



BANK OF ENGLAND

November 2016

Stress testing the UK banking system: 2016 results



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Background information on the FPC and the PRA

The Financial Policy Committee (FPC) was established under the Bank of England Act 1998, in amendments made to that Act by the Financial Services Act 2012. The legislation establishing the FPC came into force on 1 April 2013. The objectives of the Committee are to exercise its functions with a view to contributing to the achievement by the Bank of England of its Financial Stability Objective and, subject to that, supporting the economic policy of Her Majesty's Government, including its objectives for growth and employment. The responsibility of the Committee, with regard to the Financial Stability Objective, relates primarily to the identification of, monitoring of, and taking of action to remove or reduce, systemic risks with a view to protecting and enhancing the resilience of the UK financial system. The FPC is accountable to Parliament.

The Prudential Regulation Authority (PRA) is a part of the Bank of England and responsible for the prudential regulation and supervision of banks, building societies, credit unions, insurers and major investment firms. It sets standards and supervises financial institutions at the level of the individual firm. The PRA has two primary objectives: to promote the safety and soundness of these firms and, specifically for insurers, to contribute to the securing of an appropriate degree of protection for policyholders. The PRA also has a secondary objective to facilitate effective competition. The PRA's most significant supervisory decisions are taken by its Board. The PRA Board is accountable to Parliament.

This document has been produced by Bank staff under the guidance of the FPC and PRA Board. It serves three purposes. First, it sets out the Bank's approach to conducting the third concurrent stress test of the UK banking system. Second, it presents and explains the results of the exercise. Third, it sets out the judgements and actions taken by the PRA Board and FPC that were informed by the stress-test results and analysis. The annexes to this report, setting out the individual bank results and supervisory stance with respect to those banks have been formally approved by the PRA Board.

The Financial Policy Committee:

Mark Carney, Governor
Jon Cunliffe, Deputy Governor responsible for financial stability
Sam Woods, Deputy Governor responsible for prudential regulation
Ben Broadbent, Deputy Governor responsible for monetary policy
Nemat Shafik, Deputy Governor responsible for markets and banking
Andrew Bailey, Chief Executive of the Financial Conduct Authority
Alex Brazier, Executive Director, Financial Stability Strategy and Risk
Anil Kashyap
Donald Kohn
Richard Sharp
Martin Taylor
Charles Roxburgh attends as the Treasury member in a non-voting capacity.

The Prudential Regulation Authority Board:

Mark Carney, Governor
Sam Woods, Deputy Governor responsible for prudential regulation
Jon Cunliffe, Deputy Governor responsible for financial stability
Nemat Shafik, Deputy Governor responsible for markets and banking
Andrew Bailey, Chief Executive of the Financial Conduct Authority
David Belsham
Sandra Boss
Norval Bryson
Charles Randell
David Thorburn
Mark Yallop

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Executive summary

The 2016 stress test incorporated a synchronised UK and global recession with associated shocks to financial market prices, and an independent stress of misconduct costs.

The test, which is the first conducted under the Bank's new approach to stress testing, examined the resilience of the system to a more severe stress than in 2014 and 2015. It also judged banks against the Bank's new hurdle rate framework, which held systemic banks to a higher standard reflecting the phasing-in of capital buffers for global systemically important banks.⁽¹⁾

While the Prudential Regulation Authority (PRA) Board judged that some capital inadequacies were revealed for three banks (The Royal Bank of Scotland Group, Barclays and Standard Chartered), these banks now have plans in place to build further resilience. The Financial Policy Committee (FPC) judged that, as a consequence of the stress test, the banking system is in aggregate capitalised to support the real economy in a severe, broad and synchronised stress scenario.

The PRA Board judged that:

- The test did not reveal capital inadequacies for four out of the seven participating banks, based on their balance sheets at end-2015 (HSBC, Lloyds Banking Group, Nationwide Building Society and Santander UK).
- The Royal Bank of Scotland Group (RBS) did not meet its common equity Tier 1 (CET1) capital or Tier 1 leverage hurdle rates before additional Tier 1 (AT1) conversion in this scenario. After AT1 conversion, it did not meet its CET1 systemic reference point or Tier 1 leverage ratio hurdle rate. Based on RBS's own assessment of its resilience identified during the stress-testing process, RBS has already updated its capital plan to incorporate further capital strengthening actions and this revised plan has been accepted by the PRA Board. The PRA will continue to monitor RBS's progress against its revised capital plan.
- Barclays did not meet its CET1 systemic reference point before AT1 conversion in this scenario. In light of the steps that Barclays had already announced to strengthen its capital position, the PRA Board did not require Barclays to submit a revised capital plan. While these steps are being executed, its AT1 capital provides some additional resilience to very severe shocks.
- Standard Chartered met all of its hurdle rates and systemic reference points in this scenario. However, it did not meet its Tier 1 minimum capital requirement (including Pillar 2A). In light of the steps that Standard Chartered is already taking to strengthen its capital position, including the AT1 it has issued during 2016, the PRA Board did not require Standard Chartered to submit a revised capital plan.

The FPC judged that the system should be capitalised to withstand a test of this severity, given the risks it faced. It therefore welcomed the actions by some banks to improve their capital positions. Despite a more severe scenario, the aggregate low points for CET1 capital and Tier 1 leverage ratios were higher than in the 2014 and 2015 tests. The FPC noted the increased resilience to stress provided by banks' AT1 capital positions and banks' stated intention to reduce dividends in stress. It also noted the strong performance of the most domestically focused banks. Given the results, no system-wide macroprudential actions on bank capital were required in response to the 2016 stress test.

The FPC is maintaining the UK countercyclical capital buffer rate at 0% and reaffirms that it expects, absent any material change in the outlook, to maintain this rate until at least June 2017. This reflects developments since the stress test was launched in March, which suggest greater uncertainty around the UK economic outlook and an increased possibility that material domestic risks could crystallise in the near term. The FPC was concerned that banks could respond to these developments by hoarding capital and restricting lending. That position has not changed.

(1) See Bank of England (2015), 'The Bank of England's approach to stress testing the UK banking system'; www.bankofengland.co.uk/financialstability/Documents/stresstesting/2015/approach.pdf.

Background and stress scenario

In March 2016, the Bank of England launched its third concurrent stress test of the UK banking system.⁽¹⁾ The 2016 stress test covered seven major UK banks and building societies (hereafter referred to as 'banks'), accounting for around 80% of PRA-regulated banks' lending to the UK real economy.⁽²⁾

Stress tests allow policymakers to assess banks' ability not just to withstand very severe shocks, but also to maintain the supply of credit to the real economy under stress. They support the FPC in discharging its statutory responsibility to identify, monitor and take action to remove or reduce systemic risks with a view to protecting and enhancing the resilience of the UK financial system. Stress tests also support the PRA in advancing its general objective to promote the safety and soundness of the banks it regulates.

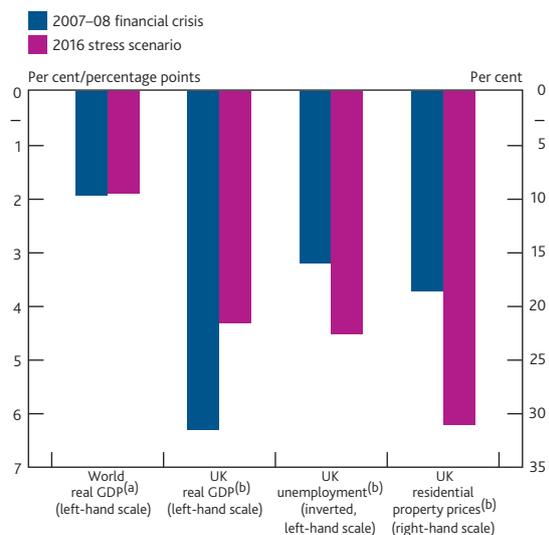
The 2016 stress-test scenario was designed under the Bank's new approach to stress testing. Under this framework, the stress being tested against will generally be severe and broad, in order to assess the resilience of major UK banks to 'tail risk' events. Its precise severity will reflect the risk assessment of the FPC and PRA Board.

As such, the 2016 test was more severe than earlier tests. The severity of the stress in the 2016 scenario is based on the risk assessment the FPC and PRA Board made in March 2016 — that overall risks to global activity associated with credit, financial and other asset markets were elevated, and that risks associated with domestic credit were no longer subdued but were not yet elevated.⁽³⁾

The 2016 annual cyclical scenario incorporates a very severe, synchronised UK and global economic recession, a congruent financial market shock and a separate misconduct cost stress. Annual global GDP growth troughs at -1.9%, as it did during the 2008 global financial crisis. Annual growth in Chinese real GDP is materially weaker than in the financial crisis and troughs at -0.5%. The level of UK GDP falls by 4.3%, accompanied by a 4.5 percentage point rise in the unemployment rate. Overall, the UK stress is roughly equivalent to that experienced during the financial crisis, albeit with a shallower fall in domestic output, and a more severe rise in unemployment and fall in residential property prices (Chart A).

The stress test also includes a traded risk scenario that is constructed to be congruent with this macroeconomic stress. Having fallen significantly during 2015, the price of oil reaches a low of US\$20 per barrel, reflecting the slowdown in world demand. Investors' risk appetite diminishes more generally and financial market participants attempt to de-risk their portfolios, generating volatility. The VIX index averages 37 during the first year of the stress, which compares to a

Chart A 2016 stress scenario compared to the 2007–08 financial crisis across selected real-economy metrics



Sources: Halifax, IMF *International Financial Statistics*, IMF October 2015 *World Economic Outlook*, Nationwide, ONS, and Bank calculations.

(a) World GDP shows the trough annual growth rate.

(b) Chart shows the peak-to-trough fall in the 2007–08 financial crisis and the 2016 stress scenario (trough to peak for the unemployment rate).

quarterly average of around 40 between 2008 H2 and 2009 H1.

Interest rates facing some households and businesses increase in the early part of the stress, partly reflecting a rise in term premia on long-term government debt. Credit spreads on corporate bonds rise sharply, with spreads on US investment-grade corporate bonds, for example, rising from around 170 basis points to 500 basis points at the peak of the stress. Meanwhile, policymakers pursue additional monetary stimulus, which starts to reduce long-term interest rates.

Residential property and commercial real estate (CRE) prices also fall. Following rapid recent growth, these falls are particularly pronounced for property markets in China and Hong Kong, with residential property prices falling by around 35% and 50%, respectively. In the United Kingdom, house prices fall by 31% and average CRE prices fall by 42%. These falls are even greater for prime CRE, reflecting the fact that prices of these properties have risen more robustly since the financial crisis.

(1) Unless otherwise stated, references to the Bank of England throughout this document include the PRA.

(2) The seven participating banks and building societies are: Barclays, HSBC, Lloyds Banking Group, Nationwide, The Royal Bank of Scotland Group, Santander UK and Standard Chartered. Prior to 2016 Nationwide used a different reporting date relative to other stress-test participants. In the 2016 stress test, actual end-2015 data is included for Nationwide. Throughout this document the term 'banks' is used to refer to the seven participating banks and building societies.

(3) See Bank of England (2016), 'Stress testing the UK banking system: key elements of the 2016 stress test'; www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/keyelements.pdf.

The 2016 stress test also incorporates stressed projections, generated by Bank staff, for potential misconduct costs, beyond those paid or provided for by the end of 2015. These stressed misconduct cost projections are not a central forecast of such costs. They are a simultaneous, but unrelated, stress alongside the macroeconomic stress and traded risk scenario incorporated in the 2016 test.

There is a very high degree of uncertainty around any approach to quantifying misconduct cost risks facing UK banks. The stressed projections relate to known past misconduct issues, such as mis-selling of payment protection insurance and misconduct in wholesale markets. They have been calibrated by Bank staff to have a low likelihood of being exceeded. They are therefore, by design, much larger than the amounts that had already been provided for by banks at end-2015. However, partly because they relate only to known issues, they cannot be considered a 'worst case' scenario.

Impact of the stress scenario on the banking system

The stress scenario is estimated to lead to system-wide losses of £44 billion over the first two years of the stress, around five times the net losses incurred by the same banks as a group over 2008–09.

Based on the Bank's projections, the 2016 stress scenario would reduce the aggregate CET1 capital ratio across the seven participating banks from 12.6% at the end of 2015 to a low point of 8.8% in 2017, after factoring in the impact of management actions and the conversion of AT1 instruments into CET1 capital (Table 1).⁽¹⁾ The aggregate Tier 1 leverage ratio falls from 4.9% at the end of 2015 to a low point of 3.9% in 2017.

Compared to previous tests, the fall in the aggregate CET1 capital ratio from start to stressed low point was larger in the 2016 stress test, reflecting the greater severity of the stress scenario. Nevertheless, at 8.8% that low point was well above the 7.6% low point reached in 2014 and 2015.⁽²⁾

This strength of banks' aggregate capital position in the 2016 stress reflects improvements in banks' starting capital positions. The aggregate CET1 capital ratio for banks at end-2015 was 12.6%, up by 1.4 percentage points relative to the end of 2014 and up by 2.6 percentage points from the end of 2013. In part this reflects banks transitioning to previously announced higher capital standards.⁽³⁾ It is those same standards that are reflected in the Bank's new hurdle rate framework.

Without any stress (including for misconduct costs)⁽⁴⁾ the baseline outlook at the end of 2015 was for participating banks' aggregate CET1 capital ratio to increase by 1.2 percentage points to 13.8% in 2017, as banks continued to build capital through retained earnings and as their

Table 1 Contributions to the shortfall in the aggregate CET1 capital ratio and Tier 1 leverage ratio at the low point of the stress in 2017 relative to the baseline projection

	CET1 ratio ^(a)	Leverage ratio ^(b)
Actual end-2015	12.6%	4.9%
Baseline end-2017	13.8%	5.3%
Impairments	-2.4 pp	-0.9 pp
Traded risk losses ^(c)	-1.0 pp	-0.4 pp
Net interest income	-0.2 pp	-0.1 pp
Misconduct costs	-1.6 pp	-0.6 pp
Risk-weighted assets/leverage exposure measure ^(d)	-1.6 pp	0.3 pp
Ordinary dividends	0.8 pp	0.3 pp
Expenses and taxes	1.1 pp	0.4 pp
Other ^(e)	-0.4 pp	-0.4 pp
Impact of AT1 conversion to CET1	0.4 pp	0.0 pp
Stress end-2017	8.8%	3.9%

Sources: Participating banks' published accounts and Firm Data Submission Framework (FDSF) data submissions, Bank analysis and calculations.

- (a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are defined in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.
- (b) The Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure, as defined in the PRA Rulebook when the stress test was launched in March 2016. For more details, see footnote (1), page 7.
- (c) Traded risk losses comprise: market risk, counterparty credit risk, credit valuation adjustment, prudential valuation adjustment, and gains/losses from available-for-sale and fair value option positions, excluding securitisation positions. This also includes investment banking revenues net of costs.
- (d) Changes in risk-weighted assets impact the CET1 ratio, whereas changes in the leverage exposure measure impact the Tier 1 leverage ratio.
- (e) Other comprises other profit and loss and other capital movements. Other profit and loss includes share of profit/loss of investments in associates, fees and commissions, and other income. Other capital movements include impacts from exchange rate movements, pension assets devaluation, deferred tax assets, prudential filters, accumulated other comprehensive income, IRB shortfall of credit risk adjustments to expected losses, and actuarial gain from defined benefits. Distributions on AT1 instruments and preference shares are included in this line.

risk-weighted assets contracted slightly. Relative to the baseline, by the low point at end-2017 the stress reduces the aggregate CET1 capital ratio by 5.0 percentage points and leverage ratio by 1.4 percentage points, reflecting a range of factors (Table 1), including:

- A domestic and global downturn combined with a sharp fall in asset prices, which reduce borrowers' ability to service debts and diminish the value of collateral held against loans. This contributes to material loan impairment charges amounting to £63 billion over the first two years of the stress, £46 billion higher than projected in the baseline and reducing the aggregate CET1 ratio by 2.4 percentage points.

- (1) Aggregate CET1 capital ratios are calculated as the sum of CET1 capital over the sum of risk-weighted assets. Risk-weighted assets are defined in line with CRR and the UK implementation of CRD IV via the PRA Rulebook. Likewise aggregate leverage ratios are the sum of Tier 1 capital over the sum of leverage exposure measure as defined in the PRA Rulebook when the stress test was launched in March 2016. Subsequent to the launch of the stress test, the FPC decided to recommend the exclusion of central bank reserves from the exposure measure in the current UK leverage ratio framework. In doing so, the FPC's aim was to ensure that the leverage ratio does not act as a barrier to the effective implementation of policy measures that might lead to an increase in central bank reserves. For more details see the FPC's policy statement from its policy meeting on 25 July 2016; www.bankofengland.co.uk/publications/Pages/news/2016/062.aspx.
- (2) These low-point figures are based on the results for the group of banks participating in the 2016 stress test. The 2014 test also included The Co-operative Bank. The equivalent aggregate CET1 ratio low point including The Co-operative Bank was 7.5% in the 2014 stress test.
- (3) For more information see Bank of England (2015), 'Supplement to the December 2015 *Financial Stability Report*: The framework of capital requirements for UK banks'; www.bankofengland.co.uk/publications/Documents/fsr/2015/fsrsupp.pdf.
- (4) In line with the guidance provided to participating banks, no misconduct costs are included in this baseline projection, beyond their end-2015 IAS 37 provisions.

- Sharp movements in market prices and increased counterparty credit risk, which lead to material traded risk losses. These losses are concentrated in 2016, before partially unwinding as asset prices recover. By the end-2017 low point, the traded risk stress, including a shortfall of investment banking revenue net of costs, reduces bank capital by £20 billion relative to the baseline projection, reducing the aggregate CET1 ratio by 1.0 percentage point.
- A slightly weaker net interest income profile, which is around £3.5 billion lower in the stress relative to banks' aggregate baseline projection over the first two years of the stress, reducing the aggregate CET1 ratio by 0.2 percentage points. This reflects lower loan growth in response to weaker demand for credit, as well as tighter spreads between sterling loans and deposits. These tighter spreads are in part related to the fact that Bank Rate is cut to zero in the stress and, in contrast to the package of monetary policy measures launched in August 2016, no Term Funding Scheme was assumed in the stress scenario.
- Stressed projections for misconduct costs beyond those already provided for at the end of 2015. Around £30 billion of these additional misconduct costs are projected to be realised by the end of 2017, reducing the aggregate CET1 ratio by 1.6 percentage points. This compares to an aggregate of around £40 billion paid and another £18 billion provided for by banks, but not yet used, over the period 2011–15.

The Bank prescribed an aggregate lending path in the stress, in which lending to the UK real economy expanded by 4.5% over the five years of the stress, in line with Bank staff's projection of the demand for credit over that period, given the stress scenario. In practice, stress-test participants' aggregate real-economy lending was projected to grow by 4.75% over the five years of the stress. This is weaker than under the baseline, given lower demand for credit. Despite weaker lending, higher average risk weights under the stress still mean that risk-weighted assets increase under the stress, driving a 1.6 percentage point reduction in the aggregate CET1 ratio.

On a non risk-weighted basis, banks are projected to reduce their total exposures in the first two years of the stress by around 3%. In the baseline, banks in aggregate increase their exposures by 4% over the same period. The reduction in the stress pushes up banks' aggregate Tier 1 leverage ratio by 0.3 percentage points at its low point.

Two important factors mitigate the impact of the stress on bank capital: cuts to ordinary dividends and conversion of AT1 instruments into CET1 capital. Together, these boost aggregate bank capital ratios by 1.2 percentage points.

Cuts to ordinary dividends fall into three broad categories applied by the Bank in the following order:

(1) 'business-as-usual' actions, cutting dividends in line with banks' public dividend policies; (2) restrictions on dividend payments resulting from the European Union Capital Requirements Directive (CRD) IV;⁽¹⁾ and (3) 'strategic' management actions, which includes departures from banks' public dividend policies that would be likely to entail significant involvement from banks' Boards (and hence were only accepted if judged by the Bank to be plausible given the stress).⁽²⁾ Under CRD IV, banks failing to maintain a combined capital buffer above their minimum capital requirements are subject to automatic restrictions on discretionary distributions including dividends, variable remuneration and other discretionary coupons.

In aggregate, ordinary dividends for 2015 were around £9 billion (Table 2). During a stress, with a significant fall in banks' profits, investors should expect a material cut in dividends. The Bank's modelling of dividend payments under the 2016 stress scenario is designed to mirror the actions that banks would be expected to take in line with the factors above. This results in dividends of only £1.6 billion during the first two years of the stress. Relative to banks' baseline dividend projections, cuts in these payments mitigate the fall in the aggregate CET1 capital ratio by 0.8 percentage points at the low point in 2017.

Table 2 Ordinary dividend payments for 2015 and over the first two years of the stress^(a)

£ billions	Actual 2015	To end-2017 in the stress
Barclays	1.1	0.0
HSBC ^(b)	5.5	1.5
Lloyds Banking Group	2.0	0.0
Nationwide ^(c)	0.1	0.1
The Royal Bank of Scotland Group	0.0	0.0
Santander UK	0.4	0.0
Standard Chartered ^(b)	0.2	0.0
Aggregate	9.2	1.6

Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) Ordinary dividends shown net of scrip payments, and are in respect of the year noted.

(b) HSBC and Standard Chartered pay dividends in US dollars. These dividends have been converted using exchange rates consistent with the stress scenario.

(c) Figures for Nationwide refer to distributions relating to its Core Capital Deferred Shares, a CET1 capital instrument.

(1) Under the Capital Requirements Directive IV as implemented in the United Kingdom, banks are expected to maintain a combined buffer above their minimum capital, which at the time of the Bank's 2016 test is comprised of the countercyclical capital buffer (CCyB), the capital conservation buffer (CCoB) and, for global systemically important banks (G-SIBs), the G-SIB buffer. The latter two of these buffers are being phased in between 2016 and 2019. In the stress, the UK CCyB rate is assumed to be set at zero, given the crystallisation of the stress. Under Article 141 of CRD IV, banks failing to meet their combined buffer are subject to automatic restrictions on certain distributions, including those in connection with CET1, discretionary payments on AT1 instruments and payments of variable remuneration or discretionary pension benefits (sometimes referred to as Maximum Distributable Amount or MDA restrictions). Banks are also prevented from making distributions in connection with CET1 (eg payment of cash dividends) if they would fail to meet their combined buffer as a result. Stress-test results include the impact of these restrictions. Reductions to ordinary dividends account for the majority of these cuts in the Bank's 2016 stress-test results. For further details see Table 3.

(2) Where a bank is subject to CRD IV restrictions in category (2), this should not be interpreted as a judgement by the Bank that any or all of such cuts would not have been 'strategic' management actions in category (3) in the absence of such restrictions.

Lloyds Banking Group and Santander UK cut their ordinary dividends to zero by the low point of the stress, in line with their published payout policies.⁽¹⁾ In reaction to losses made during both the first and second years of the stress, HSBC makes a substantial discretionary cut in ordinary dividend payments in 2016 and then pays no ordinary dividend in 2017, as it makes a loss and becomes subject to CRD IV distribution restrictions. Meanwhile, Barclays and Standard Chartered are loss-making during the first two years of the stress and cut their ordinary dividend payments to zero as they become subject to CRD IV distribution restrictions. The Royal Bank of Scotland Group does not pay an ordinary dividend in any year of the stress scenario. Nationwide continues to make distributions on its Core Capital Deferred Shares (CCDS).

The test also illustrates how AT1 instruments would convert into CET1 capital if a bank's CET1 ratio fell below a pre-defined trigger point. The conversion of AT1 instruments provides additional resilience against the impact of the stress on banks' CET1 capital ratios.

At end-2015, the seven participating banks in aggregate had issued around £23 billion of AT1 capital instruments, for which conversion to CET1 capital would be triggered if their CET1 ratios fell to 7%. The Bank has modelled the conversion of AT1 instruments into CET1 for the three banks whose CET1 ratios fell below this 7% threshold in the stress (**Table 3**). These conversions increase the aggregate CET1 ratio at the low point of the stress by 0.4 percentage points.

The FPC and PRA Board noted that this was the first stress test in which AT1 had converted. But this was not the first year in which a bank's CET1 ratio had fallen below 7% in the stress test, so the conversion of AT1 was a positive development insofar as it reflected increased amounts of such loss-absorbing capacity on some banks' balance sheets. Banks for which AT1 converted in the stress were more resilient, all else equal, than if they had not issued AT1 instruments.

Hurdle rate framework

Performance in the test was assessed against the Bank's hurdle rate framework, comprising elements expressed both in terms of risk-weighted capital and leverage ratios. Importantly, the results of the test inform judgements by the FPC and PRA Board. There is no automatic link between the results and capital actions required.

The risk-weighted capital ratio hurdle rate framework has two elements. First, a hurdle rate, equal to the sum of the internationally agreed common minimum standard for CET1 (4.5%) and — for the first time in 2016 — any Pillar 2A CET1 uplift set by the PRA, which varies across banks. The weighted average of this hurdle rate was 6.5%. Second, a CET1 'systemic reference point', which holds banks of greater systemic importance to a higher standard. For banks

designated as global systemically important banks (G-SIBs), this adds an additional buffer to the hurdle rate according to the phase-in path of each bank's G-SIB capital buffer, which has a 2019 end-point of 1%–2% of risk-weighted assets. The weighted average systemic reference point was 7.3% at the low point in 2017.⁽²⁾

G-SIB capital buffers are designed to be able to be drawn on by banks to absorb the impact of a stress. Their inclusion in the systemic reference point does not change this. Rather, and reflecting the FPC and PRA Board's risk tolerance, it acts to reduce the probability that a systemically important bank would be unable to absorb a real stress given that its failure would have a higher impact than that of a non-systemically important bank.

The Tier 1 leverage hurdle rate framework mirrors that of the risk-weighted capital ratio. The hurdle rate is 3%, while a bank's systemic reference point also includes its G-SIB additional leverage ratio buffer (which is 35% of its corresponding risk-weighted capital buffer).

Test results

The FPC judged that as a consequence of the stress test the banking system is, in aggregate, capitalised to support the real economy in a severe, broad and synchronised stress scenario.

The results show that in aggregate the low-point CET1 capital ratio of 8.8% (8.4% before AT1 conversion) was well above the 7.6% low point seen in the 2015 and 2014 tests. This low point is also well above the 6.5% weighted average hurdle rate and 7.3% weighted average systemic reference point. These results are consistent with UK banks maintaining the supply of lending to the UK real economy: banks' projections for lending were consistent, in aggregate, with Bank staff's projection of the demand for credit over the scenario.

The impact of the scenario differs substantially across banks (**Table 3**). This is due to differences between business models, the types of risks the banks are most exposed to and, in some cases, the extent of their progress through restructuring programmes.

In general, the stress has the greatest impact on those banks with significant international and corporate exposures. The three banks operating principally in domestic markets — Lloyds Banking Group, Nationwide and Santander UK — remain well above their hurdle rates throughout the stress. This reflects, in part, improvements in the asset quality of banks' core UK mortgage businesses, through a combination

(1) These cuts are classified as business as usual as opposed to 'strategic' management actions.

(2) For the purposes of the calculation of the weighted average systemic reference point, where banks do not have a systemic reference point, their systemic reference point is assumed to be the same as their hurdle rate.

Table 3 Projected CET1 capital ratios and Tier 1 leverage ratios in the stress scenario^{(a)(b)(c)(d)}

Per cent

	Actual (end-2015)	Minimum stressed ratio (before the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before conversion of AT1		Minimum stressed ratio (after the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2016 Q3)
			Non-dividend 'strategic' management actions only ^(e)	All 'strategic' management actions including CRD IV distribution restrictions				
CET1 ratios								
Barclays	11.4	5.9	5.9	6.9	8.3	6.8	7.8	11.6
HSBC	11.9	7.6	7.8	9.1	9.1	6.1	7.3	13.9
Lloyds Banking Group	12.8	9.7	10.3	10.3	10.3	7.0	n.a.	13.5
Nationwide	22.6	15.0	15.6	15.6	15.6	8.1	n.a.	23.3
The Royal Bank of Scotland Group	15.5	5.5	5.8	5.9	6.7	6.6	7.1	15.0
Santander UK	11.6	9.9	9.9	9.9	9.9	7.3	n.a.	11.1
Standard Chartered	12.6	5.5	6.1	6.7	7.2	6.1	6.6	13.0
Aggregate	12.6	7.3	7.6	8.4	8.8	6.5	7.3	13.5
Leverage ratios								
Barclays	4.5	3.0	3.0	3.4	3.4	3.0	3.4	4.2
HSBC	5.0	3.8	3.9	4.3	4.3	3.0	3.4	5.4
Lloyds Banking Group	4.8	4.1	4.3	4.3	4.3	3.0	n.a.	4.8
Nationwide	4.3	4.1	4.2	4.2	4.2	3.0	n.a.	4.0
The Royal Bank of Scotland Group	5.6	2.7	2.9	2.9	2.9	3.0	3.2	5.6
Santander UK	4.0	3.4	3.6	3.6	3.6	3.0	n.a.	3.8
Standard Chartered	5.5	4.0	4.2	4.3	4.3	3.0	3.1	5.6
Aggregate	4.9	3.6	3.7	3.9	3.9	3.0	3.3	5.0

Sources: Participating banks' published accounts and FDSF data submissions, Bank analysis and calculations.

- (a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.
- (b) The Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure, as defined in the PRA Rulebook when the stress test was launched in March 2016. For more details, see footnote (1), page 7.
- (c) Aggregate CET1 ratios are calculated by dividing aggregate CET1 capital by aggregate risk-weighted assets at the aggregate low point of the stress in 2017. Aggregate Tier 1 leverage ratios are calculated by dividing aggregate Tier 1 capital by the aggregate leverage exposure measure at the aggregate low point of the stress in 2017.
- (d) The minimum CET1 ratios and leverage ratios shown in the table do not necessarily occur in the same year of the stress scenario for all banks. For individual banks low-point years are based on their post-strategic management action and CRD IV restrictions pre-AT1 conversion projections.
- (e) This excludes CRD IV distribution restrictions. Where a bank is subject to such restrictions all non business as usual cuts to distributions subject to CRD IV restrictions will appear in the next column — 'All 'strategic' management actions including CRD IV distribution restrictions'. This should not be interpreted as a judgement by the Bank that any or all of such cuts are conditional on such restrictions.

of rising property prices, which have bolstered the value of collateral backing loans, as well as banks adopting more prudent new lending standards (for further details see Box 1).

In determining whether an individual bank's capital needed to be strengthened further, the PRA Board considered a number of factors, including whether a bank's CET1 capital ratio or Tier 1 leverage ratio was projected to fall below its individual hurdle rate or, where applicable, its systemic reference point. For a full table of individual hurdle rates and systemic reference points see Section 2.

Where an individual bank's CET1 capital or Tier 1 leverage ratios were close to these thresholds, the PRA Board also considered other factors, for example, the bank's Tier 1 and total capital ratios under stress taking into account their Pillar 1 plus Pillar 2A minima.

Banks in the 2016 stress test were judged against their hurdle rates and systemic reference points based on their capital positions before AT1 conversion. This reflects the PRA Board's

policy that capital buffers should be held in CET1 capital, as opposed to Tier 1 capital. However, the PRA Board considered the impact of any AT1 conversion on banks' CET1 capital ratios when deciding the appropriate supervisory response to banks projected to fall below their hurdle rates or systemic reference points, including the acceptable period for building an appropriate level of CET1 in banks' capital plans.

The PRA Board judged that this test did not reveal capital inadequacies for four out of the seven participating banks, based on their balance sheets at end-2015 (HSBC, Lloyds Banking Group, Nationwide Building Society and Santander UK). While some capital inadequacies were revealed for three banks (The Royal Bank of Scotland Group, Barclays and Standard Chartered), they now have plans in place to build further resilience.

For further details of the actions taken by the FPC and PRA Board in response to the test see Section 5.

Qualitative review

An important objective of the concurrent stress-testing framework is to support a continued improvement in banks' own risk management and capital planning capabilities. On that basis, as in previous concurrent tests, the Bank also undertook a qualitative review of banks' stress-testing capabilities.

The PRA Board judged that banks in aggregate have made progress this year, but was disappointed that the rate of improvement has been slower and more uneven than expected. As set out in the Bank of England's 'Approach to stress testing the UK banking system', the qualitative review will be considered in the Bank's broader assessment of banks' risk management and governance arrangements for the purpose of setting the PRA buffers and will continue to influence the intensity of supervision of individual banks.

In order to raise standards in model development and management, the Bank plans to publish expectations against which banks' modelling frameworks will be assessed. The Bank, through the Basel Committee's Working Group on Stress Testing, is also collaborating with other regulators in the review of bank and supervisory stress-testing programmes and, as needed, will be developing further guidance to enhance these programmes.

Next steps

Consistent with the approach set out in the Bank of England's 'Approach to stress testing the UK banking system', the 2017 stress test will for the first time include a second — 'exploratory' — scenario in addition to the regular 'cyclical' scenario. The Bank intends to run a second scenario biennially to examine emerging or latent threats to financial stability. The seven banks that participated in the 2016 stress test will participate in both scenarios in 2017.

Over time, the Bank's recent stress tests have tested resilience against a wide range of relevant risks. They remain informative and continue to inform the judgements of the FPC and PRA Board. The 2014 test considered the resilience of the system to a 'snap back' in interest rates and adjustment in UK property markets in the context of high levels of household indebtedness. The 2015 test focused on global risks, including a sharp slowdown in China and emerging markets and a severe euro-area stress.

The 2017 exploratory scenario will supplement these previous tests by considering the impact of weak global supply growth, persistently low interest rates, and a continuation of declines in both world trade relative to GDP and cross-border banking activity. This scenario will not be a more severe test of banks' capital positions than the annual cyclical scenario. The focus of the test will be on the implications for banks' business models, the economic impact of any actions they would take

to ensure their viability and the implications for their future resilience. The test will have a seven-year horizon to capture these long-term trends. Throughout the test horizon, the prudential standards implemented for the UK financial system will be assumed to remain at least as robust as those currently planned.⁽¹⁾ Consistent with the focus on business models rather than detailed financial performance, the data collected from banks will be significantly less detailed than that collected for the annual cyclical scenario. Box 5 provides further details on the 2017 exploratory scenario.

Although the Bank's concurrent stress tests have, since their inception in 2014, increased in severity (as measured by their impact on the aggregate capital position of the system), there will not be a bias towards more or less severe scenarios in future. The annual cyclical scenario will evolve systematically over time, increasing in severity in those areas where risks are judged to be building and decreasing in those areas where risks are materialising or abating. It will not vary because of a change in policymakers' tolerance of risk.

The results of the annual cyclical scenario will help the FPC and PRA Board to set capital buffers that move up and down to match the risk environment for the banking system as a whole, and individual banks within it.

Over time, stress-test participants should become increasingly able to anticipate broad movements in the annual cyclical scenario by monitoring developments in domestic and international credit and financial markets. As the shape and severity of the scenario becomes more predictable, stress-test participants will be able to adjust their capital and business plans accordingly.

In the 2015 *Approach Document* the Bank set out its plans to develop its capability to model system-wide dynamics. As a first step towards this goal, the Bank has designed and applied a feedback and amplification model aimed at examining solvency contagion through interbank exposures (see Box 3 for further details). Bank staff are developing additional feedback and amplification models, which may interact with the new solvency contagion model to further enhance the Bank's capability of assessing the resilience of the banking sector.

Timeline for the 2017 stress test

Consistent with previous concurrent stress tests, the balance sheet cut-off date for both the 2017 annual cyclical scenario and exploratory scenario will be end-2016. The Bank will publish the quantitative data associated with these scenarios on its website, along with an explanatory 'Key Elements' document around the end of 2017 Q1. The Bank intends to publish the results of the 2017 exercise in 2017 Q4.

(1) The FPC remains committed to robust prudential standards in the UK financial system. See Bank of England *Financial Stability Report*, November 2016; www.bankofengland.co.uk/publications/Pages/fsr/2016/nov.aspx.

1 Introduction

The 2016 stress test is the Bank's third concurrent stress test.

This document sets out and explains the results of the Bank's 2016 stress test of the UK banking system. It also describes the judgements and actions taken by the PRA Board and FPC that were informed by the stress-test results and analysis.

In March 2016, the Bank of England launched its third concurrent stress test of the UK banking system. Like the 2015 test, the 2016 stress test covered seven major UK banks and building societies (hereafter referred to as 'banks'). Between them, these banks account for around 80% of PRA-regulated banks' lending to the UK real economy.⁽¹⁾⁽²⁾

The Bank's concurrent stress-testing framework was established following a Recommendation from the FPC in March 2013.⁽³⁾ The concurrent approach provides policymakers with a better understanding of the resilience of the UK banking system as a whole — helping to inform both the FPC and PRA Board. The PRA also conducts sequential stress tests for firms both inside and outside the scope of the concurrent exercise.

To derive the projections of bank capital adequacy in the stress scenario, Bank staff used a range of models, sectoral analysis, and peer comparison. The judgements by Bank staff in producing the final projections were taken under the guidance of the FPC and the PRA Board. The bank-specific results have been approved by the PRA Board.

Concurrent stress testing serves the needs of the FPC and the PRA.

Stress tests allow policymakers to assess banks' resilience to a range of adverse shocks, not just to withstand those shocks, but also to maintain the supply of credit to the real economy. They support the FPC in discharging its statutory responsibility to identify, monitor and take action to remove or reduce

systemic risks with a view to protecting and enhancing the resilience of the UK financial system. Stress tests also support the PRA in advancing its general objective to promote the safety and soundness of the banks it regulates.

The framework delivers an integrated process for deliberations around bank capital, both at a system-wide and an individual-institution level, helping co-ordinate the conduct of macroprudential and microprudential policy, allowing policymakers to be clear about the resilience standards against which they hold the banking system. The stress-testing framework also provides a device through which the Bank can be held accountable to Parliament, and the wider public, regarding its financial stability objective.

The remainder of this document is structured as follows:

- Section 2 sets out the key features of the Bank's 2016 stress test, including the hurdle rate framework.
- Section 3 outlines the quantitative projections of capital adequacy, both in the baseline and the stress scenario.
- Section 4 provides a summary of the qualitative assessment of participating banks' stress-testing and capital management processes.
- Section 5 explains the judgements and actions taken by the PRA Board and FPC in response to the results of the stress test.
- Section 6 concludes with a description of next steps for the development of the concurrent stress-testing framework.

The annexes to this document provide more detailed information on bank-specific results — and associated supervisory responses by the PRA Board.

(1) The seven participating banks and building societies are: Barclays, HSBC, Lloyds Banking Group, Nationwide, The Royal Bank of Scotland Group, Santander UK and Standard Chartered. Prior to 2016 Nationwide used a different reporting date relative to other stress-test participants. In the 2016 stress test, actual end-2015 data are included for Nationwide. Throughout this document the term 'banks' is used to refer to the seven participating banks and building societies.

(2) Unless otherwise stated, references to the Bank of England throughout this document include the PRA.

(3) For further details see www.bankofengland.co.uk/publications/pages/news/2013/013.aspx.

2 Key features of the 2016 stress test

This is the first stress test conducted under the Bank's new countercyclical stress-testing framework.

The 2016 stress test was the first conducted under the Bank's new stress-testing framework as set out in the 2015 *Approach Document*. As outlined in that document, between 2016 and 2018 the Bank will:

- Apply an approach to stress testing that is explicitly countercyclical, with the severity of the test, and associated regulatory capital buffers, varying systematically with the state of the financial cycle.
- Improve the consistency between the concurrent stress test and the overall capital framework, including by ensuring that systemically important banks are held to higher standards.
- Enhance its own modelling capability, while ensuring that participating banks continue to play an important role in producing their own projections of the impact of the stress.

The orientation of the 2014 and 2015 stress tests were determined by the risks that the FPC and the PRA Board identified as significant and in need of further exploration. The 2014 stress test focused on risks to the UK household sector while the 2015 test focused more on global risks.

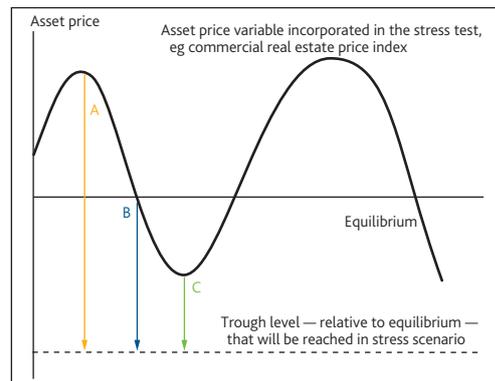
The 2016 stress test is the first to be conducted under the Bank's new annual cyclical scenario (ACS) framework. The ACS is intended to assess the risks to the banking system emanating from the financial cycle.

Under the ACS framework, the stress being tested against will generally be severe and broad, in order to assess the resilience of major UK banks to 'tail-risk' events. In addition, where risks are judged to be heightened, the related aspects of the test will be more severe and *vice versa*. As a result, the severity of the test is related systematically to policymakers' assessments of risk levels across markets and regions.

Chart 1 provides a stylised example to illustrate how the severity of the stress will vary for asset price variables in the stress, based on cyclical movements in prices. A fall in prices such as that shown between point A and point C, will result in progressively less severe stressed price drops, as prices fall to the same trough level relative to equilibrium in each stress.

An important motivation for the ACS framework is to help the FPC and PRA Board set capital requirements and buffers for individual banks and across the banking system, whether their businesses are heavily UK lending focused, or more global or trading focused. For that reason, stress tests calibrated under the ACS framework will incorporate a broader range of

Chart 1 Stylised example of stress severity across the cycle^(a)



(a) This chart plots an example path for de-trended CRE prices relative to a de-trended equilibrium. In practice, equilibrium CRE prices are likely to have risen over time.

domestic and global risks than the Bank's previous concurrent stress tests.

In addition to the macroeconomic stress, the 2016 stress test also includes two other elements: (i) a traded risk component, which is designed to be congruent with the macroeconomic aspects of the scenario, and (ii) stressed projections for additional misconduct costs above those provided for at end-2015.

It is important to note, however, that as in previous years, the stress scenario is not a forecast of macroeconomic and financial conditions in the United Kingdom or other countries. It is not a set of events that is expected, or likely, to materialise. Instead it is a coherent 'tail-risk' scenario that has been designed specifically to assess the resilience of UK banks and building societies to adverse shocks. Likewise, stressed projections for misconduct costs are calibrated to be greater than a central projection for future costs.

The 2016 stress scenario is broad and severe.

The severity of the stress incorporated in the 2016 stress-test scenario is based on the risk assessment of the FPC and PRA Board made in March 2016. The FPC and PRA Board assessed that overall risks to global activity associated with credit, financial and other asset markets were elevated, and that risks associated with domestic credit were no longer subdued but were not yet elevated.⁽¹⁾

Table A summarises policymakers' risk assessments across a range of variables informing the calibration of the 2016 ACS.

The 2016 stress scenario incorporates a synchronised global downturn in output growth, with annual global GDP growth

(1) See Bank of England (2016), 'Stress testing the UK banking system: key elements of the 2016 stress test'; www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/keyelements.pdf.

Table A Summary of FPC and PRA Board risk assessments in the 2016 stress test

	Summary of FPC and PRA Board risk assessments in the 2016 stress test
World activity	Risks to global activity associated with credit, financial and other asset markets are elevated, in large part reflecting risks in China and other EMEs. Within that assessment there are material divergences across economies.
Financial markets	Long-term interest rates remain very low, in part driven by historically compressed term premia. The risk of a sharp rise in term premia is elevated, which could have knock-on effects to other asset prices.
UK property prices	UK property prices may be vulnerable to rises in long-term interest rates. Prime commercial real estate prices appear overvalued on some metrics. Overall risks to UK property prices are a little elevated.
UK activity	Reflecting the above risks and also that domestic debt-servicing costs are below historical averages, risks are judged to be at a standard level.

reaching a trough at -1.9%, as it did during the 2008 global financial crisis. Annual growth in Chinese real GDP is materially weaker than in the financial crisis and troughs at -0.5%. The level of UK GDP falls by 4.3%, accompanied by a 4.5 percentage point rise in the unemployment rate. Overall, the UK stress is roughly equivalent to that experienced during the financial crisis, albeit with a shallower fall in domestic output.

The stress test includes a traded risk scenario that is constructed to be congruent with this macroeconomic stress. Having fallen significantly during 2015, the price of oil reaches a low of US\$20 per barrel, reflecting the slowdown in world demand. Investors' risk appetite diminishes more generally and financial market participants attempt to de-risk their portfolios, generating volatility. The VIX index averages 37 during the first year of the stress, which compares to a quarterly average of around 40 between 2008 H2 and 2009 H1.

Interest rates facing some households and businesses increase in the early part of the stress, partly reflecting a rise in term premia on long-term government debt. Credit spreads on corporate bonds rise sharply, with spreads on US investment-grade corporate bonds, for example, rising from around 170 basis points to 500 basis points at the peak of the stress. Meanwhile, policymakers pursue additional monetary stimulus, which starts to reduce long-term interest rates.

Residential property and commercial real estate (CRE) prices also fall. Following rapid recent growth, these falls are particularly pronounced for residential property markets in China and Hong Kong, falling by 35% and 50% respectively. In the United Kingdom, house prices fall by 31% and average CRE prices fall by 42%. These falls are even greater, at 49%, for prime CRE, reflecting the fact that prices of these properties have risen more robustly since the financial crisis.

An important macroprudential goal of stress testing is to help assess whether the banking system is sufficiently well

capitalised to maintain the supply of credit in the face of adverse shocks. To that end, the Bank has calibrated the 2016 test based on the assumption that banks supply the amount of credit demanded by the UK real economy in the stress. Over the five years of the stress scenario, lending to the UK real economy increases by around 4.5% in total, in line with the credit demand estimate produced by Bank staff.

Overall, the 2016 stress scenario is more severe than either of the Bank's previous tests. The UK part of the test is broadly as severe as the 2014 scenario in terms of its impact on GDP and unemployment, while the non-UK element incorporates a global stress that is broader and more severe than the 2015 test, which was focused on emerging market economies with a spillover to the euro area. In the 2016 stress scenario, UK unemployment rises and house prices fall by roughly the same amount as in the 2014 test. Meanwhile, the 1.9% contraction in global output in the 2016 test is 1.2 percentage points larger than the fall in global output in the 2015 stress scenario.

The 2016 stress test also incorporates stressed projections, generated by Bank staff, for potential misconduct costs, beyond those paid or provided for by the end of 2015. These stressed misconduct cost projections are not a central forecast of such costs. They are a simultaneous, but unrelated, stress alongside the macroeconomic stress and traded risk scenario incorporated in the 2016 test.

There is a very high degree of uncertainty around any approach to quantifying misconduct cost risks facing UK banks. The stressed projections used in the 2016 test relate to known past misconduct issues, such as mis-selling of payment protection insurance and misconduct in wholesale markets. They have been calibrated by Bank staff to have a low likelihood of being exceeded and are, by design, much larger than the amounts that had already been provided for by banks at end-2015. However, partly because they relate only to known issues, they cannot be considered a 'worst case' scenario.

The hurdle rate framework has evolved since the Bank's previous stress test.

As well as informing the appropriate size of regulatory capital buffers, the 2016 stress test also examines whether a bank currently has adequate capital resources. If it does not, it will be required to take action to strengthen its capital position over an appropriate time frame.

Performance in the test was assessed against the Bank's hurdle rate framework, comprising elements expressed both in terms of risk-weighted capital and leverage ratios. Importantly, the results of the test inform judgements by the FPC and PRA Board. There is no automatic link between the results and capital actions required.

The part of the hurdle rate framework relating to risk-weighted capital ratios has two elements.

First, a basic hurdle rate for common equity Tier 1 (CET1) capital relative to RWAs in the stress scenario that is equal to the sum of the internationally agreed common minimum standard (4.5%) and any uplift to that minimum capital requirement set by the PRA through Pillar 2A.

Pillar 2A is capital that must be held at all times and is intended to correct for risks that are not captured (or not adequately captured) in Pillar 1. As Pillar 2A varies across banks, so the CET1 risk-weighted hurdle rates also vary across banks. The inclusion of Pillar 2A in the Bank's hurdle rate framework represents an increase in the aggregate hurdle rate and an increase in transparency around the stress-test results. For stress participants in aggregate, the weighted average CET1 ratio hurdle rate was 6.5%.

The second element of the Bank's hurdle rate framework is a 'systemic reference point', the purpose of which is to hold banks of greater systemic importance to a higher standard. For banks designated as global systemically important banks (G-SIBs), this adds an additional buffer to the basic hurdle rate according to the phase-in path of each bank's G-SIB buffer, which has a 2019 end-point of 1%–2% of risk-weighted assets.⁽¹⁾ The systemic reference point is the sum of the hurdle rate and the phase-in path of a bank's G-SIB buffer. That means for some banks, the capital standard against which they are judged in the 2016 stress test is rising over time.

In practice, G-SIB capital buffers are able to be drawn on by banks to absorb the impact of a stress. Their inclusion in the systemic reference point does not change this. Rather, and reflecting the FPC and PRA Board's risk tolerance, it acts to reduce the probability that a systemically important bank would be unable to absorb a real stress given that its failure would have a higher impact than that of a non-systemically important bank.

As set out in the Bank's 'Key elements of the 2016 stress test' document, the PRA's response to a bank that is projected to fall below its hurdle rate in the stress is, therefore, likely to be more intensive relative to a bank that is projected to fall below its systemic reference point.

The Tier 1 leverage ratio hurdle rate continues to be 3% for all participating banks, as in the 2015 test. However, the Tier 1 leverage ratio systemic reference points vary across banks. G-SIB capital buffers for risk-weighted capital are scaled by 35% to convert into Tier 1 leverage ratio terms. For example, a bank with a CET1 ratio G-SIB buffer of 1% would have a Tier 1 leverage ratio systemic reference point of 3.35%. See **Table B** for individual banks' hurdle rates and systemic reference points.

Table B Hurdle rates and systemic reference points for the Bank's 2016 stress test^{(a)(b)(c)}

	Hurdle rate	Systemic reference point				
		2016	2017	2018	2019	2020
CET1 ratios						
Barclays	6.8	7.3	7.8	7.9	8.3	8.3
HSBC	6.1	6.7	7.3	7.6	8.1	8.1
Lloyds Banking Group	7.0	n.a.	n.a.	n.a.	n.a.	n.a.
Nationwide	8.1	n.a.	n.a.	n.a.	n.a.	n.a.
The Royal Bank of Scotland Group	6.6	7.0	7.1	7.4	7.6	7.6
Santander UK	7.3	n.a.	n.a.	n.a.	n.a.	n.a.
Standard Chartered	6.1	6.3	6.6	6.8	7.1	7.1
Aggregate	6.5	6.9	7.3	7.5	7.8	7.8
Tier 1 leverage ratios						
Barclays	3.0	3.2	3.4	3.4	3.5	3.5
HSBC	3.0	3.2	3.4	3.5	3.7	3.7
Lloyds Banking Group	3.0	n.a.	n.a.	n.a.	n.a.	n.a.
Nationwide	3.0	n.a.	n.a.	n.a.	n.a.	n.a.
The Royal Bank of Scotland Group	3.0	3.1	3.2	3.3	3.4	3.4
Santander UK	3.0	n.a.	n.a.	n.a.	n.a.	n.a.
Standard Chartered	3.0	3.1	3.2	3.3	3.4	3.4
Aggregate	3.0	3.1	3.3	3.3	3.4	3.4

Sources: Financial Stability Board, Bank analysis and calculations.

(a) The hurdle rate does not vary by year.

(b) The systemic reference points shown are consistent with the 2016 G-SIB list published by the Financial Stability Board on 21 November 2016. For more details see www.fsb.org/2016/11/fsb-publishes-2016-g-sib-list/.

(c) For the purposes of the calculation of the aggregate systemic reference point, where banks do not have a systemic reference point, their systemic reference point is assumed to be the same as their hurdle rate.

The PRA Board also considers other factors when deciding how to respond to stress-test results. Examples of factors that the PRA Board might take into consideration include, but are not limited to: the bank's Tier 1 and total capital ratios under stress taking into account their Pillar 1 plus Pillar 2A minima, the extent to which the bank had used up its capital conservation buffer in the stress, the adequacy and quality of its recovery and resolution plans; and the extent to which potentially significant risks are not quantified adequately or fully as part of the stress.

(1) The systemic reference points used in the 2016 stress test are consistent with the G-SIB buffers published by the Financial Stability Board (FSB) on 21 November 2016. For further information see www.fsb.org/2016/11/fsb-publishes-2016-g-sib-list/.

3 Projections of capital adequacy

This section outlines the Bank's final estimates of stress-test participants' capital ratios. Section 3.1 summarises projections under the baseline scenario, noting the important drivers. Section 3.2 sets out the headline impact of the stress. Section 3.3 describes the details underlying the headline impact of the stress. Section 3.4 describes the ways that banks are able to cushion the impact of the stress, including through 'strategic' management actions and conversion of AT1 capital instruments to CET1.⁽¹⁾

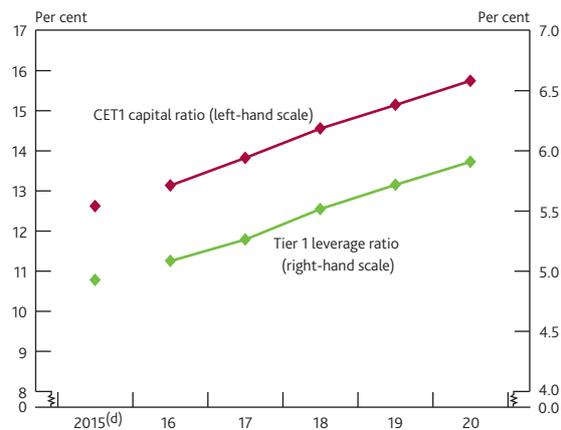
3.1 Baseline projections

The baseline projections in the Bank of England's stress test can be thought of as a representation of participating banks' business plans, conditional on the set of baseline scenario variables supplied by the Bank and in the absence of any additional misconduct costs beyond those already provided for at end-2015. This set of published baseline variables includes paths for domestic GDP growth, inflation, lending growth, and Bank Rate, which are broadly consistent with the Monetary Policy Committee's February 2016 *Inflation Report*. A range of international variables were also published consistent with the October 2015 IMF *World Economic Outlook (WEO)*.

In aggregate, UK banks have improved their capital positions over recent years through a combination of reducing RWAs and increasing capital. As a result, the aggregate CET1 capital ratio for stress-test participants had increased to 12.6% at the end of 2015. That is well above the aggregate CET1 ratio of the major UK banks in the run-up to the financial crisis, which was around 4%–4.5% based on Bank staff estimates. That said, although banks have already made material adjustments to their businesses, some banks remain in the process of restructuring their balance sheets following the crisis, and this is reflected in their baseline projections. Meanwhile, as the final elements of the Basel III capital standards are phased in between 2016 and 2019, CRD IV capital buffers such as the G-SIB buffer will continue to increase, as reflected in the evolution of individual banks' systemic reference points in the 2016 stress-test hurdle rate framework (see Section 2 for more details).

Under the baseline scenario — which incorporates no macroeconomic stress or additional misconduct costs beyond those already paid or provided for at end-2015 — in aggregate, stress-test participants are projected to continue on a path towards improved capital positions (Chart 2). The aggregate CET1 ratio increases by 3.1 percentage points from 12.6% at the end of 2015 to 15.7% by 2020. Over the same period the aggregate leverage ratio of the system is projected to rise from 4.9% to 5.9% in the baseline projection. The most important expected contributor to this gradual further

Chart 2 Aggregate CET1 capital ratio projections in the baseline^{(a)(b)(c)}



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

- (a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.
 (b) The Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure, as defined in the PRA Rulebook when the stress test was launched in March 2016. For more details, see footnote (1), page 7.
 (c) Banks' baseline projections do not include misconduct costs beyond those already paid or provisioned at end-2015.
 (d) Data for end-2015 are actual data submitted by banks.

improvement in banks' capital positions over the coming years is retained earnings.

Although some banks continue to reduce RWAs over the early years of the projection as they implement their corporate plans, aggregate RWAs are projected to increase by around 7% between end-2015 and 2020 in the baseline.

In line with the expectation set out by the Bank when the stress test was launched in March 2016, all banks had projected CET1 capital ratios exceeding their individual hurdle rates in their baseline, and Tier 1 leverage ratios which exceed 3%. All banks remain above their CET1 capital and Tier 1 leverage ratio hurdle rates and systemic reference points in their baseline.⁽²⁾

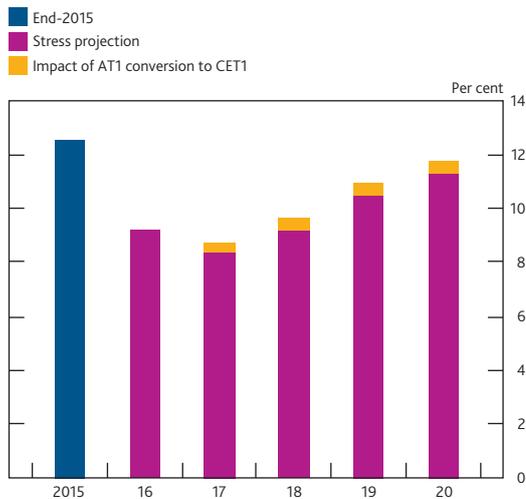
3.2 Headline impact of stress

Banks' risk-weighted CET1 capital ratios are severely affected by the stress...

Under the 2016 stress scenario, banks' aggregate risk-weighted CET1 capital ratio is projected to deteriorate significantly. Before the conversion of AT1 instruments to CET1 capital, its low point is 8.4% (Chart 3). This 4.2 percentage point decrease from a start point of 12.6% at end-2015 is driven, primarily, by a fall in the aggregate amount of CET1 capital under the stress scenario. Pre-tax losses total £44 billion in aggregate over the first two years of the stress, which is around five times more than the banks lost in aggregate during and following the financial crisis, in 2008 and 2009 (Chart 4).

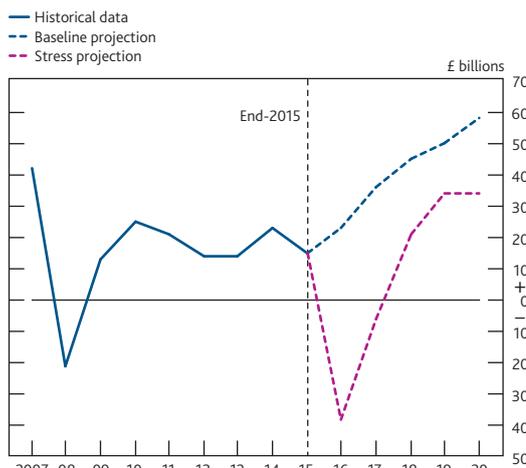
(1) Unless otherwise stated, all figures and charts in this section are presented on a post 'strategic' management actions basis, including actions related to CRD IV restrictions.

(2) For further details of the hurdle rate framework see Section 2.

Chart 3 Aggregate CET1 capital ratio projections in the stress^(a)

Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook. Projections include the impact of 'strategic' management actions.

Chart 4 Projections for aggregate profits before tax^(a)

Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) For HSBC and Standard Chartered, annual profits are converted from US dollars to sterling using exchange rates consistent with the scenarios.

Relative to projected pre-tax profits in the baseline, cumulative profits are down by just over £100 billion by the end-2017 low point of the stress. The overall impact of the stress over this period reduces the aggregate CET1 capital ratio by 5.0 percentage points and leverage ratio by 1.4 percentage points relative to baseline, reflecting a range of factors (Table C), including:

- A domestic and global downturn combined with a sharp fall in asset prices, which reduce borrowers' ability to service debts and diminish the value of collateral held against loans. This contributes to material loan impairment charges amounting to £63 billion over the first two years of the stress, £46 billion higher than projected in the baseline and reducing the aggregate CET1 ratio by 2.4 percentage points.

Table C Contributions to the shortfall in the aggregate CET1 capital ratio and Tier 1 leverage ratio at the low point of the stress in 2017 relative to the baseline projection

	CET1 ratio ^(a)	Leverage ratio ^(b)
Actual end-2015	12.6%	4.9%
Baseline end-2017	13.8%	5.3%
Impairments	-2.4 pp	-0.9 pp
Traded risk losses ^(c)	-1.0 pp	-0.4 pp
Net interest income	-0.2 pp	-0.1 pp
Misconduct costs	-1.6 pp	-0.6 pp
Risk-weighted assets/leverage exposure measure ^(d)	-1.6 pp	0.3 pp
Ordinary dividends	0.8 pp	0.3 pp
Expenses and taxes	1.1 pp	0.4 pp
Other ^(e)	-0.4 pp	-0.4 pp
Impact of AT1 conversion to CET1	0.4 pp	0.0 pp
Stress end-2017	8.8%	3.9%

Sources: Participating banks' published accounts and Firm Data Submission Framework (FDSF) data submissions, Bank analysis and calculations.

- (a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are defined in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.
- (b) The Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure, as defined in the PRA Rulebook when the stress test was launched in March 2016. For more details, see footnote (1), page 7.
- (c) Traded risk losses comprise: market risk, counterparty credit risk, credit valuation adjustment, prudential valuation adjustment, and gains/losses from available-for-sale and fair value option positions, excluding securitisation positions. This also includes investment banking revenues net of costs.
- (d) Changes in risk-weighted assets impact the CET1 ratio, whereas changes in the leverage exposure measure impact the Tier 1 leverage ratio.
- (e) Other comprises other profit and loss and other capital movements. Other profit and loss includes share of profit/loss of investments in associates, fees and commissions, and other income. Other capital movements include impacts from exchange rate movements, pension assets devaluation, deferred tax assets, prudential filters, accumulated other comprehensive income, IRB shortfall of credit risk adjustments to expected losses, and actuarial gain from defined benefits. Distributions on AT1 instruments and preference shares are included in this line.

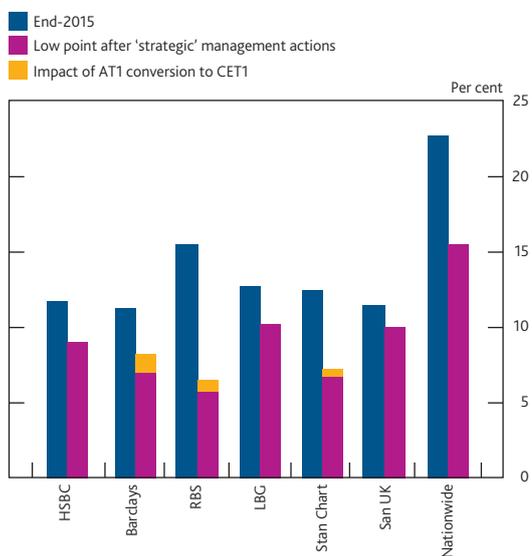
- Sharp movements in market prices and increased counterparty credit risk, which lead to material traded risk losses. These losses are concentrated in 2016, before partially unwinding as asset prices recover. By the end-2017 low point, the traded risk stress, including a shortfall of investment banking revenue net of costs, reduces bank capital by £20 billion relative to the baseline projection, reducing the aggregate CET1 ratio by 1.0 percentage point.
- A slightly weaker net interest income profile, which is around £3.5 billion lower in the stress relative to banks' aggregate baseline projection over the first two years of the stress, reducing the aggregate CET1 ratio by 0.2 percentage points. This reflects lower loan growth in response to weaker demand for credit, as well as tighter spreads between sterling loans and deposits. These tighter spreads are in part related to the fact that Bank Rate is cut to zero in the stress and, in contrast to the package of monetary policy measures launched in August 2016, no Term Funding Scheme was assumed in the stress scenario.
- Stressed projections for misconduct costs beyond those already provided for at the end of 2015. Around £30 billion of these additional misconduct costs are projected to be realised by the end of 2017, reducing the aggregate CET1 ratio by 1.6 percentage points. This compares to an aggregate of around £40 billion paid and another £18 billion provided for by banks, but not yet used, over the period 2011–15.

The headline stress-test results include projected reductions in banks' ordinary dividend payments to shareholders relative to the baseline. These reductions partially offset the impact of the stress scenario on banks' capital adequacy (Table C). For further information on dividends and other 'strategic' management actions see Section 3.3. Lower taxes as a result of lower profitability and reductions in expenses also boost banks' capital in the stress relative to the baseline.

In addition to the reduction in banks' aggregate CET1 capital projected in the stress, their aggregate CET1 ratio is also depressed by a 16% rise in aggregate risk-weighted assets between end-2015 and end-2017. Although banks' total exposures fall by around 3% in the stress over this period, the average risk weight on these exposures increases by around 20%. This rise in risk weights is driven both by the increase in credit risk in the macroeconomic stress scenario, and the increase in counterparty credit risk incorporated in the traded risk stress.

The impact of the scenario differs substantially across banks (Charts 5 and 6). In part this is due to differences between banks' business models, the types of risks they are most exposed to, and in some cases the extent of their progress through restructuring programmes.

Chart 5 End-2015 and low-point CET1 capital ratios in the stress^{(a)(b)(c)}

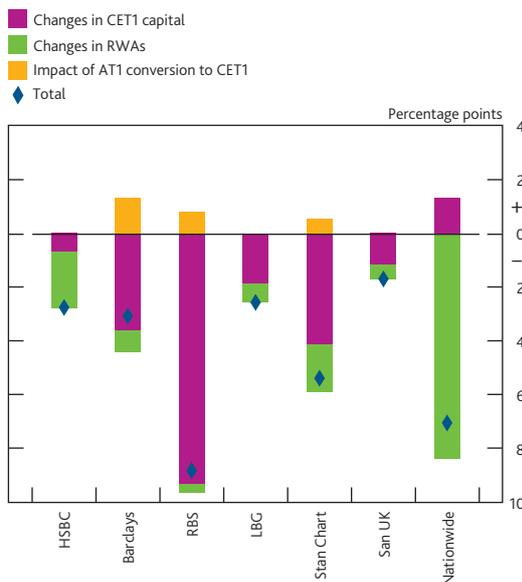


Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

- (a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook. Projections include the impact of 'strategic' management actions.
- (b) The year of the low point differs across banks.
- (c) HSBC and Standard Chartered projections have been converted from US dollars to sterling using exchange rates consistent with the stress scenario.

In general, the stress has the greatest impact on those banks with significant international and corporate exposures. The three banks operating principally in domestic markets (Chart 7) — Lloyds Banking Group, Nationwide and Santander UK — remain well above their hurdle rates

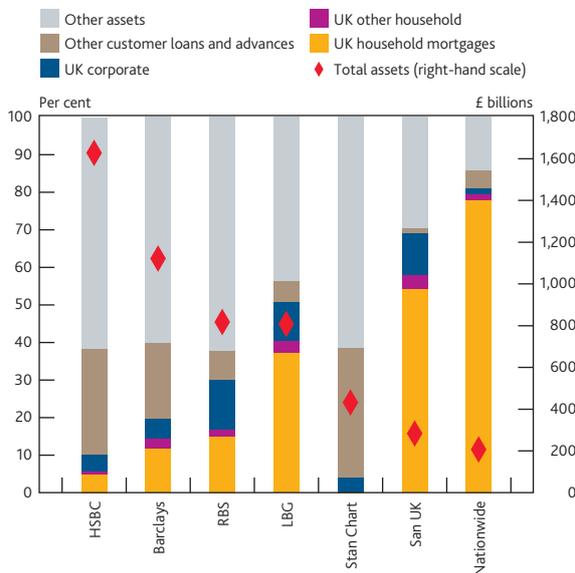
Chart 6 Contributions to the change in CET1 capital ratios at the low point of the stress relative to end-2015^{(a)(b)(c)}



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

- (a) Changes are calculated from end-2015 to the lowest point in the stress, after the impact of 'strategic' management actions. The low-point year may vary between banks.
- (b) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.
- (c) HSBC and Standard Chartered projections have been converted from US dollars to sterling using exchange rates consistent with the stress scenario.

Chart 7 End-2015 balance sheet composition and total assets for participating banks^{(a)(b)(c)(d)}



Sources: Participating banks' data submissions, Bank analysis and calculations.

- (a) UK exposures are net of impairments.
- (b) The method for determining geography of exposures may differ across participating banks.
- (c) HSBC and Standard Chartered total assets have been converted to sterling using end-2015 exchange rates.
- (d) Definitions used in this chart may not match those used in banks' FDSF submissions.

throughout the stress. To some extent this reflects the fact that the asset quality associated with banks' domestic mortgage books has improved. That improvement has come about through a combination of rising property prices, which has bolstered the value of collateral backing loans, alongside a

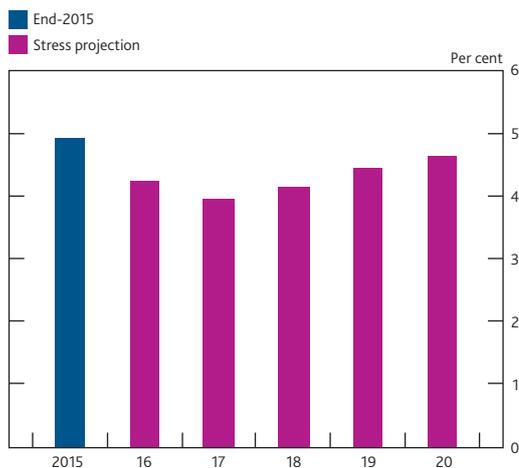
more prudent approach to mortgage lending in recent years (for further details see Box 1).

For most banks, the fall in CET1 ratios under the stress is largely driven by depletion of CET1 capital (Chart 6). The exception is Nationwide, where the driver of the deterioration in the CET1 ratio over the stress horizon is the increase of the RWAs calculated by the firm’s internal models for retail secured portfolios, which comprise the majority of Nationwide’s credit risk exposures. See Annex 1 for further details.

...as are banks’ Tier 1 leverage ratios.

Under the 2016 stress scenario, the aggregate Tier 1 leverage ratio is projected to deteriorate significantly, with the low point in 2017 (Chart 8). The decrease in the aggregate leverage ratio, which falls by 1.0 percentage point from 4.9% at end-2015 to 3.9% at end-2017, is driven by a fall in the aggregate amount of Tier 1 capital under the stress scenario.⁽¹⁾

Chart 8 Aggregate Tier 1 leverage ratio projections in the stress^(a)



Sources: Participating banks’ FDSF data submissions, Bank analysis and calculations.

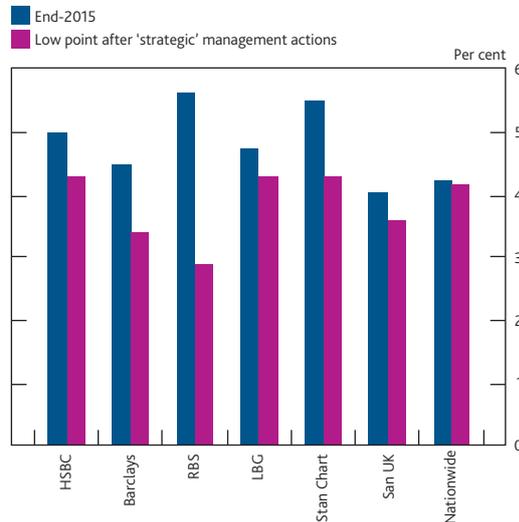
(a) The Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure, as defined in the PRA Rulebook when the stress test was launched in March 2016. For more details, see footnote (1), page 7. Projections include the impact of ‘strategic’ management actions.

At the low point of the stress in 2017, banks’ aggregate leverage exposure measure is around 6% lower than in the baseline reflecting weaker lending, boosting the aggregate Tier 1 leverage ratio (Table C). That is partially offset by differences between banks’ Tier 1 capital issuance assumptions in the baseline and the stress. To the low point, the lack of AT1 issuance in the stress reduces the aggregate Tier 1 leverage ratio by 0.2 percentage points relative to the baseline.

The projected impact of the stress on Tier 1 leverage ratios across individual banks largely reflects the factors affecting bank capital described above, with the banks operating

principally in domestic markets least impacted by the stress (Chart 9). Relative to the impact of reductions in capital, the impact of changes in the leverage exposure measure are small for most banks (Chart 10). This is not the case, however, for

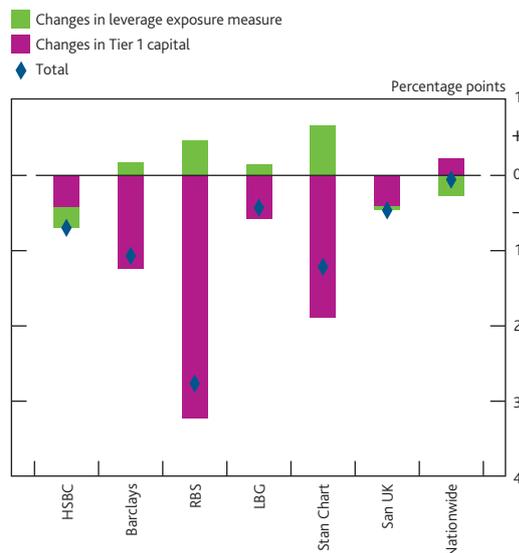
Chart 9 End-2015 and low-point Tier 1 leverage ratios in the stress^{(a)(b)}



Sources: Participating banks’ FDSF data submissions, Bank analysis and calculations.

(a) The Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure, as defined in the PRA Rulebook when the stress test was launched in March 2016. For more details, see footnote (1), page 7. Projections include the impact of ‘strategic’ management actions.
 (b) The year of the low point differs across banks.

Chart 10 Contributions to the change in Tier 1 leverage ratios in the stress relative to end-2015^{(a)(b)}



Sources: Participating banks’ FDSF data submissions, Bank analysis and calculations.

(a) Changes are calculated from end-2015 to the lowest point in the stress, after the impact of ‘strategic’ management actions. The year of the low point differs across banks.
 (b) The Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure, as defined in the PRA Rulebook when the stress test was launched in March 2016. For more details, see footnote (1), page 7.

(1) As both CET1 and AT1 capital count towards banks’ Tier 1 leverage ratios, the conversion of AT1 to CET1 for some banks in the stress does not impact their leverage ratios.

Standard Chartered and RBS, which both reduce their exposures more materially. For RBS, this largely reflects ongoing planned asset sales, in part relating to an initiative to reduce the bank's investment banking activities. For Standard Chartered, a global bank with relatively few UK exposures, this reduction is a projected reaction to the stress, partly reflecting an acceleration in the bank's efforts to remove certain less well performing assets from its balance sheet.

3.3 Details underlying the headline impact of the stress

Domestic and global contractions in output combined with falls in asset prices lead to significant credit impairments.

The stress scenario is designed to explore the vulnerability of UK banks to a stress with severe adverse impacts on domestic and global economic activity and asset prices. Increased credit risk is an important channel through which the stress impacts banks' capital positions, with borrowers less able to repay debt and the collateral against which some loans are secured reduced in value.

One manifestation of increased credit risk is higher impairment charges borne by lenders, as defaulted loans are translated into losses after taking account of any collateral. In total, banks incur just over £100 billion of impairment charges over the five years of the stress on their corporate and retail lending, more than 60% of which are realised over the first two years of the stress (see Box 1 for a detailed discussion of UK credit impairments).

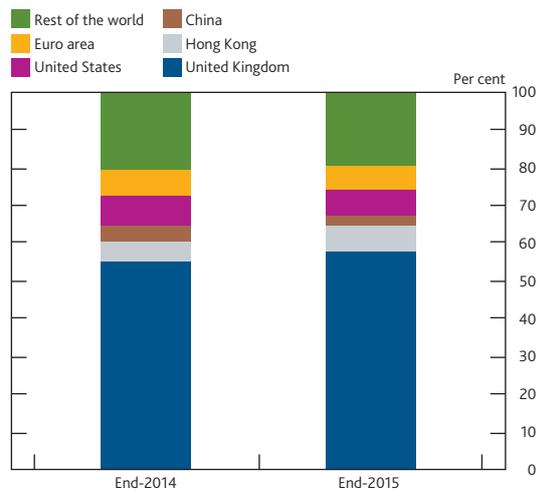
Non-UK lending accounts for around half of impairments.

Just under half of stress participants' credit exposures are outside the United Kingdom (Chart 11). So factors reducing the ability of non-UK borrowers to repay debt, and falls in non-UK asset prices have a large impact on overall impairments. Around 50% of total projected impairments in the stress relate to non-UK exposures. And of those overseas impairments, just over half relate to lending to the corporate sector.

UK banks' non-UK operations vary enormously in scale and focus. Outside China and Hong Kong, where HSBC and Standard Chartered's exposures are significant, banks' overseas exposures are geographically diverse, with individual banks' operations often concentrated in particular sectors. Stress-test participants reduced their overseas exposures somewhat during 2015, with non-UK credit exposures falling as a proportion of total lending from 45% to 42%.⁽¹⁾

A notable driver of the reduction of non-UK assets in the 2016 stress test relative to the 2015 exercise was RBS's divestment of its Citizens operations in the United States in October 2015. The three largest areas of non-UK exposure for UK banks remain the United States, euro area, and China and Hong Kong.

Chart 11 Geographical composition of participating banks' credit exposures^{(a)(b)}



Sources: Participating banks' FDSF data submissions and Bank calculations.

- (a) Geographical exposures are based on drawn balances allocated by residence of ultimate counterparty. The chart data assumes that all of Nationwide's exposures are to UK residents.
- (b) Total includes derivatives, equity instruments, debt securities and loans and advances. Other assets are not reported with a geographical split, therefore are not included.

Aggregate non-UK corporate impairments are most heavily concentrated in Hong Kong and China. In part, that reflects the severity of the stress scenario for those economies, with Chinese GDP contracting slightly after an abrupt halt to previously strong growth, and output contracting by 7% in Hong Kong, accompanied by a 60% drop in CRE prices. In Hong Kong the stress for borrowers is also compounded by a rise in lending rates.

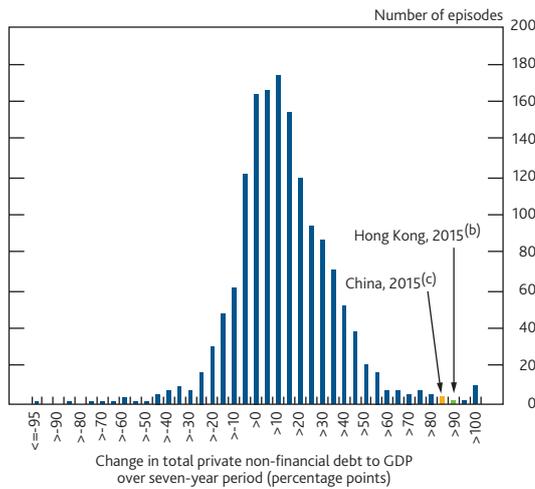
Rapid credit growth in Hong Kong and China over recent years accompanied by steep increases in property prices was a key factor in the FPC and PRA Board's judgement that risks in Hong Kong and China were elevated (Chart 12). The scale and speed of recent credit growth and the slowing of GDP growth in the stress, both unprecedented in recent history, limit the usefulness of comparisons with banks' impairments during previous episodes of stress. This was a particular focus for Bank staff in their analysis of the results of the 2015 test.⁽²⁾ Analysis of the 2016 stress-test results has built on this work.

Overall Hong Kong and China cumulative corporate impairment rates are projected to be 6.5% over the five-year stress; around five times the rate in the baseline (Chart 13). That would mean corporate impairments increasing further

(1) This 42% figure for end-2015 assets includes HSBC's Brazilian operation, which the bank sold in July 2016. HSBC's sale of its Brazilian operations was agreed in August 2015 and completed in July 2016. In exceptional cases, the Bank's guidance for participating banks allows the exclusion of assets where a binding sales process has been agreed before the balance sheet cut-off date at the start of the stress test. The Bank judged that the sale of HSBC Brazil met these criteria. As a result the impact of the scenario on HSBC is included for 2016 H1, but not for subsequent periods. For further details see Bank of England (2016), 'Stress testing the UK banking system: 2016 guidance for participating banks and building societies'; www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/guidance.pdf.

(2) See Box 1 in 'Stress testing the UK banking system: 2015 results'; www.bankofengland.co.uk/financialstability/Documents/fpc/results011215.pdf.

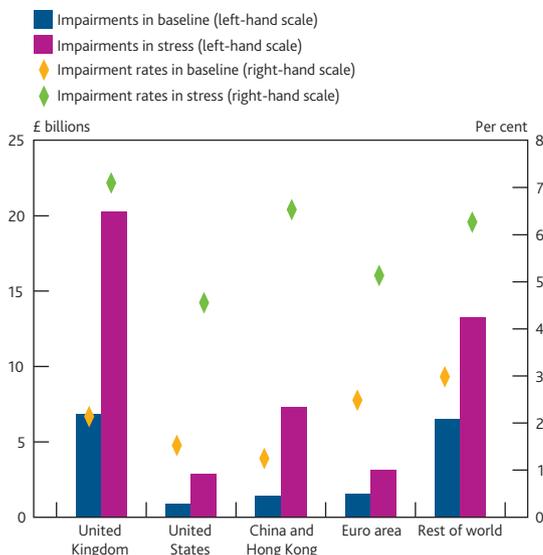
Chart 12 Distribution of historical seven-year changes in private non-financial debt to GDP ratios^(a)



Sources: BIS and Bank calculations.

- (a) Private non-financial debt to GDP taken from BIS 'Long series on total credit and domestic bank credit to the private non financial sector' data set, available at www.bis.org/statistics/totcredit/credpriv_doc.pdf.
- (b) Hong Kong's increase in private non-financial debt to GDP over the past seven years (94 percentage points) places its credit expansion in the top 99th percentile of historical episodes.
- (c) China's increase in private non-financial debt to GDP over the past seven years (90 percentage points) places its credit expansion in the top 99th percentile of historical episodes.

Chart 13 Aggregate cumulative impairment charges on lending to businesses (including commercial real estate) over the five years of the stress^{(a)(b)(c)}



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

- (a) Cumulative impairment charge rates = (five-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017, 2018, 2019 year-end positions. This calculation may result in a lower impairment rate for those banks that expand balances significantly in the later years of the scenario as the economy recovers.
- (b) Data exclude material associates.
- (c) The rest of world impairments and impairment rates shown in this chart do not include HSBC Brazil.

than during the 2007–08 financial crisis or during the 1997–98 Asian crisis. In reaching this judgement Bank staff took into account the higher leverage of corporates relative to that seen in previous episodes of stress, the associated higher debt burden, and the extent of some UK banks' direct and indirect exposures to the Hong Kong and Chinese CRE markets.

Outside Hong Kong and China, there are marked differences across stress-test participants' activities, although there has been a general trend towards banks reducing the riskiness of their businesses. Overall, stressed corporate impairment rates in the United States and euro area are lower than in Hong Kong and China, particularly in relation to baseline projections.

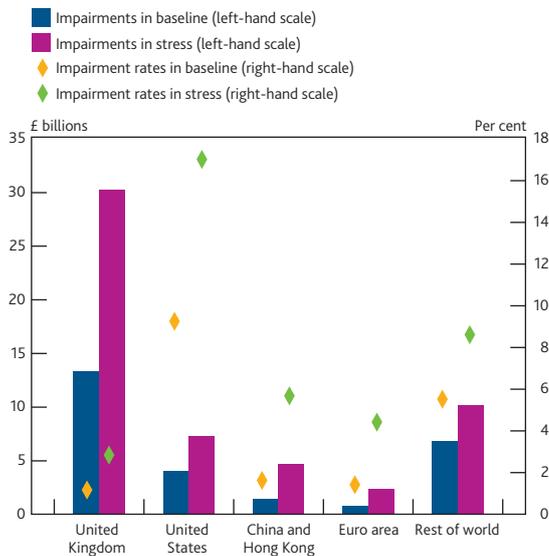
In total, corporate impairments relating to China, Hong Kong, US and euro-area lending account for around half of all non-UK corporate impairments. The other half — worth just over £13 billion — are spread across a large number of economies, reflecting the global nature of the downturn specified in the 2016 stress test, and the wide geographic reach of UK banks' exposures. The largest impairments in this rest of the world group occur on South African, Canadian and UAE exposures, accounting for £4 billion between them.

Banks incurred some material impairment charges on their commodity sector exposures in 2015, as commodity prices remained low following steep falls at the end of 2014. As part of the stress to banks' corporate lending books, the 2016 stress test incorporates a further fall in commodity prices, in which oil troughs at US\$20 a barrel and averages less than US\$40 for the first three years of the stress. While lower energy prices may benefit consumers and businesses outside the commodities sector, impairment charges related to banks' direct exposures to that sector are projected to sum to more than £7 billion or 15% of total corporate impairments over the five-year horizon of the test.

Impairment charges on non-UK lending to individuals are most concentrated in the United States (**Chart 14**). UK banks' operations in the United States are focused in the credit card and mortgage markets, with a material portion of outstanding mortgage assets relating to sub-prime loans made prior to the financial crisis. The relatively risky nature of this lending means that UK banks' US impairments on lending to individuals are relatively high, even in the baseline scenario. In the stress scenario, the five-year impairment rate is projected to be 17%, compared to 9% in the baseline.

By contrast, impairment rates on lending to individuals in Hong Kong and China remain relatively low throughout the stress. UK banks' aggregate lending volumes to individuals in Hong Kong and China are substantially higher than in the United States but, reflecting conservative rules and practices around household borrowing, this lending is heavily weighted towards mortgages with low loan to value ratios. This means that borrower defaults are less likely to result in losses. However the pace of recent credit growth means that these projections are more uncertain than those relating to more mature markets. Bank staff took this uncertainty into account when assessing the projections provided by banks, adopting a conservative approach.

Chart 14 Aggregate cumulative five-year impairment charges on lending to individuals over the five years of the stress^(a)(b)(c)



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) Cumulative impairment charge rates = (five-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017, 2018, 2019 year-end positions. This calculation may result in a lower impairment rate for those banks that expand balances significantly in the later years of the scenario as the economy recovers.

(b) Data exclude material associates.

(c) The rest of world impairments and impairment rates shown in this chart do not include HSBC Brazil.

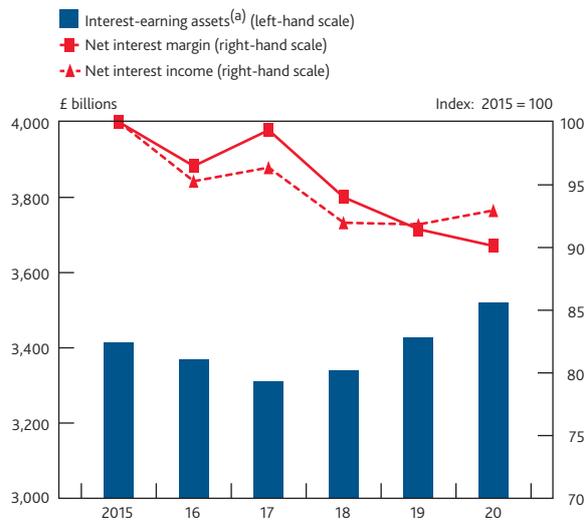
Net interest income is only a little depressed to the low point of the stress relative to the baseline.

Net interest income is the main source of income for all banks participating in the 2016 stress test. In 2015, it accounted for just under 60% of aggregate revenues, although its importance varied according to individual banks' business models. In aggregate, net interest income sums to around £310 billion over the five years of the stress scenario, equivalent to around 16% of RWAs at the end of 2015. Over the five years of the stress there is almost a £40 billion shortfall in net interest income relative to the baseline projection. But to the low point of the stress in 2017, this shortfall is just £3.5 billion, equivalent to 0.2% of starting-point RWAs.

The key factor weighing on net interest income in the 2016 stress is the reduction in lending volumes relative to the baseline. Across all currencies, the stock of interest-earning assets falls by 3% between the start of the stress and the low point in 2017 (**Chart 15**).

Lending to the domestic real economy grows by 4.75% in total over the five years of the stress, whereas in the baseline scenario it grows by more than 25% (**Chart 16**). In the United Kingdom, the projected volume of lending to the real economy reflects the demand for credit, which contracts sharply with output at the start of the stress. In line with the guidance provided to stress-test participants, banks maintain the supply of credit to the real economy in the stress. That

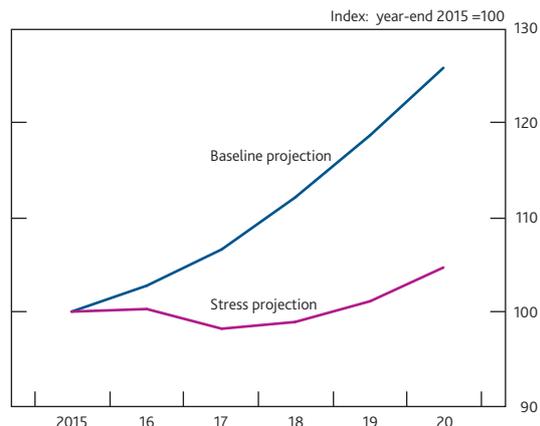
Chart 15 Net interest income and net interest margins in the stress scenario



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) Average interest-earning assets in all currencies, converted to sterling using exchange rates consistent with the stress scenario.

Chart 16 Projected lending to UK individuals and PNFs by stress-test participants

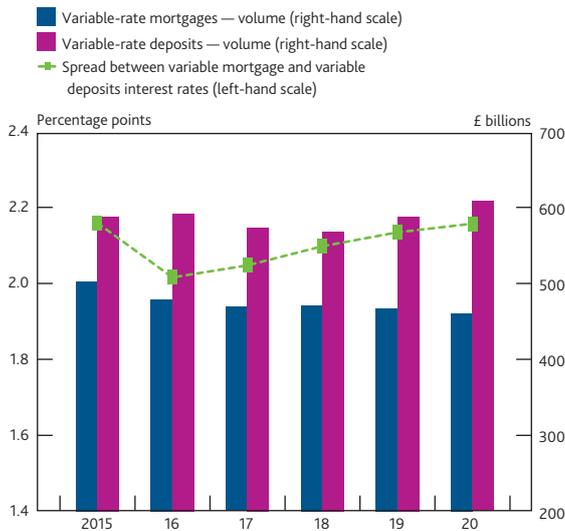


Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

reflects an important macroprudential goal of stress testing to help assess whether the banking system is sufficiently capitalised to maintain the supply of credit in the face of adverse shocks.

Net interest margins, defined as the spread between the weighted average of interest rates banks receive on their assets and pay on their liabilities, are also projected to be compressed in the stress relative to the baseline. A large part of that squeeze relates to the stock of variable-rate sterling deposits and loans banks have on their balance sheets, some of which are explicitly linked to Bank Rate. When Bank Rate is cut to zero in the stress, on average, the variable sterling deposit rates that banks pay are projected to fall by less than the variable sterling loan rates they receive. That reflects the more limited scope banks have to cut deposit rates when the starting point for these rates is close to zero (**Chart 17**).

Chart 17 UK variable-rate household deposits and mortgages in the stress^{(a)(b)(c)(d)}



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

- (a) Sterling loans and deposits only.
 (b) Variable mortgages include standard variable rate and tracker.
 (c) Deposits include interest-bearing current accounts and overnight deposits for households only.
 (d) Spread is the spread between the average projected mortgage rate and average projected deposit rate.

This projected squeeze in sterling net interest margins takes account of Bank staff analysis of the impact of the MPC's 25 basis point cut in Bank Rate in August 2016. The stress projection does not factor in the impact of the Bank's Term Funding Scheme,⁽¹⁾ which is estimated to have boosted margins; and the behaviour of interest rates in the stress scenario is also different to that observed in August, as Bank Rate is cut by 50 basis points in the stress. After taking into account those known differences, the projected squeeze in sterling net interest margins is consistent with recent outcomes.

Individual banks expect to pursue a variety of pricing strategies. But in aggregate, the spread between banks' sterling variable loan and deposit rates is projected to fall by 11 basis points between the start and low point of the stress in 2017.

The squeeze on banks' sterling lending and deposit margins, is mitigated to some extent, however, by two factors:

- Non-sterling interest margins are boosted by a projected rise in Hong Kong interbank offered rate (Hibor) — a key reference rate in Hong Kong lending and deposit markets. This rise comes about as the Hong Kong authorities are assumed to protect the US dollar/Hong Kong dollar currency peg when it comes under pressure in the stress. Banks operating in these markets pass on more of the rise in Hibor into their loan rates than they do into their deposit rates in aggregate, boosting net interest margins.

- Liquidity rules permit banks to run down their liquid asset buffers in a stress. Having built up their liquidity coverage ratios over recent years to above 100%, some banks allow these liquidity buffers to fall, removing safe but low-yielding assets from their balance sheets.⁽²⁾ This improves their interest margins because their average funding costs are higher than the interest rates on these lower-yielding assets.

Traded risk losses reduce banks' projected capital positions.

The traded risk element of the 2016 stress test reduces banks' aggregate CET1 ratio by 1.0 percentage point by the low point of the stress in 2017, relative to the baseline. With the exception of securitisation and covered bonds, the traded risk methodology covered all fair value assets, including some not classified as regulatory trading book assets, such as bonds forming part of banks' liquid asset buffers. The traded risk element of the scenario included a test of banks' ability to withstand the default of several large counterparties, as well as covering banks' investment banking revenues and costs projected over the five years of the test. (For a more detailed summary of the traded risk methodology see Box 3 in 'Stress testing the UK banking system: 2015 results'.)

The traded risk stress scenario was designed to be congruent with the macroeconomic shocks incorporated in the 2016 stress test. It involved sharp movements in several market prices, including interest rates, exchange rates, volatility measures, credit spreads and equity indices, with many of these shocks resembling the market movements observed during the latter part of 2008.⁽³⁾

Due to the design of the traded risk stress scenario, under which changes in market prices happened rapidly at the outset, losses relating to most aspects of the traded risk stress are concentrated in 2016. Excluding investment banking revenues and costs, aggregate traded risk losses were around £19 billion in the first year of the stress (Chart 18).

Banks are continuing to run low levels of trading book market risk as compared to before the financial crisis. Traded risk losses in the stress are predominantly driven by losses made on available-for-sale (AFS) and fair value option (FVO) portfolios, as well as losses related to derivative counterparty default risk, and credit valuation adjustments (CVA) (Chart 19).

- (1) Launched in August 2016, the Term Funding Scheme is designed to reinforce the transmission of Bank Rate cuts to those interest rates actually faced by households and businesses by providing term funding to banks at rates close to Bank Rate. For more details see www.bankofengland.co.uk/markets/Pages/apf/termfunding/default.aspx.
- (2) See www.bankofengland.co.uk/prd/Documents/publications/ps/2015/ps1115.pdf. The PRA set the liquidity coverage ratio at 80% when it was introduced on 1 October 2015. This requirement will apply until the end of 2016 and then rise to 90% on 1 January 2017. It will reach 100% on 1 January 2018, as required by the CRR.
- (3) For further details see 'Traded risk scenario for the 2016 stress test'; www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/tradedrisk2016.xlsx.

Box 1 The impact of the 2016 stress on lending to UK households and businesses

The 2016 scenario includes a severe UK recession designed to test the resilience of banks' lending to UK households and businesses. Overall, the UK stress is roughly equivalent to that experienced during the financial crisis. For example, the UK unemployment rate rises by 4.5 percentage points to 9.5% in the stress, whereas unemployment remained below 8% in 2008 and 2009. Residential property prices fall by 31% in the stress as compared to 19% in the crisis. On other metrics, the financial crisis represented a bigger shock than that incorporated in the stress scenario. For example, GDP contracted by more than 6% in the 2008–09 recession, which is considerably larger than the 4.3% contraction in the stress scenario.

This box explains the impact of the UK stress on banks' projected credit losses, using the losses incurred by banks during and following the financial crisis as a comparator. It also describes the impact of the stress on the risk weights associated with banks' UK exposures. This risk-weight impact also helps determine how far banks' CET1 ratios fall in the stress.

Overall, banks are projected to incur just over £50 billion of UK impairment charges over the five years of the stress (Chart A), with an average five-year impairment rate of 3.7%.

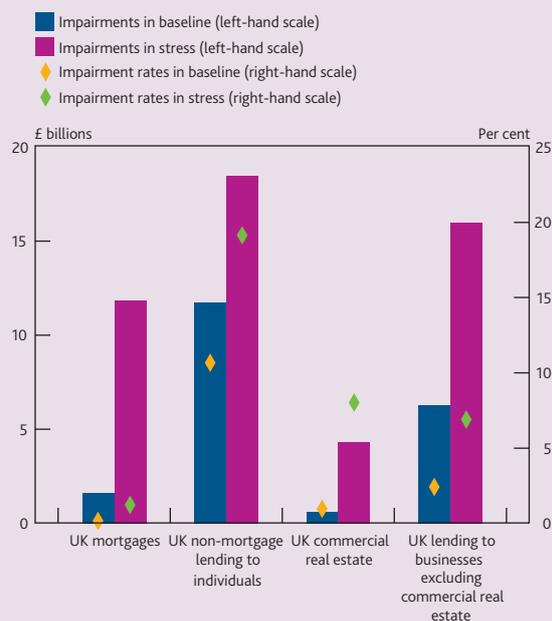
The impact of the stress on banks' lending to UK households

The primary cause of the sharp projected rise in defaults by UK household borrowers on credit cards and other unsecured borrowing is the rise in unemployment. The aggregate impairment rate for unsecured lending exceeds 19% over the five years of the stress, on portfolios worth just over £95 billion. This impairment rate is broadly consistent with the period following the financial crisis.

Differences between unsecured impairment projections across banks are marked and reflect differences in business models (Chart B). The stress-test projections are in line with Bank staff judgements about the relative quality of banks' unsecured retail loan books.

Banks are projected to incur UK mortgage impairments worth around £12 billion over the five years of the stress, with a cumulative impairment rate of 1.2%. This is somewhat higher than the mortgage impairments realised by banks in the years following the financial crisis, reflecting the severity of the 2016 stress scenario (Chart C). In absolute terms, however, UK mortgage impairment rates are projected to remain relatively

Chart A Aggregate cumulative UK impairment charges over the five years of the stress^(a)



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

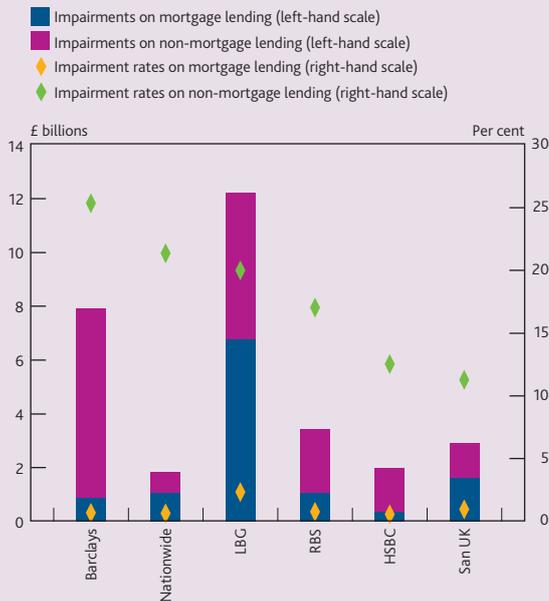
(a) Cumulative impairment charge rates = (five-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017, 2018, 2019 year-end positions.

low. Reasons for this include the value of collateral backing these loans, which limits losses in the event of default, and the fact that, in general, UK mortgage interest rates do not rise materially in the stress, which helps to limit the number of households projected to default on their mortgages. The low level of Bank Rate in the stress is one of the factors helping keep average mortgage rates low.

The asset quality of participating banks' UK mortgage books has improved markedly since the 2007–08 financial crisis. A large part of this improvement in asset quality is related to a rise in residential property prices of around 30% since their post-crisis trough, which has boosted collateral values on outstanding loans. Alongside that improvement, banks have adopted more prudent lending practices, including reducing the proportion of lending at high loan to value (LTV) ratios, better affordability testing and other improvements in loan characteristics. In 2007, the proportion of new mortgages extended at LTV ratios at or above 90% was around 30%. Since 2014, that proportion has averaged just above 18%, having risen from much lower levels in the years immediately following the financial crisis.

As a result of trends in lending practices combined with changes in house prices, the proportion of outstanding mortgages with LTVs above 70% has fallen to around a quarter — well below the 35% share observed in 2007 (Chart D). The proportion of outstanding mortgages with high LTVs has also fallen materially since the 2014 stress test,

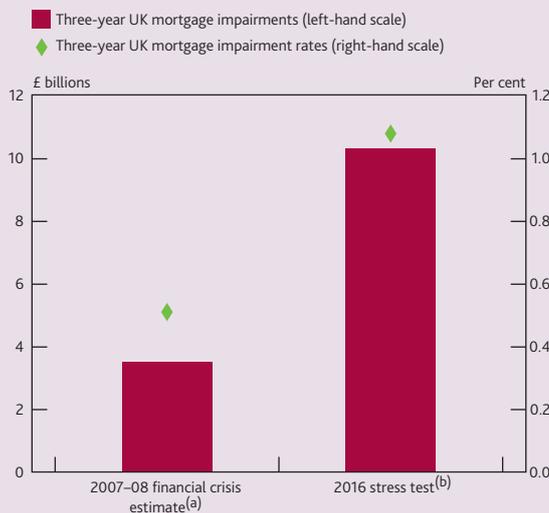
Chart B Cumulative five-year impairment charges on lending to UK individuals over the five years of the stress^{(a)(b)}



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

- (a) Cumulative impairment charge rates = (five-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017, 2018 and 2019 year-end positions. The HSBC impairment charges and impairment charge rates are calculated by first converting each component to sterling using exchange rates consistent with the stress scenario.
- (b) Standard Chartered is excluded as it has minimal exposures from UK lending to individuals.

Chart C UK mortgage impairment charges in the 2016 stress test and 2007–08 financial crisis

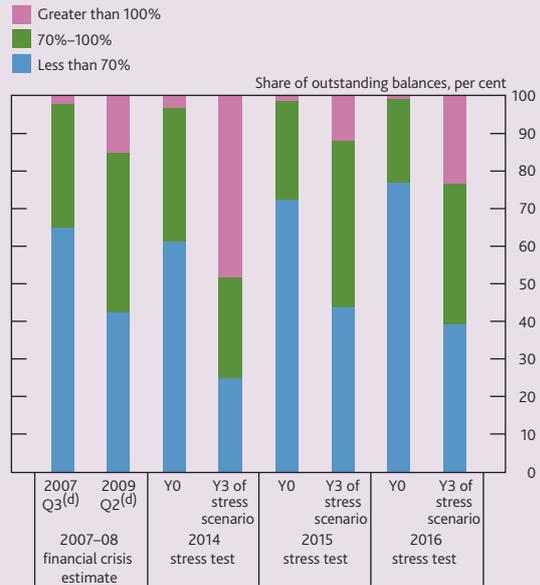


Sources: Bank of England, banks' FDSF data submissions, Bank analysis and calculations.

- (a) Impairment charges for the period following the 2007–08 financial crisis are estimated by Bank staff based on available reported write-offs data.
- (b) Cumulative impairment charge rates = (three-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017 year-end positions.

which helps to account for the lower level of UK mortgage losses in the 2016 test than projected in the Bank's 2014 test. Consistent with this improvement in asset quality, mortgage arrears have also fallen from their crisis peaks.

Chart D LTV distribution of banks' outstanding UK mortgage books^{(a)(b)(c)}



Sources: Bank of England, Bank analysis and calculations.

- (a) Standard Chartered is excluded as it does not have UK mortgage exposures.
- (b) For each pair of bars, the chart shows the peak-to-trough impact. In each of the 2014, 2015 and 2016 stress tests, house prices trough in Year 3 of the scenario.
- (c) Nationwide is excluded due to data comparability issues. The exclusion has negligible effects on the LTV distribution.
- (d) 2007 Q3 and 2009 Q2 values are estimated based on 2009 Q4 data, re-indexed for 2007 Q3 and 2009 Q2 respectively.

The buy-to-let sector has been the main driver of growth in the UK mortgage market over recent years. Between the start of 2009 and the end of 2015, the outstanding stock of buy-to-let lending grew by around 6% a year on average, compared with around 0.3% for owner-occupier mortgages. This rapid recent growth means that the vulnerability of banks' buy-to-let portfolios to a severe economic downturn has not been observed, so it is more uncertain than the performance of owner-occupier mortgages in a stress. In aggregate, impairment rates on banks' buy-to-let loans are estimated to be about two and a half times higher than for owner-occupied mortgages over the five years of the stress.

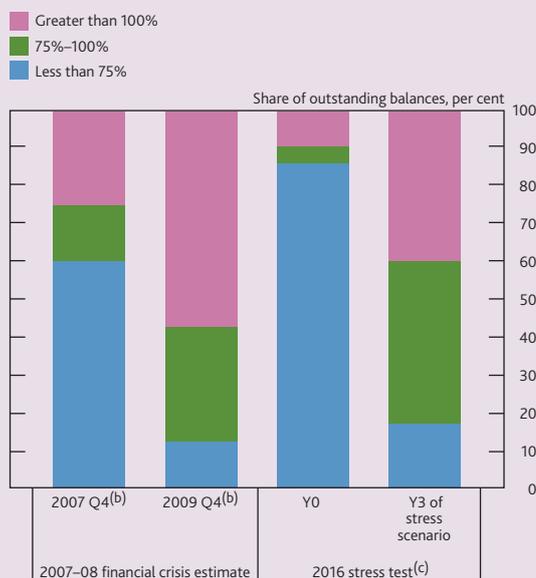
In its December 2015 *Financial Stability Report*, the FPC observed that new loans to buy-to-let investors are often subject to less stringent affordability tests than loans to owner-occupiers. The FPC remains alert to the rapid growth of the UK buy-to-let market, and any potential loosening in underwriting standards, as the sector could pose a risk to broader UK financial stability. In September 2016, the PRA issued a supervisory statement on underwriting standards for buy-to-let mortgage contracts.⁽¹⁾

(1) For more details see *PRA Supervisory Statement SS13/16*, 'Underwriting standards for buy-to-let mortgage contracts'; www.bankofengland.co.uk/pr/Pages/publications/ss/2016/ss1316.aspx.

The impact of the stress on banks' UK commercial real estate and other corporate lending portfolios

The quality of assets in major UK banks' CRE books has improved materially since the financial crisis, including over the course of 2015, with banks disposing of less well performing assets. Related to that, banks have reduced the size of their books, and tightened their underwriting standards since the financial crisis. Notwithstanding recent falls, the value of collateral backing existing loans has also increased as CRE property prices have risen from their post-financial crisis troughs. Meanwhile, the majority of recent higher risk lending has been conducted by non-UK banks and non-banks. As a result, and in common with banks' mortgage books, the distribution of LTVs on stress-test participants' CRE lending has shifted towards lower LTV loans (Chart E).

Chart E LTV distribution of banks' outstanding UK CRE books^(a)

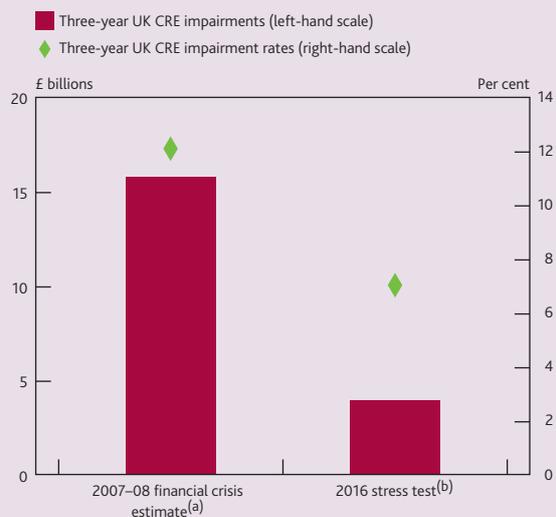


Sources: Bank of England, participating banks' FDSF data submissions, Bank analysis and calculations.

- (a) Standard Chartered is excluded as it has minimal UK CRE exposures.
 (b) 2007 and 2009 values are estimated based on end-2011 data collected by the Bank of England in 2012, re-indexed for 2007 and 2009 respectively. The numbers are therefore a simplified estimate and do not capture the impact of a number of other factors.
 (c) For comparison with Chart D, Year 0 and Year 3 distributions are shown. The quarterly CRE price index troughs in Year 2 of the 2016 stress scenario, but the year-average prices trough in Year 3.

Reflecting this improvement in asset quality, both in terms of LTV distribution and creditworthiness of borrowers, UK CRE impairment rates in the 2016 stress are projected to be materially lower than those incurred by banks in the period following the 2007–08 financial crisis (Chart F). That is highlighted by the fact that the proportion of banks' CRE books with an LTV of more than 100% after three years of the 2016 stress scenario is much smaller than it was after the financial crisis, despite the fall in CRE prices in the stress broadly mirroring the decrease observed after the 2007–08 financial crisis (Chart E). While the impairment rates in the 2016 stress test are just over half those experienced in the

Chart F UK commercial real estate impairment charges in the 2016 stress test and 2007–08 financial crisis



Sources: Bank of England, participating banks' FDSF data submissions, Bank analysis and calculations.

- (a) Impairment charges for the period following the 2007–08 financial crisis are estimated by Bank staff based on available data.
 (b) Cumulative impairment charge rates = (three-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017 year-end positions.

financial crisis, the impairment charges are under a third because of the sizable reduction in the size of the CRE books.

Risks in the CRE sector remain and prices tend to be highly cyclical. The severe shocks to CRE prices incorporated in the 2016 test — including, for example, an almost 50% fall in prime UK CRE prices — reflect the fact that the FPC and PRA Board continue to be alert to these risks (see the November 2016 *Financial Stability Report* for a discussion of these risks).⁽¹⁾

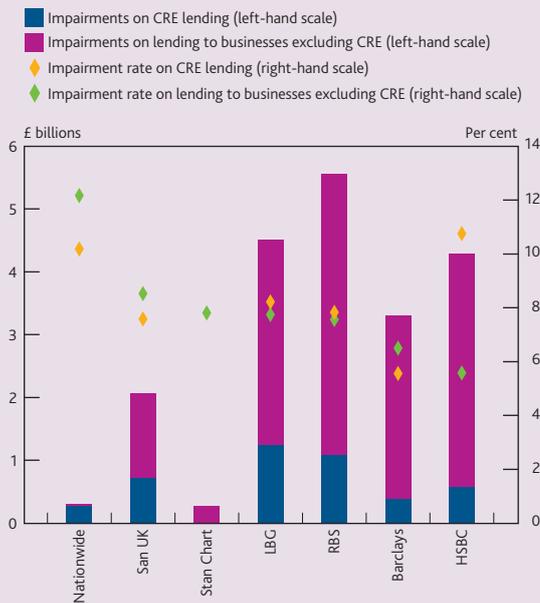
Non-CRE UK corporate impairments are material

UK banks' non-CRE domestic corporate exposures are more than four times larger than their UK CRE assets at around £230 billion, and in aggregate, projected non-CRE losses are also more substantial, at around £16 billion over the five-year stress (Charts A and G). That equates to an impairment rate of just under 7%.

Part of the reason for these substantial losses is that the 2016 stress test is particularly severe for the UK corporate sector. It incorporates an 8.5% drop in corporate profits and a 42% fall in average CRE prices, which also has an impact on companies outside the CRE sector, in part because CRE is frequently used as collateral for SME and mid-sized corporate loans. In addition, banks' corporate lending portfolios have exhibited less of an improvement in quality since 2014, relative to their household and CRE loan books.

(1) Bank of England *Financial Stability Report*, November 2016; www.bankofengland.co.uk/publications/Pages/fsr/2016/nov.aspx.

Chart G Cumulative impairments on lending to UK businesses over the five years of the stress^(a)



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) Cumulative impairment charge rates = (five-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017, 2018, 2019 year-end positions. The HSBC and Standard Chartered impairment charges and impairment charge rates are calculated by first converting each component to sterling using exchange rates consistent with the stress scenario.

Risk weights on UK lending rise appreciably

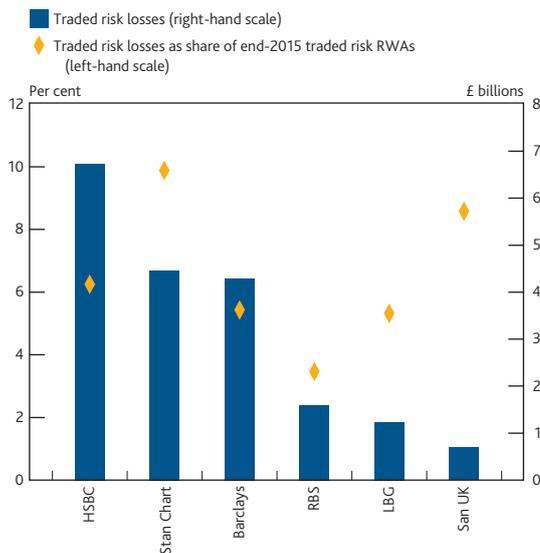
The rise in UK credit risk in the stress has an impact on the risk weights applied to banks' UK exposures, as well as on the impairment charges they face in the stress. To gauge the overall impact of the UK stress on banks' capital positions it is therefore important to consider both these impacts.

Overall internal ratings based (IRB) RWAs relating to UK credit exposures rise by almost 25% to the low point of the stress.⁽¹⁾ The vast majority of this rise is associated with an increase in average risk weights.

Average risk weights on UK mortgages under the IRB approach rise by close to 50%, as the probability of mortgage borrowers defaulting rises in the stress, and the value of collateral in the event of default diminishes as house prices fall. Within this aggregate figure, there are significant variations at the level of individual banks relating to different approaches to risk-weight modelling.

(1) The risk weights attached to more than 70% of banks' credit risk exposure are modelled using the internal ratings based (IRB) approach. The rest are modelled using the standardised approach. Risk weights modelled using the standardised approach increase in the stress much less than IRB-modelled risk weights.

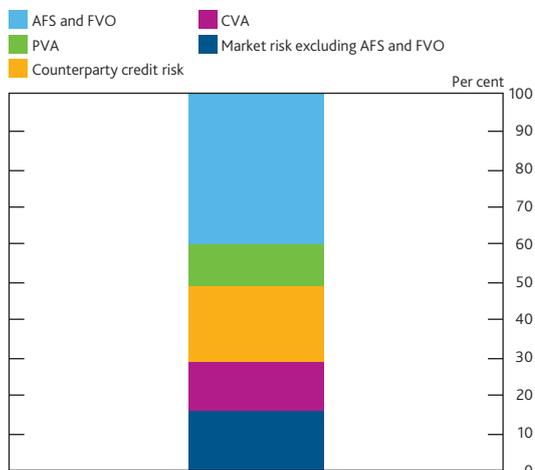
Chart 18 Traded risk losses under the stress scenario in 2016^{(a)(b)(c)(d)}



Sources: Participating banks' data submissions, Bank analysis and calculations.

- (a) Traded risk losses include: market risk losses; counterparty credit risk losses; losses arising from changes in banks' credit valuation adjustment (CVA); prudential valuation adjustment (PVA); gains/losses from available-for-sale (AFS) and fair value option (FVO) positions, excluding securitisation positions. They exclude investment banking revenues and costs.
 (b) Loss rates for HSBC and Standard Chartered are calculated by first converting each component to sterling using exchange rates consistent with the stress scenario.
 (c) Nationwide is excluded as it has minimal traded risk exposures.
 (d) Traded risk RWAs include RWAs for available-for-sale and fair value option positions.

Chart 19 Decomposition of aggregate traded risk losses under the stress scenario in 2016^{(a)(b)(c)}



Sources: Participating banks' data submissions, Bank analysis and calculations.

- (a) Traded risk losses include: market risk losses; counterparty credit risk losses; losses arising from changes in banks' credit valuation adjustment (CVA); prudential valuation adjustment (PVA); gains/losses from available-for-sale (AFS) and fair value option (FVO) positions, excluding securitisation positions. They exclude investment banking revenues and costs.
 (b) Nationwide is excluded as it has minimal traded risk exposures.
 (c) Traded risk RWAs include RWAs for available-for-sale and fair value option positions.

Banks with liquid asset buffers more heavily weighted towards Asian bonds are more severely impacted by the movements in interest rates and credit spreads incorporated in the stress. Meanwhile banks with proportionally more gilt holdings benefit from a rise in spreads between interest swap rates and gilt yields.

In addition to the traded risk losses incurred in 2016 in the stress, investment banking revenues are projected to contract

sharply in 2016, driven by a reduction in capital markets origination volumes. Revenues remain subdued relative to the baseline projection for the duration of the stress test, despite making some recovery in years two to five of the projection.

Stressed misconduct cost projections account for significant losses.

Misconduct fines and other costs have been a significant headwind to capital accretion for the UK banking system. In 2015, provisions relating to past misconduct reduced the pre-tax profits of UK banks by around 50%, or £15 billion.⁽¹⁾ In aggregate, between 2011 and 2015 participating banks had paid out or provisioned for almost £60 billion of misconduct costs. Unused provisions were £18 billion of this total at the start of the 2016 test.

In addition to these significant misconduct costs already realised and provided for, banks face further potential costs related to past misconduct. The accounting rules require provisions to be raised where an obligation exists only once settlement is considered probable and where a reliable estimate of the amount can be made. This explains why accounting provisions at end-2015 did not cover all potential misconduct costs in 2016 and beyond.

The approach adopted in the 2016 stress test has been to assess whether banks would be resilient to a much higher level of misconduct costs, well beyond current provisions. The stress test therefore includes stressed projections generated by Bank staff for additional misconduct costs and fines over and above the level of banks' provisions as at the end of 2015.

The stressed projections have been calibrated by Bank staff to have a low likelihood of being exceeded. For example, where an accounting provision has not been raised and current evidence is insufficient to reliably quantify liabilities that may exist, a confidence level of 90% of settling at or below the stressed projection has been targeted.⁽²⁾

The stressed projections are not, therefore, a central projection for future misconduct costs. In the 2016 stress test the aggregate stressed projection for misconduct costs over and above those incurred or provided for at end-2015 is around £40 billion between 2016 and 2020 of which around £30 billion is realised in the first two years of the scenario, ie by the low point in the stress. This £30 billion figure is equivalent to around 1.6% of aggregate risk-weighted assets at the end of 2015. Between 2011 and 2015 the banks paid out around £40 billion.

(1) See *Financial Stability Report*, July 2016, 'Part B: Resilience of the UK financial system'; www.bankofengland.co.uk/publications/Documents/fsr/2016/fsrjul16.pdf.

(2) See 'Stress testing the UK banking system: 2016 guidance for participating banks and building societies'; www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/guidance.pdf.

These stressed estimates for additional misconduct costs **relate to known issues around past misconduct**. They do not anticipate unknown issues around past business conducted and they do not factor in the risk of misconduct in the future. Partly because the stressed projections relate only to known issues, **they cannot be considered a 'worst case scenario'**.

There remains a very high degree of uncertainty around any approach to quantifying misconduct risks. Even in cases where misconduct risks have already crystallised or have a high likelihood of crystallising, there is a wide range of possible outcomes. Banks are also facing potential legacy misconduct issues that are in the early stages of evaluation. It is very hard to quantify the outcome of such cases with any certainty.

Reflecting the high degree of uncertainty around the stressed misconduct projections and the fact there are ongoing legal actions and regulatory investigations relating to specific misconduct issues, the Bank is not disclosing stressed projections for misconduct costs for individual participating banks.

Given the Bank's approach to producing stressed projections for additional misconduct costs outlined above, these stressed misconduct cost projections cannot be considered to be a central case for future misconduct costs so they have not been included in the baseline projections of banks' capital.

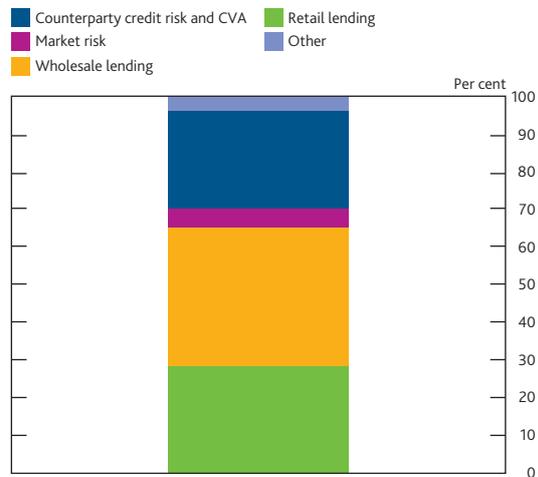
There have been a number of developments since the launch of the 2016 stress test. As well as news around fines relating to the mis-selling of US residential mortgage-backed securities, the Financial Conduct Authority announced in August that its proposed PPI time-bar will be delayed until end-June 2019. During the first three quarters of 2016 the major UK banks made around £6 billion of additional provisions for misconduct costs and fines. Bank staff have taken these developments and other news into account in calibrating the stressed projections for misconduct costs and fines included in this test.

Deterioration of credit quality under the stress increases risk weights.

A projected rise in RWAs is another significant factor driving the deterioration in banks' CET1 ratios under the stress. Between end-2015 and end-2017 aggregate RWAs are projected to rise by around 16% in the stress, which compares to a 2% fall in the baseline. This difference accounts for 1.6 percentage points of the overall reduction in the aggregate CET1 ratio relative to the baseline at the end-2017 low point.

Banks' total exposures are projected to shrink by almost 3% to the low point of the stress, while average risk weights rise by around 20%. Both the macroeconomic and traded risk

Chart 20 Contributions to the increase in risk-weighted assets in the stress relative to the baseline at the low point of the stress^(a)



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) Other includes available-for-sale (AFS)/fair value option (FVO), structured finance, operational risk and other residual items.

stresses contribute to this rise, the majority of which is related to an increase in RWAs relating to credit risk (**Chart 20**).

There are several idiosyncratic factors affecting individual banks' projected risk weights in the stress. Different banks take different approaches to modelling risk weights for example, with some banks relying more heavily on through-the-cycle models than others, making their risk weights less sensitive to cyclical movements in credit risk. In addition, because banks can change the way that they model risk weights, including in response to changes in approach from regulators, the relationship between the severity of different stress tests, and the sensitivity of banks' risk weights can shift over time.

In July 2016, the PRA issued a consultation paper on residential mortgage risk-weight modelling.⁽¹⁾ In response to a review of the high level of variability identified in the risk weights of residential mortgage portfolios under the internal ratings based (IRB) approach, the PRA proposes to set out revised expectations about the way that firms model probability of default (PD) and loss given default (LGD) for these exposures.

3.4 Automatic and 'strategic' mitigating responses to the stress

Under the Bank's approach to stress testing, in which the evolution of banks' balance sheets is projected over the stress horizon, stress-test participants can choose, and in some cases are mandated to take, a range of actions which help to mitigate the impact of the stress on their capital positions.

(1) For further details see www.bankofengland.co.uk/pr/Pages/publications/cp/2016/cp2916.aspx. This consultation closed on 31 October 2016.

Box 2

Comparing the results of the 2016 stress test with previous stress tests

This box explains the differences between the results of the Bank's 2014, 2015 and 2016 stress tests. It discusses differences in each of the scenarios and describes how banks have strengthened their balance sheets since the launch of the Bank's first concurrent stress test in 2014.

The 2016 stress scenario is broader than the 2014 and 2015 stresses.

The high-level components of the 2015 and 2016 stress tests are similar: both contain a macroeconomic stress scenario and traded risk stress, along with a separate misconduct cost stress. In contrast, the non-UK and traded risk elements of the 2014 test were designed by the European Banking Authority (EBA), and the test did not include an explicit misconduct cost stress.

The 2016 stress scenario is broader than either of the stresses in preceding tests. This reflects the desire of policymakers to use the stress-test framework to help set capital requirements and buffers for all stress-test participants. The 2016 stress is also more severe. The UK part of the test is broadly as severe as the 2014 scenario in terms of its impact on GDP and unemployment, while the non-UK element incorporates a global stress which is broader and more severe than that incorporated in the emerging markets focused 2015 test.

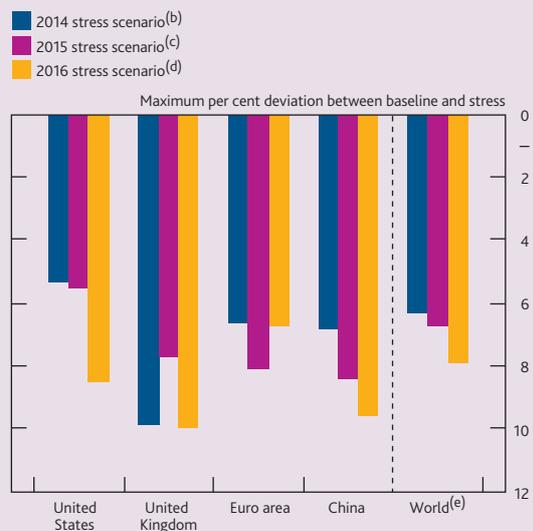
In the 2016 stress scenario, UK unemployment rises and UK GDP falls by roughly as much as they did in the 2014 test (Charts A and B). The contraction in global output in the 2016 test is larger than the fall in world demand incorporated in the 2015 stress. This is partly due to the severity of the stress to US GDP growth in the 2016 test, which was significantly greater than in the 2014 and 2015 exercises (Chart A).

The shock to UK equity prices is most severe in the 2016 stress scenario. Meanwhile, relative to the 2014 test, the 2016 stress to UK residential property prices was slightly less severe, but the shock to CRE prices was more severe. Given increases in property prices since 2014, the trough level of both residential and commercial property prices was significantly higher in the 2016 stress scenario than it was in the 2014 test.

Banks have strengthened their balance sheets since the first concurrent stress test in 2014.

Most banks started the 2016 stress test in a stronger position than the 2015 exercise. This is due to continued improvement in capital positions and the quality of their assets.

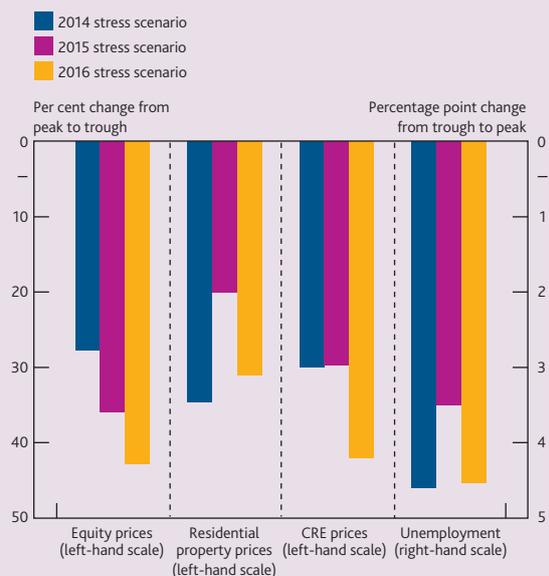
Chart A Differences in the severity of stresses across economies^(a)



Sources: Bank of England, European Banking Authority, European Commission, IMF October 2014 *World Economic Outlook*, IMF October 2015 *World Economic Outlook*, IMF January 2016 *World Economic Outlook Update* and Bank calculations.

- Chart shows the maximum deviation between calendar-year real GDP in the stress and baseline scenarios, over the three-year (2014 scenario) and five-year (2015 and 2016 scenario) horizons.
- The 2014 bars are calculated from: (i) the 2014 variant scenario (for the United Kingdom) and the 2014 EBA scenario (for foreign economies) in the stress, and (ii) the projections of the MPC as communicated in the February 2014 *Inflation Report* (for the United Kingdom) and the European Commission's Winter 2014 forecast (for foreign economies) in the baseline.
- Baseline projections in 2015, other than for the United Kingdom, are largely consistent with the IMF's projections in the October 2014 IMF *World Economic Outlook*. Bank staff have quarterly interpolated the original annual series.
- Baseline projections in 2016, other than for the United Kingdom, are largely consistent with the IMF's projections in the October 2015 IMF *World Economic Outlook*. Bank staff have quarterly interpolated the original annual series.
- World GDP is weighted by purchasing power parity.

Chart B Differences in severity of selected UK stresses across the 2014, 2015 and 2016 exercises^(a)

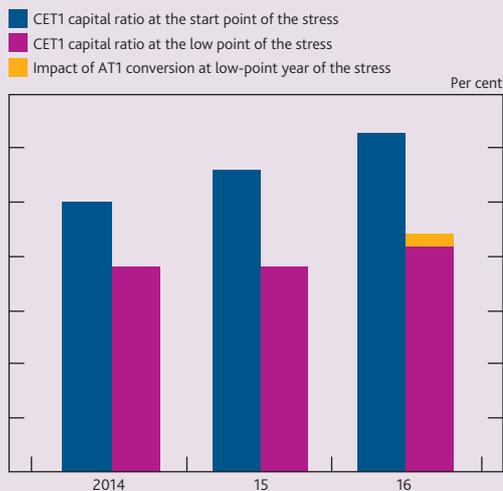


Sources: Halifax, MSCI Investment Property Databank, Nationwide, ONS, Thomson Reuters Datastream and Bank calculations.

- Chart shows the peak-to-trough fall in the stress scenario for each variable (trough to peak for the unemployment rate), over the three-year (2014 scenario) and five-year (2015 and 2016 scenario) horizons.

The aggregate CET1 capital ratio for banks at end-2015 was 12.6%, up by 1.4 percentage points compared to the previous year and up by 2.6 percentage points from 10% at end-2013 (Chart C). Around two thirds of the increase in the aggregate CET1 capital ratio is due to a reduction in banks' aggregate RWA exposure. Compared to the 2015 stress test, the starting point for the banks' aggregate RWA exposure is around 10% lower. This reflects both a reduction in the size of their balance sheets and an improvement in the quality of their assets.

Chart C Start-point and low-point CET1 capital ratios in the 2014, 2015 and 2016 tests^(a)



Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.

Under the 2016 baseline scenario, in aggregate, stress-test participants are projected to continue on a path towards improved capital positions. The aggregate CET1 ratio increases by 3.1 percentage points to 15.7% by 2020. Over the same period the aggregate leverage ratio of the system is projected to rise from 4.9% to 5.9%.

How the 2016 results compare with 2014 and 2015

Under the 2016 stress scenario, banks' aggregate risk-weighted CET1 capital ratio is projected to deteriorate significantly, falling by 3.8 percentage points between end-2015 and the low point of the stress (Table 1). This is larger than the falls in 2014 and 2015 (2.4 percentage points and 3.6 percentage points respectively). Nevertheless, the low point of 8.8% (8.4% before AT1 conversion) is well above the low point of 7.6% reached in the 2014 and 2015 tests.⁽¹⁾ Given the increased overall severity of the test, the fact that the 2016 stress impact is not greater reflects improvements in asset quality over the past two years.

The 2016 low point is also boosted by the fact that some banks' AT1 instruments convert to CET1 in the stress. This

Table 1 Contributions to the shortfall in the aggregate CET1 capital ratio at the low point of the stress relative to the baseline projection in the 2014, 2015 and 2016 stress tests

	CET1 ratios ^(a)		
	2014 ^{(b)(c)}	2015	2016
Actual end-year 0	10.0%	11.2%	12.6%
Baseline at low point	11.1%	12.0%	13.8%
Impairments	-2.4 pp	-1.8 pp	-2.4 pp
Traded risk losses ^(d)	-1.4 pp	-1.6 pp	-1.0 pp
Net interest income	0.5 pp	-0.3 pp	-0.2 pp
Risk-weighted assets ^(e)	-3.0 pp	-0.9 pp	-1.6 pp
Other ^(f)	2.8 pp	0.1 pp	-0.1 pp
AT1 conversion	0.0 pp	0.0 pp	0.4 pp
Stress at low point	7.6%	7.6%	8.8%
Start point to low point difference	-2.4 pp	-3.6 pp	-3.8 pp
Baseline at low point to stress low point difference	-3.5 pp	-4.4 pp	-5.0 pp

Sources: Participating banks' published accounts and FDSF data submissions, Bank analysis and calculations.

- (a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.
 (b) 2014 figures do not include The Co-operative Bank for consistency of comparison.
 (c) The 2014 stress test incorporated projections for further misconduct costs in both the baseline and the stress. See 'Stress testing the UK banking system: 2014 results' for further details on the 2014 misconduct cost numbers embodied in the stress-test results.
 (d) Traded risk stress-test results from 2014 are based on the 2014 EBA stress-test methodology. Traded risk losses comprise: market risk, counterparty credit risk, CVA, PVA, and AFS and FVO parts of the banking book. Investment banking revenues net of costs are included within 'Other' in this table.
 (e) The RWA impact is calculated using a new method to achieve consistency with the rest of the publication. The 2014 and 2015 RWA impacts will differ slightly from past publications.
 (f) Other includes dividends, expenses and taxes, provisions other than misconduct provisions, fees and commissions, other income, capital movements and additional misconduct cost provisions.

raises the aggregate CET1 capital ratio by 0.4 percentage points. The 2016 stress test is the first in which banks' AT1 instruments are projected to convert (see page 33).

The larger fall in the aggregate CET1 ratio in this year's test compared to previous tests reflects the fact that the 2016 scenario is more severe overall than previous scenarios.

A number of other differences between the results are described below:

- **Net interest income:** Net interest income falls slightly less in the 2016 test than it did in 2015 as banks are better able to maintain their net interest margins in the 2016 test. The impact of the 2016 stress on margins is partly mitigated through a material rise in Hibor, which allows those banks operating in Hong Kong to increase their Hong Kong dollar margins.
- **Traded risk losses:** Traded risk losses are £12 billion lower in the first two years of the stress than in 2015. An important driver of this is lower risk-weighted assets, which are around 20% lower at the start of the 2016 test than in 2015, as some banks continue to shrink their books. Losses

(1) These low-point figures are based on the results for the group of banks participating in the 2016 stress test. The 2014 test also included The Co-operative Bank. The equivalent aggregate CET1 ratio low point including The Co-operative Bank was 7.5% in the 2014 stress test.

as a share of risk-weighted assets are also lower, with wider swap spreads in this year's scenario helping banks with gilt holdings in their liquid asset buffers. A like-for-like comparison with the results of the 2014 test is not possible, as the traded risk element of that test adopted the methodology used in the EBA's 2014 test.

- **Impairments:** The quality of banks' UK retail and CRE books has been rising over recent years and that continued during 2015. Nevertheless, because of the severity of the domestic stress, impairments are higher than in the 2015 test. Domestic impairments are somewhat lower than observed in the 2014 test, however, in part because of rises in property prices since 2014, and also reflecting the fact that

Bank Rate increased significantly in the 2014 test adding to the stress on borrowers. International impairments are higher in the 2016 test than in both 2014 and 2015 despite continued reductions in UK banks' non-UK exposures. This reflects the breadth of the stress. For example, US impairments are much higher, reflecting the more severe projection for key US macroeconomic variables.

- **Risk-weighted assets:** Reflecting the increased overall severity of the scenario, relative to 2015, RWAs increase by more than they did in that test, driven by increases in average risk weights. Increases in risk weights are much lower than in 2014, however, in part reflecting improvements in the quality of banks' assets.

These actions fall into three broad categories applied by the Bank in the following order: (1) 'business-as-usual' actions that would be a natural response to weakening economic conditions (for example, taking plausible steps to reduce operating costs, or cutting dividends in line with any public payout policies); (2) restrictions on discretionary distributions resulting from the European Capital Requirements Directive (CRD) IV;⁽¹⁾ and (3) 'strategic' management actions, which would be likely to entail significant involvement from banks' Boards (for example, departures from banks' public dividend policies). 'Strategic' management actions of this sort were only accepted if they were judged by the Bank to be plausible given the stress.⁽²⁾ Under CRD IV, banks failing to maintain a combined capital buffer above their minimum capital requirements are subject to automatic restrictions on discretionary distributions including dividends, variable remuneration and other discretionary coupons.

The overall impact of actions in response to CRD IV distribution restrictions is to increase the 2017 low point by around 0.6 percentage points, the majority of which relates to cuts in dividend payments. The impact of other 'strategic' management actions is to increase that aggregate CET1 ratio by 0.5 percentage points.

Dividend reductions help to mitigate the impact of the stress on banks' capital positions.

For banks making profits, reductions in dividend payments to ordinary shareholders are an important element in the range of possible responses to a stress. In aggregate, ordinary dividends for 2015 were around £9 billion. A continuation of that would have resulted in ordinary dividend payments of almost £20 billion over the first two years of the stress scenario, but banks are assumed to pay out only £1.6 billion. Relative to banks' baseline dividend projections, cuts in these payments mitigate the fall in the aggregate CET1 capital ratio by 0.8 percentage points at the low point of the stress.

In a real stress, which had a significant impact on banks' profits, investors should expect banks to cut dividends materially. The Bank's modelling of dividend payments under stress is designed to mirror the actions that banks would be expected to take in a real stress. Published payout policies are assumed to operate, and mandatory cuts in dividends are modelled in line with CRD IV restrictions. Where plausible, further discretionary cuts in dividends were accepted as 'strategic' management actions.

Lloyds Banking Group and Santander UK cut their ordinary dividends to zero by the low point of the stress in line with their published payout policies.⁽³⁾ In reaction to losses made during the first year of the stress, HSBC makes a substantial discretionary cut in ordinary dividend payments in 2016 (a 'strategic' management action). As a result of continuing to make a loss and becoming subject to CRD IV distribution restrictions in the second year of the stress, HSBC pays no ordinary dividends in 2017 (**Table D**). Meanwhile, Barclays and Standard Chartered are loss making during the first two years of the stress and cut their dividend payments to zero as they become subject to CRD IV distribution restrictions. RBS does not pay a dividend in the stress scenario. Nationwide continues to make distributions on its Core Capital Deferred Shares (CCDS).

(1) Under the Capital Requirements Directive IV as implemented in the United Kingdom, banks are expected to maintain a combined buffer above their minimum capital, which at the time of the Bank's 2016 test is comprised of the countercyclical capital buffer (CCyB), the capital conservation buffer (CCoB) and, for global systemically important banks (G-SIBs), the G-SIB buffer. The latter two of these buffers are being phased in between 2016 and 2019. In the stress, the UK CCyB rate is assumed to be set at zero, given the crystallisation of the stress. Under Article 141 of CRD IV, banks failing to meet their combined buffer are subject to automatic restrictions on certain distributions, including those in connection with CET1, discretionary payments on AT1 instruments and payments of variable remuneration or discretionary pension benefits (sometimes referred to as Maximum Distributable Amount or MDA restrictions). Banks are also prevented from making distributions in connection with CET1 (eg payment of cash dividends) if they would fail to meet their combined buffer as a result. Stress-test results include the impact of these restrictions. Reductions to ordinary dividends account for the majority of these cuts in the Bank's 2016 stress-test results. For further details see **Table 3**.

(2) 'Strategic' management actions taken by individual banks are described in Annex 1.

(3) These cuts are classified as business as usual as opposed to 'strategic' management actions.

Table D Ordinary dividend payments for 2015 and over the first two years of the stress^(a)

£ billions	Actual 2015	To end-2017 in the stress
Barclays	1.1	0.0
HSBC ^(b)	5.5	1.5
Lloyds Banking Group	2.0	0.0
Nationwide ^(c)	0.1	0.1
The Royal Bank of Scotland Group	0.0	0.0
Santander UK	0.4	0.0
Standard Chartered ^(b)	0.2	0.0
Aggregate	9.2	1.6

Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) Ordinary dividends shown net of scrip payments, and are in respect of the year noted.

(b) HSBC and Standard Chartered pay dividends in US dollars. These dividends have been converted using exchange rates consistent with the stress scenario.

(c) Figures for Nationwide refer to distributions relating to its Core Capital Deferred Shares, a CET1 capital instrument.

Banks are also projected to cut their staff expenses by almost £15 billion relative to their baseline projections over the first two years of stress. Business-as-usual actions by banks account for around £13.5 billion of that cut, as, for example, variable remuneration falls given its link to bank profits.

The impact of the stress on some banks' CET1 ratios triggers the conversion of additional Tier 1 instruments to equity.

Under the CRD IV regime, AT1 is assumed to be the second most loss-absorbing form of capital on a going-concern basis, after common equity Tier 1 capital (CET1, which primarily consists of ordinary shares and retained earnings).

The role of AT1 in this framework is to provide an additional buffer in the event that banks' CET1 capital ratios are depleted in a stress. As at the end of 2015, UK banks had issued around £23 billion of AT1 capital instruments, for which conversion to CET1 would be triggered if their CET1 ratios fell below 7%.

The Bank has modelled the conversion of AT1 instruments into CET1 for the three banks whose CET1 ratios fell below this 7% threshold in the stress (Table 1). These conversions increase the aggregate CET1 ratio at the low point of the stress by 0.4 percentage points.

Box 3

Capturing the system-wide impact of the stress

The Bank is committed to enhancing the role that its own models play in the stress test, with a focus on better capturing the role that system-wide dynamics could play in a stress. This box explains the steps the Bank has taken towards this goal.

The financial crisis highlighted the need to place stronger emphasis on mitigating systemic risks in the banking system. This includes understanding how feedback and amplification channels during a stress can drive contagion losses and exacerbate the impact of an initial shock. For example, during the financial crisis the interbank market provided a mechanism by which problems could quickly spread between banks, exacerbating the overall crisis.

Modelling solvency contagion through interbank exposures

To help address this, in the 2015 *Approach Document* the Bank set out its plans to develop its capability to model system-wide dynamics. Including these dynamics will better exploit the potential of a concurrent stress test to assess the resilience of the banking system. As a first step towards this goal, the Bank has developed and applied a feedback and amplification model aimed at examining solvency contagion through interbank exposures.⁽¹⁾

In the event of a stress to the banking system, a shock to a particular bank's assets causes the value of its capital position to deteriorate, increasing its probability of default. In turn, this causes banks with claims on the first bank to reassess the market value of those claims, causing their own capital position to deteriorate. These subsequent reductions in bank capital may lead to further rounds of contagion as losses spread through the system. The 2016 annual cyclical scenario is the first of the Bank's stress tests to incorporate such a model.

The solvency contagion model helps address two of the Bank's key priorities: developing a genuinely macroprudential approach to identifying risks in the banking sector; and enhancing the Bank's modelling capabilities as part of the concurrent stress tests of the banking system.

The model analyses the likely impact that a shock to a particular bank's assets, and subsequent increased probability of default, would have on the capital position of other banks in the system, including what would happen as these subsequent losses reverberate through the system.

In the 2016 stress test, the amplification of losses through interbank exposures, as calculated via the Bank's model, is projected to be negligible. This contrasts to the result generated when applying the model to banking sector data from the time of the financial crisis, which suggests a material impact from solvency contagion effects.

Two changes in the banking system since the financial crisis help to explain that difference. First, banks have reduced their unsecured interbank debt holdings in recent years, with remaining exposures largely secured. That means the market value of exposures is less sensitive to the creditworthiness of the borrowing bank. Stricter liquidity regulations introduced since the crisis, including rules around liquidity coverage ratios, have limited the scope for interbank lending. Second, banks' capital positions have improved in the years following the crisis. This improvement helps limit the impact that a given fall in capital is likely to have on banks' probability of default. Consequently, any revaluation of interbank exposures in response to the stress scenario is not as severe as it otherwise would be.

Further work is ongoing

The Bank's new solvency contagion model captures only one, partial, source of systemic risk. The Bank remains committed to further, ongoing, work to monitor and assess systemic risks. Bank staff are developing additional feedback and amplification models, which may interact with the new solvency contagion model to further enhance the Bank's capability of assessing the resilience of the banking sector.

(1) This model will be discussed in a forthcoming *Bank Staff Working Paper*.

4 Qualitative review of banks' stress-testing frameworks

The Bank conducted a review of stress-testing practices across participating banks.

An important objective of the stress-testing framework is to support a continued improvement in banks' own risk management and capital planning capabilities. As part of the annual stress test, the Bank conducts a rigorous review of participants' stress-testing practices. The findings of that qualitative review are then fed back to banks. The Bank expects participants to demonstrate sustained improvements in their capabilities over time, in particular in any areas of weakness identified in the qualitative review. The embedding of stress testing in business planning processes should support banks' ability to assess the risks associated with their business strategies.

Building on the 2015 qualitative review, which had assessed the level of engagement by banks' boards and senior executives, the 2016 review focused on assessing the effectiveness of challenge and control processes at less senior levels of management. The review also tested the extent to which practices observed in the 2014 and 2015 reviews had become embedded in banks. The PRA Board judged that banks in aggregate have made progress this year, but was disappointed that the rate of improvement has been slower and more uneven than expected.

As set out in the 2015 *Approach Document*, the qualitative review will be considered in the Bank's broader assessment of banks' risk management and governance assessments for the purpose of setting PRA buffers and will continue to influence the intensity of supervision of individual banks.

The Bank observed continued improvements in the overall quality of data submitted by banks.

Relative to previous reviews, the Bank observed the most improvement in the quality and accuracy of the data submitted by participating banks. In particular, data quality for credit risk and RWAs has improved. The Bank notes that banks have continued to invest in data collection, reconciliation and validation processes, and that this investment has resulted in clear improvements in data quality. There were, however, notable exceptions which hindered the Bank's analysis of the projections submitted by banks. For example, traded risk data quality continued to be poor for most banks. The Bank expects participating banks to continue to invest in improving data quality.

Relative to previous tests, the quality of net interest income data was higher for most banks. This was particularly the case for those banks that tested their submissions as part of a 'Dry Run' process during 2016 H1. But some banks continued

to struggle with data coverage, granularity and accuracy. Banks' liquidity-related projections were also generally of insufficient quality.

In line with the commitment set out in the 2015 *Approach Document*, the Bank has been working to deliver more stable data requirements, with the development of a core data set for future stress tests. This will help banks to improve further the quality of the data they submit. (For further details see Section 6.)

The Bank observed improvement in banks' ability to explain how they generated their stress-test projections.

The Bank observed improvement in banks' ability to explain how they generated their stress-test projections, including how they made their key assumptions and set out the rationale for decisions. This has given Bank staff more confidence in the projections submitted by banks. In part, that improvement has stemmed from banks giving greater consideration to the overlays and judgements they have applied to their projections via their governance processes.

Banks had generally taken account of the new annual cyclical scenario framework appropriately when producing their projections for variables not specified by the Bank in the March 2016 'Key elements' document and had used robust statistical techniques to generate their additional variable paths. Some banks did not, however, apply robust statistical techniques systematically. This is an area where the Bank expects to see further improvement.

The 2016 qualitative review identified three key areas where banks need to further improve their capabilities.

Review and challenge of results: The Bank expects a formalised process for banks' review and challenge of stress-testing outputs, particularly where expert judgement is being exercised. The 2016 review found varying levels of formalisation in the review and challenge processes of stress-test results with the use of informal channels to agree adjustments to modelled results observed for some banks. Such practices can reduce the effectiveness of the review and challenge process. For example, where assumptions are not clearly recorded or the rationale for adjustments is not documented, senior management are less able to effectively challenge stress-testing results.

Independent review of models: The Bank notes that independent review of models is standard practice in model development, with the independent review undertaken by a team not involved in the model development. The Bank's review identified the need for further improvement in banks' use of independent review for stress-testing models. This is particularly the case for models outside of traditional risk modelling disciplines, where oversight tends to be more limited. Where models have not been through an

independent review process this should be made transparent during the challenge and approval process and any adjustments to the outputs of these models should be subject to an appropriate level of challenge.

Development of new models: The Bank expects banks to continue to enhance their ability to model the impact of the stress over time. The 2016 review found that development of new models and approaches had slowed in more established areas of risk modelling such as credit risk. Beyond these traditional disciplines, banks are yet to make significant progress in developing their modelling capability. For

example, banks continue to rely largely on judgement-based approaches when projecting their revenues and costs.

In order to raise standards in model development and management, the Bank plans to publish expectations against which banks' modelling frameworks will be assessed. The Bank, through the Basel Committee's Working Group on Stress Testing, is also collaborating with other regulators in the review of bank and supervisory stress-testing programmes and, as needed, will be developing further guidance to enhance these programmes.⁽¹⁾

(1) For further details see www.bis.org/bcbs/groups.htm.

5 Actions taken in response to the stress test

Capital plans of individual banks

Banks in the 2016 stress test were judged against their hurdle rates and systemic reference points based on their capital positions before AT1 conversion. This reflects the PRA Board's policy that capital buffers should be held in CET1 capital, as opposed to Tier 1 capital. However, the PRA Board considered the impact of any AT1 conversion on banks' CET1 capital ratios when deciding the appropriate supervisory response to banks projected to fall below their hurdle rates or systemic reference points, including the acceptable period for building an appropriate level of CET1 in banks' capital plans.

The FPC and PRA Board noted that this was the first stress test in which AT1 had converted. But this was not the first year in which a bank's CET1 ratio had fallen below 7% in the stress test, so the conversion of AT1 was a positive development insofar as it reflected increased amounts of such loss-absorbing capacity on some banks' balance sheets. Banks for which AT1 converted in the stress were more resilient, all else equal, than if they had not issued AT1 instruments.

The PRA Board judged that:

- The test did not reveal capital inadequacies for four out of the seven participating banks, based on their balance sheets at end-2015 (HSBC, Lloyds Banking Group, Nationwide Building Society and Santander UK).
- The Royal Bank of Scotland Group did not meet its CET1 capital or Tier 1 leverage hurdle rates before AT1 conversion in this scenario. After AT1 conversion, it did not meet its CET1 systemic reference point or Tier 1 leverage ratio hurdle rate. Based on RBS's own assessment of its resilience identified during the stress-testing process, RBS has already updated its capital plan to incorporate further capital strengthening actions and this revised plan has been accepted by the PRA Board. The PRA will continue to monitor RBS's progress against its revised capital plan.
- Barclays did not meet its CET1 systemic reference point before AT1 conversion in this scenario. In light of the steps that Barclays had already announced to strengthen its capital position, the PRA Board did not require Barclays to submit a revised capital plan. While these steps are being executed, its AT1 capital provides some additional resilience to very severe shocks.
- Standard Chartered met all of its hurdle rates and systemic reference points in this scenario. However, the PRA Board may also take into account other factors, as set out in Section 2. In this scenario Standard Chartered

did not meet its minimum Tier 1 risk-weighted capital requirement (including Pillar 2A). In light of the steps that Standard Chartered is already taking to strengthen its capital position, including the AT1 it has issued during 2016, the PRA Board did not require Standard Chartered to submit a revised capital plan.

System-wide assessment

The FPC judged that the system should be capitalised to withstand a test of this severity, given the risks it faced. It therefore welcomed the actions by some banks to improve their capital positions. Despite a more severe scenario, the aggregate low points for CET1 capital and Tier 1 leverage ratios were higher than in the 2014 and 2015 tests. The FPC noted the increased resilience to stress provided by banks' AT1 capital positions and banks' stated intention to reduce dividends in stress. It also noted the strong performance of the most domestically focused banks. **The FPC judged that, as a consequence of the stress test, the banking system is in aggregate capitalised to support the real economy in a severe, broad and synchronised stress scenario.**

Calibration of regulatory capital buffers

The results of the stress test, together with the stress tests that banks conduct as part of the Internal Capital Adequacy Assessment Process (ICAAP) and for some banks, the results of the EBA stress test, provide the FPC and PRA Board with a rich information set. These results, and other relevant information, are used by each of the FPC and the PRA to co-ordinate their respective policy responses to ensure that the banking system as a whole, and individual banks within it, have sufficient capital to absorb losses and maintain the supply of credit to the real economy in a stress. They can do so by adjusting a range of regulatory capital buffers.

Stress tests provide an estimate of the amount of capital banks might deplete in a hypothetical stress scenario. So they are well-suited to inform the calibration of capital buffers. The FPC and PRA Board use the results to inform the setting of system-wide capital buffers and bank-specific capital buffers (the PRA buffer).

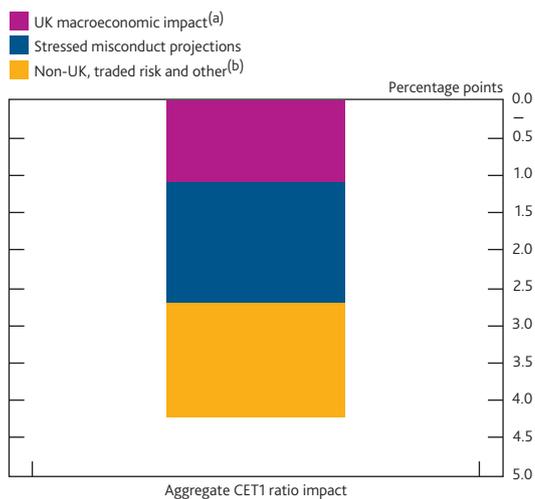
There is no mechanical link between stress-test results and the setting of capital buffers. However, the aggregate system-wide impact on banks' capital ratios of the UK economic part of the stress scenario can be used by the FPC to calibrate the setting of the UK countercyclical capital buffer rate, which is applicable to banks' UK exposures. The countercyclical capital buffer is a time-varying extension of the fixed capital conservation buffer (when fully phased in by 2019, the capital conservation buffer will be 2.5% of all risk-weighted assets).

Some banks will see their capital depleted by more than the aggregate effect of the UK economic component of the test.

This could be because of the nature of their UK exposures, exposure to further misconduct costs, or losses related to overseas and traded risk exposures. This additional effect is used to calibrate bank-specific capital buffers.

The aggregate CET1 ratio of the participating banks falls by 4.2 percentage points from 12.6% to 8.4% at the trough of the stress, before allowing for the conversion of AT1 instruments. The UK economic element of the stress scenario, including credit impairments, net interest income, fees and commissions and expenses, contributes around one quarter of the overall fall in the aggregate capital ratio (**Chart 21**). Misconduct costs contribute another third of the fall, with the remainder including the traded risk stress on investment banking activities and the international element of the scenario.

Chart 21 Contributions to the impact of the stress on the aggregate CET1 ratio at the low point, pre-AT1 conversions



Sources: Participating banks' FDSF submissions, Bank analysis and calculations.

- (a) UK macroeconomic impact includes most UK elements of the stress including credit impairments and RWAs, net interest income, fees and commissions and expenses.
 (b) Non-UK, traded risk and other is computed as a residual in this chart. It includes global elements in the same category as the UK macroeconomic impact and the impact of the traded risk stress on investment banking activities.

The contribution of the UK economic scenario — a little over 1% of total risk-weighted assets — is equivalent to around 3.5% of related UK risk-weighted assets. The related UK assets account for around a third of total risk-weighted assets.

When fully phased in, banks will hold a capital conservation buffer of 2.5% of risk-weighted assets. If the UK countercyclical capital buffer were calibrated to extend this so that the buffer of capital against UK exposures could absorb the aggregate effect of the UK economic scenario, it would suggest a rate in the region of 1% of related UK risk-weighted assets.

This is consistent with the FPC's view at the time the test was launched. In December 2015, the FPC signalled its intention to set the UK countercyclical capital buffer rate in the region of 1% in a standard UK risk environment. It was this sort of risk environment that underlay the calibration of the UK economic element of the stress scenario. The 2016 stress test has not therefore revealed material news for the FPC's view of this 'neutral' setting of the UK countercyclical capital buffer rate.

However, given the developments since the stress test was launched in March, which suggest greater uncertainty around the UK economic outlook and an increased possibility that material domestic risks could crystallise in the near term, **the FPC is maintaining the UK countercyclical capital buffer rate at 0% and reaffirms that it expects, absent any material change in the outlook, to maintain this rate until at least June 2017.** When the FPC cut the UK countercyclical capital buffer rate to 0% in July 2016, it was concerned that banks could respond to these developments by hoarding capital and restricting lending.

That position has not changed. The 0% setting of the UK countercyclical capital buffer rate reinforces the FPC's expectation that all elements of substantial capital buffers that have been built up are able to be drawn on, as necessary, to cushion shocks and maintain the provision of financial services to the real economy.

The PRA Board will take this into account when revising PRA buffers for individual banks following the stress-test results to avoid having the effect of introducing a system-wide buffer of capital that overlaps with the role of the UK countercyclical capital buffer. As a result of this co-ordination between the FPC and PRA, banks will not be expected to reflect the full impact of the UK economic stress scenario in regulatory capital buffers.

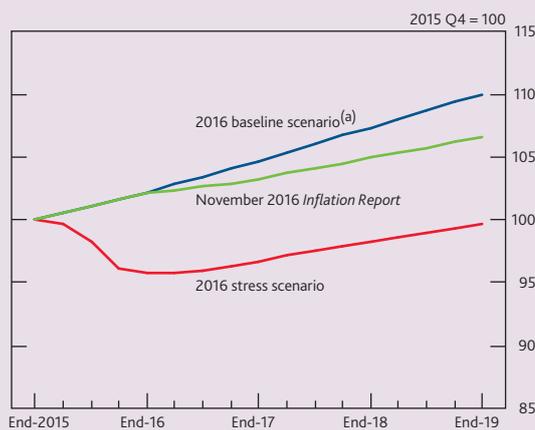
Box 4 Developments since the launch of the 2016 test

Producing and analysing stress-test results takes time, which creates a lag between the launch of a test and the publication of results. During this lag, the resilience of banks along with the risk environment facing them can change, and these changes can have implications for how the FPC and PRA Board interpret the results of a test. This box outlines developments since the 2016 stress test was launched in March.

Macroeconomic developments since March 2016

The near-term outlook for UK economic activity has deteriorated since March, and some asset prices have fallen. According to the MPC's November 2016 *Inflation Report* projection, annual real GDP growth is expected to be around 0.8 percentage points lower on average between 2016 and 2019 than in the baseline path specified for the 2016 test, which was for steady growth (Chart A). The Bank's November 2016 *Inflation Report* projections also indicate that unemployment is expected to rise a little, in contrast to the slight fall incorporated in the baseline path. UK CRE prices have fallen by around 3% since June, and house price growth has slowed. Some of the risks considered by the FPC and PRA Board when the 2016 stress test was calibrated can therefore be considered to have crystallised to some extent (see November 2016 *Financial Stability Report*).

Chart A Changes in the outlook for UK GDP growth since the 2016 stress test was launched



Sources: Bank of England, ONS and Bank calculations.

(a) Baseline projection consistent with February 2016 *Inflation Report* projection.

The outlook for the UK economy remains much stronger than in the stress scenario. For example, in the stress, the level of UK GDP falls by 4.3%, compared to continued positive growth in the MPC's latest *Inflation Report* projections.

Evolution of banks' capital positions since December 2015

The evolution of banks' capital positions since the end-2015 start point of the 2016 stress test has varied considerably between stress-test participants. In aggregate, the CET1 ratio for participating banks rose from 12.6% at end-2015 to 13.5% in 2016 Q3 (Table 1). But around half of that increase is attributable to a rise in HSBC's CET1 ratio related to a change in the regulatory treatment of their investment in Bank of Communications (BoCom), a Chinese bank in which HSBC has an equity stake.⁽¹⁾ Abstracting from that one-off change, the aggregate CET1 capital position of banks has improved modestly since the launch of the stress test.

Table 1 Changes in banks' capital positions since end-2015

Per cent	CET1 ratios ^(a)		Leverage ratios ^(b)	
	End-2015	Actual 2016 Q3	End-2015	Actual 2016 Q3
Barclays	11.4	11.6	4.5	4.2
HSBC	11.9	13.9	5.0	5.4
Lloyds Banking Group	12.8	13.5	4.8	4.8
Nationwide	22.6	23.3	4.3	4.0
RBS	15.5	15.0	5.6	5.6
Santander UK	11.6	11.1	4.0	3.8
Standard Chartered	12.6	13.0	5.5	5.6
Aggregate	12.6	13.5	4.9	5.0

Sources: Banks' published disclosures.

(a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.

(b) The Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure. For more details, see footnote (1), page 7.

Banks' aggregate Tier 1 leverage ratio rose by 0.1 percentage points to 5.0% over the same period. Within that aggregate, some banks' Tier 1 leverage positions were improved by the issuance of AT1 instruments worth over £7 billion in 2016 up to Q3, taking the total stock to around £30 billion.⁽²⁾

(1) For further details see HSBC's 2016 Q3 earnings release, page 16; www.hsbc.com/~media/hsbc-com/investorrelationsassets/hsbc-results/2016/3q-results/hsbc-holdings-plc/3q-2016-earnings-release.pdf.

(2) Refers to the stock of AT1 instruments which convert to CET1 when the issuing bank's CET1 ratio falls to 7%.

6 Next steps

The 2016 stress test represents an important step towards realising the vision set out in the 2015 *Approach Document*. Notably:

- The 2016 scenario was the first to be designed under the ACS framework. Under this framework, the severity of the test is related systematically to policymakers' assessments of risk levels across markets and regions. The approach is explicitly countercyclical.
- The hurdle rate framework evolved to increase consistency with the capital framework and increase transparency around individual banks' capital requirements.

This section describes the next steps that the Bank intends to take to implement its approach.

The 2017 stress test will test the resilience of the system, and individual banks within it, against two stress scenarios.

Consistent with the approach set out in the 2015 *Approach Document*, the 2017 stress test will for the first time include two scenarios. In addition to the annual cyclical scenario, there will be an additional 'exploratory' scenario. This will allow the Bank to assess the resilience of the system, and the individual banks within it, to a wider range of potential threats. Box 5 provides further details on the 2017 'exploratory scenario'.

The design of the 2017 annual cyclical scenario will reflect the evolution of the Bank's risk assessment.

The Bank aims for the severity of the ACS in future years to vary through time with its assessment of the risks facing the banking system, both in the United Kingdom and globally.

Stress-test participants can expect the ACS to evolve systematically over time, in line with policymakers' judgements around the magnitude of domestic and international risks. The results of the ACS will therefore help the FPC and PRA Board to set capital buffers which move up and down to match the risk environment for the banking system as a whole, and individual banks within it.

Over time, stress-test participants should become increasingly able to anticipate broad movements in the ACS by monitoring developments in domestic and international credit and

financial markets. As the shape and severity of the scenario becomes more predictable, stress-test participants will be able to adjust their capital and business plans accordingly.

The introduction of a core data set

In September 2016 the Bank rolled out its core stress-testing data set to participating banks. This establishes a core set of stress-testing data that is critical for the Bank's stress-testing analysis and will be collected as part of every stress test.

The establishment of this core set of data is intended to allow the Bank and participating banks to make a long-term investment in the infrastructure required to submit, collect and validate data. As a result, the degree of automation of the data collection and submission process should increase over time. The bar on data quality expected of participating banks will also be raised over time (in line with the Basel Committee on Banking Supervision 'Principles for effective risk data aggregation and risk reporting').⁽¹⁾

In addition to the core data, the Bank will continue to make scenario-specific data requests as appropriate. These will vary, depending on the nature of the stress scenario being explored in a particular year. This information will give the Bank the flexibility to gain deeper insights into the way banks have taken account of specific features of the scenario in their projections. It will also allow the Bank to undertake deep dives into parts of banks' balance sheets that are likely to be particularly affected in a given scenario. As provision of core data becomes more automated over time, participants should have more time to provide scenario-specific data. The Bank will continue to be mindful of the burden on participating banks when making requests for stress-testing data.

A stable data set will also make it easier for the Bank and participating banks to invest in their modelling capabilities.

Timeline for the 2017 stress test

In 2017, the Bank will run an annual cyclical scenario alongside the additional 'exploratory' scenario. Consistent with previous concurrent stress tests, the balance sheet cut-off date for both these tests will be end-2016. The Bank will publish the quantitative data associated with the 2017 scenario on its website, along with an explanatory 'Key elements' document around the end of 2017 Q1. The Bank intends to publish the results of the 2017 exercise in 2017 Q4.

(1) For further details see www.bis.org/publ/bcbcs239.pdf.

Box 5

The 2017 exploratory scenario

2017 will be the first year the Bank of England runs an 'exploratory' scenario alongside the annual cyclical scenario (ACS). The aim of the exploratory scenario, which will be conducted every other year, is to complement the ACS by probing the resilience of the system to risks that may not be neatly linked to the financial cycle.⁽¹⁾

The 2017 exploratory scenario will assess risks to, and arising from, bank profitability.

As the November 2016 *Financial Stability Report* notes, the FPC has judged that a prolonged period of low profitability could impact banks' ability to recover from future shocks by generating internal capital or issuing new equity.⁽²⁾ The Bank therefore intends that **the first exploratory scenario will consider the impact of weak global supply growth, persistently low interest rates, and a continuation of declines in both world trade relative to GDP and cross-border banking activity.** It will also consider the impact of other structural changes on the profitability of individual banks and the sector as a whole, including increased competitive pressure on major banks from smaller banks and non-bank businesses.

The focus of the test will be on the implications for banks' business models, the economic impact of any actions they would take to ensure their viability and the implications for their future resilience. The test will have a seven-year horizon to capture these long-term trends. Throughout the test horizon, the prudential standards implemented for the UK financial system will be assumed to remain at least as robust as those currently planned.⁽³⁾ Consistent with the focus

on business models rather than detailed financial performance, the data collected from banks will be significantly less detailed than that collected for the annual cyclical scenario.

This scenario will not be a more severe test of banks' capital positions than the annual cyclical scenario. The test will instead allow the Bank to examine the potential future resilience of the banking system to shocks and consider the actions banks might take to restore their profitability. This will include examining the implications of any material changes for the UK and global economies.

Banks' approaches to long-term strategic and capital planning will also be assessed.

While banks will be required to provide quantitative data there will be a stronger qualitative focus than in the annual cyclical scenario. Because the test will focus on how banks would adjust to the challenges to their business models, there will be a stronger emphasis on banks' choices of strategic management actions and on their ability to plan for long horizons and business model challenges.

Next steps

The seven banks that took part in the 2016 stress test will participate in both the scenarios in 2017. The Bank will publish the exploratory scenario and the 2017 ACS in the first quarter of 2017.

(1) See 'The Bank of England's approach to stress testing the UK banking system'; www.bankofengland.co.uk/financialstability/Documents/stresstesting/2015/approach.pdf.

(2) Bank of England *Financial Stability Report*, November 2016; www.bankofengland.co.uk/publications/Pages/fsr/2016/nov.aspx.

(3) The FPC remains committed to robust prudential standards in the UK financial system. See Bank of England *Financial Stability Report*, November 2016; www.bankofengland.co.uk/publications/Pages/fsr/2016/nov.aspx.

Annex 1: Bank-specific results

Barclays plc

Table 1A Projected consolidated solvency ratios in the stress scenario

	Actual (end-2015)	Minimum stressed ratio (before the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before conversion of AT1		Minimum stressed ratio (after the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2016 Q3)	Submit revised capital plan?
			Non-dividend 'strategic' management actions only ^(f)	All 'strategic' management actions including CRD IV distribution restrictions					
Common equity Tier 1 ratio ^{(a)(b)}	11.4%	5.9%	5.9%	6.9%	8.3%	6.8%	7.8%	11.6%	Not required
Tier 1 capital ratio ^(c)	14.7%	8.5% ^(f)	8.5% ^(f)	9.5% ^(f)	9.5% ^(f)			14.8%	
Total capital ratio ^(d)	18.6%	12.1% ^(f)	12.1% ^(f)	13.2% ^(f)	13.2% ^(f)			18.8%	
Memo: risk-weighted assets (£ billion)	358	400 ^(f)	400 ^(f)	400 ^(f)	400 ^(f)			373	
Memo: CET1 (£ billion)	41	24 ^(f)	24 ^(f)	28 ^(f)	33 ^(f)			43	
Tier 1 leverage ratio ^{(a)(e)}	4.5%	3.0%	3.0%	3.4%	3.4%	3.0%	3.4%	4.2%	
Memo: leverage exposure (£ billion)	1,028 ^(g)	976 ^(h)	976 ^(h)	976 ^(h)	976 ^(h)			1,185	

(a) The low points for the common equity Tier 1 (CET1) ratio and leverage ratio shown in the table do not necessarily occur in the same year of the stress scenario and correspond to the year where the minimum stressed ratio is calculated after all 'strategic' management actions and before conversion of AT1.

(b) The CET1 ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs) where CET1 capital is defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and in Supervisory Statement SS7/13, 'CRD IV and capital', December 2013, and RWAs are defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and relevant Supervisory Statements, December 2013.

(c) Tier 1 capital ratio is defined as Tier 1 capital expressed as a percentage of RWAs where Tier 1 capital is defined as the sum of CET1 capital and additional Tier 1 capital in line with the UK implementation of CRD IV.

(d) Total capital ratio is defined as total capital expressed as a percentage of RWAs where total capital is defined as the sum of Tier 1 capital and Tier 2 capital in line with the UK implementation of CRD IV.

(e) The leverage ratio is calculated in line with the Policy Statement 'The Financial Policy Committee's powers over leverage ratio tools', July 2015. For further details following the FPC's July 2016 Recommendation relating to the calculation of the Tier 1 leverage ratio, see footnote (1) on page 7.

(f) Corresponds to the same year as the minimum CET1 ratio over the stress scenario.

(g) Leverage exposure measure taken from the bank's annual accounts.

(h) Corresponds to the same year as the minimum leverage ratio over the stress scenario.

(i) This excludes CRD IV distribution restrictions. Where a bank is subject to such restrictions all non business as usual cuts to distributions subject to CRD IV restrictions will appear in the next column — 'All 'strategic' management actions including CRD IV distribution restrictions'. This should not be interpreted as a judgement by the Bank that any or all of such cuts are conditional on such restrictions.

Barclays is a retail and commercial bank with trading operations, focused in the United Kingdom and United States. The results show that Barclays' capital position remains above its CET1 hurdle rate of 6.8% and its Tier 1 leverage hurdle rate of 3.0% in the hypothetical stress scenario with a low point of 6.9% CET1 ratio and 3.4% leverage ratio in 2017 after 'strategic' management actions. The results show that Barclays' capital position fell below its CET1 systemic reference point in 2017. At this point its systemic reference point was 7.8%. **The PRA Board judged that Barclays did not meet its CET1 systemic reference point before AT1 conversion in this scenario.**

The combination of the global downturn scenario and traded risk scenario in the 2016 exercise led to an increase in investment banking losses related to market and counterparty credit risk. An increase in credit impairment charges, particularly in Barclays' credit card portfolio and in Africa, also contributed to the deterioration. In addition, risk-weighted assets increased, driven by credit, market and counterparty credit risk. The assessment includes stressed projections of misconduct costs. As Barclays becomes loss making and is within its CRD IV buffers in 2016 and 2017 (the CET1 low point) it pays no dividend and is subject to CRD IV restrictions on other distributions for those years.

At 31 December 2015 Barclays had issued £5.3 billion of AT1 with a CET1 trigger of 7%. As Barclays' CET1 capital ratio after 'strategic' management actions is below 7% at the low point, it is assumed that this AT1 converts to CET1 capital. This increases Barclays' CET1 capital ratio after 'strategic' management actions and AT1 conversion to 8.3% at the low point, meeting the CET1 systemic reference point. Since December 2015, Barclays has announced it will sell the majority of its shareholding in Barclays Africa Group Limited (BAGL) which will reduce risk-weighted assets and leverage exposure. It also issued an additional £1.1 billion of AT1 in 2016. Neither of these actions are included in the results above. The Interim Management Statement published on 27 October 2016 showed CET1 and leverage ratios of 11.6% and 4.2% respectively. **In light of the steps that Barclays had already announced to strengthen its capital position, the PRA Board did not require Barclays to submit a revised capital plan. While these steps are being executed, its AT1 capital provides some additional resilience to very severe shocks.**

HSBC Holdings plc

Table 1B Projected consolidated solvency ratios in the stress scenario

	Actual (end-2015)	Minimum stressed ratio (before the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before conversion of AT1		Minimum stressed ratio (after the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2016 Q3)	Submit revised capital plan?
			Non-dividend 'strategic' management actions only ^(f)	All 'strategic' management actions including CRD IV distribution restrictions					
Common equity Tier 1 ratio ^{(a)(b)}	11.9%	7.6%	7.8%	9.1%	9.1%	6.1%	7.3%	13.9%	Not required
Tier 1 capital ratio ^(c)	13.9%	8.9% ^(f)	9.2% ^(f)	10.5% ^(f)	10.5% ^(f)			16.3%	
Total capital ratio ^(d)	17.2%	11.9% ^(f)	12.3% ^(f)	13.5% ^(f)	13.5% ^(f)			20.1%	
Memo: risk-weighted assets (US\$ billion)	1,103	1,345 ^(f)	1,312 ^(f)	1,312 ^(f)	1,312 ^(f)			904	
Memo: CET1 (US\$ billion)	131	102 ^(f)	102 ^(f)	119 ^(f)	119 ^(f)			126	
Tier 1 leverage ratio ^{(a)(e)}	5.0%	3.8%	3.9%	4.3%	4.3%	3.0%	3.4%	5.4%	
Memo: leverage exposure (US\$ billion)	2,794 ^(g)	2,927 ^(h)	2,879 ^(h)	2,879 ^(h)	2,879 ^(h)			2,529	

(a) The low points for the common equity Tier 1 (CET1) ratio and leverage ratio shown in the table do not necessarily occur in the same year of the stress scenario and correspond to the year where the minimum stressed ratio is calculated after all 'strategic' management actions and before conversion of AT1.

(b) The CET1 ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs) where CET1 capital is defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and in Supervisory Statement SS7/13, 'CRD IV and capital', December 2013, and RWAs are defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and relevant Supervisory Statements, December 2013.

(c) Tier 1 capital ratio is defined as Tier 1 capital expressed as a percentage of RWAs where Tier 1 capital is defined as the sum of CET1 capital and additional Tier 1 capital in line with the UK implementation of CRD IV.

(d) Total capital ratio is defined as total capital expressed as a percentage of RWAs where total capital is defined as the sum of Tier 1 capital and Tier 2 capital in line with the UK implementation of CRD IV.

(e) The leverage ratio is calculated in line with the Policy Statement 'The Financial Policy Committee's powers over leverage ratio tools', July 2015. For further details following the FPC's July 2016 Recommendation relating to the calculation of the Tier 1 leverage ratio, see footnote (1) on page 7.

(f) Corresponds to the same year as the minimum CET1 ratio over the stress scenario.

(g) Leverage exposure measure taken from the bank's annual accounts.

(h) Corresponds to the same year as the minimum leverage ratio over the stress scenario.

(i) This excludes CRD IV distribution restrictions. Where a bank is subject to such restrictions all non business as usual cuts to distributions subject to CRD IV restrictions will appear in the next column — 'All 'strategic' management actions including CRD IV distribution restrictions'. This should not be interpreted as a judgement by the Bank that any or all of such cuts are conditional on such restrictions.

HSBC is a global universal bank. The results show that HSBC's capital position remains above its CET1 hurdle rate of 6.1% and Tier 1 leverage hurdle rate of 3% in the hypothetical stress scenario with a low point of 9.1% CET1 ratio and 4.3% leverage ratio in 2017 after 'strategic' management actions. The results show that HSBC's capital position remains above its CET1 and leverage systemic reference points throughout the test. **The PRA Board judged that this stress test did not reveal capital inadequacies for HSBC given its balance sheet at end-2015.**

The scenario for the 2016 stress test includes a synchronised global downturn and a traded risk shock in many of the economies where HSBC operates, including Asia, the United States, the United Kingdom and the euro area, as well as a generalised downturn in emerging markets, particularly severe among countries exposed to China and the United States. Compared to the 2015 stress test, the scenario incorporates a larger set of domestic and global risks and, overall, features a more severe economic downturn. The assessment includes stressed projections of misconduct costs. In the stress scenario, HSBC proposed, as a management action, a reduction of its ordinary dividend (net of scrip) to US\$2.1 billion in 2016. As HSBC becomes loss making and within its CRD IV buffers in 2017 (the CET1 low point) it pays no dividend and is subject to CRD IV restrictions on other distributions for that year. The assessment also incorporates the impact of other 'strategic' management actions that the PRA Board judged HSBC could realistically take in the stress scenario, including cost and asset reductions.

Since December 2015, HSBC has issued US\$2 billion of AT1. In addition, RWA reductions and disposal plans to be achieved by the end of 2017 are on track compared to the June 2015 strategy update plan. HSBC completed the sale of its Brazilian operations in July 2016. The Bank judged that this sale met the guidance for participating banks allowing the exclusion of assets where a binding sale process has been agreed before the balance sheet cut-off date at the start of the stress test. As a result the impact of the scenario on HSBC Brazil is included for 2016 H1, but not for subsequent periods. The Interim Management Statement published on 7 November 2016 showed CET1 and Tier 1 leverage ratios of 13.9% and 5.4% respectively. In 2016 Q3, the PRA allowed HSBC to move the regulatory treatment of its investment in BoCom from a proportional consolidation to a threshold deduction approach. This new approach is not reflected in the results above. **The PRA Board did not require HSBC to submit a revised capital plan.**

Lloyds Banking Group plc

Table 1C Projected consolidated solvency ratios in the stress scenario

	Actual (end-2015)	Minimum stressed ratio (before the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before conversion of AT1		Minimum stressed ratio (after the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2016 Q3)	Submit revised capital plan?
			Non-dividend 'strategic' management actions only ^(f)	All 'strategic' management actions including CRD IV distribution restrictions					
Common equity Tier 1 ratio ^{(a)(b)}	12.8%	9.7%	10.3%	10.3%	10.3%	7.0%	n.a.	13.5%	Not required
Tier 1 capital ratio ^(c)	16.4%	12.4% ^(f)	12.9% ^(f)	12.9% ^(f)	12.9% ^(f)			16.7%	
Total capital ratio ^(d)	21.5%	15.7% ^(f)	16.2% ^(f)	16.2% ^(f)	16.2% ^(f)			22.1%	
Memo: risk-weighted assets (£ billion)	223	237 ^(f)	238 ^(f)	238 ^(f)	238 ^(f)			222	
Memo: CET1 (£ billion)	29	23 ^(f)	24 ^(f)	24 ^(f)	24 ^(f)			30	
Tier 1 leverage ratio ^{(a)(e)}	4.8%	4.1%	4.3%	4.3%	4.3%	3.0%	n.a.	4.8%	
Memo: leverage exposure (£ billion)	712 ^(g)	688 ^(h)	688 ^(h)	688 ^(h)	688 ^(h)			732	

(a) The low points for the common equity Tier 1 (CET1) ratio and leverage ratio shown in the table do not necessarily occur in the same year of the stress scenario and correspond to the year where the minimum stressed ratio is calculated after all 'strategic' management actions and before conversion of AT1.

(b) The CET1 ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs) where CET1 capital is defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and in Supervisory Statement SS7/13, 'CRD IV and capital', December 2013, and RWAs are defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and relevant Supervisory Statements, December 2013.

(c) Tier 1 capital ratio is defined as Tier 1 capital expressed as a percentage of RWAs where Tier 1 capital is defined as the sum of CET1 capital and additional Tier 1 capital in line with the UK implementation of CRD IV.

(d) Total capital ratio is defined as total capital expressed as a percentage of RWAs where total capital is defined as the sum of Tier 1 capital and Tier 2 capital in line with the UK implementation of CRD IV.

(e) The leverage ratio is calculated in line with the Policy Statement 'The Financial Policy Committee's powers over leverage ratio tools', July 2015. For further details following the FPC's July 2016 Recommendation relating to the calculation of the Tier 1 leverage ratio, see footnote (1) on page 7.

(f) Corresponds to the same year as the minimum CET1 ratio over the stress scenario.

(g) Leverage exposure measure taken from the bank's annual accounts.

(h) Corresponds to the same year as the minimum leverage ratio over the stress scenario.

(i) This excludes CRD IV distribution restrictions. Where a bank is subject to such restrictions all non business as usual cuts to distributions subject to CRD IV restrictions will appear in the next column — 'All 'strategic' management actions including CRD IV distribution restrictions'. This should not be interpreted as a judgement by the Bank that any or all of such cuts are conditional on such restrictions.

Lloyds Banking Group (LBG) is a retail and commercial bank with a small trading business operating primarily in the United Kingdom. The results show that LBG's capital position remains above its CET1 hurdle rate of 7% and Tier 1 leverage hurdle rate of 3% in the hypothetical stress scenario with a low point of 10.3% CET1 ratio and 4.3% leverage ratio in 2018 after 'strategic' management actions. **The PRA Board judged that this stress test did not reveal capital inadequacies for Lloyds Banking Group given its balance sheet at end-2015.**

LBG's largely UK-centric business model meant it faced increases in impairments and RWAs as a result of the UK macroeconomic stress, driven by higher unemployment and house price falls. Past increases in house prices and collateral values, an improved starting point as well as a continued de-risking of the balance sheet meant that LBG's UK retail exposures were impacted by the 2016 scenario to a lesser extent than by the scenario explored in the 2014 stress test, despite the scenarios both constituting severe UK macroeconomic downturns with significant house price falls. The assessment includes stressed projections of misconduct costs. In the stress scenario, LBG does not pay a dividend for 2016, 2017 or 2018 (when it reaches its CET1 low point), as a result of the operation of the firm's published dividend policy. The assessment also incorporates the impact of 'strategic' management actions that the PRA Board judged LBG could realistically take in the stress scenario, including cost reductions.

The Interim Management Statement published on 26 October 2016 showed CET1 and leverage ratios of 13.5% and 4.8% respectively. **The PRA Board did not require Lloyds Banking Group to submit a revised capital plan.**

Nationwide Building Society

Table 1D Projected consolidated solvency ratios in the stress scenario

	Actual (end-2015)	Minimum stressed ratio (before the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before conversion of AT1		Minimum stressed ratio (after the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2016 Q3)	Submit revised capital plan?
			Non-dividend 'strategic' management actions only ^(f)	All 'strategic' management actions including CRD IV distribution restrictions					
Common equity Tier 1 ratio ^{(a)(b)}	22.6%	15.0%	15.6%	15.6%	15.6%	8.1%	n.a.	23.3%	Not required
Tier 1 capital ratio ^(c)	26.5%	17.3% ^(f)	17.8% ^(f)	17.8% ^(f)	17.8% ^(f)			27.4%	
Total capital ratio ^(d)	31.0%	22.0% ^(f)	22.6% ^(f)	22.6% ^(f)	22.6% ^(f)			35.1%	
Memo: risk-weighted assets (£ billion)	35	55 ^(f)	54 ^(f)	54 ^(f)	54 ^(f)			35	
Memo: CET1 (£ billion)	8.0	8.2 ^(f)	8.5 ^(f)	8.5 ^(f)	8.5 ^(f)			8.1	
Tier 1 leverage ratio ^{(a)(e)}	4.3%	4.1%	4.2%	4.2%	4.2%	3.0%	n.a.	4.0%	
Memo: leverage exposure (£ billion)	211 ^(g)	225 ^(h)	225 ^(h)	225 ^(h)	225 ^(h)			228	

(a) The low points for the common equity Tier 1 (CET1) ratio and leverage ratio shown in the table do not necessarily occur in the same year of the stress scenario and correspond to the year where the minimum stressed ratio is calculated after all 'strategic' management actions and before conversion of AT1.

(b) The CET1 ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs) where CET1 capital is defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and in Supervisory Statement SS7/13, 'CRD IV and capital', December 2013, and RWAs are defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and relevant Supervisory Statements, December 2013.

(c) Tier 1 capital ratio is defined as Tier 1 capital expressed as a percentage of RWAs where Tier 1 capital is defined as the sum of CET1 capital and additional Tier 1 capital in line with the UK implementation of CRD IV.

(d) Total capital ratio is defined as total capital expressed as a percentage of RWAs where total capital is defined as the sum of Tier 1 capital and Tier 2 capital in line with the UK implementation of CRD IV.

(e) The leverage ratio is calculated in line with the Policy Statement 'The Financial Policy Committee's powers over leverage ratio tools', July 2015. For further details following the FPC's July 2016 Recommendation relating to the calculation of the Tier 1 leverage ratio, see footnote (1) on page 7.

(f) Corresponds to the same year as the minimum CET1 ratio over the stress scenario.

(g) Leverage exposure measure taken from the bank's annual accounts.

(h) Corresponds to the same year as the minimum leverage ratio over the stress scenario.

(i) This excludes CRD IV distribution restrictions. Where a bank is subject to such restrictions all non business as usual cuts to distributions subject to CRD IV restrictions will appear in the next column — 'All 'strategic' management actions including CRD IV distribution restrictions'. This should not be interpreted as a judgement by the Bank that any or all of such cuts are conditional on such restrictions.

Nationwide is a UK building society. The results show that Nationwide's capital position remains above its CET1 hurdle rate of 8.1% and Tier 1 leverage hurdle rate of 3.0% in the hypothetical stress scenario with a low point of 15.6% CET1 ratio and 4.2% leverage ratio in 2018 after 'strategic' management actions. **The PRA Board judged that this stress test did not reveal capital inadequacies for Nationwide given its balance sheet at end-2015.**

Nationwide's UK-centric business model meant it faced increases in impairments and RWAs as a result of the UK macroeconomic stress, driven by higher unemployment and house price falls. In this scenario, Nationwide's balance sheet continues to grow but its net interest income reduces to the low-point year. In the first two years of the stress, it experiences an increase in funding costs in line with the scenario at the same time as it earns less from its variable-rate mortgages. The increase in impairments is mostly driven by its buy-to-let mortgage book. The significant increase in risk weights on retail secured mortgages is largely due to the firm's use of a 'point in time' based modelling approach for these portfolios. The assessment includes stressed projections of misconduct costs. Despite these factors, it remains profitable in each year of the stress. Nationwide makes distributions on Core Capital Deferred Shares (CCDS) of £56 million for 2016, 2017 and 2018 (when it reaches its CET1 low point) in the stress scenario. The assessment also incorporates the impact of 'strategic' management actions that the PRA Board judged Nationwide could realistically take in the stress scenario, including cost reductions.

The half-year results published on 18 November 2016 showed CET1 and leverage ratios of 23.3% and 4.0% respectively. **The PRA Board did not require Nationwide to submit a revised capital plan.**

The Royal Bank of Scotland Group plc

Table 1E Projected consolidated solvency ratios in the stress scenario

	Actual (end-2015)	Minimum stressed ratio (before the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before conversion of AT1		Minimum stressed ratio (after the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2016 Q3)	Submit revised capital plan?
			Non-dividend 'strategic' management actions only ^(f)	All 'strategic' management actions including CRD IV distribution restrictions					
Common equity Tier 1 ratio ^{(a)(b)}	15.5%	5.5%	5.8%	5.9%	6.7%	6.6%	7.1%	15.0%	Revised capital plan received and accepted
Tier 1 capital ratio ^(c)	19.1%	8.1% ^(f)	8.5% ^(f)	8.5% ^(f)	8.5% ^(f)			19.1%	
Total capital ratio ^(d)	24.7%	12.5% ^(f)	12.8% ^(f)	12.9% ^(f)	12.9% ^(f)			24.1%	
Memo: risk-weighted assets (£ billion)	243	255 ^(f)	255 ^(f)	255 ^(f)	255 ^(f)			235	
Memo: CET1 (£ billion)	38	14 ^(f)	15 ^(f)	15 ^(f)	17 ^(f)			35	
Tier 1 leverage ratio ^{(a)(e)}	5.6%	2.7%	2.9%	2.9%	2.9%	3.0%	3.2%	5.6%	
Memo: leverage exposure (£ billion)	702 ^(g)	591 ^(h)	591 ^(h)	591 ^(h)	591 ^(h)			703	

(a) The low points for the common equity Tier 1 (CET1) ratio and leverage ratio shown in the table do not necessarily occur in the same year of the stress scenario and correspond to the year where the minimum stressed ratio is calculated after all 'strategic' management actions and before conversion of AT1.

(b) The CET1 ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs) where CET1 capital is defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and in Supervisory Statement SS7/13, 'CRD IV and capital', December 2013, and RWAs are defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and relevant Supervisory Statements, December 2013.

(c) Tier 1 capital ratio is defined as Tier 1 capital expressed as a percentage of RWAs where Tier 1 capital is defined as the sum of CET1 capital and additional Tier 1 capital in line with the UK implementation of CRD IV.

(d) Total capital ratio is defined as total capital expressed as a percentage of RWAs where total capital is defined as the sum of Tier 1 capital and Tier 2 capital in line with the UK implementation of CRD IV.

(e) The leverage ratio is calculated in line with the Policy Statement 'The Financial Policy Committee's powers over leverage ratio tools', July 2015. For further details following the FPC's July 2016 Recommendation relating to the calculation of the Tier 1 leverage ratio, see footnote (1) on page 7.

(f) Corresponds to the same year as the minimum CET1 ratio over the stress scenario.

(g) Leverage exposure measure taken from the bank's annual accounts.

(h) Corresponds to the same year as the minimum leverage ratio over the stress scenario.

(i) This excludes CRD IV distribution restrictions. Where a bank is subject to such restrictions all non business as usual cuts to distributions subject to CRD IV restrictions will appear in the next column — 'All 'strategic' management actions including CRD IV distribution restrictions'. This should not be interpreted as a judgement by the Bank that any or all of such cuts are conditional on such restrictions.

The Royal Bank of Scotland Group (RBS) has retail, commercial and trading businesses predominately in the United Kingdom and Western Europe. The results show that RBS's capital position fell below its CET1 hurdle rate of 6.6% and Tier 1 leverage hurdle rate of 3% in the hypothetical stress scenario with a low point of 5.9% CET1 ratio and 2.9% leverage ratio in 2017 after 'strategic' management actions. **The PRA Board judged that The Royal Bank of Scotland Group did not meet its CET1 or Tier 1 leverage hurdle rates before AT1 conversion. After AT1 conversion, it did not meet its CET1 systemic reference point or Tier 1 leverage ratio hurdle rate.**

The stress test demonstrates that RBS remains susceptible to financial and economic stress. This assessment includes stressed projections of misconduct costs. RBS faces a range of costs and risks over the projected period, as it continues to execute its strategy to reshape its balance sheet. The analysis takes into account a prudent assessment of the Williams & Glyn disposal mandated under the State Aid Agreement. Account has been taken of RBS's strategic plans for its Corporate and Institutional Banking business. An increase in RBS's impairments relating to its corporate and retail lending books also contributed to the deterioration. RBS does not pay an ordinary dividend in the stress test and is subject to CRD IV restrictions on other distributions for 2017. The assessment includes the impact of 'strategic' management actions that the PRA Board judged RBS could realistically take in this stress scenario, including cost reductions.

At 31 December 2015 RBS had issued £2 billion of AT1 with a CET1 trigger of 7%. As RBS's CET1 capital ratio after strategic management actions is below 7% at the low point, it is assumed that this AT1 converts to CET1 capital. This increases RBS's CET1 capital ratio after 'strategic' management actions and AT1 conversion to 6.7% at the low point, meeting the CET1 hurdle rate. Since December 2015, RBS has issued a further £2 billion of AT1. This action is not shown in the results above, but it would provide further support to RBS's capital position. The Interim Management Statement published on 28 October 2016 showed CET1 and leverage ratios of 15.0% and 5.6% respectively. **Based on RBS's own assessment of its resilience identified during the stress-testing process, RBS has already updated its capital plan to incorporate further capital strengthening actions and this revised plan has been accepted by the PRA Board. The PRA will continue to monitor The Royal Bank of Scotland Group's progress against its revised capital plan.**

Santander UK plc

Table 1F Projected consolidated solvency ratios in the stress scenario

	Actual (end-2015)	Minimum stressed ratio (before the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before conversion of AT1		Minimum stressed ratio (after the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2016 Q3)	Submit revised capital plan?
			Non-dividend 'strategic' management actions only ^(f)	All 'strategic' management actions including CRD IV distribution restrictions					
Common equity Tier 1 ratio ^{(a)(b)}	11.6%	9.9%	9.9%	9.9%	9.9%	7.3%	n.a.	11.1%	Not required
Tier 1 capital ratio ^(c)	14.1%	12.1% ^(f)	12.2% ^(f)	12.2% ^(f)	12.2% ^(f)			13.4%	
Total capital ratio ^(d)	17.4%	15.0% ^(f)	15.1% ^(f)	15.1% ^(f)	15.1% ^(f)			16.7%	
Memo: risk-weighted assets (£ billion)	86	91 ^(f)	91 ^(f)	91 ^(f)	91 ^(f)			89	
Memo: CET1 (£ billion)	10.0	8.9 ^(f)	9.0 ^(f)	9.0 ^(f)	9.0 ^(f)			9.9	
Tier 1 leverage ratio ^{(a)(e)}	4.0%	3.4%	3.6%	3.6%	3.6%	3.0%	n.a.	3.8%	
Memo: leverage exposure (£ billion)	285 ^(g)	289 ^(h)	289 ^(h)	289 ^(h)	289 ^(h)			302	

(a) The low points for the common equity Tier 1 (CET1) ratio and leverage ratio shown in the table do not necessarily occur in the same year of the stress scenario and correspond to the year where the minimum stressed ratio is calculated after all 'strategic' management actions and before conversion of AT1.

(b) The CET1 ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs) where CET1 capital is defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and in Supervisory Statement SS7/13, 'CRD IV and capital', December 2013, and RWAs are defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and relevant Supervisory Statements, December 2013.

(c) Tier 1 capital ratio is defined as Tier 1 capital expressed as a percentage of RWAs where Tier 1 capital is defined as the sum of CET1 capital and additional Tier 1 capital in line with the UK implementation of CRD IV.

(d) Total capital ratio is defined as total capital expressed as a percentage of RWAs where total capital is defined as the sum of Tier 1 capital and Tier 2 capital in line with the UK implementation of CRD IV.

(e) The leverage ratio is calculated in line with the Policy Statement 'The Financial Policy Committee's powers over leverage ratio tools', July 2015. For further details following the FPC's July 2016 Recommendation relating to the calculation of the Tier 1 leverage ratio, see footnote (1) on page 7.

(f) Corresponds to the same year as the minimum CET1 ratio over the stress scenario.

(g) Leverage exposure measure taken from the bank's annual accounts.

(h) Corresponds to the same year as the minimum leverage ratio over the stress scenario.

(i) This excludes CRD IV distribution restrictions. Where a bank is subject to such restrictions all non business as usual cuts to distributions subject to CRD IV restrictions will appear in the next column — 'All 'strategic' management actions including CRD IV distribution restrictions'. This should not be interpreted as a judgement by the Bank that any or all of such cuts are conditional on such restrictions.

Santander UK is the UK subsidiary of Banco Santander S.A. and is a retail and commercial bank with a relatively small trading business. The results show that Santander UK's capital position remains above its CET1 hurdle rate of 7.3% and Tier 1 leverage hurdle rate of 3.0% in the hypothetical stress scenario with a low point of 9.9% CET1 ratio in 2016 and 3.6% leverage ratio in 2018 after 'strategic' management actions. **The PRA Board judged that this stress test did not reveal capital inadequacies for Santander UK given its balance sheet at end-2015.**

Santander UK's UK-centric business model meant it faced increases in impairments and RWAs as a result of the UK macroeconomic stress, driven by higher unemployment and house price falls. Net interest income was reduced in the stress as a result of lower customer margins, driven by low interest rates and higher funding costs. The assessment includes stressed projections of misconduct costs. Santander UK does not pay ordinary dividends for 2016 (when it reaches its CET1 low point) in the stress scenario as a result of the operation of the firm's published dividend policy. The assessment also incorporates the impact of 'strategic' management actions that the PRA Board judged Santander UK could realistically take in the stress scenario, including cost reductions and further reductions in ordinary dividend payments, the benefits of which largely materialise after the CET1 low point.

The Interim Management Statement published on 26 October 2016 and the 2016 Q3 Additional Capital Disclosures showed CET1 and leverage ratios of 11.1% and 3.8% respectively. **The PRA Board did not require Santander UK to submit a revised capital plan.**

Standard Chartered plc

Table 1G Projected consolidated solvency ratios in the stress scenario

	Actual (end-2015)	Minimum stressed ratio (before the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before conversion of AT1		Minimum stressed ratio (after the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2016 Q3)	Submit revised capital plan?
			Non-dividend 'strategic' management actions only ^(f)	All 'strategic' management actions including CRD IV distribution restrictions					
Common equity Tier 1 ratio ^{(a)(b)}	12.6%	5.5%	6.1%	6.7%	7.2%	6.1%	6.6%	13.0%	Not required
Tier 1 capital ratio ^(c)	14.1%	6.3% ^(f)	7.1% ^(f)	7.7% ^(f)	7.7% ^(f)			15.0%	
Total capital ratio ^(d)	19.5%	9.4% ^(f)	10.4% ^(f)	11.0% ^(f)	11.0% ^(f)			20.5%	
Memo: risk-weighted assets (US\$ billion)	303	390 ^(f)	371 ^(f)	371 ^(f)	371 ^(f)			292	
Memo: CET1 (US\$ billion)	38	21 ^(f)	23 ^(f)	25 ^(f)	27 ^(f)			38	
Tier 1 leverage ratio ^{(a)(e)}	5.5%	4.0%	4.2%	4.3%	4.3%	3.0%	3.1%	5.6%	
Memo: leverage exposure (US\$ billion)	729 ^(g)	607 ^(h)	591 ^(h)	591 ^(h)	591 ^(h)			745	

(a) The low points for the common equity Tier 1 (CET1) ratio and leverage ratio shown in the table do not necessarily occur in the same year of the stress scenario and correspond to the year where the minimum stressed ratio is calculated after all 'strategic' management actions and before conversion of AT1.

(b) The CET1 ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs) where CET1 capital is defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and in Supervisory Statement SS7/13, 'CRD IV and capital', December 2013, and RWAs are defined in line with the UK implementation of CRD IV as set out in the PRA Rulebook and relevant Supervisory Statements, December 2013.

(c) Tier 1 capital ratio is defined as Tier 1 capital expressed as a percentage of RWAs where Tier 1 capital is defined as the sum of CET1 capital and additional Tier 1 capital in line with the UK implementation of CRD IV.

(d) Total capital ratio is defined as total capital expressed as a percentage of RWAs where total capital is defined as the sum of Tier 1 capital and Tier 2 capital in line with the UK implementation of CRD IV.

(e) The leverage ratio is calculated in line with the Policy Statement 'The Financial Policy Committee's powers over leverage ratio tools', July 2015. For further details following the FPC's July 2016 Recommendation relating to the calculation of the Tier 1 leverage ratio, see footnote (1) on page 7.

(f) Corresponds to the same year as the minimum CET1 ratio over the stress scenario.

(g) Leverage exposure measure taken from the bank's annual accounts.

(h) Corresponds to the same year as the minimum leverage ratio over the stress scenario.

(i) This excludes CRD IV distribution restrictions. Where a bank is subject to such restrictions all non business as usual cuts to distributions subject to CRD IV restrictions will appear in the next column — 'All 'strategic' management actions including CRD IV distribution restrictions'. This should not be interpreted as a judgement by the Bank that any or all of such cuts are conditional on such restrictions.

Standard Chartered is a retail and commercial bank with trading operations, serving many economies and markets in Asia, Africa and the Middle East. The results show that Standard Chartered's capital position remains above its CET1 hurdle rate of 6.1% and Tier 1 leverage hurdle rate of 3.0% in the hypothetical stress scenario with a low point of 6.7% CET1 ratio in 2017 and 4.3% leverage ratio in 2016 after 'strategic' management actions. **The PRA Board judged that Standard Chartered met all hurdle rates and systemic reference points in this scenario. However, the PRA Board may also take into account other factors as set out on page 15 of Section 2. In this scenario Standard Chartered did not meet its minimum Tier 1 risk-weighted capital requirement (including Pillar 2A).**

The scenario for the 2016 stress test was severe for Standard Chartered's business operations as it includes a synchronised global downturn with a particularly severe impact on Asia, as well as a generalised downturn in emerging market economies. The sharp falls in a number of commodity prices including oil also impacted on Standard Chartered's exposures. As a result, impairments rise and risk weights increase significantly. Market risk losses also arise from the traded risk scenario which impacts Standard Chartered's Financial Markets business. The assessment includes stressed projections of misconduct costs. As Standard Chartered becomes loss making and is within its CRD IV buffers in 2016 and 2017 (the CET1 low point) it pays no dividend and is subject to CRD IV restrictions on other distributions for those years. The assessment also incorporates the impact of 'strategic' management actions that the PRA Board judged Standard Chartered could realistically take in the stress scenario, including cost and asset reductions.

At 31 December 2015 Standard Chartered had issued US\$2 billion of AT1 with a CET1 trigger of 7%. As Standard Chartered's CET1 capital ratio after 'strategic' management actions is below 7% at the low point, it is assumed that this AT1 converts to CET1 capital. This increases Standard Chartered's CET1 capital ratio after 'strategic' management actions and AT1 conversion to 7.2% at the low point. Since December 2015, Standard Chartered has made significant disposals from its liquidation portfolio, reducing risk-weighted assets. Standard Chartered has issued an additional US\$2 billion of AT1 in 2016. Neither of these actions are included in the results above. The Interim Management Statement published on 1 November 2016 showed CET1 and Tier 1 leverage ratios of 13.0% and 5.6% respectively, and that RWAs have reduced by 3.6% from December 2015 as the bank follows a strategy to de-risk its balance sheet. **In light of the steps that Standard Chartered is already taking to strengthen its capital position, including the AT1 it has issued during 2016, the PRA Board did not require Standard Chartered to submit a revised capital plan.**

Annex 2: Bank-specific projected impairment charges and traded risk losses

Table 2A Projected cumulative five-year impairment charge rates on UK lending in the stress scenario^{(a)(b)}

Per cent	Mortgage lending to individuals	Non-mortgage lending to individuals	Commercial real estate lending	Lending to businesses excluding commercial real estate
Barclays	0.7	25.3	5.5	6.5
HSBC	0.5	12.5	10.7	5.6
Lloyds Banking Group	2.3	20.0	8.2	7.7
Nationwide	0.6	21.3	10.2	–
The Royal Bank of Scotland Group	0.8	17.0	7.8	7.6
Santander UK	1.0	11.3	7.6	8.5
Standard Chartered	–	–	–	7.8

Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) Cumulative impairment charge rates = (five-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017, 2018, 2019 year-end positions. The HSBC and Standard Chartered impairment charge rates are calculated by first converting each component to sterling using exchange rates consistent with the stress scenario.

(b) Portfolios with cumulative impairment charges of £0.0 billion (ie below £0.05 billion) are excluded.

Table 2B Projected cumulative five-year impairment charges on UK lending in the stress scenario^{(a)(b)}

£ billions	Mortgage lending to individuals	Non-mortgage lending to individuals	Commercial real estate lending	Lending to businesses excluding commercial real estate
Barclays	0.9	7.0	0.4	2.9
HSBC	0.4	1.6	0.6	3.7
Lloyds Banking Group	6.8	5.4	1.2	3.3
Nationwide	1.1	0.8	0.3	–
The Royal Bank of Scotland Group	1.1	2.3	1.1	4.5
Santander UK	1.6	1.3	0.7	1.3
Standard Chartered	–	–	–	0.3

Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) The HSBC and Standard Chartered impairment charges are calculated by first converting each component to sterling using exchange rates consistent with the stress scenario.

(b) Portfolios with cumulative impairment charges of £0.0 billion (ie below £0.05 billion) are excluded.

Table 2C Projected cumulative five-year impairment charge rates in the stress scenario^{(a)(b)(c)}

Per cent

	Lending to individuals					Lending to businesses				
	United Kingdom	Hong Kong and China	United States	Euro area	Rest of world	United Kingdom	Hong Kong and China	United States	Euro area	Rest of world
Barclays	4.9	–	28.2	4.9	10.0	6.4	–	7.7	7.6	11.7
HSBC	2.1	5.6	8.8	3.7	8.7	6.0	6.2	3.4	4.1	5.9
Lloyds Banking Group	3.8	–	–	4.3	–	7.9	–	2.0	–	6.2
Nationwide	1.1	–	–	–	–	10.3	–	–	–	–
The Royal Bank of Scotland Group	2.3	–	–	4.6	3.6	7.6	–	–	7.8	4.6
Santander UK	1.7	–	–	–	–	8.2	–	–	–	–
Standard Chartered	–	5.8	–	–	8.2	7.8	8.6	1.9	3.9	5.5

Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) Cumulative impairment charge rates = (five-year total impairment charge)/(average gross on balance sheet exposure), where the denominator is a simple average of 2015, 2016, 2017, 2018, 2019 year-end positions.

The HSBC and Standard Chartered impairment charge rates are calculated by first converting each component to sterling using exchange rates consistent with the stress scenario.

(b) Portfolios with cumulative impairment charges of £0.0 billion (ie below £0.05 billion) are excluded.

(c) Data exclude material associates.

Table 2D Projected cumulative five-year impairment charges in the stress scenario^{(a)(b)(c)}

£ billions

	Lending to individuals					Lending to businesses				
	United Kingdom	Hong Kong and China	United States	Euro area	Rest of world	United Kingdom	Hong Kong and China	United States	Euro area	Rest of world
Barclays	7.9	–	5.1	0.8	1.7	3.3	–	1.6	0.7	2.4
HSBC	2.0	3.2	2.2	0.6	5.1	4.3	5.9	1.1	1.5	6.5
Lloyds Banking Group	12.2	–	–	0.4	–	4.5	–	0.1	–	0.2
Nationwide	1.8	–	–	–	–	0.3	–	–	–	–
The Royal Bank of Scotland Group	3.4	–	–	0.6	0.1	5.6	–	–	0.8	0.4
Santander UK	2.9	–	–	–	–	2.1	–	–	–	–
Standard Chartered	–	1.4	–	–	3.2	0.3	1.4	0.1	0.2	3.7

Sources: Participating banks' FDSF data submissions, Bank analysis and calculations.

(a) The HSBC and Standard Chartered impairment charges are calculated by first converting each component to sterling using exchange rates consistent with the stress scenario.

(b) Portfolios with cumulative impairment charges of £0.0 billion (ie below £0.05 billion) are excluded.

(c) Data exclude material associates.

Table 2E Projected traded risk losses in 2016 of the stress scenario^{(a)(b)(c)}

	£ billions
Barclays	4.3
HSBC	6.7
Lloyds Banking Group	1.2
The Royal Bank of Scotland Group	1.6
Santander UK	0.7
Standard Chartered	4.5

Sources: Participating banks' data submissions, Bank analysis and calculations.

(a) Traded risk losses include: market risk losses; counterparty credit risk losses; losses arising from changes in banks' credit valuation adjustment; prudential valuation adjustment; gains/losses from available-for-sale and fair value option positions, excluding securitisation positions. They exclude investment banking revenues and costs.

(b) Nationwide is excluded as it has minimal traded risk exposures.

(c) Losses for HSBC and Standard Chartered are calculated by first converting losses and RWAs to sterling using exchange rates consistent with the stress scenario.

Table 2F Projected traded risk losses in 2016 of the stress scenario as a percentage of traded risk RWAs as at end-2015^{(a)(b)(c)(d)}

	Per cent
Barclays	5.4
HSBC	6.3
Lloyds Banking Group	5.3
The Royal Bank of Scotland Group	3.5
Santander UK	8.6
Standard Chartered	9.9

Sources: Participating banks' data submissions, Bank analysis and calculations.

(a) Traded risk losses include: market risk losses; counterparty credit risk losses; losses arising from changes in banks' credit valuation adjustment; prudential valuation adjustment; gains/losses from available-for-sale and fair value option positions, excluding securitisation positions. They exclude investment banking revenues and costs.

(b) Nationwide is excluded as it has minimal traded risk exposures.

(c) Losses for HSBC and Standard Chartered are calculated by first converting losses and RWAs to sterling using exchange rates consistent with the stress scenario.

(d) Traded risk RWAs also include RWAs for available-for-sale and fair value option positions.

Glossary

ACS – annual cyclical scenario.
AFS – available-for-sale.
AT1 – additional Tier 1.
BAGL – Barclays Africa Group Limited.
BIS – Bank for International Settlements.
BoCom – Bank of Communications.
CCDS – Core Capital Deferred Shares.
CCoB – capital conservation buffer.
CCyB – countercyclical capital buffer.
CET1 – common equity Tier 1.
CRD IV – Capital Requirements Directive IV.
CRE – commercial real estate.
CRR – Capital Requirements Regulation.
CVA – credit valuation adjustment.
EBA – European Banking Authority.
EME – emerging market economy.
FDSF – Firm Data Submission Framework.
FPC – Financial Policy Committee.
FSB – Financial Stability Board.
FVO – fair value option.
GDP – gross domestic product.
G-SIBs – global systemically important banks.
Hibor – Hong Kong interbank offered rate.
ICAAP – Internal Capital Adequacy Assessment Process.
IMF – International Monetary Fund.
IRB – internal ratings based.
LBG – Lloyds Banking Group.
LGD – loss given default.
LTV – loan to value.
MDA – Maximum Distributable Amount.
MPC – Monetary Policy Committee.
MSCI – Morgan Stanley Capital International Inc.
ONS – Office for National Statistics.
PD – probability of default.
PNFCs – private non-financial corporations.
PPI – payment protection insurance.
PRA – Prudential Regulation Authority.
PVA – prudential valuation adjustment.
RBS – The Royal Bank of Scotland Group.
RWAs – risk-weighted assets.
SMEs – small and medium-sized enterprises.
UAE – United Arab Emirates.
VIX – CBOE Volatility Index.
WEO – IMF *World Economic Outlook*.

