Account Imbalances and Exchange Rate Adjustments. *Brookings Papers on Economic Activity, 1,* 67–123.

Rajan, R. (2010). *Fault Lines.* Princeton: Princeton University Press.

RBS. (2009). *Annual Report and Accounts, 2008*.

Regling, K., & Watson, M. (2010). *A Preliminary Report on the Sources of Ireland's Banking Crisis*.

Schweitzer, M., & Venkatu, G. (2009, January). *Adjustable-Rate Mortgages and the Libor Surprise*. Federal Reserve Bank of Cleveland Economic Commentary.

Setser, B., & Roubini, N. (2005, July/August). Our Money, Our Debt, Our Problem. *Foreign Affairs, 84*(4), 194–198.

Shin, H. S. (2012). Global Banking Glut and Loan Risk Premium. *IMF Economic Review, 60*(2), 155–192.

Summers, L. (2004, October). *The US Current Account Deficit and the Global Economy*. Per Jacobsson Lecture. Washington, DC: International Monetary Fund.

Swiss Federal Banking Commission. (2008, October 16). *UBS Subprime Report*.

Swiss National Bank. (2010). *102nd Annual Report*.

Tooze, A. (2018). *Crashed: How a Decade of Financial Crises Changed the World*. New York: Viking.

UBS. (2008, April). *Shareholder Report on UBS's Write-Downs*.

US Senate, Committee on Homeland Security and Governmental Affairs, Permanent Subcommittee on Investigations. (2011, April 13). *Wall Street and the Financial Crisis: Anatomy of a Financial Collapse*.

US Treasury, Federal Reserve Bank of New York, & Board of Governors of the Federal Reserve. (2002, April). *Report on Foreign Holdings of US Long-Term Securities as of March 31, 2000.*

US Treasury, Federal Reserve Bank of New York, & Board of Governors of the Federal Reserve. (2008, 2009, April). *Report on Foreign Portfolio Holdings of US Securities as of June 30, 2007, 2008*.

Warnock, F., & Warnock, V. (2009). International Capital Flows and U.S. Interest Rates. *Journal of International Money and Finance, 28,* 903–919.

Wolf, M. (2014). *The Shifts and the Shocks: What We've Learned—And Have Still to Learn—From the Financial Crisis*. New York: Penguin Press.

Zaki, M. (2008). *UBS, les dessous d'un scandale*. Lausanne: Favre Sa.

Zuckerman, G. (2009). *The Greatest Trade Ever.* New York: Crown.