

# Bank business models and the separation issue

by

Adrian Blundell-Wignall, Paul Atkinson and Caroline Roulet\*

*The main hallmarks of the global financial crisis were too-big-to-fail institutions taking on too much risk with other people's money while gains were privatised and losses socialised. It is shown that banks need little capital in calm periods, but in a crisis they need too much – there is no reasonable ex-ante capital rule for large systemically important financial institutions that will make them safe. The bank regulators paradox is that large complex and interconnected banks need very little capital in the good times, but they can never have enough in an extreme crisis. Separation is required to deal with this problem, which derives mainly from counterparty risk. The study suggests banks should be considered for separation into a ring-fenced non-operating holding company (NOHC) structure with ring-fencing when they pass a key allowable threshold for the gross market value (GMV) of derivatives, a case which is reinforced if the bank has high wholesale funding and low levels of liquid trading assets. The pricing of derivatives and repos would become more commensurate with the risks if the NOHC proposal were to be pursued as a unifying strategy for the different national approaches. Most of the objections to this structure are summarised and rebutted. Other national proposals for separation in Switzerland, the Volcker rule, the Vickers rule, and the Liikanen proposal are argued to be inferior to the ring-fenced NOHC proposal, on the grounds that empirical evidence about what matters for a safe business model is not taken properly into account.*

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\* Adrian Blundell-Wignall is the Special Advisor to the OECD Secretary-General on Financial Markets and Deputy Director of the OECD Directorate of Financial and Enterprise Affairs ([www.oecd.org/daf/abw](http://www.oecd.org/daf/abw)). Paul Atkinson is a former deputy director of the OECD and principal of NHA Economics. Caroline Roulet is an economist and analyst in the OECD Directorate of Financial and Enterprise Affairs. This work is published on the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein are those of the author and do not necessarily reflect the official views of the Organisation or of the governments of its member countries.

## I. Introduction

The most important cause of the financial crisis was the under-pricing of risk. This resulted in the failure of some banks, taxpayer support to avoid failures of systemically important banks, and deleveraging as processes of forbearance were allowed to operate. Banks faced two broad pressures during the crisis: fundamental insolvency and liquidity crises arising from counterparty risk. All banks can become insolvent by having too many bad assets relative to liabilities – or thought of from the perspective of capital, by being too levered compared to the losses they can make in a stressed situation. Banks are quite often able to hide bad assets by valuing them at unrealistic prices or, more commonly, through forbearance, where terms and conditions are altered so that borrowers are not seen to default, even if they can only continue to service debt without being able to pay back the principal. Counterparty risk, however, is more dangerous in the short term. A sudden decline in asset values (if properly marked to market) can wipe out bank capital. But the very risk of this in a crisis makes counterparties unwilling to lend, which is especially problematic when banks need cash and/or liquid securities to meet margin calls for derivatives transactions, repos and other collateral needs.<sup>1</sup> Here “immediacy” is the issue: the contracts must be settled on a daily basis either bilaterally or with the clearing house. The size of these counterparty activities became very large because of the under-pricing of risk that occurs when counterparties are too-big-to-fail (TBTF) institutions. If it is reasonable to believe that the bank will not be allowed to fail, then the process of initial margin setting, variation margin management and custody and re-hypothecation arrangements have very different implications for the pricing of contracts than is the case when resolvable securities firms operate on a level playing field with each other. The enormous bailout of AIG, in the absence of which many large TBTF US and (mainly) European banks would have been at risk of failure, is a good example of this issue.

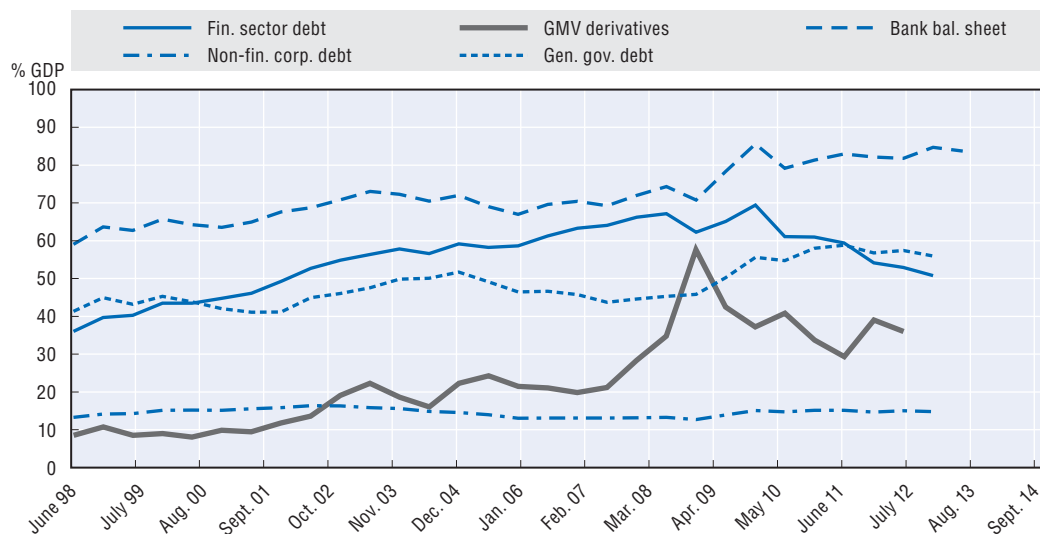
Policy makers are putting in place the Basel rules to deal with the leverage and solvency issues and, at the same time, there is a proposal to deal with the liquidity problems that banks face with the Liquidity Coverage Ratio (LCR). Such global rules would apply to all banks regardless of their business model. Historically, policy makers have at times combined capital rules and other asset ratio rules with policies that constrain the business models of banks (particularly in the USA with the Glass-Steagall Act). But this was gradually undermined by the great push for deregulation in the past few decades. At the national level regulators are implementing the capital rules in different ways and are also combining this with some attempts to constrain certain aspects of what banks actually do, “i.e. banks” business models (Vickers, Volcker, Liikanen, and Swiss “separability” requirements).<sup>2</sup> Whatever regulations are put in place at a global level, such as Basel capital and liquidity rules, they will affect different banks in very uneven ways, depending on what the banks actually do. This may lead to unnecessary costs and not achieve the desired prudential outcomes in the most efficient way.

The paper first briefly examines the evolution in the structure of global finance after the late 1990s in Section II, noting the sharp rise in derivatives activity and the use of wholesale funding. The ultimate aim of regulatory policy is to reduce bank default risk. To understand this better, the paper then looks at the factors that determine bank default risk in Section III, using a distance-to-default (DTD) measure. If global cross-border regulations are to be efficient, it is important that they reflect business model features as they pertain to risk. Section IV presents new empirical evidence on the solvency and liquidity factors by looking at what level of capital might have been needed to keep banks safe during the extreme risk event of the crisis, distinguishing banks that mainly undertake activities that expose them to significant counterparty risk from those that are less involved in such activities. To help reduce the TBTF problem, and to reduce cross-subsidisation of high-risk business segments, it would be helpful to put fundamentally different businesses on a level playing field where risk would be priced according to where it is taken and regulations would be less distorting. Section V outlines the OECD's separation proposal to deal with different business models and the TBTF problem. In Section VI the national approaches to separation currently proposed are compared. Finally Section VII, in concluding, provides a summary of the main arguments.

## II. The changing structure of global finance

Since 1998 there have been significant changes in the nature of global finance. Figure 4 shows the total of global banking balance sheets, and the amount financed by debt securities, as a share of world GDP. It also shows the gross market value (GMV) of derivatives, dominated by the global systemically important financial institutions (GSIFIs), and general government as well as non-financial corporate debt.

Figure 1. **The changing structure of global finance**



Sources: BIS, Datastream, authors' calculations.

The more striking features of this broad picture of global finance are:

- The financial sector has seen large compositional changes. Bank balance sheets rose faster than world GDP, prior to the crisis and this appears to have accelerated since the

crisis. Prior to the crisis the proportion of bank business financed by securities rose sharply (the dashed and solid line at the top of the graph move closer together). Since the crisis this has collapsed, and the gap has been more than filled by central bank liabilities and non-bank deposits, as risk perceptions shifted asset allocation away from equities and other investments.

- Most spectacular of all was the virtual quadrupling of derivatives activity. In 1998 the GMV of derivatives was around 8% of world GDP and, in 2007 just prior to the crisis, it reached 21% of GDP before sky-rocketing to 58% of world GDP as a consequence of the sharp rise in volatility to unprecedented levels (which directly affects the value of derivatives). This period led to massive changes in counterparty obligations (including those for AIG noted earlier). This made central bank lending the key to avoiding a collapse in the global financial system.
- Non-financial corporate debt has been relatively stable at around 15% of world GDP.<sup>3</sup> General government debt was also relatively stable in the global economy at around 45% of world GDP prior to the crisis, but it has since risen sharply to just under 60% of world GDP – underlining the notion that the financial sector crisis was the cause of the more recent deterioration in the indebtedness of the public sector, not the other way around.

It would be very surprising, given the above developments, if derivatives and the extent of wholesale funding (counterparty risk) were not to figure strongly in any explanation of bank default risk.

### III. Determinants of bank default risk

It is difficult to measure the default risk of a bank by looking at its reported balance sheet. This is because of the forbearance problem with respect to troubled assets and the related use of complex (manipulatable) models to value illiquid assets. The distance-to-default (DTD) is a measure that uses a combination of bank reported data and market information to calculate the number of standard deviations a bank is from the default point, where the (directly unobservable) market value of assets equals the (observable) book value of debt. The formula to calculate the distance-to-default is derived from the option pricing model of Black and Scholes (1973) as specified below. The DTD is analysed in a panel regression with three sets of determinants:

- *Leverage*: Where the Basel Tier 1 ratio and the simple IFRS leverage ratio are considered (to be decided on which one appears to be most correlated with the DTD – leverage in general is expected to be negatively correlated with the DTD).
- *Macro-prudential factors*: Where the house price index (HPI) percentage change was found easily to be the best indicator; and the beta of the bank in its own market (to control for systemic importance).
- *Business model features*: Related to margin calls and liquidity needs (the gross market value (GMV) of derivatives, wholesale funding (mainly short-term including repo), and trading assets (trading book plus available for sale assets). Derivatives and wholesale funding are expected to have a negative sign while trading assets should be positively related to the DTD (as they enable a bank to have liquid assets to sell or pledge in the face of margin and collateral calls).

The model and results are fully reported in the Annex to this paper. Four important features of the results stand out.

1. The leverage ratio (LEV in the Annex) appears to be strongly supported by the data, whereas the Basel Tier 1 ratio appears to find no support as a determinant of the DTD. This is true for all samples: the full sample, the GSIFI sample and the non-GSIFI sample. A cut in leverage from say 50 (not un-typical of a GSIFI bank) to the OECD preferred maximum of 20 would raise the DTD by 1.2 standard deviations.
2. While leverage is very important statistically, its role is still limited. The macro-prudential variables in house prices and the market beta are correctly signed and are significant at the 1% level.
3. In terms of arguments relating to the business model counterparty risk features, the GMV of derivatives and wholesale funding are negatively related to the DTD and strongly supported by the data. Trading assets are positively related to the DTD, and so in principle a large portfolio of liquid assets reduces the risk associated with large portfolio holdings: they provide liquidity in the face of margin and collateral calls. These factors are quite independent of leverage. As business model risks can dominate those associated with leverage, they need to be treated separately.
4. The GSIFI banks differ from the more traditional banks. The main difference is that counterparty risk factors (derivatives, wholesale and trading securities) are highly significant for the GSIFI banks, but not for the non-GSIFI banks. Both sets of banks are subject to the same macro cycle (HPI) factor, which is convenient if macro-prudential policy, conducted outside the micro-prudential capital rules, were to be implemented. However, when it comes to counterparty and liquidity risk, it is very inconvenient that the business model features consistent with investment banking and prime broking are so important to the GSIFI group, but not to the more traditional banks. For these latter banks the leverage ratio coefficient is nearly double the size of that for the GSIFI banks. This suggests that capital rules and leverage are a more powerful influence on default risk for this group than for the GSIFI banks, where liquidity risk factors are more dominant.

### ***Counterparty derivatives and repo risk that is separable from leverage rules***

Figure 2 illustrates the counterparty and liquidity issues that may apply to GSIFI banks, but which appear not to be significant for traditional banks. Margin and collateral calls have to be met, and forbearance is not possible. In normal times the repo market and other forms of interbank lending adjust and the system meets all of its commitments. But in a crisis this lending may dry up, and banks fail not because they are insolvent (even though they may well be) but because liquidity stops functioning. The central bank responses with respect to quantitative easing in the USA and LTROs in Europe need to be understood in this context – the inability to meet margin calls is the rapid path to default.

### ***Collateral and margin calls***

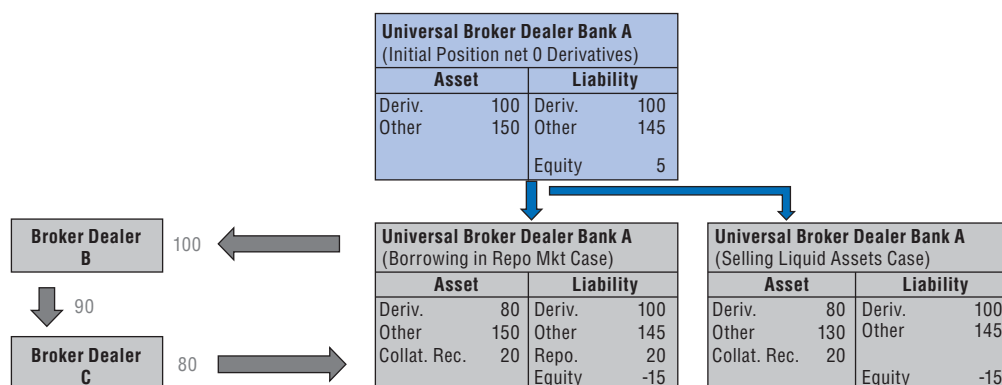
The top section of Figure 2 shows a universal bank's simple balance sheet, where the net derivatives position is zero. Notwithstanding how useful netting is for settlement, a point made frequently by ISDA, it is critical to understand that netting provides no protection from market risk. Now assume a bout of volatility hits the bank positions:

- In the bottom section, the universal bank A still owes bank B 100, but the offsetting cash from bank C has now dropped to 80. One option for bank A is to borrow the net 20

(liability) that now is needed to maintain the cash 100 with bank B (shown as a receivable asset of 20).<sup>4</sup> The banks' capital at the point in time marked to market becomes negative (-15 as shown), but lack of day-to-day transparency allows it to continue, as long as the bank can borrow in the repo market.

- Alternatively, in the bottom section to the far right (shown with the long arrow), provided the bank has a healthy liquid trading book and available-for-sale securities, it may sell them and post the margin (as shown), or pledge them in an offsetting derivatives transaction.
- The ability to borrow or to carry out an offsetting derivatives trade depends on the liquidity of the market. In normal times, the volatility of the market will see a price reversal. This is why management sometimes allows traders the latitude to carry large losses – it will reverse in the swings and roundabouts. But in a crisis situation the markets may not reverse and risk control by management will be in grave error (examples of which abound, both during the crisis and more recently). At these times the repo borrowing and hedging transactions may not be feasible, and the bank will then have to rely on official support. Of course if this support is not forthcoming, the bank will fail. It is for these reasons that governments and the OECD have recognised the need to separate the aspects of universal banking from the core deposit taking functions of a bank that are so critical in funding economic growth. If the other assets and liabilities (shown as 150 and 145 in the example) are separated from the mechanisms shown with respect to derivatives, the contamination of the core deposit taking and lending will be removed and any cross-subsidisation of risk taking by the presence of TBTF will be removed – a subject taken up more fully below.

Figure 2. **Collateral and margin calls**



### Central clearing counterparties

These problems are not solved by the introduction of central clearing counterparties (CCPs). Regulatory developments support CCPs, which have many advantages in settlement, particularly following a default. But it is an error to assume that counterparty risk can somehow be destroyed by shifting it to a CCP. The CCP needs capital, and it must model risk and set appropriate margins commensurate with that risk for all of its counterparties like any other player. In the above example, nothing is changed for bank A in terms of the market risk it suffered. The net exposure is 20 for the system as a whole, as opposed to gross exposures of 270, and bank B may feel more comfortable. But the ability

of the CCP to guarantee the trades depends on its skill in setting initial and variation margins, as well as having sufficient capital to cover all default scenarios (in the above example, bank A). Market risk is not destroyed by a CCP, and the problem of the underpricing of that risk due to the TBTF implicit guarantee may be significantly worse. The CCP becomes a vital node, interconnecting multiple players in the financial system. The failure of such a node would lead to multiple contamination effects compared to bilateral trading. Governments and central banks could not allow the CCP to fail.

#### IV. New empirical evidence on interconnectedness risk

While Basel III has propelled reform of capital rules, there has been no consensus on what to do about the risks created by the structure of bank business models. Approaches to the latter include the Vickers recommendations,<sup>5</sup> the Dodd-Frank Act's Volcker rule,<sup>6</sup> and the Liikanen proposal<sup>7</sup> that has been influencing decisions in a number of European countries including France and Germany.<sup>8</sup> Most international organisations have focused on replacing Basel II with Basel III, improved supervision, better disclosure, and cross-border cooperation. Better resolution regimes are proposed to deal with TBTF, including the bail-in of unsecured creditors.<sup>9</sup> Academics have stressed the difficulties of interpreting rules based on separation proposals, and some have been strongly against it.<sup>10</sup> This discussion has not, however, been informed by empirical research on the determinants of sudden moves of banks towards the default point.

##### *Business model risk factors for GSIFI banks cannot be dealt with by Basel III capital rules*

Most international organisations appear to place less weight on business model reform than does the OECD.<sup>11</sup> The problems with derivatives and repos that lead to margin and collateral calls cannot be handled by the Basel III reforms aimed at establishing more capital for banks to deal with leverage, with add-ons such as the CVA charge to deal with counterparty risk – the amounts involved are potentially too large. This can be illustrated with the DTD calculation. The formula to calculate the distance-to-default is derived from the option pricing model of Black and Scholes (1973) and is set out as follows:

$$DTD_t = \frac{\log\left(\frac{V_t}{D_t}\right) + \left(r_f - \frac{\sigma_t^2}{2}\right)T}{\sigma_t\sqrt{T}} \quad [1]$$

where:  $V_t$ : Market value of bank's assets at time t,

$r_f$ : Risk-free interest rate,

$D_t$ : Book value of the debt at time t,

$\sigma_t^2$ : Volatility of the bank's assets at time t,

T: Maturity of the debt.

The calculation is set out in more detail in Appendix 1 of Blundell-Wignall and Roulet (2012).

A DTD minimum of 3 standard deviations, often achieved in the late 1990s and early 2000s, implies a less than 1% chance of bank failure which, after the crisis, would seem to be a reasonable requirement. To illustrate the limited role of capital rules when counterparty risk is present, it is relevant to ask: what capital levels would have been



sufficient to guarantee this level of safety during the crisis period and more recently? To explore this idea, the DTD model of equation (1) is first solved. DTD is then set to 3.0 and (for a maturity of  $T = 1$ ) target bank capital  $K^*$  is calculated by solving for the  $V/D$ -ratio that satisfies that condition for any bank below the critical 3.0 standard deviation threshold.

$$3.0 \cdot \sigma_t - \left( r_f - \frac{\sigma_t^2}{2} \right) = \log \left( \frac{V_t}{D_t} \right) = \alpha_t \quad [2]$$

Given that  $D = TA - K$ , where  $TA$  is total assets, it is then possible to calculate  $K^*$  holding  $\sigma$  and  $V$  at their original solved values, given the historical observations of  $TA$ :

$$K_t^* = TA_t - \frac{V_t}{e^{\alpha_t}} \quad [3]$$

The gap  $K^* - K$  is then computed for each bank and summed over the system.<sup>12</sup> This gap is calculated for 21 of the GSIFI banks in the USA and in Europe (defined by the FSB,<sup>13</sup> excluding Asian and non-listed banks) and for 48 other large banks. It is also calculated for the USA, Europe and the UK data separately. The results for all banks, the GSIFI banks and non-GSIFI banks, are shown in Table 1.

From 2002 to 2007  $K^* - K$  is not material for most banks, underlining the point that banks do not need capital, until they need it in a tail event. This amount rises in 2008 as the main wave of the crisis hits at the end of the year. The full effect can be seen in 2009.

- In 2009, the 69 large US and European banks in this study had USD 1.6 trillion in capital, but those below 3 standard deviations in the DTD would have required USD 4.5 trillion more to stay at the safe level (almost a quadrupling).
- The GSIFI banks in this group had USD 1.1 trillion of the capital, but would have required USD 3.6 trillion in addition to have been safe: i.e. not to have required capital injections and “back-door” support on a massive scale by the world’s central banks. The capital rule cannot possibly come close to making these banks safe without addressing the business model issues and TBTF.
- While the USA needed the most support early in the crisis, Europe needed much more in recent years. The US is simply further ahead in the capital rebuilding and write-offs process.

The amounts shown in this exercise are not unlike the sum of capital injections and back-door support from central banks provided from their own balance sheets during the crisis. Many of the GSIFI banks would have failed without massive support because of the nature of their business models. The issue for GSIFI banks arises because of what they do in the capital markets unrelated to deposit taking and lending. To hold capital even remotely near the levels needed in the good times to be safe in a tail-risk event would seem to be unreasonable.

GSIFI banks are typically very large and combine elements of traditional banking – deposit taking and lending – but also carry out investment banking, prime broking, market making, origination and underwriting, which require huge inventories of securities to be held and are all subject to short-term price volatility and different forms of counterparty risk. These banks are TBTF, and these counterparty risk activities are cross-subsidised by the implicit guarantee from governments and central banks.<sup>14</sup> If risk is under-priced in this way, the size of the activities becomes larger than otherwise and, as the crisis showed,



these institutions became of extreme systemic importance. If such activities were separated from the core deposit banking function, and the separated securities firms were fully (and credibly) resolvable, then risk would be priced according to where it is taken without the implicit guarantee. This idea is explored in the next section.

Table 1. **The capital needs of banks and regional breakdown**

USD billion

	2007	2008	2009	2010	2011	2012
Type of bank						
<b>Global</b>						
Core Tier 1 Cap.	1 222	1 144	1 621	1 708	1 831	1 960
Add. Cap. Req. For DTD 3.0	14	2 225	4 560	363	616	314
<b>G-SIFIs</b>						
Core Tier 1 Cap.	820	741	1 138	1 191	1 230	1 335
Add. Cap. Req. For DTD 3.0	7	1 624	3 611	250	449	203
<b>Non G-SIFIs</b>						
Core Tier 1 Cap.	402	403	483	516	601	624
Add. Cap. Req. For DTD 3.0	7	602	949	113	166	111
Domicile of bank						
<b>United States</b>						
Core Tier 1 Cap.	331	329	530	577	634	702
Add. Cap. Req. For DTD 3.0	5	1 285	2 473	32	176	17
<b>United Kingdom</b>						
Core Tier 1 Cap.	215	211	348	354	352	363
Add. Cap. Req. For DTD 3.0	3	252	1 075	79	80	53
<b>Europe</b>						
Core Tier 1 Cap.	675	604	743	777	845	894
Add. Cap. Req. For DTD 3.0	6	689	1 013	252	359	245

Source: Bloomberg, authors' calculations.

## V. The OECD structural separation proposal

### *The proposal*

Following the 2008 crisis, the OECD Secretariat was amongst the first to propose separation as necessary for the future stability of the financial system.<sup>15</sup> It proposes a non-operating holding company (NOHC) structure for banks that require separation. In this article, a separation threshold for banks based on the research about the determinants of the DTD is proposed, and once a bank moves beyond that threshold the offending securities businesses will be separated from the core bank and both would be ring-fenced from each other. The aim of separation is to ensure that deposit banking is very safe, so that the central bank and/or the taxpayer do not need to support the bank each time derivatives and repo margin calls cannot be met in a liquidity crisis. To help to ensure this, the creditors of the securities subsidiaries must not be able to pursue the assets and capital of the core deposit bank or the non-operating parent. This smaller core bank would be easier to resolve, but the structure proposed would greatly reduce the risk of such a need. The securities and other subsidiaries would not necessarily have banking licenses (in an ideal world), and in that case would not have access to the lender-of-last-resort facility, and certainly would not be guaranteed by governments. The risks undertaken in the ring-

fenced securities subsidiaries would then have to be priced in line with the activities being undertaken, as opposed to the current situation of being the recipients of cross-subsidisation from the group and implicit TBTF guarantees from the authorities. The subsidiaries would not be able to trade off the reputation and credit rating of the parent (i.e. they would have their own credit rating and can issue debt); their own capital, assets and liabilities would not be able to be shifted between subsidiaries directly or via the parent; assets would not be able to be pledged or otherwise encumbered between subsidiaries.

The OECD Secretariat believes that a bank should be considered for separation if the GMV of its derivatives rises above 10% of TA (on an IFRS basis). This primary case for separation would be increased if its business model resulted in high wholesale funding, low liquid trading assets and high group leverage. The separate core deposit bank would be subject to the simple leverage ratio rule of at least 5% for core equity of total (un-weighted) assets. The OECD Secretariat recommendations are fully consistent with the above empirical findings on which factors are important in driving banks to the default point. This distinguishes it from the other approaches to separation in the US, the UK, and Europe mentioned above and discussed below.

### Illustrative example

It is interesting for illustrative purposes to ask what impact this proposal might have on a typical universal bank. Table 2 shows a hypothetical universal bank (left column) with business model components well within the range of those that can be observed in Europe and the USA.

Table 2. **Hypothetical universal bank and separation**

Hypothetical large universal bank and NOHC separated bank with 5% leverage ratio						
	Universal bank before separation		Separated deposit bank		Separated securities subsidiary	
<b>Asset ratios</b>	€ bn	Ratio TA	€ bn	Ratio TA	€ bn	Ratio TA
Trading assets	300	0.15	160	0.25	200	0.50
Loans	400	0.20	400	0.63	0	0.00
Derivative assets (IFRS)	800	0.40	64	0.10	200	0.50
Other assets	500	0.25	16	0.03	0	0.00
<b>Liability ratios</b>	€ bn	Ratio TL	€ bn	Ratio TL	€ bn	Ratio TL
Deposits/liabilities	585	0.30	585	0.98	0	0
Wholesale funding (incl. deriv.)	780	0.40	0	0.00	195	0.50
Other liabilities/liabilities	585	0.30	15	0.03	195	0.50
<b>Capital indicators</b>	€ bn	%	€ bn	%	€ bn	%
Core T1 capital	40	2.0	32	5.0	8	2.0
Tier 1	50	2.5	40	6.3	10	2.5
RWA/TA %		31.3		78.1		31.3
T1/RWA %		8.0		8.0		8.0
<b>Memo:</b>		(see row)		(see row)		(see row)
Market beta (elasticity to market stock price)		1.4		1.0		1.6
National HPI % change		4		4.0		4
Leverage to core T1 (ratio)		50		20		50
Size as % national banking system %		15		5.2		3.2

Source: Authors' calculations.

The two right-hand columns show the bank separated into a NOHC structure: a core deposit bank and a securities subsidiary, separated according to the following (illustrative only) rules:

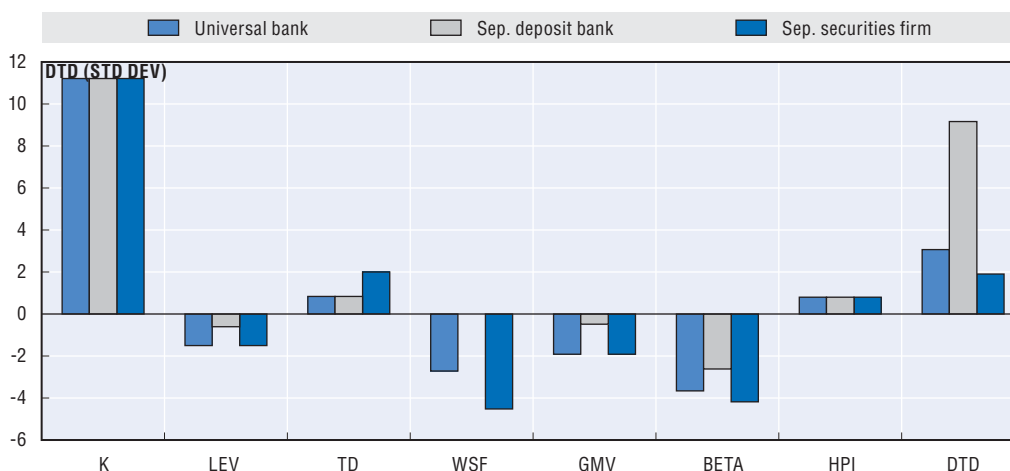
- The deposit bank takes 100% of the deposits, 100% of the loans and 80% of the capital. A leverage ratio of 5% is imposed (20 times core T1). It keeps a 25% trading asset portfolio. It keeps the separation threshold of 10% derivatives for internal hedging (for reference, a safe bank like Wells Fargo keeps around 7% in derivatives). Its implied RWA/TA ratio is 78% (again, something like Wells Fargo).
- The securities firm takes 20% of the capital, is asked to maintain the original leverage ratio of 2% for core T1 capital, and allocates 50% to derivatives and 50% to trading assets. It takes no deposits, and funds 50% of its liabilities in the wholesale market.

Both NOHC subsidiaries respect a Basel rule 8% T1 ratio, though with a very different ratio of RWA/TA.

From this separation example it should be clear as to why universal banks are vehemently opposed to such a policy: because under any reasonable leverage rules, even allowing the original 50 times core T1 for the securities subsidiary, the size of that business must shrink substantially if the loans and deposits are going to be kept, and shifted into the core deposit bank, and the leverage ratio of 5% is to be respected in that institution. But the reason for doing this is to reflect (and hence price) the risks according to where they are being taken. In short, the aim is to end cross-subsidisation from the TBTF deposit bank.

The changes in the DTD measure of risk following separation are illustrated in Figure 3 (with illustrative assumptions) using the coefficients of the model for GSIFIs shown in the Annex and the hypothetical separation numbers from Table 2. The horizontal axis shows the contributions of the components of the model starting with the constant term on the left side (K), then leverage (LEV), trading assets (TD), etc. The far right-hand-side shows the

Figure 3. **DTD: Universal bank versus separated deposit bank and securities firm**  
Contributions to distance-to-default (DTD) of DTD determinants



Notes: The bars show, for the hypothetical banks specified in Table 2, the DTD contributions of the components of the model specified in the Annex. K : constant; LEV: total assets (TA)/bank equity; T1: Basel Tier 1 ratio; TD: trading book plus available for sale securities/TA; WSF: wholesale funding/total liabilities; GMV: gross market value of derivatives/TA; BETA: covariance between a bank's stock return with national market return/market variance; HPI: annual percentage change of house price index; DTD: total of all components.

Source: Authors' calculations.

sum of the contributions, i.e. the estimate of the total DTD. For each contribution (K, LEV, TD, etc.) and for the estimated total DTD on the right hand side, the three institutions are shown in order: the original universal bank on the left, the new core deposit bank in the middle and the new securities subsidiary on the right (in dark blue).

The estimated DTD for the original universal bank is 3 (actually very close to that for a number of GSIFI banks in 2012). The new core deposit bank has a DTD of over 9 standard deviations, which is very safe indeed. The new securities subsidiary has a DTD of around 2, where there is a 5% chance of failure. These relative risks will be priced into the cost of equity, debt, etc. (lower for the deposit bank and higher for the securities subsidiary), particularly as the securities firm is smaller and not TBTF.

Counterparties dealing with the securities firm would do so in the knowledge that their obligations would not be met by governments in the event of default. This would raise the cost of derivatives and repo securities businesses due to: higher initial margins; 100% variation margins; and third party custody (no co-mingled funds) which would reduce re-hypothecation possibilities. These necessary developments would push up the pricing of risk, while the size of the business would decline to levels that would be less disruptive in the event of default. This effect on risk aversion would be greater if the automatic stay of bankruptcy exceptions for derivatives laws were repealed. The subsidiaries would be eminently resolvable. In the event of a default, close-out netting would be allowed to come into effect without intervention and support from the authorities.

This unsupported sector would most likely include prime broking activities, derivatives origination (including most structured products), market making and proprietary trading – all activities which put the subsidiaries' capital at risk via inventories of securities and speculation on short-term price movements. These smaller subsidiaries would be on a level playing field with other securities businesses and competition would be improved. The ring-fenced core deposit bank would be able to facilitate its own internal hedging and end-user securities and derivatives activities within the limits of the thresholds allowed.

### **Criticisms of the OECD separation proposal**

Since the OECD first made its NOHC proposal in 2009, it has received five broad sets of comments or criticisms (other than banks' resistance based on a desire to return to rent-seeking returns so prevalent in the first half of the 2000s). These are:

1. That Lehman Brothers and AIG were not universal banks that could be considered for separation, and yet they caused systemic concerns.
2. That it was not the GSIFI banks that failed during the crisis; it was the specialised mortgage banks involved in the real estate boom busts in the USA, the UK, Ireland and Spain that mainly failed.
3. That separating core deposit banking will force investment banks into more wholesale funding, which the DTD model results suggest is a riskier business model feature.
4. That it is legally too complex to separate assets and liabilities while meeting all of the tax and corporate laws of the country concerned.
5. That separation with full ring fencing of all subsidiaries is essentially Glass-Steagall, so why bother with NOHC?

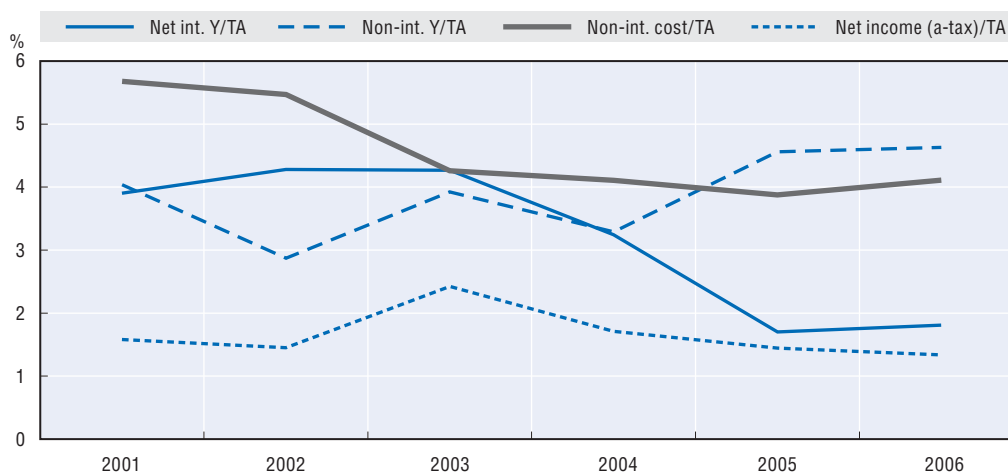
***Ad 1: Investment banks failed***

The first of these critiques, concerning Lehman Brothers and AIG, is perhaps the most flawed. The most basic methodology of economics is counterfactual analysis – get the counterfactuals right. One is required to ask: what would the size of the London branch of AIG and the Lehman Brothers investment bank have been if the above proposal applied on a global scale? What would the Lehman business have looked like if its counterparties were not large TBTF un-separated universal banks like Citigroup, JP Morgan, UBS, CS, Barclays, Bank of America, Deutsche Bank, BNP Paribas, Société Générale and the like, but ring-fenced boutique subsidiaries of those banks with no official or implicit guarantees? And what if Lehman did not have a low 20% Basel risk weight for these banks when they extended credit to it? With respect to AIG, the exposures that took it down were precisely credit-default swap (CDS) contracts written for the above banks (plus Goldman Sachs) for the explicit purposes of those banks reducing the capital they were required to hold under the Basel risk-weighting system. The banks were bailed out by the US taxpayer. The history of the past decade would have been very different with separation and the leverage ratio proposed by the OECD Secretariat.

***Ad 2: Mortgage banks failed***

The second criticism does not stand up to scrutiny. Putting to one side the point that the GSIFIs were explicitly supported by capital injections, the US government paying out all the AIG counterparty exposures and the massive liquidity support from central banks, the argument essentially assumes that the business models of traditional specialist mortgage banks did not adapt in a risky way to the innovations and business model changes in the GSIFI banks. Countrywide Financial was a specialised mortgage bank with the net income patterns illustrated in Figure 4 that reflect quite well the changing business model of this sector. With the removal of constraints on leverage after 2004, and the new constraints placed on the two US government-sponsored enterprises (GSEs) Fannie Mae and Freddie Mac, following accounting scandals, the securitisation and structured products businesses accelerated sharply. Mortgage banks adjusted their business models to supply the huge demand for loans from investment banks, and fee-for-sale business income rose sharply, i.e. loans were made and on-sold for a fee. Loans were also retained on the balance sheet and wholesale funding to finance them rose. Strong demand meant that banks competitively bid for loans, forcing up the price (lowering lending rates), and moving increasingly into higher quantities of low-quality (subprime) borrowers.

This competition caused net interest income to decline as a share of assets, particularly after 2004, but this was offset as fee-for-sale income rose to replace it. Countrywide moved to a situation where net interest income had fallen from 4.3% of assets in 2002 to 1.8% just prior to the crisis, well below non-interest costs at 4.1% of assets. This did not matter, as non-interest income was a healthy 4.6% of assets, and the overall returns on assets after tax was positive. Subsequently, once the crisis began, fee-for-sale income collapsed, and Countrywide was left with a loss-making business model and a large quantity of poor quality loans on its balance sheet. This pattern is quite common with mortgage banks more generally. It is erroneous to believe that the business models of mortgage banks did not adjust in a dangerous direction in response to developments going on in the GSIFI banks.

Figure 4. **Countrywide Financial's changing business model**

Source: Bloomberg, authors' calculations.

### **Ad 3: Separated investment banks would become riskier**

The third criticism is not relevant to the NOHC proposal, where it is well understood that the securities businesses will move to forms of funding other than insured deposits – that is the whole idea. These institutions will fund themselves either with equity, like an insurance company, or via wholesale funding. These will be smaller resolvable firms that will be forced to price risk at levels commensurate with being ring-fenced from TBTF deposit banks. A level playing field will be applied to newly-separated securities businesses and pre-existing specialist investment banks not subject to separation. Such institutions will (as Goldman Sachs and Morgan Stanley already do) match their wholesale funding on the asset side with large portfolios of liquid trading securities – which have a positive influence on the DTD. As already noted, if risk is not cross-subsidised the price of risk will adjust and the level of risk undertaken will be consistent with financial stability.

### **Ad 4: Legal complexity**

The fourth criticism does not square with the facts. In March 1997 Australia's Wallis (1997) Review recommended the NOHC as a safe business model, without trying to suggest it as a structural regulation. It was seen as the best method to quarantine entities in a group containing a depository institution (to protect against creditors of one entity seeking to pursue the other entities of a group). The 1998 Financial Sector (Shareholdings) Act amended the 1959 Banking Act to permit NOHCs as a legal corporate structure. However, there was no actual adoption of NOHCs due to corporate and tax law complications (impediments under the Corporations Act, 2001, and the taxation laws). In 2007, Macquarie Bank was the only Australian bank that had highly-levered securities businesses mixed into a common structure, and the bank could see that it was very much in its interest to adopt the NOHC structure. Importantly, it was also encouraged strongly to do so by the Australian Prudential Regulatory Authority (APRA). To deal with the complexity issue, the Financial Sector Legislation Amendment (Restructures) Bill (2007) was passed. This created two simplifying instruments:

- Restructure instruments: to grant relief to the specific statutory impediments to NOHC affiliates complying with the requirements of corporate law.



- Internal Transfer Certificates: issued by APRA, to facilitate the rearrangement of assets and liabilities of the different activities into their separate business lines.

To complete the process, a number of amendments to the Income Tax Assessment Act 1997 were passed, i.e. amendments to the consolidation rules and capital gains tax aspects that were impediments to restructuring. Macquarie Bank adopted the NOHC structure in 2007, the very same year as the legislation was passed, and this structure served it very well as the global crisis unfolded.

#### ***Ad 5: Full (Glass-Steagall-type) separation may be better***

Finally, the fifth comment may be right – that full separation is a superior business model. The current authors do not believe so because belonging to a ring-fenced group still carries many advantages. These include synergies in the technology platform, and back office and human resources sharing. Cross-selling would be permitted, though with arms-length pricing. The business model has great advantages for the equity investor, who will receive dividends from diversified sources. If traditional banking falls on hard times, dividends may still be paid from the investment bank, and other business lines. This will make the group desirable from an equity raising perspective. Finally, the NOHC model has advantages politically, in allowing large national champion banks to stay as conglomerate entities, but in a form that is much safer for the taxpayer.

### **Comparisons with other separation proposals**

#### **The USA**

The Dodd-Frank Volcker rule<sup>16</sup> is complex and asks for rules to be written that depend on the intent of a trader; whether the intent is servicing a client for a fee without speculating on short-term price movements against which there is a blanket ban. Banks successfully argued that the Volcker rule should continue to allow underwriting and market making, in spite of a blanket ban on speculating on short-term price movements with the banks' own balance sheet. However, the nature of these prime broking activities is immediacy, which requires banks to maintain an inventory of assets. Speculation on short-term price movements for a profit is inherent in this business. The banks have also succeeded in achieving major exemptions for many OTC derivatives – one of the most important of which is foreign exchange swaps.<sup>17</sup> Official support for banks' subsidiaries in a crisis has been made more difficult under the Volcker Rule, which is a very positive step to reduce moral hazard, although this may be overridden by Congress in a crisis. Origination of new structured products for sale to clients is certainly permissible under the Volcker rule, despite the complexity and warehousing required, and the encouragement they give to leverage and tax and regulatory arbitrage activities. While full separation of proprietary trading, as defined by Volcker, is more radical than some of the other proposals which allow subsidiarisation, this is a relatively small part of the banking business model. Proprietary trading needs to be more broadly interpreted to bring it closer to the OECD view.

#### **The UK**

The Vickers rule<sup>18</sup> ring-fences UK retail operations of large banks, and the separated securities-focused subsidiaries can also have banking licenses, setting up as wholesale/investment banks anywhere around the world. If such non-retail banks have access to a lender of last resort, in addition to the retail bank, risk taking will be subsidised. If a global subsidiary fails, the losses can be passed up to the parent, equity will be reduced for the

group, and the creditors of the group (other than the retail bank) can be bailed in as required. The aim of Vickers is to ring-fence the domestic retail business from international finance and to limit taxpayer costs for losses given default. While this proposal of ring-fencing is closest to the OECD proposal, the particular form does not reduce all of the risks related to interconnectedness discussed earlier, particularly since the creditors of one group may essentially pursue the assets and capital of the parent or other non-core subsidiaries.

### **Europe**

The Liikanen group proposal<sup>19</sup> focuses on removing interconnectedness incentives while allowing all subsidiaries to remain in a holding company structure which is not unlike the OECD proposal. However, the explicit recommendation requires a major rethink. In the first stage, a bank that has above 15-25% trading securities (trading book plus available-for-sale securities) should be considered for separation in a second stage. The aim is to limit the TBTF implicit guarantees, enhance resolvability, and strengthen governance. Liikanen recommends more capital for the trading function, but this works via strengthening the Basel III risk-weighting approach to capital requirements. Market making is (correctly) suggested to lie in the trading entity (unlike Volcker), but underwriting can stay with the deposit-taking institution. Bail-in bonds are recommended for the trading group.

There are two fundamental problems with the Liikanen proposal. First, it has not chosen the right variable as a threshold for separation in the first stage. The above panel regression results show that the trading book plus available-for-sale securities are strongly positively related to the DTD – they make a bank safer, not weaker. The scale of the GMV of derivatives should be the separation threshold variable (which affects leverage and counterparty risk in highly significant ways). This feature of the Liikanen report means, puzzlingly, that a very safe bank such as Wells Fargo would (if it were a European bank) be considered in the first stage for separation, even though only 7% of its portfolio is in GMV (IFRS concept) of derivatives, simply because it has 21% in liquid trading securities, which adds to safety. Second, the Basel risk-weighting approach is not correlated with the DTD – the role of a simple leverage ratio should be raised to 5%. As stated at the outset, regulatory reform needs to be consistent with the available empirical evidence and not based on negotiations with large universal banks. As noted above, other countries such as France and Germany are currently proposing or implementing variants of Liikanen. The French, for example, diverge from Liikanen by allowing market making in the universal bank which is highly risky.<sup>20</sup>

### **Switzerland**

The Swiss authorities have so far opted against separation and/or ring-fencing for Credit Suisse (CS) and UBS and instead rely on “single point of entry” bail-ins, i.e. the creditors of the top holding company or parent bank (which owns all the companies in the group) are bailed in to the extent necessary to recapitalise the whole group of companies.<sup>21</sup> This is argued to buy time to resolve some non-viable part of the group, presumably if management feels like it. There are two basic problems with this approach. First, if a major Swiss bank were estimated as likely to fail, and unsecured bond holders were to be bailed in before that failure, there would in practice be a run on the bank by creditors (but not derivatives, where bail in does not apply). Second, it is difficult to see how this reduces

proprietary risk taking in derivative counterparty positions in the same way that actual separation does. The cross-subsidisation of high-risk businesses (notably derivatives) is not eliminated prior to the universal bank moving to full default, which the authorities cannot possibly allow to happen. Indeed, creditor counterparties to the derivatives and repo activities will be very pleased to do business with the two large Swiss banks: they can reasonably assume defaults will not be allowed for any business segments and that the holders of unsecured bonds for the whole group will be bailed in at the first loss and the taxpayer will be there for anything beyond that. The creditors of one group do not even have to pursue the assets or capital of others in the group – which the OECD proposal is designed to do – it is built into the very process. This is not the way to align the pricing of risk with the extent of risk being taken in the various business segments and to enhance credible resolvability. In September 2013, the lower house of the Swiss parliament voted in a bi-partisan manner in favour of the need for separating the two large banks, requiring an answer from the Swiss Federal Council that governs the country as to whether this is possible.

## VI. Concluding remarks

The above analysis shows that business models of GSIFI banks have evolved into such a complex and interconnected state that there is no reasonable capital rule that can be in place in normal times to protect the financial system in the event of major defaults and related bouts of market volatility. The panel regression results also showed that the DTD is sensitive to both business model features and to the simple leverage ratio, but not to the Basel Tier 1 ratio. Yet despite the evidence, the reform process continues to focus on allowing banks to run complex models for risk weighting to control leverage, while business model features that have strong independent effects on the DTD have not been the subject of coordinated global reforms.

The necessity of structural separation has been recognised in a number of jurisdictions, and new regulatory approaches have been proposed. These however are inconsistent across borders, particularly as to where the lines for separation should be drawn.

The bank regulators' paradox is that large complex and interconnected banks need very little capital in the good times, but they can never have enough in an extreme crisis. Separation is required to deal with this problem. This study suggests banks should be considered for separation into an NOHC structure with ring-fencing when they pass the key allowable threshold for the GMV of derivatives of 10% of TA on an IFRS basis, a case which is reinforced if the bank has high wholesale funding and low levels of liquid trading assets. The separated core deposit bank should have a maximum of 10% derivatives in total assets, a 5% leverage ratio (core equity over total assets, no netting) and a reasonably low share of wholesale funding. The pricing of derivatives and repos would become more commensurate with the associated risks if a ring-fenced NOHC separation proposal were to be pursued as a unifying strategy for the different national approaches. Most of the objections to the NOHC structure were summarised and rebutted. Other national proposals for separation in the Volcker rule, the Vickers rule, and the Liikanen proposal were argued to be inferior to the ring-fenced NOHC proposal, on the grounds that empirical evidence about what matters for a safe business model is not taken properly into account.

## Notes

1. Similarly, fear of insolvency can lead to a “run” on deposits. This can be the most rapid path to default.
2. See US Congress (2010), ICB (2011), Liikanen (2012) and FINMA (2013).
3. Here BIS Data is a little patchy on emerging market debt, of which there has been strong growth in recent years.
4. This could be a net 20 paid to a clearer, if clearing was introduced into the simple example.
5. See ICB (2011); the interim report makes explicit reference to OECD work on the topic (Blundell-Wignall et al., 2009). This “Vickers proposal” has been adopted in the UK Financial Services (Banking Reform) Bill; see <http://services.parliament.uk/bills/2013-14/financialservicesbankingreform.html>.
6. See section 619 of Dodd-Frank (US Congress, 2010).
7. Liikanen (2012).
8. The French parliament recently adopted a law to reform the banking sector that will separate risky speculative activity from the rest of the banking sector (see Fernandez-Bollo, 2013), and the German parliament has approved legislation which requires banks to separate trading activities and other risky activities from deposit-taking into a legally and financially independent corporation above specified size thresholds.
9. For example, see IMF (2011), p. 2.
10. See Duffie (2012) for the former and Goodhart (2011) for the latter.
11. A search of BIS, IMF and FSB websites to 2012 could not find a single paper on business models, compared to hundreds of papers on capital rule reforms. This began to change only in 2013.
12. The idea is to see what ex-ante amount of extra capital would be needed, without taking into account any subsequent impact on  $\sigma$  and  $V$  that an actual injection of  $K^* - K$  might have on  $\sigma$ , etc.
13. For FSB’s 2013 update of the group of global systemically important banks (“G-SIBs”) see [www.financialstabilityboard.org/publications/r\\_131111.pdf](http://www.financialstabilityboard.org/publications/r_131111.pdf).
14. For a discussion and estimates of funding cost advantages from implicit government guarantees for the banks that benefit from them see Schich and Lindh (2012).
15. See, for example, OECD (2009), and Blundell-Wignall et al. (2009).
16. See section 619 of Dodd-Frank (US Congress, 2010).
17. Because they are settled without the usual netting.
18. See ICB (2011) and the UK Financial Services (Banking Reform) Bill at <http://services.parliament.uk/bills/2013-14/financialservicesbankingreform.html>.
19. Liikanen (2012); so far no further steps have been undertaken at EU level towards implementation of these proposals, but are on Commissioner Barnier’s “to-do list”, see “A new financial system for Europe” at [http://ec.europa.eu/internal\\_market/publications/docs/financial-reform-for-growth\\_en.pdf](http://ec.europa.eu/internal_market/publications/docs/financial-reform-for-growth_en.pdf).
20. The French reform of the banking sector has been adopted by parliament in July 2013 and will be fully implemented by July 2015. See Fernandez-Bollo (2013) for a brief presentation and discussion of the reform.
21. See FINMA (2013).

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## ANNEX A

### *Modeling the distance to default*

A panel regression approach is used to explain the differences in DTDs across banks over the period 2005-12. The sample consists of the top G20 internationally active commercial banks and broker-dealer banks by equity market capitalisation, for those banks where all the data required is available. In addition, six banks that failed in the crisis, but which can be considered as GSIFIs, HBOS, Merrill Lynch, Lehman Brothers, Washington Mutual, Wachovia and Bear Stearns, are included. This is essential, as they are the main banks of size whose assets were absorbed by others included in the sample – they act essentially as dummy variables for the M&A activity involved that would otherwise distort the results with breaks in the data on leverage ratios, etc. There are a total of 90 banks in the sample, consisting of 26 FSB GSIFI banks (excluding non-listed banks), 6 failed former GSIFI banks, and 58 other large banks.

The empirical model takes account of systemic importance, leverage, and business model aspects. The model is estimated with two alternatives for leverage: the leverage ratio and the regulatory capital approach of the Basel Tier 1 ratio. The variables and results are shown in Table A.1. LEV corresponds to the simple leverage ratio (total assets TA divided by core equity, with no risk weighting of assets, no netting of derivatives and US bank leverage is based on IFRS conversions), which is expected to have a negative sign. T1 is the Basel Tier 1 ratio based on risk-weighted-assets (T1/RWA), which is expected to have a positive sign. TD is the sum of the trading book and available-for-sale securities, and is expected to have a positive sign. The reason for this is that liquidity drives the banks' path to default in practice, when margin and collateral calls cannot be met. Liquid assets can be sold or used as collateral making a bank safer. WSF refers to wholesale funding as a share of total liabilities and is expected to have a negative sign – higher wholesale funding typically at a shorter duration is less stable than deposits for funding longer term assets.<sup>1</sup> GMV refers to the gross market value of derivatives as a share of the banks' total assets – appropriately converting all US banks to the IFRS concept for consistency. GMV is expected to have a negative sign – this is the quintessential interconnectedness variable where volatility drives rapid changes in margin requirements. BETA is a systemic importance variable, defined as the covariance of the firm's stock price with the national stock market, using daily data to calculate annual observations, divided by the variance of the national stock index. It is expected to have a negative sign, on the grounds that the firm is more connected to the national macro and asset price cycle. Finally, %HPI refers to the annual percentage change in the national house price index, and is expected to have a positive sign as rising prices improve a borrower's equity in the home and vice versa.

Causality in the model is tested with an error correction model shown at the bottom of the table: the DTD in the current year adjusts to gap between the actual DTD and its predicted level in the previous year. All of the error correction terms have large coefficients (rapid adjustment within the year) and are significant at the 1% level.<sup>2</sup> A fuller set of results and stability robustness in the face of different sample periods and the treatment of M&A through the crisis is presented in Annex 2 of Blundell-Wignall and Roulet (2013).

Table A.1. **Determinants of bank distance to default: Multivariate panel results**

	All banks		GSIFIs banks	Other large banks
Constant, $\alpha$	8.17*** (7.15)	6.74*** (4.75)	11.21*** (6.94)	6.55*** (8.72)
LEV: TA/bank equity	-0.04*** (-3.30)	-	-0.03*** (-3.21)	-0.05*** (-2.53)
T1: Basel Tier 1 ratio	-	2.24 (0.58)	-	-
TD: trading book plus available-for-sale securities/TA	4.51 ** (2.06)	3.72 (1.47)	3.34 ** (2.16)	3.79 (1.51)
WSF: wholesale funding/total liabilities	-4.14*** (-3.04)	-4.54 ** (-2.31)	-6.78*** (-2.47)	-1.81 (-1.30)
GMV: GMV of derivatives/TA	-3.48*** (-2.42)	-5.39 ** (-2.21)	-4.79*** (-3.02)	-3.26 (-0.37)
BETA: CoVar bank stock ret. with ntl. mkt ret./var.mkt	-1.47*** (-5.36)	-1.33*** (-3.61)	-2.61*** (-4.75)	-1.21*** (-3.47)
%HPI: house price index ann. % change	16.29*** (4.98)	17.45*** (4.12)	20.10*** (6.70)	17.32*** (4.75)
DUM_MA: dummy equals to 1 following M&A, else 0	-	-	-	-
R2	0.69	0.65	0.73	0.67
Fisher statistic	11.25	9.47	12.58	9.76
P-value F	0.00	0.00	0.00	0.00
Total observations	569	569	201	368
VECM 1-year lagged residual (Engel & Granger test)	-0.85*** (-17.72)	-0.85*** (-18.01)	-0.78*** (-11.05)	-0.90*** (-14.20)

Note: This table shows the results of estimating multivariate regressions for an unbalanced panel of 108 US and European internationally active commercial banks and broker dealers with equity market capitalisation in excess of USD 5bn over the period 2004-12. Cross-section and time fixed effects are used in the regressions as is the White diagonal covariance method. \*, \*\* and \*\*\* indicate statistical significance at the 10%, 5% and 1% levels, respectively. The VECM error correction results show adjustment of the current DTD to the previous year gap between the predicted and actual values, allowing one lagged innovation in the standard model. See Ericsson and MacKinnon (2002).

The results may be summed up as follows:

- The Basel Tier 1 ratio appears to find no support as a determinant of the DTD. The simple leverage ratio case is the preferred model, shown in the first column of the first data panel.<sup>3</sup> LEV is well determined at the 1% level for all banks, for the GSIFI banks and for the other large bank panels.
- The macro control variables in house prices and the market BETA are correctly signed and significant at the 1% level, across all models.
- In terms of arguments relating to business models, the GMV of derivatives and wholesale funding have the expected negative signs and are significant at the 1% level for the full sample and for the GSIFI group.
- Trading assets have the expected positive sign that find support at the 5% level for the full sample and the GSIFI banks, but not in a sample of traditional banks that excludes the GSIFIs.

**Notes**

1. These are short-term (including repo) and some longer-term debt securities that need to be rolled – it excludes deposits, equity, subordinated debt and derivatives liabilities from total liabilities.
2. The error correction equation takes the lagged residuals of the panel regression, and allows for one lagged change in the dependent variable.
3. The T1 variable is not significant in any of the sub-models; these are not shown for simplicity but results are available from the authors upon request.