BANK OF ENGLAND

November 2017

Stress testing the UK banking system: 2017 results

On 5 July 2018, **Table A5C** in Annex 5 was amended to correct a Bank of England calculation used to produce the impairment rates.

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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. 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 the Prudential Regulation Committee (PRC). The PRC is accountable to Parliament.

This document has been produced by Bank staff under the guidance of the FPC and PRC. It serves three purposes. First, it sets out the Bank's approach to conducting the fourth concurrent stress test of the UK banking system. Second, it presents and explains the results of the first Biennial Exploratory Scenario. Third, it sets out the judgements and actions taken by the PRC and FPC that were informed by the test results and analysis. Annexes 4 and 5 of this report, setting out the individual bank results and supervisory stance with respect to those banks, have been formally approved by the PRC.

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
David Ramsden, Deputy Governor responsible for markets and banking
Andrew Bailey, Chief Executive, 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 Committee:
Mark Carney, Governor
Sam Woods, Deputy Governor responsible for prudential regulation
Jon Cunliffe, Deputy Governor responsible for financial stability
Ben Broadbent, Deputy Governor responsible for monetary policy
David Ramsden, Deputy Governor responsible for markets and banking
Andrew Bailey, Chief Executive, Financial Conduct Authority
David Belsham
Sandra Boss
Norval Bryson
Charles Randell
David Thorburn
Mark Yallop

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Executive summary

For the first time since the Bank of England launched its stress tests in 2014, no bank needs to strengthen its capital position as a result of the stress test. The 2017 stress test shows the UK banking system is resilient to deep simultaneous recessions in the UK and global economies, large falls in asset prices and a separate stress of misconduct costs.

The economic scenario in the test is more severe than the global financial crisis. Significant improvements in asset quality since the crisis mean that the loss rate on banks' loans in the stress test is the same as in the financial crisis.

In the test, banks incur losses of around £50 billion in the first two years of the stress. This scale of loss, relative to their assets, would have wiped out the common equity capital base of the UK banking system ten years ago. The stress test shows these losses can now be absorbed within the buffers of capital banks have on top of their minimum requirements.

Capital positions have strengthened considerably in the past decade. Banks started the test with — in aggregate — a Tier 1 leverage ratio of 5.4% and a Tier 1 risk-weighted capital ratio of 16.4%. The aggregate common equity Tier 1 (CET1) ratio was 13.4% — three times stronger than a decade ago. Even after the severe losses in the test scenario, the participating banks would, in aggregate, have a Tier 1 leverage ratio of 4.3%, a CET1 capital ratio of 8.3% and a Tier 1 capital ratio of 10.3%. They would therefore be able to continue to supply the credit the real economy could demand even in a very severe stress.

Banks have continued to build their capital strength during 2017. **As a result, the Prudential Regulation Committee (PRC) judged that all seven participating banks now have sufficient capital to meet the standard set by the test.**

The Financial Policy Committee (FPC) has increased the system-wide UK countercyclical capital buffer rate, which applies to all banks, from 0.5% to 1%. This was informed by the losses banks made on their UK credit assets in the stress test.

Capital buffers for individual banks ('PRA buffers') will be set by the PRC in light of the stress-test results. PRA buffers will in part reflect the judgement made by the FPC and PRC in September 2017 that, following recent rapid growth, the loss rate on consumer credit in the first three years of the scenario would be 20%.

The setting of the countercyclical and PRA buffers, as informed by the stress test, will not require banks to strengthen their capital positions. It will require them to incorporate some of the capital they currently have in excess of their regulatory requirements into their regulatory capital buffers.

Section 1: The 2017 annual cyclical scenario

Background

The 2017 stress test includes two scenarios. Alongside the annual cyclical scenario (ACS) — the fourth concurrent stress test since 2014 — the Bank has conducted its first exploratory scenario. The test covered seven major UK banks and building societies (hereafter referred to as 'banks'), accounting for around 80% of the outstanding stock of PRA-regulated banks' lending to the UK real economy.(1)

The 2017 annual cyclical scenario

The 2017 ACS was calibrated to reflect the FPC and PRC's March 2017 assessment of risks. At that time, the FPC judged that domestic credit risks were at a standard level overall, while global vulnerabilities were elevated and had increased somewhat over the past year. Reflecting these risks, in the test scenario:

- **World GDP falls by 2.4%.**
- **UK GDP falls by 4.7%.**
- **UK unemployment rises to 9.5%.**
- **UK residential property prices fall by 33%.**
- **UK commercial real estate prices fall by 40%.**
- **UK Bank Rate rises and peaks at 4%.**
- **The sterling exchange rate index falls by 27%.**

Overall, the scenario is more severe than the financial crisis. The path of Bank Rate is very different. In the crisis it was cut by 5 percentage points, from 5.5% at the start of 2008 to 0.5% by March 2009, but in the stress scenario it rises by 3.75 percentage points to 4%. Although the fall in UK GDP is smaller than in the financial crisis, the increase in unemployment is larger. The scenario also includes a bigger fall in UK residential property prices. The fall in world GDP of 2.4% is larger than the 1.9% fall in the financial crisis.

The increase in Bank Rate reflects a challenging trade-off between growth and inflation in the scenario, triggered by a sudden increase in the return investors demand for holding sterling assets and an associated fall in sterling. This large sterling depreciation inflates all foreign currency projections when converted to sterling. This impact is highlighted where relevant in this document.

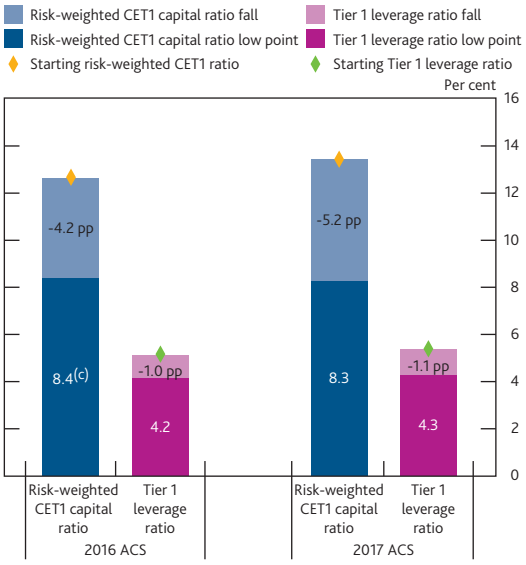
As in previous years, the 2017 ACS incorporates a traded risk scenario designed to be congruent with the macroeconomic scenario. Also included are stressed projections, generated by Bank staff, for potential misconduct costs beyond those paid or provided for at the end of 2016.(2)

Impact of the annual cyclical scenario on the banking system

Capital positions have strengthened considerably in the past decade. Banks started the test with — in aggregate — a Tier 1 leverage ratio of 5.4% and a Tier 1 risk-weighted capital ratio of 16.4%. The aggregate common equity Tier 1 (CET1) ratio was 13.4% — three times stronger than a decade ago.

In the test, banks incur losses of around £50 billion in the first two years of the stress. The stress reduces the aggregate CET1 capital ratio from 13.4% at the end of 2016 to a **low point of 8.3% in 2018** (**Chart 1.1**). The aggregate Tier 1 leverage ratio falls by 1.1 percentage points, from 5.4% at the end of 2016 to a **low point of 4.3% in 2018** (**Chart 1.1**). A breakdown of these overall effects is presented in **Table 1.A**.(3)

Chart 1.1 Aggregate risk-weighted CET1 capital and Tier 1 leverage ratio falls in the 2016 and 2017 tests(a)(b)(c)



Sources: Participating banks' published accounts and Stress Testing Data Framework (STDF) 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 Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(c) The CET1 capital ratio low point for the 2016 ACS is before the conversion of additional Tier 1 (AT1) instruments.

(1) The seven participating banks and building societies are: Barclays, HSBC, Lloyds Banking Group, Nationwide, The Royal Bank of Scotland Group, Santander UK Group Holdings plc and Standard Chartered. Throughout this document the term 'banks' is used to refer to the seven participating banks and building societies.
(2) Further details of the 2017 stress scenarios can be found in 'Stress testing the UK banking system: key elements of the 2017 stress test; www.bankofengland.co.uk/-/media/boe/files/stress-testing/2017/stress-testing-the-uk-banking-system-key-elements-of-the-2017-stress-test.pdf.
(3) Unless otherwise stated, all figures and charts relating to the annual cyclical scenario are presented on a post 'strategic' management actions basis, including actions related to CRD IV restrictions.

Without the macroeconomic and traded risk stress or Bank staff's stressed projections for misconduct costs, banks' baseline projections implied a 0.9 percentage point increase in their aggregate risk-weighted CET1 capital ratio, to 14.3% by 2018 (**Table 1.A**).(1)

Table 1.A Contributions to the shortfall in the aggregate CET1 capital ratio and Tier 1 leverage ratio at the low point of the stress in 2018 relative to the baseline projection

	CET1 ratio[a]	Leverage ratio[b]
Actual end-2016	**13.4%**	**5.4%**
Baseline end-2018	**14.3%**	**5.7%**
Impairments	-4.2 pp	-1.5 pp
Traded risk losses[c]	-1.8 pp	-0.6 pp
Net interest income	1.2 pp	0.4 pp
Misconduct costs	-1.7 pp	-0.6 pp
Risk-weighted assets/leverage exposure[d][e]	-2.7 pp	-0.2 pp
Reductions in discretionary distributions in stress[f]	2.2 pp	0.8 pp
Expenses and taxes[g]	0.6 pp	0.2 pp
Other[h]	0.3 pp	0.1 pp
Stress end-2018	**8.3%**	**4.3%**
Aggregate systemic reference point[i]	**7.7%**	**3.6%**

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

(a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs), 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 excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(c) Traded risk losses comprise: market risk, counterparty credit risk, credit and other valuation adjustments, prudential valuation adjustments, and gains/losses from available-for-sale and fair value option positions, excluding securitisation positions. This also includes investment banking revenues net of costs. RWA impact is not included.
(d) Changes in RWAs impact the CET1 ratio, whereas changes in the leverage exposure measure impact the Tier 1 leverage ratio.
(e) The rise in RWAs is inflated by the large sterling depreciation in the 2017 ACS. However, this depreciation also increases the value of the CET1 capital that UK banks hold in foreign currency. Netting these two factors together suggests that the underlying impact on the CET1 capital ratio is around -2.7 percentage points. Without this netting effect the impact would mean a reduction of 4.2 percentage points. This effect also reduces the impact of the leverage exposure measure on the leverage ratio from -0.7 percentage points to -0.2 percentage points.
(f) Reductions in discretionary distributions includes reductions in dividends, non-contractual variable remuneration and AT1 coupons.
(g) Expenses comprise of administrative and staff expenses excluding the non-contractual portion of variable remuneration which is included in reductions in discretionary distributions in stress.
(h) 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 pension assets devaluation, prudential filters, accumulated other comprehensive income, IRB shortfall of credit risk adjustments to expected losses, and actuarial gain from defined benefit pension schemes.
(i) 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 impact of the stress, relative to this baseline, is to reduce the aggregate CET1 capital ratio by 6.0 percentage points. This reflects a range of factors, including:

- A domestic and global downturn, combined with a sharp fall in asset prices and a rise in sterling interest rates, 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 almost £50 billion on UK domestic exposures and over US$40 billion on overseas lending over the first two years of the stress. These reduce the aggregate CET1 ratio by 4.2 percentage points relative to the baseline.

- Sharp movements in market prices and increased counterparty credit risk. The **traded risk** stress, including a shortfall of investment bank revenues net of costs, results in substantial losses in 2017. These losses are partially reversed as asset prices recover. By the low point of the stress at the end of 2018, this reduces bank capital by over £33 billion relative to the baseline projection, lowering the aggregate CET1 ratio by 1.8 percentage points.

- A stronger profile for aggregate **net interest income**. This relates in large part to the higher path for sterling interest rates in the ACS. The benefit comes primarily from the fact that banks retain a stock of non-interest bearing liabilities (such as retail current accounts and equity) and, over the course of the stress, are able to allocate the cash associated with these liabilities to higher returning assets. The benefit is reduced somewhat as some customers respond to higher interest rates by switching deposits into savings accounts. Overall, net interest income is almost £23 billion higher in the first two years of the stress, relative to the baseline, and this increases the aggregate CET1 ratio by 1.2 percentage points at the low point. Box 6 on page 38 provides further details of how the increase in Bank Rate affects net interest income.

- **Stressed misconduct costs**, which total around £40 billion over the five years of the stress. In aggregate, between 2011 and 2016 participating banks had paid out or provisioned for around £67 billion of misconduct costs. The stress scenario would therefore take total misconduct costs over the period from 2011 to 2021 to over £100 billion. Around £30 billion of these additional misconduct costs are projected to be realised by the end of 2018 and reduce the aggregate CET1 ratio at the low point by 1.7 percentage points, relative to the baseline.

- An increase in **risk-weighted assets** (RWAs) as credit and market risks increase in the stress. Credit risk RWAs rise by 51% during the first two years of the stress. Traded risk RWAs also increase significantly, particularly for Asian-focused business. The overall impact of rising RWAs is to reduce the aggregate CET1 ratio by around 2.7 percentage points relative to the baseline.(2)

- As in previous stress tests, **cuts to ordinary dividends help mitigate the fall in the aggregate CET1 capital ratio**. In aggregate, banks paid ordinary dividends of around £8 billion in 2016 and in the baseline projection (which

(1) The baseline projections of the Bank's stress tests 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 provisioned for at end-2016. This set of published baseline variables are broadly consistent with the Monetary Policy Committee's February 2017 *Inflation Report*. A range of published international variables are consistent with the October 2016 IMF *World Economic Outlook* (*WEO*). For more information see Bank of England (2017), 'Stress testing the UK banking system: key elements of the 2017 stress test'; www.bankofengland.co.uk/-/media/boe/files/stress-testing/2017/stress-testing-the-uk-banking-system-key-elements-of-the-2017-stress-test.pdf.
(2) The large sterling depreciation in the scenario means that the sterling value of foreign currency assets and foreign currency capital both increase as sterling falls in the stress. Both of these effects are incorporated into this number.

does not include misconduct costs) they pay £26 billion in the first two years. During a stress, with a significant fall in banks' profits, investors should expect a material cut in dividends. Banks pay out no dividends on ordinary shares during the first two years of the stress (**Table 1.B**).(1) This retention of £26 billion, relative to the baseline pushes up the aggregate CET1 ratio by 1.4 percentage points at the 2018 low point.

- The stress also means **banks significantly reduce the amount of other discretionary distributions** they pay out over the first two years of the stress. In aggregate, total variable remuneration falls from £4.4 billion in 2016 to £0.5 billion over the two years to end-2018. This boosts the CET1 capital ratio by 0.5 percentage points relative to banks' baseline projections. Other distributions, including additional Tier 1 (AT1) discretionary coupons, are reduced from £2.9 billion in 2016 to £1.3 billion over the same period, boosting banks' aggregate CET1 capital ratio by 0.3 percentage points relative to the baseline. Further details of these cuts to distributions can be found in **Table 1.B**.

- **Lower taxes** as a result of lower profitability combined with **reductions in expenses** together boost the aggregate CET1 ratio by 0.6 percentage points relative to the baseline.

Table 1.B Dividends, variable remuneration, additional Tier 1 coupons and other distributions in the 2017 annual cyclical scenario

£ billions	Actual 2016	To end-2018 in the baseline	To end-2018 in the stress
Ordinary dividends[a]	8.2	26.2	0.1
Variable remuneration[b]	4.4	9.0	0.5
ATI discretionary coupons and other distributions[c]	2.9	7.5	1.3

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

(a) Ordinary dividends shown net of scrip payments, and are in respect of the year noted. They are on a foreseeable basis.
(b) Variable remuneration reflects discretionary distributions only (ie upfront cash awards awarded in the current year, paid in the current year only), pre-tax.
(c) Other distributions includes preference dividends, and other discretionary distributions.

The 'other' row in **Table 1.A** sums a number of different factors. This includes regulatory deductions made to CET1 capital (such as goodwill or deferred tax assets). In the stress, these deductions shrink as the underlying valuations they apply to change. The overall impact of these 'other' factors is to increase the aggregate CET1 ratio by 0.3 percentage points relative to the baseline.

Compared to the 2016 test, the 5.2 percentage point fall in the aggregate CET1 capital ratio from start to low point is 0.9 percentage points larger. This difference is explained by:

(i) The judgement made by the FPC and PRC that consumer credit losses would be higher than in previous tests.

(ii) A tougher global scenario causing a larger increase in trading book risk-weighted assets, some of which is driven by the fall in sterling in the scenario. (Further details of the traded risk shock can be found in Annex 1).

(iii) The mechanical effect that a given increase in risk-weighted assets has a larger percentage point impact on a higher starting capital ratio (a simple example of this effect is shown in Box 3 on pages 27–28).

Only the first of these factors is captured in banks' leverage ratios. In the 2017 test, the aggregate Tier 1 leverage ratio falls by 1.1 percentage points, only 0.1 percentage points more than in the 2016 test. Further discussion of how this year's results compare with the 2016 test can be found in Box 3.

The FPC announced market-wide consumer credit impairments following its 2017 Q3 meeting. The FPC and PRC judged that banks had been placing too much weight on the recent performance of consumer lending in benign conditions as an indicator of underlying credit quality.

This judgement contributed to an increase in the three-year market-wide level of impairments to £30 billion in the 2017 ACS. For participating banks, which account for around 70% of total consumer lending, this drove some of the increase in the three-year impairment rate from 13% in the 2016 test to 20% in the 2017 ACS. The overall increase in consumer credit impairments, relative to the 2016 ACS, reduced the low-point CET1 capital ratio by 0.4 percentage points. Further details of how the 2017 ACS affected consumer credit lending can be found in Box 4 on page 30.

On a non risk-weighted basis, banks' aggregate exposures are projected to increase in the first two years of the stress, but this increase is boosted by the sterling depreciation in the scenario. Once the impact of foreign exchange movements on the leverage exposure measure is offset against the corresponding impact on Tier 1 capital, the overall effect is to reduce the leverage ratio by 0.2 percentage points relative to the baseline.

The impact of all major elements of the stress on the Tier 1 leverage ratio is around a third of their effect on the risk-weighted capital ratio. This is because the leverage exposure measure is almost three times larger than aggregate RWAs at the start of the test.

Hurdle rate

Performance in the test was assessed against the Bank's hurdle rate framework which comprises elements expressed in terms of both risk-weighted capital and leverage ratios.

(1) Nationwide continues to make distributions on its Core Capital Deferred Shares (CCDS) during the stress. These total £0.1 billion by the low point.

As with the 2016 ACS, the CET1 capital ratio hurdle rate framework has two elements:

(i) A **hurdle rate**, equal to the sum of the internationally agreed common minimum standard for CET1 (4.5% of RWAs) and any Pillar 2A CET1 uplift set by the PRA, which varies across banks. The weighted average of this hurdle rate was 6.7%; and

(ii) A **'systemic reference point'**, which is higher than the hurdle rate and applies to those banks designated as globally systemically important banks (G-SIIs).(1) This adds to the hurdle rate an amount equal to each banks' G-SII capital buffer. These buffers are currently being phased in and will, by 2019, be between 1% and 2% of risk-weighted assets. The weighted average systemic reference point was 7.7% at the low point in 2018.

The process of phasing in banks' G-SII capital buffers has progressed since the 2016 ACS. As a result, the capital standard against which banks subject to a systemic reference point are judged is 0.4 percentage points higher, in aggregate, than it was in the 2016 test.

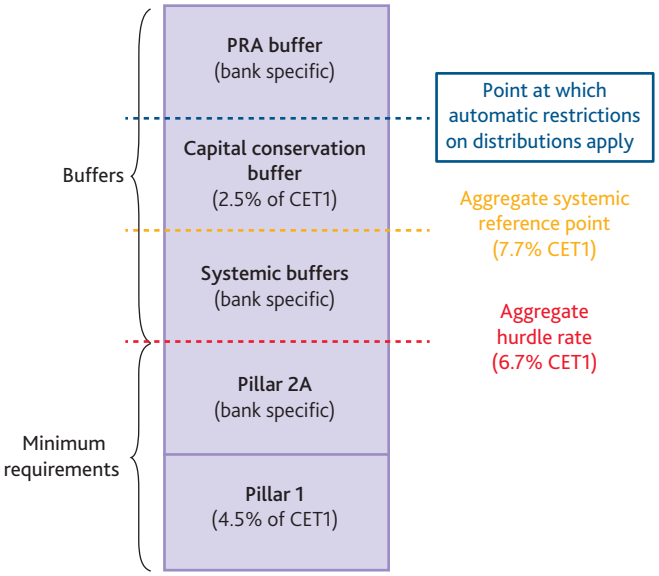
Figure 1.A illustrates how the hurdle rate framework interacts with the regulatory capital framework, including buffers. Minimum requirements are the amount of capital a bank is expected to maintain at all times. For this reason they are reflected in the hurdle rate. All of the regulatory capital buffers that sit on top of those minimum requirements can, in practice, be used to absorb losses in a stress. The existence of usable buffers allows banks to absorb losses without breaching minimum requirements, enabling them to maintain the supply of credit to the real economy in the face of adverse shocks.

The systemic reference point sits some way above the minimum requirements, inside these buffers. This means that systemically important banks are held to a higher standard in the stress test than their minimum capital requirement and, as a result, they will have a larger buffer of capital overall than is needed to absorb the stress test. This recognises the greater impact the failure of such a bank could have on lending to the real economy and financial stability more generally.

Two final points in the capital framework are of relevance to the stress test. The conversion of additional Tier 1 (AT1) capital instruments to common equity is triggered when a bank's common equity ratio falls to 7%.(2) In aggregate, this sits a little above the hurdle rate, but below the systemic reference point.

In addition, automatic restrictions on the payment of distributions, including dividends, AT1 coupons and variable remuneration start to apply at the point when a bank's capital ratio falls below the level required to maintain a certain buffer of capital. That buffer is at least as great as the sum of the buffer of capital reflecting its systemic importance and the capital conservation buffer (which will be 2.5% when fully phased in).

Figure 1.A Illustration of how the hurdle rate framework interacts with the regulatory capital framework(a)(b)



Sources: Bank of England, FSB and Bank calculations.

(a) Hurdle rate and systemic reference point are shown at the low point of the stress in 2018.
(b) The countercyclical capital buffer rate is not shown as it is assumed to be cut to zero in the stress scenario.

As in previous years, the Tier 1 leverage ratio hurdle rate framework mirrors that of the CET1 capital ratio. The leverage hurdle rate reflects minimum requirements. This is 3.25% (of exposures excluding central bank reserves).(3) The systemic reference point adds in any relevant G-SII leverage buffer. These are 35% of any corresponding risk-weighted capital buffer. Details of each bank's hurdle rate and systemic reference point — for both CET1 capital and leverage ratios — can be found in Annex 2, **Table A2.A**.

Banks are judged against their hurdle rates and, where relevant, systemic reference points based on their capital positions before the conversion of contingent capital instruments such as AT1. This reflects the PRC's policy that capital buffers should be held in CET1 capital.

The systemic risk buffer (SRB) will be applied to ring-fenced banks and building societies by the PRA, effective from 2019.(4) Its application will have implications for the amount

(1) For further details of G-SIIs see Financial Stability Board, November 2017; www.fsb.org/wp-content/uploads/P211117-1.pdf.
(2) All AT1 instruments currently in issue by UK banks have a 7% trigger.
(3) See 'Financial Policy Committee statement' from its meeting, 20 September 2017; www.bankofengland.co.uk/publications/Pages/news/2017/009.aspx.
(4) For more details, see www.bankofengland.co.uk/financialstability/Documents/fpc/srbf_cp.pdf. For further explanation of the implications of the SRB at banking group level see also www.bankofengland.co.uk/pra/Pages/publications/ss/2017/ss3115update.aspx.

of capital stress-test participants need at group level, if they are subject to the SRB. Banks are still finalising their ring-fence plans, so the precise amounts of capital needed are yet to be determined. But the PRC will take the future implications of the SRB into account when using the 2017 stress test to inform its assessment of the adequacy of banks' capital plans for 2019 and beyond. The Bank intends to take more precise account of the implications of the SRB for group capital in the 2018 stress-test hurdle rate framework.

Results of the 2017 annual cyclical scenario

For the first time since the Bank launched its stress tests in 2014, no bank needs to strengthen its capital position as a result of the stress test.

Banks in aggregate cleared the aggregate CET1 capital and Tier 1 leverage ratio systemic reference points by 0.6 percentage points and 0.7 percentage points respectively. Even after the severe losses in the test scenario, the participating banks would, in aggregate, have a Tier 1 leverage ratio of 4.3%, a CET1 capital ratio of 8.3% and a Tier 1 capital ratio of 10.3%. They would therefore be able to continue to supply the credit the real economy could demand even in a very severe stress.

The results differ substantially across banks. This is due to differences between banks' business models, the types of risk the banks are most exposed to and, in some cases, the extent of their progress through restructuring programmes.

Based on their end-2016 capital positions, Barclays and RBS did not meet their CET1 capital ratio systemic reference points. Barclays also fell marginally below its Tier 1 leverage ratios systemic reference point (**Charts 1.2** and **1.3**).

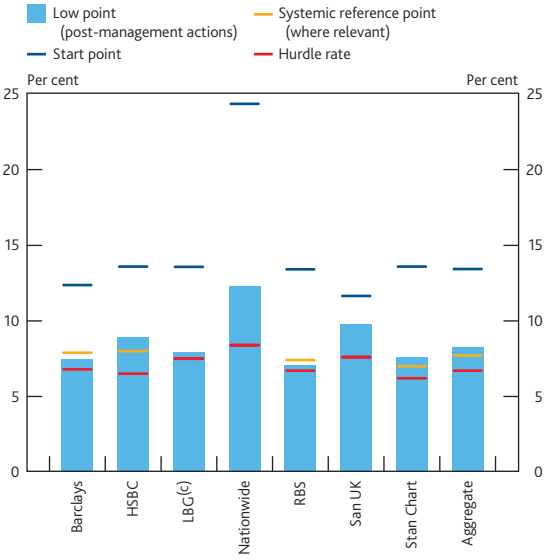
However, Barclays and RBS have significantly improved their capital positions since the end of 2016 (**Table 1.C**). If the test were run on the basis of their latest capital positions, both banks would meet their CET1 capital ratio and Tier 1 leverage ratio systemic reference points.

RBS has increased its CET1 capital ratio from 13.4% at end-2016 to 15.5% in 2017 Q4. This increase is around five times greater than the shortfall against its systemic reference point in the test.

Barclays increased its CET1 capital ratio from 12.4% to 13.1%, and its Tier 1 leverage ratio from 5% to 5.1%, over the same period. This is sufficient for it to now meet the systemic reference points in the test.

As a result, **the PRC judged that no bank was required to take action to improve its capital position as a result of the stress test.**

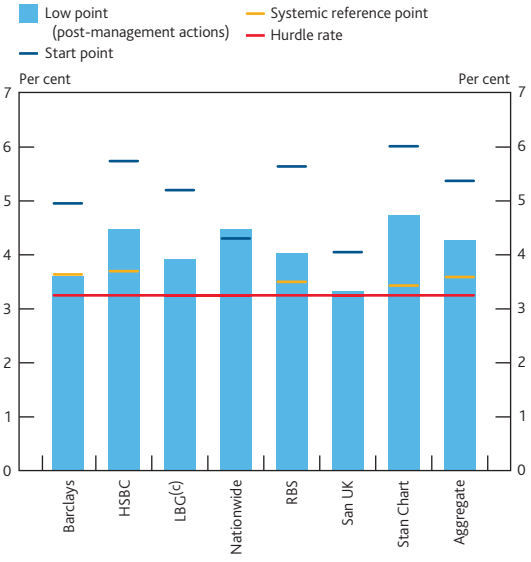
Chart 1.2 Projected CET1 capital ratios in the stress scenario[a][b]



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

(a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of RWAs, where these are in line with CRR and the UK implementation of CRD IV via the PRA Rulebook. Aggregate CET1 capital ratios are calculated by dividing aggregate CET1 capital by aggregate RWAs at the aggregate low point of the stress in 2018.
(b) The minimum CET1 capital ratios shown in the chart 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 actions and CRD IV restrictions pre-AT1 conversion projections.
(c) The end-2016 CET1 ratio of 13.6% includes 80 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 80 basis point of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.

Chart 1.3 Projected Tier 1 leverage ratios in the stress scenario[a][b]



Sources: Participating banks' STDF 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 excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*. 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 2018.
(b) The minimum Tier 1 leverage ratios shown in the chart 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 actions and CRD IV restrictions pre-AT1 conversion projections.
(c) The end-2016 Tier 1 leverage ratio of 5.2% includes 30 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 30 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.

Table 1.C Projected CET1 capital ratios and Tier 1 leverage ratios in the stress scenario[a][b][c][d]

	2017 ACS				
	Actual (end-2016)	Low point (post strategic management actions)	Hurdle rate	Systemic reference point	Actual (2017 Q3)
CET1 ratios					
Barclays	12.4	7.4	6.8	7.9	13.1
HSBC	13.6	8.9	6.5	8.0	14.6
Lloyds Banking Group[e]	13.6	7.9	7.5	n.a.	14.1
Nationwide	24.4	12.3	8.4	n.a.	29.6
The Royal Bank of Scotland Group	13.4	7.0	6.7	7.4	15.5
Santander UK	11.6	9.7	7.6	n.a.	12.1
Standard Chartered	13.6	7.6	6.2	7.0	13.6
Aggregate	**13.4**	**8.3**	**6.7**	**7.7**	**14.4**
Leverage ratios					
Barclays	5.0	3.6	3.25	3.6	5.1
HSBC	5.7	4.5	3.25	3.7	6.1
Lloyds Banking Group[f]	5.2	3.9	3.25	n.a.	5.4
Nationwide	4.3	4.5	3.25	n.a.	4.9
The Royal Bank of Scotland Group	5.6	4.0	3.25	3.5	6.0
Santander UK	4.1	3.3	3.25	n.a.	4.4
Standard Chartered	6.0	4.7	3.25	3.4	5.9
Aggregate	**5.4**	**4.3**	**3.25**	**3.6**	**5.7**

Sources: Participating banks' published accounts and STDF 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 excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(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 2018. 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 2018.
(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.
(e) The end-2016 CET1 ratio of 13.6% includes 80 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 80 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.
(f) The end-2016 Tier 1 leverage ratio of 5.2% includes 30 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 30 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.

Calibration of regulatory capital buffers

In general, the capital buffers banks are required to have for use during the stress are calibrated to be big enough to withstand all elements of the stress test.

The aggregate effect of the UK economic scenario on banks' capital ratios is used by the FPC to calibrate the setting of the UK countercyclical capital buffer (CCyB) rate, which is applicable to banks' relevant UK-related assets and captures the risk of losses on those assets. This buffer is a time-varying extension of the capital conservation buffer.

The capital conservation buffer will — when fully phased in by 2019 — be 2.5% of all total RWAs. The UK economic scenario reduces banks' capital by 3.5% of their risk-weighted UK credit assets. The test results are therefore **consistent with the judgement of the FPC to set the system-wide UK countercyclical capital buffer rate, which applies to all banks, at 1%**.

Capital buffers for individual banks (PRA buffers) are set by the PRC in light of the stress-test results. These 'PRA buffers' are informed by the other elements of the stress test, including losses on trading books and global exposures.

PRA buffers are also informed by losses on UK exposures in the test where they differ from the system average, as well as the uplift to consumer credit losses applied to the results to the stress test this year.

The setting of the countercyclical and PRA buffers, as informed by the stress test, will not require banks to strengthen their capital positions. It will require them to incorporate some of the capital they currently have in excess of their regulatory requirements into their regulatory capital buffers.

Qualitative review

An important objective of the concurrent stress-testing framework is to support a continued improvement in banks' own risk management capital planning capabilities. For this reason, as in previous tests, the Bank also undertook a qualitative review of banks' stress-testing capabilities for both of the 2017 stress-test scenarios.

The PRC did not expect to observe a step change in banks' stress testing capabilities in 2017, given the need to produce two sets of results. **The PRC expects further progress in future tests.** As set out in the Bank of England's *Approach to stress testing the UK banking system*, the results of 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.[1]

The overall quality of data provided and the credibility of the analysis across a number of areas has improved since the 2016 ACS. While participating banks are overall on the right trajectory, some weaknesses remain. These weaknesses are particularly apparent in their ability to assess the impact of the stress on net interest income and traded risk.

The Bank is committed to raising standards in model development and management and issued model management principles to banks in March of this year.[2] The Bank intends to publish a consultation paper on model risk management standards for stress testing in December 2017 and a Supervisory Statement in April 2018.

(1) See Bank of England (2015), 'The Bank of England's approach to stress testing the UK banking system'; www.bankofengland.co.uk/-/media/boe/files/stress-testing/2015/the-boes-approach-to-stress-testing-the-uk-banking-system.pdf.
(2) See PRA, 27 March 2017; www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/letter/2017/stress-test-model-management.pdf.

2 The 2017 biennial exploratory scenario

Executive summary

The Bank's first exploratory scenario examined major UK banks' long-term strategic responses to an extended low growth, low interest rate environment with increasing competitive pressures in retail banking enabled in part by an increase in the use of financial technology (FinTech).

FinTech has the potential to create a more competitive market. It may also have profound consequences for incumbent banks' business models. Ensuring the strategic flexibility and resilience of major banks is an integral part of ensuring the long-term resilience of the UK financial system and its ability to adapt safely to structural changes that promote competition and benefit consumers and businesses.

The motivation for this exploratory scenario is different from the cyclical scenario. It is an exploratory exercise, designed to encourage banks to think about their strategic challenges. It will influence future work by banks and regulators, rather than informing the FPC and PRC about the immediate capital adequacy of participants. The focus of the exercise is not whether, but how, major UK banks would meet the requirements of regulators and investors in the scenario.

In aggregate, participating banks project that they could adapt to a low rate, low growth macroeconomic environment without major strategic change or taking on more risk. Net interest margins and lending volumes are squeezed. However, banks consider that they can offset this by extending their baseline plans to reduce costs.

Banks expect that they would generate a return on equity of a little over 8% by 2023. They judge that this would meet the return demanded by investors — their estimated cost of equity — in the exploratory scenario. Most banks' current return on equity targets are at or above 10%.

The Bank has identified three important risks to the banks' projections. First, competitive pressures enabled by FinTech, and in particular the emergence of Open Banking, may cause greater and faster disruption to banks' business models than banks project. Second, banks are projecting large reductions in costs and there is a risk that they will be unable to execute these plans fully while delivering a broad range of services, particularly given that the cost of maintaining and acquiring customers may be higher in the scenario. Third, in an environment of low growth and low interest rates the equity risk premium may be higher than banks expect.

Supervisors will now discuss the results of the exercise with banks, including the potential implications of these risks. The exploratory scenario has provided the FPC and PRC with a series of insights, ranging from the development of such exercises to the possible future of banking.

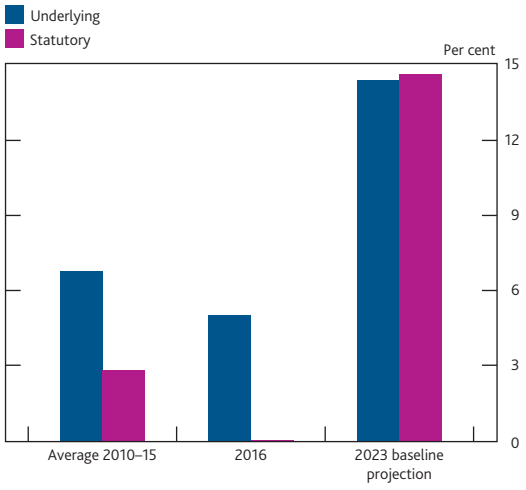
Key features of the 2017 exploratory scenario

The Bank's first biennial exploratory scenario (BES) examined major UK banks' long-term strategic responses to an extended low growth, low interest rate environment with increasing competitive pressures in retail banking enabled in part by an increase in the use of financial technology (FinTech). To capture these long-term trends, the Bank calibrated a ten-year scenario, with banks submitting projections for seven years out to 2023.

UK banks have experienced a decline in profitability relative to the years before the financial crisis. Banks' aggregate return on equity — net income as a fraction of shareholder equity — was around zero in 2016 and has averaged only 2.5% since 2010. While this is partly explained by issues such as misconduct costs and one-off charges like restructuring expenses, underlying profitability has also been low relative to the pre-crisis period, averaging 6.7% since 2010.

Banks are expecting a recovery in profitability as existing headwinds begin to abate. In aggregate, they expect their return on equity to rise significantly to just under 15% by 2023 (**Chart 2.1**). This rise is driven by expected increases in net interest income as interest rates start to rise and an assumed reduction in misconduct costs. Banks also expect to cut other costs in their baseline projections.

Chart 2.1 Return on equity: post-crisis comparison with banks' baseline projections(a)(b)(c)



Sources: Participating banks' published accounts and participating banks' STDF data submissions.

(a) Return on equity calculated as net income attributable to shareholders after AT1 interest over (year average) shareholder equity.
(b) For the baseline 2023 return on equity (RoE) projections, the level of CET1 capital is adjusted so that the baseline CET1 ratio is consistent with CET1 ratios submitted by banks under BES in 2023.
(c) Underlying return on equity is statutory return excluding misconduct costs and other one-off profit and loss (P&L) items.

The 2017 exploratory scenario is calibrated to assume that, rather than abating, many of the existing headwinds to profitability persist or intensify. The exercise is focused on how banks would ensure they have sustainable business models while meeting regulatory and investor requirements in the face of these headwinds.

One major headwind to large banks' profitability in the exploratory scenario is competitive pressure from smaller banks and from non-banks in retail banking, in part facilitated by an expansion in the use of FinTech. This expansion is, in turn, partly motivated in the scenario by the forthcoming implementation of the European Union's second payment services directive (PSD2) and the 'Open Banking' initiative mandated by the UK Competition and Markets Authority.(1)

These reforms, due to be introduced from January 2018, will require banks — at a customer's request — to allow third parties secure access to account information and to enable them to initiate payments on the customer's behalf. Under Open Banking, third parties must be able to 'plug-in' directly to the major banks' IT systems. One consequence will be that customers can switch between banks and services more easily. The exploratory scenario explicitly captures this effect by incorporating a reduction in major banks' pricing power, forcing them to price close to market averages or lose market share.(2)

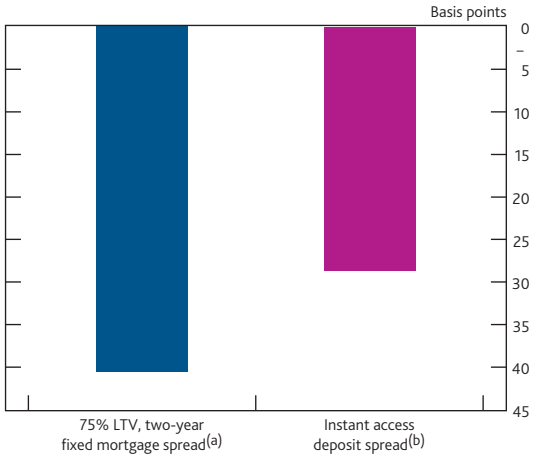
Increased competition affects both lending and deposit markets (**Chart 2.2**). Under the scenario, it is associated with a fall of around 40% in the spread between UK retail lending and deposit rates relative to current levels, squeezing banks' net interest margins. It is further associated with a reduction in the share of household savings held as retail deposits.

The scenario also incorporates weak economic growth, in the United Kingdom and globally (**Table 2.A**). This is reflected in a persistently low path for global interest rates, stagnant world trade, and weaker cross-border banking activity. Market volatility measures remain low. And asset price growth is subdued: for example, UK house prices grow by around 11% between 2016 and 2023, compared to 30% in the baseline.

These factors put downward pressure on the demand for a range of retail, commercial and investment banking services, as well as on trading income. In particular, lending by major banks to businesses is projected to shrink (**Chart 2.3**). This adds to the pressure on net interest income.

(1) For more details, see www.fca.org.uk/firms/revised-payment-services-directive-psd2 and www.gov.uk/government/news/cma-paves-the-way-for-open-banking-revolution.
(2) For further details see Box 2 of Bank of England (2017), 'Stress testing the UK banking system: key elements of the 2017 stress test'; www.bankofengland.co.uk/-/media/boe/files/stress-testing/2017/stress-testing-the-uk-banking-system-key-elements-of-the-2017-stress-test.pdf.

Chart 2.2 Changes in UK retail lending and deposit rates, in the exploratory scenario between end-2016 and end-2023



Sources: Bank of England, Bloomberg and Bank calculations.

(a) Spread to two-year sterling swap rate.
(b) Spread to Bank Rate (Inverted).

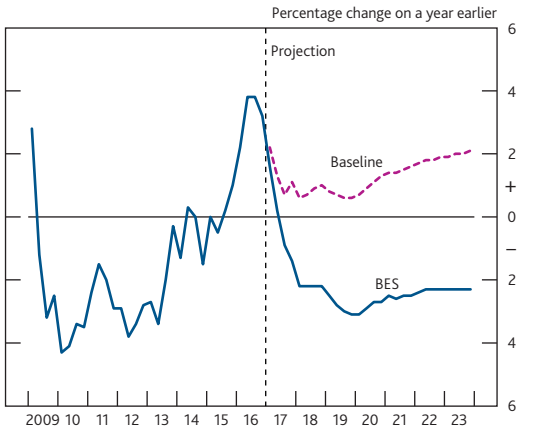
Table 2.A Comparison of trend GDP growth rates and cumulative residential property price growth in the exploratory and baseline scenarios

	Trend GDP(a)		Residential property prices(b)	
	Baseline	BES	Baseline	BES
United Kingdom	2.2	1.2	30	11
World	3.8	1.9	n/a	n/a
United States	1.6	0.9	32	13
Euro area	1.5	0.7	23	5
Hong Kong	2.9	1.5	35	11
China	5.8	3.5	68	30

Source: Bank calculations.

(a) Trend growth rate measured as the year on year per cent growth rate at the seven year point of the scenario.
(b) Cumulative per cent growth rate from the beginning of the scenario to the seven year point.

Chart 2.3 Growth in the demand for credit from UK companies in the exploratory scenario(a)



Source: Bank of England.

(a) Historical data are monetary financial institutions' (MFI) sterling net lending to private non-financial corporations, seasonally adjusted.

The scenario further includes a stressed projection for misconduct costs over the first five years of its seven-year horizon. This mirrors the level of stressed misconduct losses over the first five years of the ACS. From the third year of the exploratory scenario onwards, banks' projections also include estimates of expenditure to guard against and control further misconduct risks.

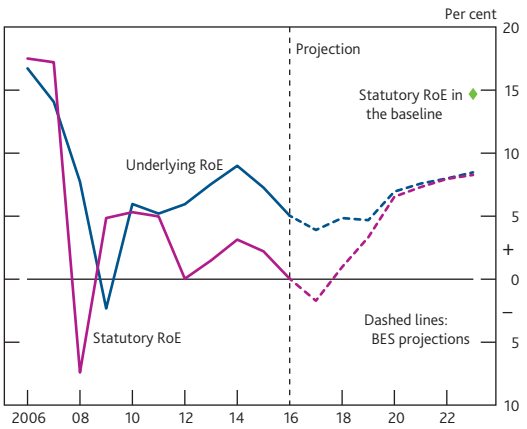
Banks were expected to aim for a return on equity above their projections for the return demanded by investors — the cost of equity — by the end of 2023. They were also expected to meet their regulatory requirements on capital and liquidity throughout the scenario.

Banks' projections under the exploratory scenario

The results reported in this document reflect the projections submitted by participating banks. The Bank has only adjusted the results submitted by participating banks to make any necessary corrections. This means that unlike the results of the ACS they do not reflect the Bank's judgement. This approach reflects the longer horizon of the exploratory scenario. The risks to banks' projections are discussed on pages 17–20.

Based on banks' projections, aggregate statutory return on equity reaches 8.3% in 2023 under the exploratory scenario. This is substantially below banks' baseline projection of 14.7% and remains significantly below returns before the financial crisis (**Chart 2.4**). However, it is significantly higher than the current level of zero. Much of this improvement reflects the assumption that misconduct costs abate. The pickup in underlying return on equity, which excludes these costs, is more muted. Underlying return on equity starts at 5.0%, and rises to 8.5% by 2023 under the exploratory scenario.

Chart 2.4 Return on equity(a)(b)

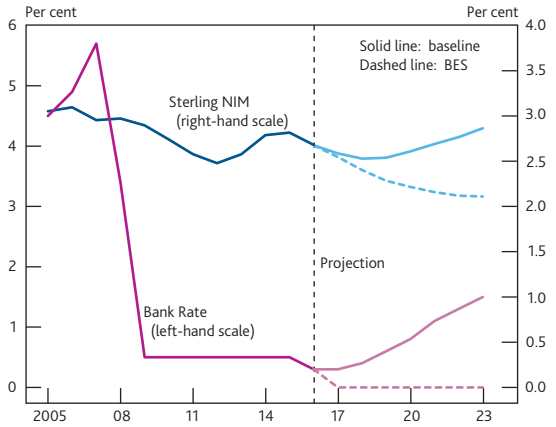


Sources: Participating banks' published accounts and participating banks' STDF data submissions.

(a) Historical data are based on participating banks' published accounts and uses a different accounting standard to the FinRep accounting standard used in the banks' stress-test submissions.
(b) Underlying RoE excludes misconduct costs and other one-off costs.

The reduction in net interest margins is a key factor putting downward pressure on returns in the scenario. At the end of 2023, global net interest margins are projected to be 35 basis points lower than at the end of 2016. Meanwhile, sterling margins are 57 basis points lower (**Chart 2.5**).

Chart 2.5 Sterling net interest margins and Bank Rate[a]



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

(a) Historical sterling net interest margin (NIM) data are estimated using the spread between the effective interest rate on UK MFI sterling loans to UK households and PNFCs and the effective interest rate on sterling deposits from UK households and PNFCs with UK MFIs. The level of participating banks' projected sterling NIM is adjusted upwards to be consistent with this historical estimate.

Overall, annual profits (net income attributable to shareholders) rise by £28 billion from 2016 to 2023 (**Table 2.B**). This reflects three factors that more than compensate for the £13 billion fall arising from the squeeze in net interest margins:

- Loan growth, which contributes £7 billion to net interest income;
- A pick-up in non-interest income, which increases net income by £11 billion; and
- Sharp reductions in operating costs, which increase net income by £13 billion.

Table 2.B Selected contributions to changes in net income between end-2016 and end-2023 under the BES

£ billions unless stated	2016 (actual)	2023 (BES)	Difference
Net interest income	64	59	-5
of which, margins	–	–	*-13*
of which, volumes	–	–	*7*
Non-interest income	42	53	11
Operating costs	-72	-60	13
Misconduct and one-off P&L	-16	-1	15
Impairments	-9	-9	-1
Net income attributable to shareholders[a]	**0**	**28**	**28**
Memo: average equity	321	343	23
Memo: statutory RoE	0.0%	8.3%	8.2 pp
Memo: underlying RoE	5.0%	8.5%	3.4 pp

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

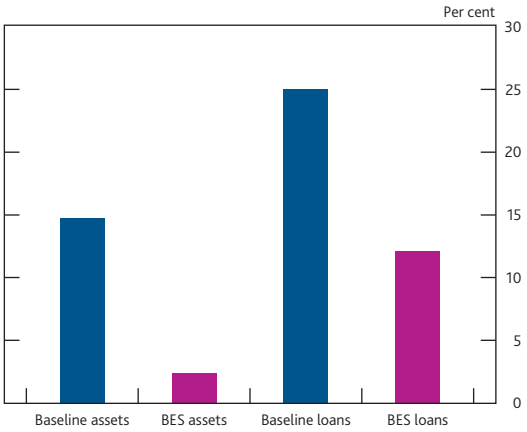
(a) Net of AT1 interest.

In addition, the assumption, in line with the scenario guidance, that misconduct costs abate, increases net income by just over £10 billion. One-off costs, for example relating to restructuring are also expected to fall, contributing a further £5 billion to net income relative to 2016. Meanwhile, impairments were projected to remain close to the low levels observed over recent years, reflecting a continuation of sluggish rather than negative output and income growth. These reduce net income in 2023 relative to 2016 by £1 billion.

Loan volumes and market share

Weaker demand for bank credit in aggregate and some loss of market share mean banks grow their balance sheets by less than their baseline plans in the exploratory scenario. But they still expect that their businesses will grow: in aggregate, they project that the stock of outstanding loans will increase by 12% between end-2016 and end-2023 (**Chart 2.6**). This compares to 20% growth in UK nominal GDP over this period, as specified under the scenario.

Chart 2.6 Cumulative projected growth in total assets and loans between end-2016 and end-2023



Source: Participating banks' STDF data submissions.

In both the baseline and the exploratory scenario, banks' projections suggest that they anticipate losing only a limited amount of UK market share to other banks. Market share is projected to fall by around 4 percentage points in both cases.

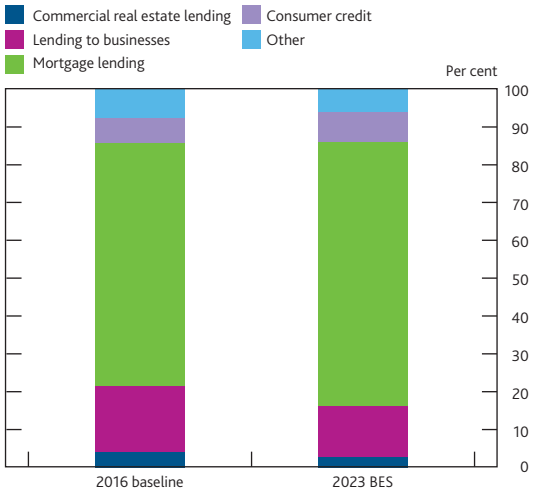
In general, banks prioritised the maintenance of market share in the exploratory scenario. For example, they did not choose to attempt to mitigate the squeeze in margins implied by the scenario by setting less competitive interest rates and accepting that this would mean they would lose more market share. This might suggest that, given the competitive conditions incorporated in the scenario, banks perceived that the loss of market share incurred by pricing above market prices would be large, so any profitability gains from higher margins would be more than offset by lower volumes.

Equally, banks did not choose to mitigate the squeeze in net interest margins by making riskier loans, which would have allowed them to charge higher interest rates.

The absence of increased risk-taking is evident across a number of metrics. For example, the proportion of UK mortgage lending at greater than 75% LTV remains broadly flat between 2016 and 2023. Meanwhile, the proportion of banks' risk-weighted assets accounted for by investment banking, and the share of total revenue accounted for by trading revenue, is also projected to remain flat.

The geographical distribution of banks' credit exposures is projected to remain broadly unchanged relative to end-2016, and within the United Kingdom the share of mortgages in total loan balances is projected to increase. In line with that, average risk weights in 2023 under the exploratory scenario are projected to be slightly lower than in 2016 (**Chart 2.7**).

Chart 2.7 Composition of participating banks' UK loan books



Source: Participating banks' STDF submissions.

Non-interest income

Banks also expect a rise in non-interest income to boost earnings in the exploratory scenario. This is consistent with projected growth in customer loans under the scenario, together with a modest increased in fee margins from 0.9% to 1% — with banks projecting higher fee income from credit card transactions, for example.

A pick-up in banks' net trading income also contributes to non-interest income growth. Based on a view that 2016 was an abnormally weak year for trading income, banks project a modest recovery between 2016 and 2023. However, trading income is projected to be materially weaker than in the baseline, given low market volatility and historically low risk-free rates of return in the exploratory scenario.

Operating costs

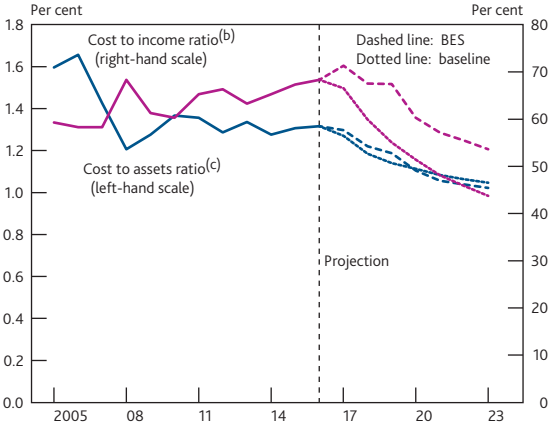
The main active response of banks to the squeeze on interest income in the scenario was to accelerate and extend their existing corporate plans, in particular by further cutting costs.

Banks project reducing their operating expenses from around £72 billion in 2016 to just under £60 billion by 2023 under the exploratory scenario, despite a small increase in total assets. Just over a third of this reduction reflects a continuation of current cost cutting initiatives, including some already planned branch closures and reductions in staff expenses.

The other two thirds of this cost reduction represents a response to the scenario. Banks project employing more technology to deliver services, allowing them to reduce staff and other administrative expenses further. This is enabled by the increase in the use of FinTech specified in the scenario, with the associated increase in competition also giving banks the impetus to push cost savings further than in their baseline projections.

The projected cost cuts under the exploratory scenario leave banks' aggregate cost to income ratio at 54% at the end of 2023, down from an underlying cost to income ratio of 68% in 2016. This is lower than banks' aggregate cost to income ratio in the years preceding the financial crisis (**Chart 2.8**).

Chart 2.8 Underlying cost to income and cost to assets ratios[a]



Sources: Participating banks' published accounts and participating banks' STDF data submissions.

(a) Historical data are adjusted to remove discontinuity caused by shifting from banks' published accounts to the same basis as SDTF data submissions.
(b) Defined as operating income over operating expense excluding misconduct costs and other non-underlying P&L items.
(c) Defined as total assets over operating expense excluding misconduct costs and other non-underlying P&L items.

Bank capital ratios and cost of equity

Under the exploratory scenario, in aggregate, banks choose to strengthen their capital positions. The aggregate risk-weighted CET1 capital ratio rises from 13.4% at end-2016

to 14.9% at end-2023. Likewise, the aggregate Tier 1 leverage ratio rises from 5.4% to 6%. At the same time, banks are able to pay out, in aggregate, £74 billion in dividends to shareholders. This compares to £55 billion paid out in the seven-year period from 2010–16.

Banks also remain clear of minimum regulatory liquidity requirements in the scenario. In aggregate, they project liquidity coverage ratios (LCR) of around 130% in 2023, which also means they maintain headroom relative to their Pillar 2 liquidity guidance.(1)

In aggregate, banks further expect to be able to meet investor requirements, as implied by their projections for the cost of equity. Banks' projections suggest that they expect their cost of equity to be around 8% by 2023 in the exploratory scenario. This is lower than banks' aggregate return on equity projection of 8.3% by 2023.

Taken together, these results suggest that, in aggregate, banks expect to be able to build sustainable business models under the exploratory scenario. There are, however, clear risks to these projections.

Risks to banks' projections

Some banks had engaged well with the challenge of the extended low growth, low interest rate environment posed by the exploratory scenario, including at board level. Banks were able to describe qualitatively a range of possible responses to the scenario, some of which would have represented material departures from their existing corporate plans. However, they did not, in general, submit these responses as part of their projections.

All income and cost projections at a seven year horizon are inherently uncertain. But the FPC and PRC have identified some specific aspects of participants' BES projections that represent particular risks.

First, competitive pressures enabled by FinTech, and in particular the emergence of Open Banking, may cause greater and faster disruption to banks' business models than banks projected. Beyond the impact on retail deposit pricing explicitly specified in the scenario, there are other channels through which banks' profitability could be affected, and their exposure to risk could be increased. Banks did not model these in detail in their projections. Box 1 explores these risks in further detail.

Second, banks are projecting large reductions in costs and there is a risk that they will be unable to execute these plans fully while continuing to deliver a broad range of services. Between end-2016 and end-2023, banks project annual costs to fall by almost £13 billion under the exploratory scenario, despite a 2% rise in total assets over that period. This is around the same magnitude of cost cuts banks achieved between end-2009 to end-2016, but over that period, total assets fell by around 8%. Banks' projections under the scenario equate to a fall in their aggregate ratio of costs to assets from 1.3% to 1.0%; well below pre-financial crisis levels of around 1.5% (**Chart 2.8**).

A significant proportion of these savings hinge on using new technology to deliver more services digitally. But banks could face significant execution risks in bringing about this change. For example, banks generally expect to front-load IT investment under the scenario, enabling them to benefit from efficiency savings towards the latter end of the exercise. It may be that they have underestimated the ongoing running costs of new IT systems. Banks project that the share of their total cost base accounted for by IT will fall over the scenario horizon, despite the fact that they expect to rely more heavily on digital delivery.

Banks may also find they have to spend more than they anticipate on IT given advances in the use of FinTech, to protect market share against third parties offering to manage their existing customers' accounts (see Box 1).

Alternatively, if banks were to find that some groups of customers were slower or more reluctant to switch to digital services than they have anticipated under the scenario, it may be more difficult than banks expect to reduce spending on staff, branches and their legacy systems.

In addition, banks' planned spending under the exploratory scenario on cyber risk and misconduct cost mitigation may prove to be insufficient. Despite the increase in cyber risk that may be associated with a rise in the use of FinTech under the scenario, in general, banks projected their cyber risk prevention spending to remain close to current levels (see Box 1).

If banks were able only to reduce costs in line with the already significant cuts projected in their baseline plans, this would reduce aggregate return on equity by around 1.5 percentage points by 2023.

A third risk to banks' projections that the FPC and PRC have identified is that the cost of equity may be higher than banks expect. In a low growth, low rates environment, the equity risk premium may not fall. In aggregate, banks project that their aggregate cost of equity will settle at around 8% under the exploratory scenario. Given this assumption, in general they expect to deliver what they perceive would be an acceptable level of return to investors without changing their corporate plans significantly, or altering their risk profiles. But

(1) For details about how the PRA regulates liquidity and funding risk; see www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2016/ss2415-update.pdf.

Box 1
Advances in the use of FinTech and their implications in the exploratory scenario

One of the key features of the exploratory scenario is an increase in the use of FinTech. This box focuses, in particular, on the potential impact of increased FinTech use on retail banking in the United Kingdom.

Innovation in financial technology (FinTech) is opening up new opportunities for consumers, banks and other businesses, as evidenced by the proliferation of new FinTech start-ups. The Bank of England supports this, and is seeking to do so in a way that boosts growth and supports financial stability.(1) This is in line with the Prudential Regulation Authority's secondary competition objective.(2)

The Bank is broadening access to its payments settlement system.(3) Its 'FinTech accelerator' project is further aimed, in part, at increasing its understanding of FinTech and its implications for financial markets and Bank of England operations.(4) The inclusion of increased FinTech use in the exploratory scenario is another way in which the Bank is seeking to assess the possible effects of future FinTech scenarios and banks' preparedness.

For consumers, the increased use of FinTech to deliver financial services is likely to offer better information and access to services as well as more competitive pricing. FinTech also potentially offers small and medium-sized enterprises (SMEs) the chance to tap new sources of credit through, for example, peer-to-peer lending platforms.

From the perspective of incumbent banks, FinTech offers the chance to supply financial services more efficiently through the replacement of legacy processes, by reducing transaction fees and by delivering more services to customers via digital channels. The adoption and integration of new technology is a major factor underlying the large reductions in costs banks have projected under the exploratory scenario.

Growth in the use of FinTech also presents challenges for incumbent banks as a wider range of competitors have the chance to utilise new technology to compete away profits across different parts of their businesses.

Two related reforms should spur the increased use of FinTech over coming years. The EU's revised payment services directive (PSD2) and the 'Open Banking' initiative mandated by the UK Competition and Markets Authority (CMA) are both due to be implemented from January 2018. These reforms, designed to increase competition, innovation and security in payments and banking services have the potential to change the way customers interact with banks, reducing customer inertia and the costs of seeking the best value services.

Under PSD2, all providers of online payment accounts will be required to allow regulated third parties to have access to customers' online payment accounts, at the request of their customers. These third parties will have to be authorised by the Financial Conduct Authority (FCA), or by another EU supervisor.(5)

Two new types of authorised firms will exist from January 2018:

- **Account Information Service Providers (AISPs)**. As well as acting as aggregators to collate information on customers' payment accounts, these firms might suggest tailored actions on where to place savings, or who to borrow from, at the best rate.

- **Payment Initiation Service Providers (PISPs)** which might, with customers' active permission, allow third parties to shift money around accounts — in a way that customers could in theory already do themselves — to improve returns or help customers avoid going overdrawn.

Alongside PSD2 coming into force, nine major UK banks are required by the CMA to implement 'Open Banking' — a related reform that specifies the technology banks should use to make third party access to their systems available (**Figure A**).

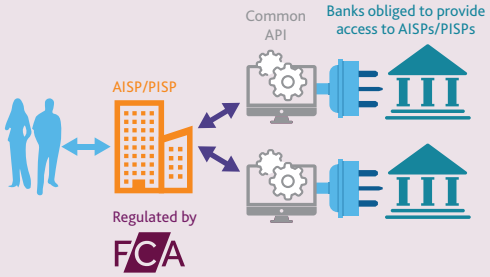
Open Banking was initiated by the CMA following its 2016 investigation into the retail banking market. It hopes to assist UK banks in meeting PSD2, but is narrower in scope.(6) Under Open Banking, data sharing must occur via a single common Application Programming Interface (API).(7) Third parties must be able to 'plug-in' directly to any of the nine banks to which it applies using that standardised API. Challenger banks are not compelled to use the common API, but can opt to.

(1) See 'Building the infrastructure to realise FinTech's promise', Carney, M, April 2017; www.bankofengland.co.uk/-/media/boe/files/speech/2017/building-the-infrastructure-to-realise-fintechs-promise.pdf.
(2) The Prudential Regulation Authority's (PRA's) secondary competition objective requires the PRA to act, where possible, in a way that facilitates effective competition when making policies to advance its primary objectives of safety and soundness, and policyholder protection. For further details see 'The Prudential Regulation Authority's secondary competition objective', Dickinson, S *et al*., *Bank of England Quarterly Bulletin* 2015 Q4; www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2015/the-pras-secondary-competition-objective.pdf.
(3) For more details on the Bank's plans to renew its Real-Time Gross Settlement (RTGS) service see; www.bankofengland.co.uk/-/media/boe/files/payments/a-blueprint-for-a-new-rtgs-service-for-the-uk.pdf.
(4) See 'The Bank of England's FinTech Accelerator: what have we done and what have we learned', Hauser, A, 6 October 2017; www.bankofengland.co.uk/-/media/boe/files/speech/2017/the-boes-fintech-accelerator-what-have-we-done-and-what-have-we-learned.pdf.
(5) Companies that have been providing these services since before 12 January 2016 do not need to be authorised by the FCA until the end of 2019.
(6) The banks and building societies to which Open Banking requirements apply are RBS, Lloyds, Barclays, HSBC, Santander UK, Nationwide, Danske Bank, Bank of Ireland and Allied Irish Bank. These banks were selected by the CMA based on their market share of retail current accounts in Great Britain and, separately, Northern Ireland.
(7) This common API has been jointly developed by the nine banks and is publically available.

Figure A Impact of reforms

Current model — direct interaction with banks

Post reform — access account through third parties



AISP/PISP: Account Information Service Providers and Payment. Initiation Service Providers. API: Application Programming Interface.

Source: Financial Conduct Authority.

Open Banking does not change the regulatory perimeter. But a new entity, Open Banking Ltd, has been created to maintain a directory of registered third parties and provide authentication. Open Banking Ltd will likely be absorbed into the New Payments System Operator in due course.

The reforms pave the way for improved smart phone apps to be provided by 'aggregators'. Major UK banks' internet banking systems can already allow third party apps to access accounts, if the customer provides their log-in details. Around two million UK customers use these apps or aggregators. But the technology behind existing aggregators (known as 'screen scraping')(1) has shortcomings — for instance compared with API technology it is less secure given the need to share passwords — and functionality is basic. The functionality of future apps could grow to offer a form of basic 'robo-advice' on where to place money to optimise rates or avoid going overdrawn.

Such standardisation will support innovation by reducing barriers to entry as third parties will not have to integrate with different technology on a firm by firm basis, and can enhance security across the industry.

The impact of FinTech innovation on the banking system will take time to materialise fully. But the longer horizon of the exploratory scenario offered an opportunity for the Bank to investigate its potential effects on the business models of individual banks and on the resilience of the system.

The most explicit way that this was incorporated in the scenario was via a specified increase in average sight deposit rates, and a reduction in incumbent banks' ability to price below the market without losing market share. This contributed to the significant squeeze in net interest margins banks experienced in the exploratory scenario, leading to a reduction of £1.1 billion in banks' aggregate profits by end-2023 — worth just over 0.2 percentage points of projected return on equity in 2023.

The scenario was not explicit, however, about other potential effects of an increase in FinTech use, which might impact banks' profitability as well as their operational and liquidity risk profiles. Banks did not model these additional impacts of PSD2 and Open Banking in their projections. These additional impacts include:

Income from overdrafts may fall.
Bank staff have identified two potential impacts of FinTech on incumbent banks' revenue streams from overdrafts. First, new technology could help customers to better manage their accounts, making it easier to avoid becoming overdrawn. And second, third parties could help direct customers to cheaper sources of credit to replace longer-term overdraft use. These dynamics seem likely to impact both the quantity and price of banks' overdraft products, which could lead to a material reduction in their profitability. For the major UK banks, overdraft revenues currently contribute roughly £2.6 billion to annual pre-tax profits — worth approximately 0.6 percentage points of projected return on equity in 2023.

Competition in payment services may erode fee income.
Banks currently receive fee income from payment services — where customers use their infrastructure to make debit card payments to merchants. As PSD2 allows non-bank payment service providers more easily to initiate payments directly from customer bank accounts, it potentially reduces the role of banks in the transaction chain. UK payments income, currently contributes around £0.8 billion to annual pre-tax profits — worth around 0.2 percentage points of projected return on equity in 2023.

Banks may pay more to reduce liquidity risk.
More frequent switching of deposits by customers could also expose banks to greater liquidity risk, as well as squeezing

(1) Screen scraping refers to third party use of automated systems to log in to a particular financial institution using a username and password provided by the consumer; in order to take (or 'scrape') the account information that is made available online. In contrast, APIs allow an aggregator to directly connect to a financial institution's systems and obtain the desired information through an orderly exchange protocol.

banks' net interest margins — a key feature of the exploratory scenario.

To mitigate this, banks may increase liquid asset buffers or build more stable funding, moving some customers away from instant access accounts and towards time deposits by paying higher time deposit interest rates. Bank staff estimate that raising the time deposit rate by 25 basis points relative to current average sight deposit rates would imply around a £0.8 billion reduction in aggregate major bank pre-tax profits — worth around 0.2 percentage points on return on equity in 2023.(1)

It may be harder to attract and retain customers, or cross-sell products.

FinTech innovations, including those encouraged by PSD2, could break or weaken the link between banks and their customers. For instance, in the future it may be possible for a customer to manage their finances with only minimal direct engagement with their banks.

PSD2 also allows customers to ask for their transaction and activity data to be shared with third parties. Beyond immediate product-level impacts this could also reduce incumbent banks' data advantages that arise from their currently unrivalled access to customers' account data.

These forces will likely erode banks' ability to cross-sell products to existing customers, and may make it harder for incumbents to attract and retain customers. One proxy estimate of this effect is to assume that major banks have to double their spend on marketing in the United Kingdom. That would reduce their aggregate annual pre-tax profits by £1 billion — worth around 0.2 percentage points on return on equity in 2023.

Increased cyber risk

Beyond impacts on banks' ability to generate profits, the increased use of FinTech might increase cyber risks.

A greater number of providers potentially entering the market, with customer data shared more widely may create a greater number of avenues for potential cyber threats, and a greater number of potential points of importance within the system infrastructure. The FCA is working to reduce these risks. Before third parties are authorised, the FCA will look at applicants' security policies, governance, business continuity arrangements and controls around access to sensitive data. If implemented appropriately, it is possible that APIs will provide a more secure way to access account information.

However, a heightened threat environment may mean banks have to spend more than projected in their scenario submissions to mitigate cyber risks. In aggregate, banks projected spending £4.9 billion over the seven years of the scenario on cyber risk prevention. Doubling banks' projected anti-cyber risk spend in 2023 would reduce aggregate bank pre-tax profits by £0.7 billion — worth a little under 0.2 percentage points on return on equity in 2023.

(1) Between 2014 and 2017, major UK banks experienced an 18 percentage point shift out of time deposits, in response to a 1.2 percentage point reduction in the time deposit interest rate relative to the sight deposit rate.

a higher cost of equity would call that strategic response into question. Banks with return on equity persistently below the required return of investors could be under pressure to restructure or adjust their business models in order to improve risk-adjusted profitability. In the absence of such improvements, these banks could find it more costly to issue new equity, making it more difficult for them to rebuild capital after periods of stress. A higher cost of equity could therefore mean banks were less sustainable. Box 2 explores uncertainties around the cost of equity in further detail.

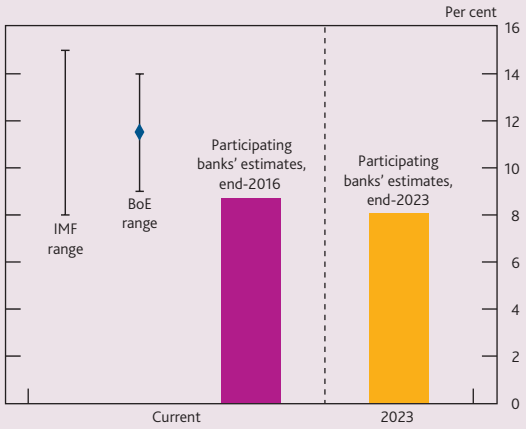
Box 2
Banks' cost of equity under the exploratory scenario

This box explains the drivers of banks' cost of equity in the exploratory scenario and explores the sensitivity of those projections to alternative assumptions.

Current bank cost of equity estimates

There is a wide spread of plausible current cost of equity estimates for BES participants (**Chart A**). Bank staff's estimate of the market wide equity risk premium is in the range 7%–9%.(1) Combining that with a risk-free rate of 1.3% and a range of relative bank earnings volatility measures suggests an aggregate cost of equity for major UK banks in the range of 9%–14%, centred on 11.5%.(2)

Chart A Comparison of cost of equity estimates



Sources: IMF *Global Financial Stability Report*, October 2017, participating banks' STDF data submissions, Bank calculations. See IMF *Global Financial Stability Report*, October 2017, Chapter 1; www.imf.org/en/Publications/GFSR/Issues/2017/09/27/global-financial-stability-report-october-2017.

Alternatively, comparing price to book ratios with consensus return on equity forecasts for a range of international banks suggests a breakeven level — the point at which price to book ratios are around one — at an average of about 10% or less (**Chart B**). This is broadly consistent with the 11% average cost of equity estimated by the IMF for global systemically important banks, with a range of 8%–15% for a broader range of banks.(3)

In aggregate, banks submitted end-2016 estimates of 8.7%, which is at the lower end of the ranges estimated by the Bank of England and IMF. Banks submitted slightly lower cost of equity projections for end-2023, of 8.1% in aggregate under the exploratory scenario.

Chart B Price to book ratio and expected one-year ahead return on equity for large European banks in 2017(a)

Sources: Bloomberg Finance L.P., Thomson Reuters Datastream and Bank calculations.

(a) The price to book ratio relates the share price with the book, or accounting, value of shareholders' equity per share. Data cut-off 17 November 2017.

Factors likely to drive cost of equity under the exploratory scenario

Conceptually, the cost of equity faced by a specific bank can be thought of as being driven by investor expectations about:

(a) risk-free interest rates;
(b) the market-wide equity risk premium; and
(c) the volatility of that banks' equity returns relative to the rest of the market.

Each of these factors will embody investor perceptions about future prospects for the bank or the wider economy, which are difficult to observe in practice. Banks' estimates of cost of equity will be sensitive to these perceptions.

Risk-free interest rates

Risk-free interest rates were specified as part of the exploratory scenario, so that banks took them as given in constructing their cost of equity estimates. The scenario specified that risk-free rates across a range of maturities would

(1) See 'An improved model for understanding equity prices'; www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2017/an-improved-model-for-understanding-equity-prices.pdf. The equity risk premium is estimated using a dividend discount model based on the net present value relationship that relates equity prices to expected future shareholder payouts, risk-free interest rates and compensation for risk. The model captures both dividends and share buybacks. Expected growth in shareholder payouts is estimated based on equity analysts' dividend forecasts and IMF long-term GDP forecasts. Note that the estimate of the equity risk premium published in this 2017 Q2 *Quarterly Bulletin* article is 9%. The estimate quoted here uses a 7%–9% range to take account of the uncertainty associated with these estimates, including from the possibility of upwards bias in the IBES forecasts, as discussed on page 94 of the article.
(2) This spread reflects the use of a range of measures of bank earnings volatility relative to the FTSE All-share of between 1.1 and 1.4, based on different estimation windows spanning from two to five years. These data are published by Bloomberg. The risk-free rate used is the ten-year gilt yield. All estimates based on market prices as of 17 November.
(3) See IMF *Global Financial Stability Report*, October 2017, Chapter 1; www.imf.org/en/Publications/GFSR/Issues/2017/09/27/global-financial-stability-report-october-2017.

fall slightly below the unusually low levels observed at end-2016.

Implicit in the profile of risk-free interest rates are perceptions around the distribution of future outcomes for the economy.

Lower interest rates may reflect heightened perceptions of downside risk, either because general uncertainty around the future path of the economy is high, or there is reason to believe that there is a high likelihood of bad — or tail — outcomes.(1) In such cases, risk-free assets can provide protection against these adverse outcomes.

Market-wide equity risk premium

The evolution of the market-wide equity risk premium was also specified in the scenario, with banks instructed to assume it stayed flat. In practice, however, the future path of this equity risk premium is far from certain and may depend, among other things, on the perceptions of economic risk embodied in the low level of interest rates.

In particular, the equity risk premium could be higher if general uncertainty under the scenario rises or perceptions of tail risk increase, for example, if investors perceive that monetary policy would be less effective at mitigating adverse shocks given very low interest rates.

Investors may also vary the price they attach to risk — the higher the price, the larger the equity risk premium and the higher the cost of equity.

Volatility of banks' equity returns

In the scenario, banks were free to determine their own projections for the expected volatility of their earnings. Based on banks' projections, two factors are likely to put downward pressure on the cost of equity by reducing the volatility of bank equity returns:

- Banks increase their equity ratios in the scenario. This makes their debt safer and cheaper, and makes the cash flows to equity investors safer.
- By assumption, uncertainty about misconduct costs is reduced towards the end of the scenario. Currently, the anticipation of further material misconduct costs is an important factor pushing up on some banks' cost of equity — both by lowering the market value of equity and increasing uncertainty around future earnings. These costs are assumed in the scenario to fall to almost zero by 2023.

There are, however, risks to the volatility of bank equity returns in this scenario that are not captured in banks' projections:

First, the scale of future misconduct costs is very difficult to predict. So the assumption that these dissipate under the exploratory scenario, while in line with published scenario guidance is subject to considerable uncertainty.

Second, as discussed on pages 17–20, there are uncertainties around future earnings both in relation to the impact of increased use of FinTech, which banks' projections do not fully factor in, and the ability of banks to deliver their material projected cost savings. Relatedly, to the extent that banks lose market share in cheap deposits (such as current accounts) while maintaining lending volumes, these will need to be replaced with more expensive, and potentially more variable, sources of funding. Investor uncertainty around these factors could lead to a persistently higher level of volatility of bank equity returns relative to the rest of the market.

Third, banks might find themselves more exposed to cyber risk as FinTech utilisation among customers rises, and they deliver a higher proportion of their services digitally. This raises the potential for significant losses, which should in turn be reflected in higher uncertainty around future returns.

Overall, based on the scenario and banks' projections, it is possible that the cost of equity could fall by 2023. But there are also risks, that if they were to materialise, would support a higher cost of equity than banks project. In that case, the banks would need to take measures beyond those submitted to boost risk-adjusted profitability.

(1) For further discussion see 'Monetary policy, asset prices and distribution', speech by Broadbent, B, 23 October 2014; www.bankofengland.co.uk/-/media/boe/files/speech/2014/monetary-policy-asset-prices-and-distribution.pdf and 'Real interest rates and risk', speech by Vlieghe, G, 15 September 2017; www.bankofengland.co.uk/-/media/boe/files/speech/2017/real-interest-rates-and-risk.pdf.

Annex 1: Further details of the 2017 annual cyclical scenario

Background

This annex begins by setting out details of the scenario used in the 2017 ACS. It then outlines how the stress affects individual banks and the system as a whole. This includes looking at a number of different channels including impairments, traded risk, net interest income, misconduct and risk-weighted assets. It also describes the various ways banks are able to cushion the impact of the stress, including through 'strategic' management actions.(1)

The Bank's concurrent stress-testing framework was established following a Recommendation from the FPC in March 2013.(2) 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 PRC. 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 PRC. The bank-specific results have been approved by the PRC.

The 2017 annual cyclical scenario

The ACS comprises three types of stress, which are assumed to be synchronised:

- A macroeconomic stress scenario, spanning a five-year period to the end of 2021.
- A traded risk stress scenario, which is consistent with the content and calibration of the macroeconomic stress scenario.
- A misconduct costs stress, which is separate from the macroeconomic and traded risk stress scenarios.

Other things equal, the sizes of the shocks to different sectors and economies are adjusted each year to deliver a similar stressed outcome. However, where imbalances in credit and financial markets have increased (or decreased), the stressed outcome may be more (or less) severe. And where there are likely spillovers between sectors and economies, these are taken into account when the scenario is calibrated.

Adjusting the stress scenario in this systematic way should mean that the impact of the stress on banks' risk-weighted CET1 capital and leverage ratios grows in an upswing. This makes the ACS useful for the FPC in assessing the appropriate setting for the UK countercyclical capital buffer (CCyB) rate.

From a macroprudential perspective, an important goal of the ACS 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, banks participating in the ACS are expected to meet the projected demand for credit from UK households and businesses in the stress. Over the five years of the 2017 ACS, lending to UK households and businesses is projected to grow by around 2% in total.

Vulnerability assessment and calibration

The calibration of the 2017 ACS reflects the FPC and PRC's March 2017 assessment of risks. At that time, the FPC judged that domestic risks were at a standard level but that global vulnerabilities were elevated and had increased somewhat over the past year. A significant factor in this assessment was the continuation of rapid Chinese credit growth. The stressed outcome for Chinese and world GDP is therefore more severe than in the 2016 ACS.

As the FPC has highlighted in recent *Financial Stability Reports*, the United Kingdom's large current account deficit creates a vulnerability to a sharp reduction in foreign investor appetite for UK assets, and increases in funding costs for real-economy borrowers. The 2017 ACS incorporates a sudden increase in the return investors demand for holding sterling assets and an associated fall in sterling. The sterling exchange rate index falls by 27% from its 2016 Q4 level and the sterling/US dollar exchange rate troughs at 0.85 US dollars per pound sterling around the end of 2017.

Longer-term interest rates are pushed up by an increase in term premia, as well as a higher expected path for Bank Rate. The ten-year gilt yield peaks at 6.9% in 2018 Q1, before falling back over the final three years of the scenario.

Bank Rate peaks at 4% in the 2017 ACS, differentiating it from the 2016 exercise, in which Bank Rate was cut to zero. This rise in Bank Rate reflects a challenging trade-off between growth and inflation in the scenario.

Taken together, these judgements mean that overall the test scenario is more severe than the financial crisis, with a larger fall in world GDP, and a bigger increase in UK unemployment (**Table A1.A**).

(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 see www.bankofengland.co.uk/-/media/boe/files/news/2013/october/a-framework-for-stress-testing-the-uk-banking-system-discussion-paper.pdf.

Table A1.A How the 2017 annual cyclical scenario compares to the financial crisis

	Financial crisis	2017 ACS
UK GDP (percentage change)	-6.3	-4.7
World GDP (percentage change)(a)	-1.9	-2.4
Increase in unemployment rate (percentage point change)(b)	+3.2	+4.7
UK residential property prices (percentage change)	-19	-33
Bank Rate (percentage point change)(c)	-5.0	+3.75

Sources: Halifax, IMF International Financial Statistics, IMF October 2016 *World Economic Outlook*, Nationwide, ONS, and Bank calculations.

(a) World GDP shows the trough annual growth rate.
(b) The peak rise in unemployment for the financial crisis is calculated as the difference between the minimum unemployment rate from the period 2006–07 and the maximum rate from the period 2008–12.
(c) The change in Bank Rate refers to the difference between the beginning of 2008 and March 2009.

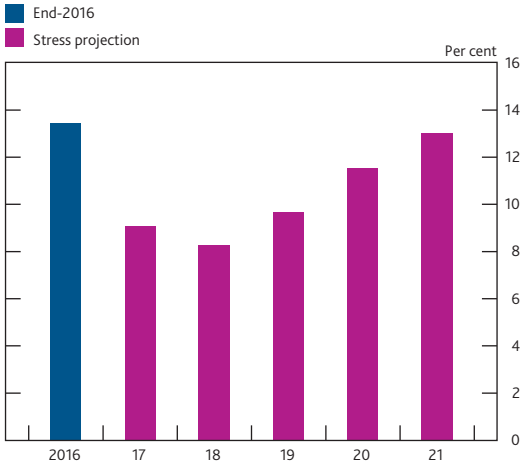
Headline impact of the stress

Banks' CET1 capital ratios are significantly affected by the stress.

In the 2017 ACS, the aggregate risk-weighted CET1 capital ratio for participating banks is projected to deteriorate by 5.2 percentage points, from a start point of 13.4% to a low point of 8.3% (**Chart A1.1**).

Pre-tax losses total around £50 billion in aggregate over the first two years of the stress. However, there is a strong recovery in profits in the final three years (**Chart A1.2**), which helps banks rebuild their capital positions. By 2021 the aggregate CET1 capital ratio is only 0.4 percentage points below its 2016 start point.

Chart A1.1 Aggregate CET1 capital ratio projections in the stress(a)

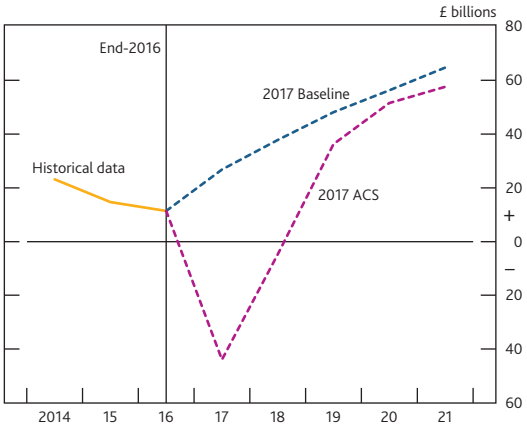


Sources: Participating banks' STDF data submissions, Bank analysis and calculations.

(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.

The baseline scenario incorporates no macroeconomic stress or additional misconduct costs beyond those already paid or provided for at end-2016. Partly as a result, banks expect their profitability to improve over the baseline projection. Under this scenario, participating banks project the aggregate CET1 capital ratio to rise by 0.9 percentage points from 13.4% to 14.3% by end-2018. Over the same period, the aggregate leverage ratio of the system is projected to rise from 5.4% to 5.7%.(1)

Chart A1.2 Projections for aggregate profits before tax(a)



Sources: Participating banks' STDF 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 the baseline, by the low point at the end of 2018, the stress reduces the aggregate CET1 capital ratio by 6.0 percentage points and the Tier 1 leverage ratio by 1.4 percentage points. The main drivers of this impact (**Table A1.B**) are:

- Loan impairment charges, which reduce the aggregate CET1 capital ratio by 4.2 percentage points relative to the baseline.
- Traded risk losses, which reduce the aggregate CET1 capital ratio by 1.8 percentage points relative to the baseline.
- Stressed misconduct costs, of which around £30 billion are projected to be realised by the end of 2018, reducing the aggregate CET1 capital ratio at the low point by 1.7 percentage points, relative to the baseline.
- An increase in risk-weighted assets, which reduces the aggregate CET1 capital ratio by 2.7 percentage points relative to the baseline.(2)

The overall impact of the stress on banks' capital positions is reduced by:

- A stronger profile for aggregate net interest income, which increases the aggregate CET1 capital ratio by 1.2 percentage points relative to the baseline.

(1) The baseline projections of the Bank's stress tests 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 provisioned for at end-2016. This set of published baseline variables are broadly consistent with the Monetary Policy Committee's February 2017 *Inflation Report*. A range of published international variables are consistent with the October 2016 IMF *World Economic Outlook* (*WEO*). For more information see Bank of England (2017), 'Stress testing the UK banking system: key elements of the 2017 stress test'; www.bankofengland.co.uk/-/media/boe/files/stress-testing/2017/stress-testing-the-uk-banking-system-key-elements-of-the-2017-stress-test.pdf.
(2) The rise in RWAs is inflated by the large sterling depreciation in the 2017 ACS. However, this depreciation also increases the value of the CET1 capital that UK banks hold in foreign currency. Netting these two factors together suggests that the underlying impact on the CET1 capital ratio is around -2.7 percentage points. Without this netting effect the impact would mean a reduction of 4.2 percentage points.

- Cuts to ordinary dividends, which increase the aggregate CET1 capital ratio by 1.4 percentage points relative to the baseline.
- Reductions in variable remuneration and other distributions (including AT1 coupons) also increase the CET1 capital ratio by 0.8 percentage points relative to the baseline.
- Lower taxes as a result of lower profitability alongside reductions in expenses, which increase the aggregate CET1 ratio, by 0.6 percentage points relative to the baseline.

An explanation of how these drivers affect the overall results are provided later in this section.

Table A1.B Contributions to the shortfall in the aggregate CET1 capital ratio and Tier 1 leverage ratio at the low point of the stress in 2018 relative to the baseline projection

	CET1 ratio[a]	Leverage ratio[b]
Actual end-2016	**13.4%**	**5.4%**
Baseline end-2018	**14.3%**	**5.7%**
Impairments	-4.2 pp	-1.5 pp
Traded risk losses[c]	-1.8 pp	-0.6 pp
Net interest income	1.2 pp	0.4 pp
Misconduct costs	-1.7 pp	-0.6 pp
Risk-weighted assets/leverage exposure[d][e]	-2.7 pp	-0.2 pp
Reductions in discretionary distributions in stress[f]	2.2 pp	0.8 pp
Expenses and taxes[g]	0.6 pp	0.2 pp
Other[h]	0.3 pp	0.1 pp
Stress end-2018	**8.3%**	**4.3%**
Aggregate systemic reference point[i]	**7.7%**	**3.6%**

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

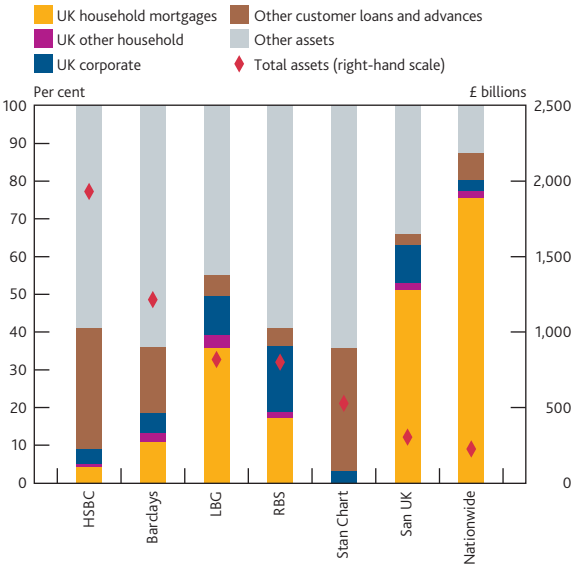
(a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of risk-weighted assets (RWAs), where these are defined in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.
(b) The Tier 1 leverage ratio is Tier 1 capital expressed as percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement 21/17*.
(c) Traded risk losses comprise: market risk, counterparty credit risk, credit and other valuation adjustments, prudential valuation adjustments, and gains/losses from available-for-sale and fair value option positions, excluding securitisation positions. This also includes investment banking revenues net of costs. RWA impact is not included.
(d) Changes in RWAs impact the CET1 ratio, whereas changes in the leverage exposure measure impact the Tier 1 leverage ratio.
(e) The rise in RWAs is inflated by the large sterling depreciation in the 2017 ACS. However, this depreciation also increases the value of the CET1 capital that UK banks hold in foreign currency. Netting these two factors together suggests that the underlying impact on the CET1 capital ratio is around -2.7 percentage points. Without this netting effect the impact would mean a reduction of 4.2 percentage points. This effect also reduces the impact of the leverage exposure measure on the leverage ratio from -0.7 percentage points to -0.2 percentage points.
(f) Reductions in discretionary distributions includes reductions in dividends, non-contractual variable remuneration and AT1 coupons.
(g) Expenses comprise of administrative and staff expenses excluding the non-contractual portion of variable remuneration which is included in reductions in discretionary distributions in stress.
(h) 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 pension assets devaluation, prudential filters, accumulated other comprehensive income, IRB shortfall of credit risk adjustments to expected losses, and actuarial gain from defined benefit pension scheme.
(i) 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.

Chart A1.3 End-2016 and low-point CET1 capital ratios in the stress[a][b][c]

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

(a) The CET1 capital ratio is defined as CET1 capital expressed as a percentage of RWAs, 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 may differ across banks.
(c) HSBC and Standard Chartered projections have been converted from US dollars to sterling using exchange rates consistent with the stress scenario.
(d) The end-2016 CET1 ratio of 13.6% includes 80 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 80 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.

Chart A1.4 End-2016 balance sheet composition and total assets for participating banks[a][b][c][d]



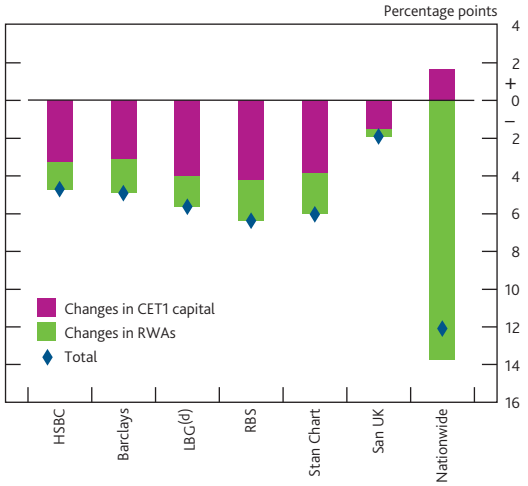
Sources: Participating banks' STDF data submissions, Bank analysis and calculations.

(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-2016 exchange rates.
(d) Definitions used in this chart may not match those used in banks' STDF submissions.

The impact of the scenario differs substantially across banks (**Chart A1.3**). This is due to differences between banks' business models (**Chart A1.4**), the types of risks they are most exposed to, and in some cases the extent of their progress through restructuring programmes.

For most banks, the fall in the CET1 capital ratio over the course of the stress reflects both the depletion of CET1 capital and an increase in RWAs (**Chart A1.5**). Nationwide is the exception. It remains profitable in every year of the stress as it is not affected in the same way as the other banks by the traded risk scenario, the misconduct stress or corporate credit losses. The large fall in its CET1 capital ratio is primarily due to a material increase in RWAs. This in turn reflects the particular sensitivity of the 'point-in-time' model Nationwide uses to calculate mortgage risk weights to changes in macroeconomic conditions. For further details see page 35.

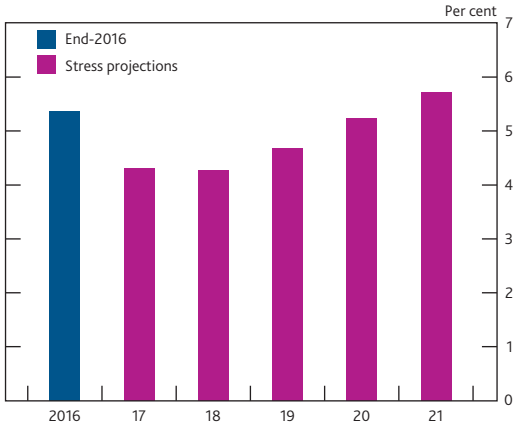
Chart A1.5 Contributions to the change in CET1 capital ratios at the low point of the stress relative to end-2016[a][b][c]



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

(a) Changes are calculated from end-2016 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 CET1 capital ratio is defined as CET1 capital expressed as a percentage of RWAs, where these are defined in line with CRR and the UK implementation of CRD IV via the PRA Rulebook.
(c) HSBC and Standard Chartered projections are calculated in reporting currency.
(d) The end-2016 CET1 ratio of 13.6% includes 80 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 80 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.

Chart A1.6 Aggregate Tier 1 leverage ratio projections in the stress[a]



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

(a) The Tier 1 leverage ratio is Tier 1 capital expressed as percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement 21/17*. Projections include the impact of 'strategic' management actions.

Banks' Tier 1 leverage ratios also deteriorate.

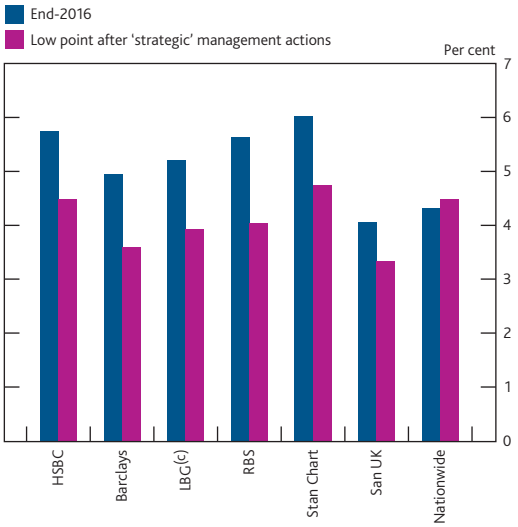
In the 2017 ACS, the aggregate Tier 1 leverage ratio is projected to deteriorate by 1.1 percentage points, to a low point of 4.3% at end 2018 (**Chart A1.6**).

This is accounted for primarily by a fall in the aggregate amount of Tier 1 capital under the stress scenario, rather than by an increase in the leverage exposure measure. While the leverage exposure measure is projected to increase in the first two years of the stress, this reflects the impact of foreign exchange movements. The measure is largely unchanged at the low point of the stress in 2018 once the effect of the large sterling depreciation in the scenario is accounted for.

Chart A1.7 summarises the impact of the stress on Tier 1 leverage ratios for the participating banks. Nationwide increases its Tier 1 leverage ratio over the course of the stress, as its continued profitability outweighs the increase in its leverage exposure measure. (**Chart A1.8**).

Details of how the results of the 2017 ACS compare with last year's test are discussed in Box 3.

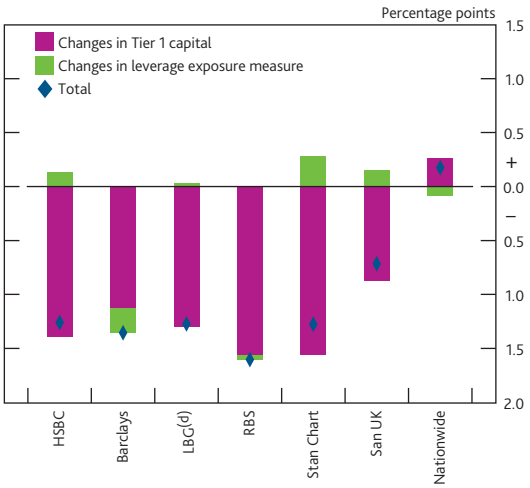
Chart A1.7 End-2016 and low-point Tier 1 leverage ratios in the stress[a][b]



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

(a) The Tier 1 leverage ratio is Tier 1 capital expressed as percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement 21/17*.
(b) The year of the low point may differ across banks.
(c) The end-2016 Tier 1 leverage ratio of 5.2% includes 30 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 30 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.

Chart A1.8 Contributions to the change in Tier 1 leverage ratios in the stress relative to end-2016[a][b][c]



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

(a) Changes are calculated from end-2016 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 percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement 21/17*. Projections include the impact of 'strategic' management actions.
(c) HSBC and Standard Chartered projections are calculated in reporting currency.
(d) The end-2016 Tier 1 leverage ratio of 5.2% includes 30 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 30 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.

Box 3
Comparing the results of the 2016 and 2017 tests

This box explains the differences between the results of the Bank's 2016 and 2017 tests. It discusses variations in scenarios and describes how banks' balance sheets changed during 2016.

The 2017 global stress scenario was more severe

The broad components of the 2017 ACS are identical to the 2016 test. Both contain a macroeconomic stress scenario, a congruent traded risk stress, and a separate misconduct stress.

The calibration of global elements of the 2017 ACS reflects the March 2017 judgement that global risks were elevated and had increased somewhat over the previous year. The peak-to-trough fall for Chinese and world GDP in the 2017 ACS is therefore larger than in the 2016 test (**Chart A**).

The severity of the UK economic scenario was broadly unchanged

UK GDP falls by 4.7% in the 2017 ACS, as compared to 4.3% in the 2016 test. But the stressed outturn for unemployment is the same as in the 2016 exercise, at 9.5%.

The UK residential property price fall (33%) is slightly larger than in the 2016 ACS (31%), reflecting the fact that house prices increased faster than household incomes over 2016. The fall in UK commercial real estate prices (40%), however, is smaller than in the 2016 ACS (42%), reflecting the fall in UK CRE prices relative to nominal GDP during 2016.

The path for Bank Rate was very different in the 2017 scenario

Bank Rate rises and peaks at 4% in the 2017 ACS, whereas it was cut to zero in the 2016 ACS. This reflects the challenging trade-off facing monetary policymakers in the scenario between growth and inflation, which is triggered by a sudden increase in the return investors demand for holding sterling assets and an associated fall in the value of sterling.

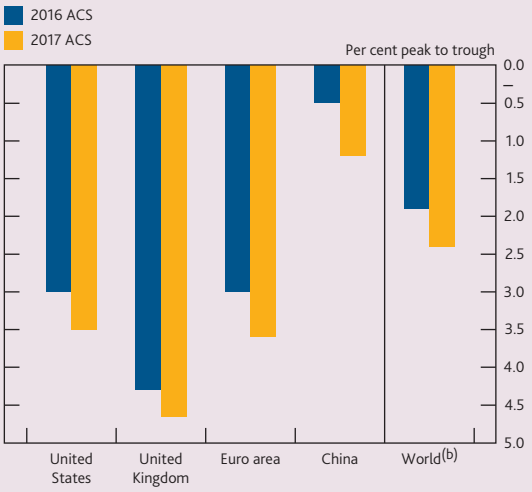
The sterling exchange rate index (ERI) falls by 27% in the 2017 ACS, compared to a 7% fall in the 2016 test.

Banks started the 2017 stress test in a stronger position

The aggregate CET1 capital ratio for banks at end-2016 was 13.4%, up from 12.6% at end-2015.

Participating banks' aggregate Tier 1 leverage ratio also increased, from 5.1% to 5.4% on a like-for-like basis (that is, adjusting the end-2015 figure to take account of the FPC's recommendation and subsequent PRA implementation to exclude central bank reserves from the calculation and recalibrate the minimum requirement).

Chart A Peak-to-trough falls in GDP in the 2016 and 2017 ACS(a)



Sources: Bank of England, European Banking Authority, European Commission, IMF and Bank calculations.

(a) Chart shows the peak-to-trough fall in the stress scenario for each economy over the five-year horizons.
(b) World GDP is weighted by purchasing power parity.

How the 2017 results compare with the 2016 ACS

The impact of the 2017 ACS, relative to 2016, can be analysed across three broad components: the UK impact; the stressed misconduct impact; and the non-UK, traded risk and 'other' impact. All of these are larger than in the 2016 ACS (**Chart B**).

The increase in the UK impact largely reflects the judgement of the FPC and PRC that banks had been underestimating the losses on consumer credit exposures that could occur in a severe stress. The increase in consumer credit impairments, relative to the 2016 ACS, reduces the aggregate low-point CET1 capital ratio by 0.4 percentage points.

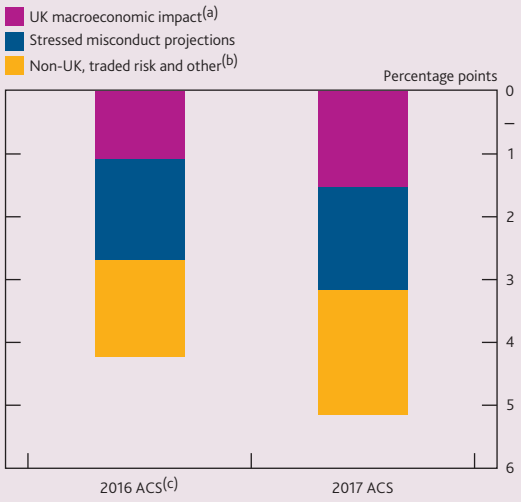
Although stressed misconduct cost projections are broadly unchanged in nominal terms, they have a slightly bigger impact on banks' capital ratios in the 2017 ACS as banks start the test with smaller balance sheets.

Banks have also been affected by a tougher global scenario, causing a larger increase in trading book risk-weighted assets, some of which is driven by the fall in sterling in the scenario.

The main drivers of the difference between the impact of the 2017 ACS and the 2016 ACS are described below:

Impairments: UK impairments in the 2017 ACS have increased, relative to the 2016 test, largely reflecting the higher path for Bank Rate and the FPC and PRC's judgement around the quality of consumer credit portfolios. Non-UK

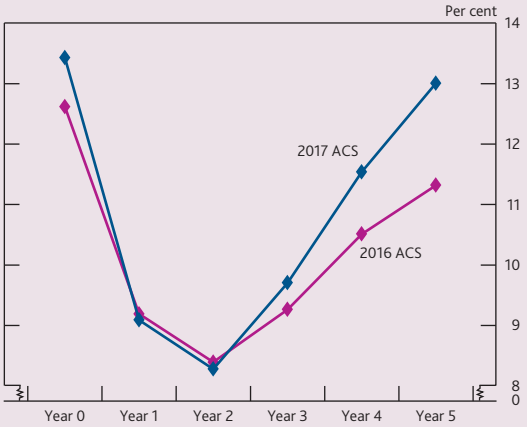
Chart B Peak-to-trough falls in the CET1 capital ratio (post-management actions, pre-AT1 conversion) in the 2016 and 2017 ACS



Sources: Participating banks' STDF data 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.
(c) The CET1 impact for the 2016 ACS is before the conversion of AT1 instruments.

Chart C Evolution of CET1 capital ratios in the 2016 and 2017 tests(a)



Sources: Participating banks' STDF 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.

impairment rates are also higher than in the 2016 ACS in certain key regions, reflecting the tougher global scenario. In the United States, the rise in impairments has been concentrated in corporate and in particular leveraged lending and oil and gas portfolios. Corporate impairment rates in Hong Kong and China are also higher than in the 2016 test. In total, impairments are over £40 billion higher over the five years of the stress than in the 2016 ACS.

Traded risk losses: In the first year of the stress, traded risk losses, excluding revenues and costs, are around £10 billion higher than in the 2016 ACS. The significant interest rate rises in the 2017 scenario increase fair valued losses on unhedged bond holdings in banks' liquidity buffers. In addition, the sterling depreciation increases cross-currency exposures at risk of default.

Net interest income: The higher path for Bank Rate in the 2017 scenario means that net interest income rises in the 2017 ACS compared with a fall in the 2016 test. Higher net interest income also contributes to a faster recovery in bank profits than in the 2016 ACS, as net interest income continues to rise after impairment losses peak in year two of the stress. This helps support the recovery in the CET1 capital ratio relative to the 2016 test (**Chart C**).

Risk-weighted assets: Aggregate RWAs increase by almost 50% in the first two years of the 2017 ACS, compared with a rise of around 16% in the 2016 ACS. These higher RWAs reduce the CET1 capital ratio by 2.7 percentage points relative to the baseline, compared with a 1.6 percentage point reduction in the 2016 test.(1)

The increase in RWAs is particularly apparent in trading books. Traded risk RWAs more than double in the 2017 ACS — a larger increase that in the 2016 tests.

Risk-weight inflation also has a bigger percentage point effect on bank capital this year simply because CET1 capital ratios start from a higher point. This raises the effect of RWA inflation on the CET1 capital ratio by 0.3 percentage points relative to last year's start point.

A simple example illustrates this arithmetic effect. A doubling of risk-weighted assets would reduce the capital ratio of a bank starting at 10% by 5 percentage points. If that same bank started at 12%, its capital ratio would fall by 6 percentage points.

Misconduct: Misconduct costs are broadly unchanged from the 2016 ACS. Stressed projections for misconduct costs beyond those already provided for at the end of 2016 total £40 billion over the five years of the stress, with £30 billion of this realised in the first two years of the scenario.

Additional Tier 1 conversion: Unlike in the 2016 test, no bank's CET1 capital ratio falls below 7% in the stress and no AT1 capital instruments are converted into CET1 capital.

(1) The rise in RWAs is inflated by the large sterling depreciation in the 2017 ACS. However, this depreciation also increases the value of the CET1 capital that UK banks hold in foreign currency. Netting these two factors together suggests that the underlying impact on the CET1 capital ratio is around -2.7 percentage points. Without this netting effect the impact would mean a reduction of 4.2 percentage points.

Details underlying the headline impact of the stress

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

The 2017 ACS is designed to explore the vulnerability of UK banks to a stress with severe adverse impacts on domestic and global activity and asset prices as well as a sharp increase in interest rates. Increased credit risk is an important channel through which the stress impacts banks' capital positions, with borrowers more likely to struggle to repay debt. The collateral against which some loans are secured will also be reduced in value.

Over the five years of the stress, banks incur impairment charges of over £70 billion on UK lending and almost US$70 billion on overseas lending. Almost two-thirds of total impairments are realised in the first two years of the stress.

Rising Bank Rate and the FPC and PRC's judgement regarding consumer credit asset quality have pushed up UK impairment rates.

Impairment charges of more than £70 billion on UK lending over the five years of the stress (**Chart A1.9**) translate to a cumulative five-year impairment rate of 4.9%. The primary drivers of UK impairments are the fall in GDP, the rise in unemployment, falls in property prices and the impact of higher interest rates on borrowers' ability to service debts. The FPC and PRC's judgement about the quality of consumer credit portfolios also push up the overall UK impairment rate.

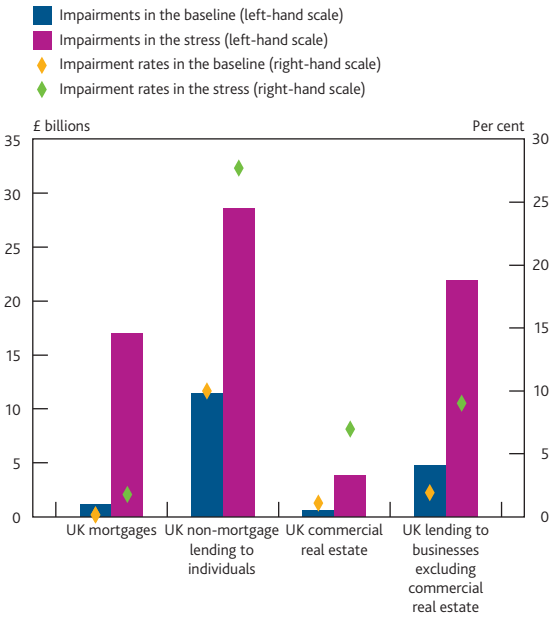
Just under 40% of impairment charges on UK lending (almost £29 billion) relate to banks' consumer credit books over the five-year horizon of the ACS, despite these books accounting for only 7% of the stock of lending.

Differences between unsecured impairment projections across banks are marked and reflect differences in banks' business models and the riskiness of their books (**Chart A1.10**). Further details of the impact of the 2017 ACS on banks' consumer credit books can be found in Box 4.

UK mortgage impairments are projected to total around £17 billion over the five years of the stress. Mortgages account for two-thirds of UK exposures and are projected to experience an impairment rate of 1.7% over the five years of the stress. Over a three year horizon, the impairment rate in the 2017 ACS is around two and half times the 0.6% rate observed during the financial crisis. This is despite a marked improvement in the quality of banks' owner-occupier mortgage books since the crisis.

Loan to value (LTV) ratios have improved in recent years as residential property prices have risen, by around 40% since the crisis trough, boosting collateral values on outstanding loans. Meanwhile, banks have also adopted more prudent lending practices. The proportion of outstanding mortgages with LTV ratios above 70% has fallen to 21% — well below the 35% share observed before the financial crisis (**Chart A1.11**). As a result, even with residential property prices falling by over 14 percentage points more than they did in the financial crisis, the number of high LTV loans in the stress is broadly the same as at the depth of the crisis.

Chart A1.9 Aggregate cumulative UK impairment charges over the five years of the stress[a][b]



Sources: Participating banks' STDF 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 2016, 2017, 2018, 2019, 2020 year-end positions.
(b) UK non-mortgage lending to individuals uses the same definition as the consumer credit impairments included in the 2017 Q3 FPC statement.

In addition, as at end-2016, 43% of the stock of owner-occupied mortgages had been written under FCA rules that require lenders to conduct a detailed affordability assessment for customers.

In 2014, the FPC recommended that, when assessing affordability, mortgage lenders should apply an interest rate stress test that assesses whether borrowers could still afford their mortgage if Bank Rate rose by 3 percentage points over the first five years of the loan.[1] The FPC further recommended that mortgage lenders should not extend more than 15% of new residential mortgages at loan to income ratios at or greater than 4.5. These moves have helped continue the trend towards better mortgage asset quality since the financial crisis.

(1) The original recommendation on mortgage affordability tests has been superseded by the recommendation made in June 2017 to clarify the rate to which the 3 percentage points stress should be applied, following a review by the FPC. Further details are set out in the June 2017 *Financial Stability Report* and the Annex of the latest FPC record, www.bankofengland.co.uk/-/media/boe/files/financial-stability-report/2017/june-2017.pdf; and www.bankofengland.co.uk/-/media/boe/files/record/2017/financial-policy-committee-meeting-june-2017.pdf.

Box 4
Consumer credit in the 2017 annual cyclical scenario

The quality of banks' consumer credit portfolios is an important determinant of banks' ability to withstand severe economic downturns. This is because defaults on consumer credit tend to rise substantially during recessions.

Defaults on consumer debt have fallen in recent years, with write-off rates falling from 5% to 2% between 2011 and 2016. In part, that reflects an improvement in underlying credit quality since the financial crisis, consistent with a sharp fall in the level of consumer debt relative to income. It is also consistent with a shift in the distribution of consumer lending towards borrowers with lower credit risk, as evidenced by borrower credit scores.

However, the fall in defaults also reflects factors that should be discounted when assessing how loans would perform under stress. These include the macroeconomic environment of sustained employment growth and low interest rates, as well as growth of interest-free credit card balance transfer offers.

In September 2017, the FPC and PRC judged that lenders overall have been attributing too much of the improvement in consumer credit performance in recent years to underlying improvement in credit quality and too little to the macroeconomic environment.(1) As a result, they have been underestimating the losses they could incur in a downturn.

This judgement was supported by a recent review by the PRA of consumer lending, which found that lenders were reducing interest margins and risk weights associated with consumer loans while, at the same time, beginning to increase lending to higher-risk segments of the market.

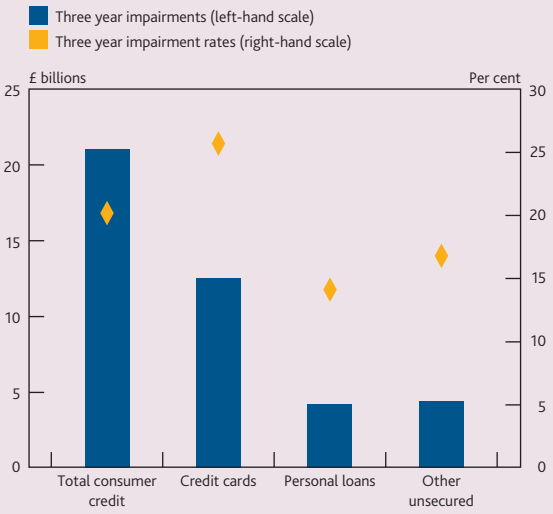
The assessment of the losses the banking system would incur on consumer credit in the 2017 ACS was brought forward to September this year. In this assessment, the FPC and PRC judged that, in the first three years of the 2017 stress-test scenario, the UK banking system would, in aggregate, incur credit losses on UK consumer loans of around £30 billion, or 20% of UK consumer credit loans. This comprises impairment rates of around 25% on credit cards, 15% on personal loans and 10% on car finance.

Banks participating in the 2017 ACS account for around 70% of the stock of consumer credit extended by the banking system. They are also projected to have a total consumer credit impairment rate of 20% over the first three years of the stress. This equates to credit losses on UK consumer credit of around £21 billion — more than 40% higher than the projected losses for mortgages over the same period in the 2016 ACS.

The change reflects the increase in Bank Rate in the 2017 scenario as well as the more rigorous assessment of underlying consumer credit quality undertaken in recent months by the FPC and PRC.

Within their consumer credit books, participating banks are projected to see three-year impairment rates of 26% on credit cards, 14% on personal loans and 17% on other unsecured lending (which includes store credit, motor finance and overdrafts) (**Chart A**).(2)

Chart A Three-year consumer credit impairment rates in the 2017 ACS(a)



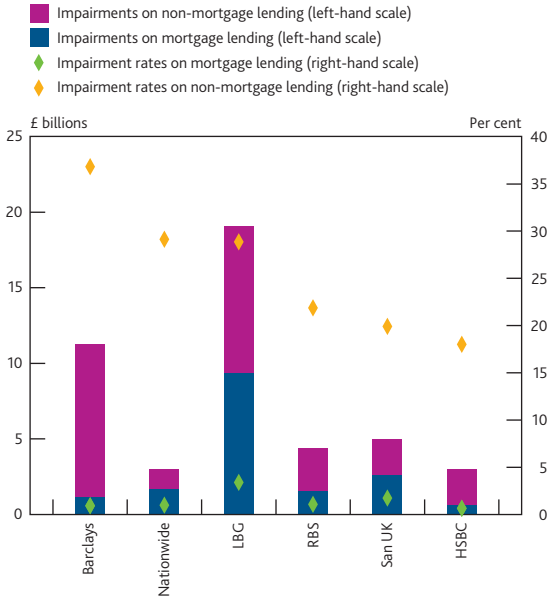
Sources: Participating banks' STDF data submissions, Bank analysis and calculations.

(a) The breakdown into credit cards and personal or term loans is not exhaustive. 'Other' includes for example, store credit, motor finance and overdrafts.

(1) For more details, see the FPC's policy statement from its policy meeting on 20 September 2017; www.bankofengland.co.uk/-/media/boe/files/statement/fpc/2017/financial-policy-committee-statement-september-2017.pdf.

(2) In exceptional cases, the Bank's guidance for participating banks allows the exclusion of assets where a binding sale process has been agreed before the balance sheet cut-off date at the start of the test. This guidance is symmetrical. Lloyds Banking Group completed the purchase of MBNA in June 2017 and these assets have been included in their stress test projections. For further details see: www.bankofengland.co.uk/-/media/boe/files/stress-testing/2017/stress-testing-the-uk-banking-system-2017-guidance-for-participating-banks-and-building-societies.pdf.

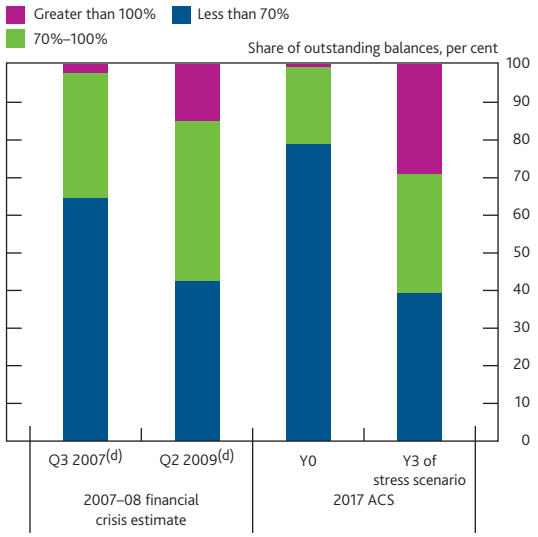
Chart A1.10 Cumulative five-year impairment charges on lending to UK individuals over the five years of the stress(a)(b)



Sources: Participating banks' STDF 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 2016, 2017, 2018, 2019, 2020 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 A1.11 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 the 2017 ACS 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 higher mortgage impairment rate, relative to the financial crisis, is therefore driven by a number of specific factors that more than offset the improvement in asset quality. First, the higher peak in unemployment combined with the sharp rise in Bank Rate in the scenario increase the probability of default for owner-occupier mortgages.

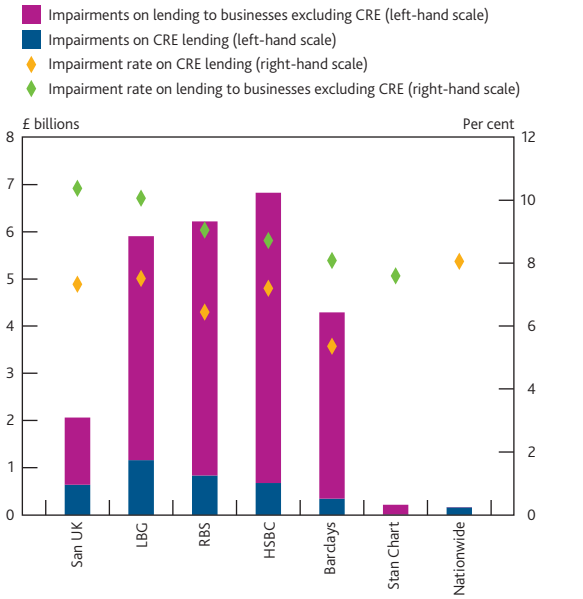
Second, the share of buy-to-let mortgages, as a proportion of the overall stock of mortgages has grown significantly since the financial crisis. Within the banks' mortgage portfolios, the **buy-to-let sector** is more affected by the scenario than the owner-occupied sector, in part because buy-to-let loans are more likely to be extended on interest-only terms, meaning that they are more exposed to the rise in Bank Rate. In aggregate, impairment rates on banks' buy-to-let loans are estimated to be almost four and a half times higher than for owner-occupier mortgages over the five years of the stress. This compares with a ratio of two and a half times higher in the 2016 ACS, when Bank Rate was cut to zero.

Corporate impairments continue to be material…

The 2017 ACS incorporates a fall in UK corporate profits of almost 7%. The 40% reduction to UK commercial real estate (CRE) prices also affects corporate credit losses more widely, in part because CRE is frequently used as collateral for SME and mid-sized corporate loans.

UK banks' aggregate non-CRE domestic **corporate exposures** were just over £250 billion in total at the start of the test and banks are projected to incur impairments of around £22 billion over the five years of the stress. That equates to an impairment rate of 9.0% (**Charts A1.9** and **A1.12**).

Chart A1.12 Cumulative five-year impairment charges on lending to UK businesses over the five years of the stress(a)(b)



Sources: Participating banks' STDF 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 2016, 2017, 2018, 2019, 2020 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.
(b) Portfolios with cumulative impairment charges of £0.0 billion (ie below £0.05 billion) are excluded.

Unlike other portfolios, there has not been a marked improvement in the quality of non-CRE corporate credit exposures in recent years. Since the 2016 test, banks' non-CRE corporate asset quality is broadly unchanged.

The sharp rise in Bank Rate in the stress scenario increases corporate impairments. UK mid-sized companies and SMEs are more vulnerable to the Bank Rate rise. This is because they tend to have less financial flexibility and are less sophisticated than larger companies in managing interest rate risk.

…but further improvements to asset quality help mitigate UK commercial real estate impairments.

As noted above, the 2017 ACS incorporates a 40% fall in average **UK commercial real estate** prices. This is slightly less than the 42% fall observed in the financial crisis. Over the five years of the stress, UK CRE impairments total £3.8 billion on just over £60 billion of starting exposures. This equates to a five-year impairment rate of 6.9%.

The quality of assets in major UK banks' CRE books has improved since the financial crisis, a trend that continued over the course of 2016. Since the financial crisis, banks have disposed of less well performing assets, reduced the size of their books, and tightened their underwriting standards. In 2016, only 10% of the stock of loans had an LTV of more than 70%, compared with around 60% in 2012. And around 95% of new lending in 2016 had an LTV of less than 70%.

This recent and ongoing improvement in asset quality helps explain why the three-year CRE impairment rate in the 2017 ACS, at 6.2%, is around half the financial crisis rate.

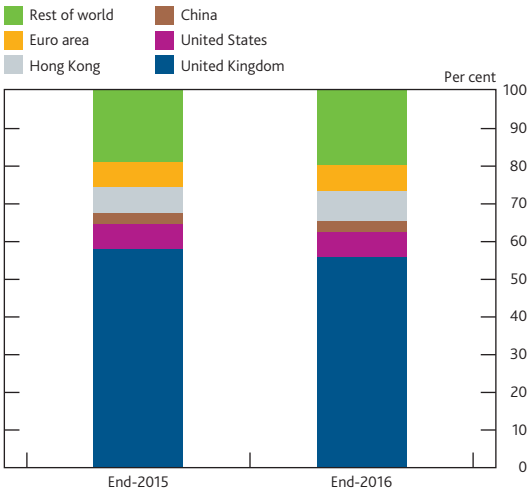
The tough global stress leads to significant global impairments…

Just under half of the exposures of participating banks are to borrowers outside the United Kingdom (**Chart A1.13**). Non-UK credit exposures have increased as a proportion of total lending, from 42% to 44%, during 2016.(1) In part, this reflects the depreciation of sterling during 2016, which has increased the sterling value of UK banks' foreign currency credit exposures.

Factors reducing the ability of non-UK borrowers to repay debt, alongside falls in non-UK asset prices, have a large impact on overall impairments. Over 50% of total projected impairments in the stress relate to non-UK exposures. And of those overseas impairments, more than half relate to lending to the corporate sector (including CRE).

The three largest areas of non-UK exposure for UK banks remain China and Hong Kong (11% of total exposures), the euro area (7%) and the United States (6%).

Chart A1.13 Geographical composition of participating banks' credit exposures



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

…with the United States incurring the highest impairment rates for corporate exposures…

Outside the United Kingdom, the highest corporate impairment rate is in the United States (7.8% over five years), followed by Hong Kong and China (7.1%), the rest of the world (5.6%) and the euro area (4.7%) (**Chart A1.14**).

These loss rates do not purely reflect the severity of the scenario. For example, the GDP falls in the United States and euro area are broadly similar (3.5% and 3.6% respectively). The composition of banks' balance sheets in different regions and differences in asset quality are also important factors.

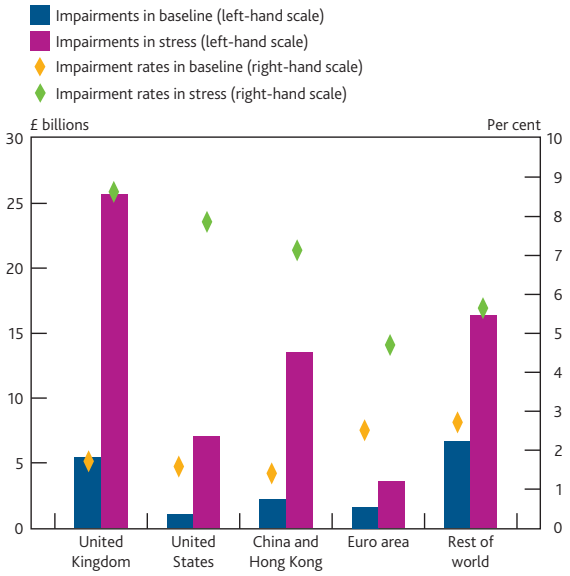
In the United States, for example, a deterioration in corporate asset quality is contributing to a higher impairment rate, relative to the 2016 ACS. In addition, US companies involved in the oil and gas extraction industry are among those most severely affected. This reflects the weakness of commodity prices in the scenario, where oil troughs at US$24 a barrel and averages less than US$30 for the first three years of the stress.

Much of the US corporate impairments relate to losses on leveraged loans. In total, aggregate cumulative losses on leveraged loans in banks' underwriting pipeline were projected to reach £2.5 billion, with a five-year loss rate of 19% in the 2017 ACS. (These are accounted for as trading rather than banking book losses).

Overall the US corporate impairment rate (excluding CRE) is projected to be 7.8% over the five-year stress, around five times higher than in the baseline and significantly higher than the 4.8% rate in the 2016 ACS.

Euro-area impairments account for a small share of the overall total. They make up just over 5% of the aggregate

Chart A1.14 Aggregate cumulative impairment charges on lending to business (including commercial real estate) over the five years of the stress[a][b]



Sources: Participating banks' STDF 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 2016, 2017, 2018, 2019, 2020 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.

impairments for CRE and corporate lending with loss rates of around 2% and 5% respectively.

One significant factor behind the March 2017 assessment that global vulnerabilities have risen was the continuation of rapid Chinese credit growth. China has seen a further widening in credit gap measures, and signs of increasing overvaluation in a number of sectors. In particular, strong property price growth in China has been associated with an increase in household indebtedness.

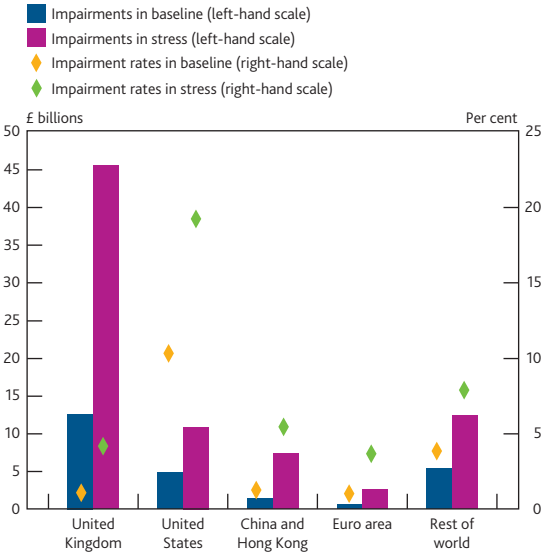
The cumulative corporate impairment rate (excluding CRE) for Hong Kong and China is projected to be 7.8% over the five-year stress, compared with a rate of 1.5% in the baseline. In the 2017 ACS, Chinese GDP contracts by 1.2%, with output in Hong Kong falling by 7.9% alongside a 56% drop in CRE prices.

In total, corporate impairments relating to China, Hong Kong, US and euro-area lending account for around 60% of all non-UK corporate impairments. The other 40% — worth more than £16 billion — are spread across a large number of economies, reflecting the global nature of the downturn specified in the 2017 ACS, and the wide geographic reach of UK banks' exposures. The largest impairments in this rest of the world group occur on Canadian, Indian, Malaysian and UAE exposures, accounting for more than £5 billion between them.

…and lending to individuals.

Impairment charges on non-UK lending to individuals (mortgages and consumer credit) are also most concentrated in the United States (**Chart A1.15**). While a number of outstanding mortgage assets relate to sub-prime loans made prior to the financial crisis, this proportion has reduced significantly in recent years. Despite this, the relatively riskier nature of this lending means that 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 around 19%, compared with just over 4% in the United Kingdom.

Chart A1.15 Aggregate cumulative impairment charges on lending to individuals over the five years of the stress[a][b]



Sources: Participating banks' STDF 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 2016, 2017, 2018, 2019, 2020 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.

In China and Hong Kong, lending to individuals is impacted by conservative rules and practices around household borrowing and, as a result, is heavily weighted towards mortgages with low loan to value ratios. The five-year mortgage impairment rate is 1.9% in the stress, which compares with a rate of 3.3% in the United States over the same period. The Hong Kong and China consumer credit impairment rate is 22% over the five years of the stress. However, unsecured lending to individuals accounts for just 6% of participating banks' total exposures in China and Hong Kong, as opposed to almost 18% in the United States.

The traded risk shock materially reduces banks' projected capital positions.

The traded risk scenario was designed to be congruent with the macroeconomic shocks incorporated into the 2017 ACS. As in previous tests, it involved sharp movements in several

market prices and indices (**Table A1.C**), including interest rates, exchange rates, volatility measures, credit spreads and equity indices, with many of these shocks resembling the market movements observed during the financial crisis. The scenario included a test of banks' ability to withstand the default of several large counterparties (five uncollateralised and two collateralised),(1) as well as covering banks' investment banking revenues and costs projected over the five years of the test.

Table A1.C Selected variables in the 2017 traded risk scenario(a)

Percentage change, except where stated

	Liquidity horizons			
	One day	Two weeks	One month	One year
Equities: FTSE 100 index	-11.0%	-20.0%	-31.0%	-45.0%
Commodities: Oil price	-8.0%	-13.5%	-20.1%	-52.1%
Foreign exchange: GBP/US$	-3.7%	-6.1%	-9.1%	-31.7%
Rates: UK ten-year government(b)	40	60	105	525

Sources: Bank of England and Bank calculations.

(a) All shocks were applied to the spot values prevailing on the effective date of 25 January 2017.
(b) Absolute rate change, in basis points.

Aggregate traded risk losses, excluding investment banking revenues and costs, are just under £28 billion in the first year of the stress (**Chart A1.16**). This covers fair valued assets held in both the trading and banking books, and includes market risk and counterparty credit risk losses and changes in derivative and prudential valuation adjustments. The largest losses are incurred on available-for-sale (AFS) and fair value option (FVO) portfolios, followed by losses related to counterparty credit risk (**Chart A1.17**).

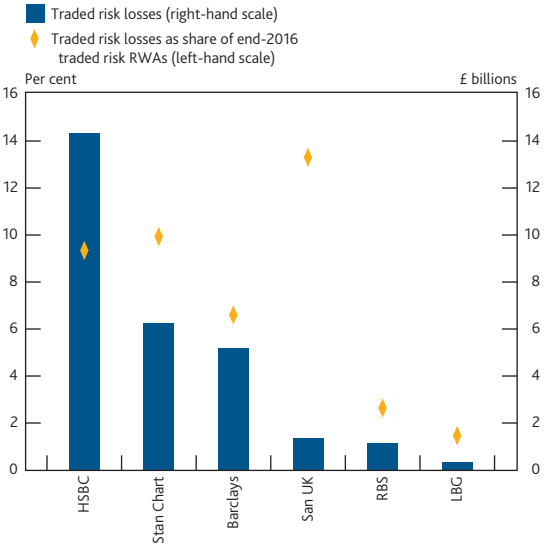
Some of these losses are driven by specific aspects of this year's scenario relative to the 2016 ACS. For example, the rise in interest rates in the 2017 ACS increases fair valued losses on unhedged bond holdings in banks' liquidity buffers. And some market risk and counterparty credit losses are driven by the sterling depreciation in the scenario, which increases cross-currency exposures at risk of default.

The traded risk scenario combined with a deterioration of credit quality under the stress lead to an increase in risk-weighted assets.

The macroeconomic stress and the traded risk stress drive higher credit risk and traded risk RWAs respectively. The increase in aggregate RWAs is also boosted by the large sterling depreciation in the scenario.

The average risk weight rises from 43% to 58% in the first two years of the scenario and aggregate RWAs are projected to rise by almost 50% over the same period. Relative to the baseline, the largest rise overall relates to wholesale lending (**Chart A1.18**), of which non-UK wholesale lending accounts for the vast majority of the increase.

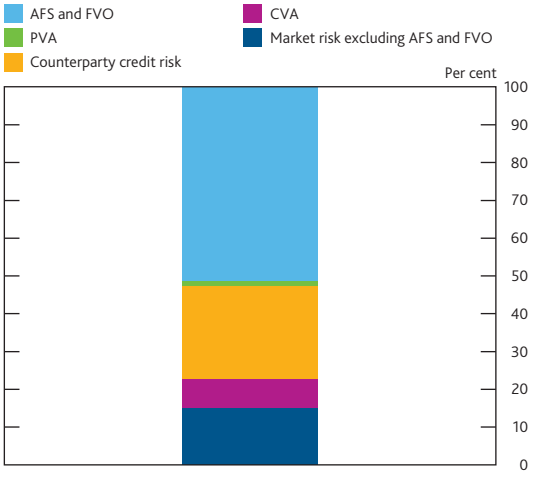
Chart A1.16 Traded risk losses under the stress scenario in 2017(a)(b)(c)(d)



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; 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) Losses for HSBC and SCB are converted to sterling using stressed exchange rates. The comparison of losses with end-2016 traded risk RWA uses the banks' base currency.
(c) Nationwide is excluded as it has minimal traded risk exposures.
(d) Traded risk RWAs also include RWAs for available-for-sale and fair value option positions.

Chart A1.17 Decomposition of aggregate traded risk losses under the stress scenario in 2017(a)(b)(c)

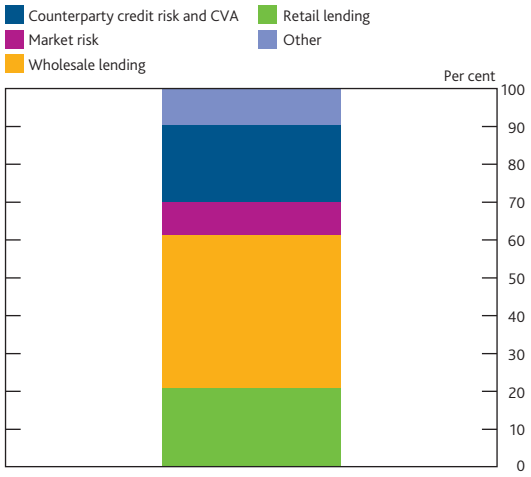


Sources: Participating banks' data submissions, Bank analysis and calculations'.

(a) Traded risk losses include: market risk losses; counterparty credit risk losses; losses arising from changes in banks' credit and funding valuation adjustments (XVA); 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 also include RWAs for available-for-sale and fair value option positions. The traded risk scenario combined with a deterioration of credit quality under the stress lead to an increase in risk-weighted assets.

(1) Banks were asked to select two uncollateralised counterparties to default of their top 10 Asia and emerging-economy exposures, and one from each of their top 10 UK, US and euro-area uncollateralised exposures. Banks were also asked to default two of their top 30 collateralised global counterparties.

Chart A1.18 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' STDF submissions, Bank analysis and calculations.

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

In relation to UK credit exposures, internal ratings based (IRB) RWAs rise by almost 45% to the low point of the stress.(1)

Around two-fifths of this overall increase is accounted for by mortgage risk weights. Average risk weights on UK mortgages under the IRB approach rise by close to 80%, 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.

Some banks rely heavily on through-the-cycle models, making their risk weights relatively insensitive to cyclical movements in credit risk, while others use point-in-time models, which are much more sensitive.

In 2016, the PRA issued a consultation paper on residential mortgage risk-weight modelling. As a result, the PRA has said that banks will be expected to adopt probability of default modelling approaches for their residential mortgage portfolios that avoid deficiencies in risk capture identified in both point-in-time and through-the-cycle models, and instead calibrate their models using a consistent and appropriate assumption for the level of model cyclicality. Banks will be expected to meet these revised expectations by the end of 2020.(2)

Non-mortgage retail credit accounts for approximately 19% of the RWA increase for UK credit exposures in the stress. This is due to the increased default rates for consumer credit, such as loans and credit cards, which leads to higher risk weights.

The remaining 39% of the UK credit RWA increase is accounted for by wholesale credit risk. This includes lending to sovereigns, companies and financial institutions and reflects a broad expectation of rating downgrades over the stress period.

The traded risk shock also leads to a substantial increase in traded risk RWAs. Traded risk RWAs more than double in the stress. The impact is particularly acute for the banks with the largest global foreign exchange trading operations.

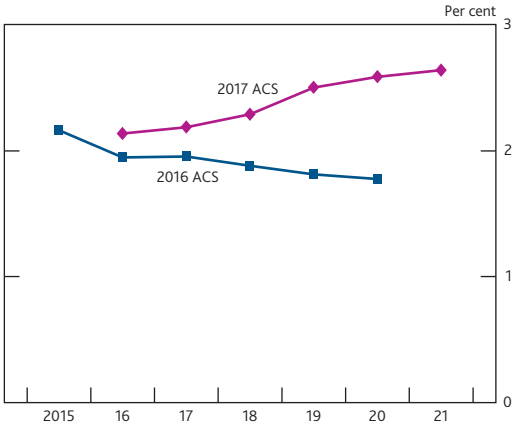
Net interest margins widen in the stress, boosting net interest income relative to the baseline.

Net interest income is the main source of income for all banks participating in the 2017 ACS. In 2016, it accounted for around three quarters of banks' aggregate revenues. In aggregate, net interest income sums to around £415 billion over the five years of the stress scenario.

Net interest income is around £23 billion higher in the first two years of the stress than in the baseline projection.

Sterling net interest margins, here defined as sterling net interest income divided by average sterling interest-earning assets, are projected to widen relative to the baseline (**Chart A1.19**). This increase is facilitated by the 3.75% rise in Bank Rate (see Box 6). The sterling value of non-sterling net interest income is also boosted by the sterling depreciation in the scenario.

Chart A1.19 The path for sterling net interest margins[a]



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

(a) Sterling net interest margin is defined as sterling net interest income divided by sterling average interest earning assets.

(1) The risk weights attached to close to 80% 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.
(2) For more details see 'Residential mortgage risk weights', *PRA Policy Statement PS13/17*; www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/policy-statement/2017/ps1317.pdf.

Individual banks pursue a variety of pricing strategies in the stress. In aggregate, sterling net interest margins widen by 15 basis points between the start and low point of the stress in 2018. The main driver of this increase is the ability of banks to reinvest their non-interest bearing liabilities (such as current accounts and equity) in assets earning higher returns through the stress. This benefit is slowed, however, by the nature of the structural hedges the banks have in place. These are designed to make their net interest margin more stable, but mean they are less able to benefit immediately from higher rates, as only a fraction of the associated assets mature in each period and become available for reinvestment.

The gain is also reduced as some customers are assumed to respond to higher interest rates by switching deposits from non-interest bearing accounts into savings accounts. Indeed, over the five years of the stress, banks' share of non-interest bearing liabilities return to their pre-crisis levels.

By the low point of the scenario banks have passed on the majority of the rise in Bank Rate to loans and interest-bearing deposits.

Banks are also able to increase margins on new lending as credit risk rises. For example, during the course of the stress the proportion of new mortgage lending at higher LTVs naturally increases as residential property prices decline.

Non-sterling interest margins are also boosted by a projected rise in the 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.

The impact of the scenario on pension schemes further reduces capital.

Banks' pension schemes are significantly impacted by the changes to long-term real interest rates incorporated into the 2017 ACS. In the first year of the scenario, the nominal yield on 20-year gilts rises from less than 2% to more than 7%, before slowly falling again. This is driven predominantly by the real yield component, with the rise in inflation expectations more muted.

Defined benefit pension schemes are particularly vulnerable to falls in interest rates, which increase the present value of their future liabilities by more than the value of their non-derivative assets. Because of this, schemes typically hedge against downward movements in interest rates, primarily through interest rate derivatives.

However, on the accounting basis used for the stress test, some banks' schemes are more than fully hedged against falling interest rates in the stress. This is because pension scheme trustees use their own preferred measure of liabilities, the scheme-specific funding basis. At the start of the scenario, this is a tougher measure than the one used in banks' statutory accounts. This leads to a higher measure of liabilities, and a demand for additional interest rate protection over and above that required by the accounting measure.

As a result, while higher interest rates in the stress reduce the net present value of those banks' liabilities by more than the value of their assets, this benefit is more than offset by mark-to-market losses on their derivative positions.

A number of participating banks have multiple pension schemes, some of which gain and some of which lose in the stress.

Stressed misconduct cost projections continue to weigh down on banks' capital.

Misconduct costs have continued to be a significant headwind to capital accretion for the UK banking system. In 2016, provisions relating to past misconduct totalled around £11 billion, reducing the pre-tax profits of banks by around 50%. In aggregate, between 2011 and 2016, participating banks had paid out or provisioned for around £67 billion of misconduct costs.

Banks face further potential costs related to past misconduct. 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.

As in previous years, the 2017 ACS assesses banks' resilience to a much higher level of misconduct costs, well beyond current provisions.

These 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 quantify reliably liabilities that may exist, a confidence level of 90% of settling at or below the stressed projection has been targeted.(1)

(1) See 'Stress testing the UK banking system: 2017 guidance for participating banks and building societies'; www.bankofengland.co.uk/-/media/boe/files/stress-testing/2017/stress-testing-the-uk-banking-system-2017-guidance-for-participating-banks-and-building-societies.pdf.

Box 5
A comparison of banks' losses in the 2017 stress test and the financial crisis

This box considers how the losses reported by banks in the financial crisis compare to those in the 2017 stress test.

Direct comparison with the crisis is complicated by two main factors. First, losses in the crisis would likely have been considerably larger in the absence of the significant government and central bank support that followed. Second, the banking system has been transformed since the financial crisis. Capital and funding positions have been strengthened significantly and banks have become less complex. They lend more to households and businesses and less to each other.

Notwithstanding these caveats, as the 2017 stress test examines the resilience of the UK banking system to a macroeconomic scenario more severe than the financial crisis, it is useful to compare the results to the crisis experience.

Table 1 shows the cumulative impairment rates during the first two years of the crisis for each individual bank, calculated from their annual accounts. These are defined as the sum of impairments realised in 2008 and 2009, divided by the average level of outstanding loans and advances over this period. All major UK banks incurred significant losses on their lending during the financial crisis.

Table 1 Cumulative impairment rates for major UK banks in 2008 and 2009[a]

Per cent

	Cumulative impairment rate
Barclays	3.3
HSBC	5.3
Lloyds TSB and HBOS	6.1
Nationwide	0.4
Royal Bank of Scotland	2.5
Santander UK	0.8
Standard Chartered	2.0
Aggregate	**3.8**
Two year aggregate (2017 ACS)[b]	**3.8**

Sources: Banks' annual reports, participating banks' STDF data submissions, Bank analysis and calculations.

(a) Financial crisis impairment rates are calculated as the sum of impairments in 2008 and 2009, divided by average loans and advances in 2007 and 2008.
(b) The two year ACS cumulative impairment rate is calculated as total impairments in the first two years of the stress (2017 and 2018), divided by average gross on balance sheet exposure), where the denominator is a simple average of 2016 and 2017.

Loss rates varied significantly across UK banks in the crisis, but overall, the aggregate cumulative impairment rate was 3.8% for the period 2008–09 (**Table 1**).

Despite significant improvements in asset quality since the crisis, this same group of banks also had a cumulative impairment rate of 3.8% over the first two years of the 2017 stress test. This reflects the fact that the higher path for Bank Rate is particularly tough for UK borrowers as well as the tougher global scenario.

Several banks continued to make pre-tax profits during the crisis. This reduced the net losses incurred by the system (**Table 2**). In contrast, during the 2017 ACS only Nationwide are projected to remain profitable.

Table 2 Major UK banks' profit before tax as recorded in published accounts for 2008 and 2009

£ billions

	Profit before tax
Barclays	9.7
HSBC[a]	9.5
Sum of Lloyds TSB and HBOS[b]	-26.8
Nationwide	0.5
Royal Bank of Scotland[c]	-28.3
Santander UK	2.8
Standard Chartered[a]	5.8
Aggregate (2008 and 2009)	**-26.8**
Aggregate (2017 ACS)[d]	**-48.7**

Sources: Banks' annual reports, participating banks' STDF data submissions, Bank analysis and calculations.

(a) Profit before tax numbers for HSBC and SCB are converted to sterling using average exchange rates for 2008 and 2009.
(b) Lloyds Banking Group's losses are calculated by summing the losses of LTSB and HBOS in 2008 and 2009. LBG also published PBT for the consolidated group in 2009, which would result in a higher PBT over the two-year period, of -£9 billion. This includes, for example, the negative goodwill gain made by Lloyds on the purchase of HBOS. The accounting impact of the merger of Lloyds and HBOS is to reduce their combined losses significantly. On this basis, profit before tax for this group of banks would have been -£9 billion in 2008 and 2009.
(c) The initial figure published for 2008 was -£40.7 billion, which was later restated to -£25.7 billion, because some of these losses related to the acquisition of ABN AMRO, and in part accrued to other members of the consortium that acquired it and so were not attributable to RBS.
(d) The PBT figure for the 2017 ACS in the losses made in the first two years of the stress (ie to the low point of the stress). It includes the impact of foreign exchange movements in the scenario.

Box 6
The impact of rising Bank Rate

A key feature of this year's ACS is the increase in the Bank Rate, which peaks at 4% in 2017 Q4. This differentiates the test from the 2016 scenario, in which Bank Rate was cut to zero.

While the increase in Bank Rate does not materially affect the severity of the scenario it does impact a number of key aspects of the test. And, overall, it slightly reduces the aggregate risk-weighted CET1 capital ratio low point. Details of the various ways in which the path for Bank Rate has impacted the underlying aspects of the 2017 results are set out in this box.

Higher interest repayments put borrowers under greater pressure leading to additional UK impairments.

Bank staff estimate that the higher path for Bank Rate leads to over £10 billion of additional UK impairments by the low point in the 2017 ACS. There are two main drivers for higher impairments resulting from the increase in Bank Rate.

First, borrowers come under direct pressure due to either higher interest repayments on variable rate loans, or having to re-fix their loan midway through the stress at a higher rate. The prevalence of short-term fixed rate mortgage contracts means that UK households are particularly exposed to the risk of unexpected changes in interest rates. Around three quarters of the stock of mortgage lending at the end of 2016 was either on a fixed rate for a period of two years or less, or on a floating rate. **Chart A** shows how the interest rate shock combined with the large increase in unemployment in the scenario puts borrowers with mortgages under significant pressure by historical standards. Despite a relatively strong starting position, 11% of mortgage holders would have a debt service ratio of 40% or above in the third year of the severe stress scenario.

Second, there is a 'contagion' effect as consumer credit borrowers with mortgages are likely to prioritise higher mortgage interest payments at the expense of servicing their consumer debt. Bank staff estimate that the higher path for Bank Rate accounts for around a third of the £7.3 billion increase in UK consumer credit impairments to the low point in 2018, relative to the 2016 ACS.

Additional impairments are broadly offset by higher UK net interest income.

Banks benefit from the higher path for Bank Rate because they retain a stock of non-interest bearing liabilities that, over the course of the stress, they allocate to assets in which interest rates are increasing. Both deposit and lending rates are assumed to increase in the scenario, and by the low point of the stress, banks have passed on the majority of the rise in Bank Rate to loans and interest-bearing deposits.

Chart A Mortgages with a debt service ratio of 40% or above[a][b][c]

Sources: British Household Panel Survey (BHPS), NMG consulting survey, ONS and Bank calculations.

(a) Mortgage debt service ratio calculated as total mortgage payments as a percentage of pre-tax income.
(b) The figures for 1992 and 2007 are calculated using the British Household Panel Survey. The figure for 2016 is calculated using the NMG Consulting survey.
(c) 2017 ACS figures are for the third year of the stress.

In total, Bank staff estimate that banks gain a little over £10 billion of additional UK net interest income by the low point of the stress, as a result of higher Bank Rate.

The overall impact is to reduce slightly the CET1 capital ratio as the higher path for Bank Rate also pushes up risk-weighted assets on UK exposures and increases the pensions impact.

Higher interest rates in the stress push up on credit risk weights alongside impairments. UK credit risk weights rise by 38% in the first two years, around 15 percentage points more than they did in the 2016 ACS.

The capital impact of pensions is also higher for UK banks in the 2017 ACS than last year, despite higher gilt yields. This is because some banks with defined benefit pension schemes are, on the accounting basis used in the stress, more than fully hedged against the risk of falling interest rates, which means they lose out when rates rise (see page 36).

There have been a number of developments since the launch of the 2017 ACS. During the first three quarters of 2017 the major UK banks made around £3 billion of additional provisions for misconduct costs and fines. As well as news around fines relating to the mis-selling of US residential mortgage-backed securities, the FCA has also launched a publicity campaign around the August 2019 time-bar for Payment Protection Insurance (PPI) complaints. Bank staff have taken such developments into account in calibrating the stressed projections for misconduct costs included in the test.

In the 2017 ACS, the aggregate stressed projection for misconduct costs over and above that incurred or provided for at end-2016 is around £40 billion over the five years of the stress. If realised, this would take total aggregate misconduct costs to over £100 billion between 2011 and 2021. Around £30 billion of the stressed projection is realised in the first two years of the stress.

The stressed projections are not a central forecast for future misconduct costs and have therefore not been included in the baseline projections for banks' capital. Equally, they should not be considered a 'worst case scenario'. The stressed projections 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.

Overall, there remains a very high degree of uncertainty around any approach to quantifying misconduct costs. Even in cases where misconduct risks have already crystallised or have a high likelihood of crystallising, there is a wide range of possible outcomes.

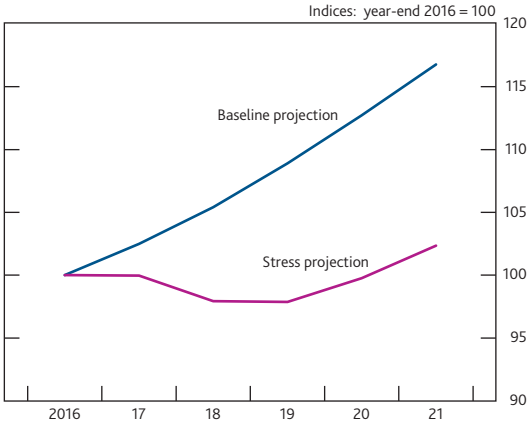
Reflecting this degree of uncertainty and the fact there are ongoing legal actions and regulatory investigations relating to specific misconduct issues, the Bank is not, as in previous years, disclosing stressed projections for misconduct costs for individual participating banks.

Banks continue to lend to the real economy in the stress.
The results of the ACS are consistent with the major UK banks maintaining a supply of lending to UK households and businesses that meets Bank staff's projection of the demand for credit in the scenario.

When the Bank launched the 2017 ACS, it set out an aggregate lending path in the stress, in which lending to the UK real economy expanded by 2% over the five years of the stress. This is considerably lower than the projected demand for credit in the baseline (**Chart A1.20**).

Over the first two years of the stress scenario, the demand for credit falls as Bank Rate rises, asset prices fall, investment growth declines, and as the rise in bank funding costs incorporated in the stress is passed through to lending rates. The demand for credit rises thereafter as economic activity increases and Bank Rate and funding costs decline somewhat towards the end of the scenario.

Chart A1.20 Projected lending to UK individuals and companies by stress-test participants(a)



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

(a) Companies are defined as private non-financial corporations.

Automatic and 'strategic' mitigating responses to the stress

Under the Bank's approach to stress testing, stress-test participants can choose, and in some cases need, to take a range of actions that help to mitigate the impact of the stress on their capital positions.

These actions fall into three broad categories, applied by the Bank in the following order. First 'business-as-usual' actions (or pre-management 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 published payout policies.

Second, restrictions on discretionary distributions that would result from compliance with the European Capital Requirements Directive (CRD) IV.(1) Specifically, under CRD IV, banks failing to maintain a sufficient capital buffer above their minimum capital requirements are subject to automatic restrictions on discretionary distributions including

(1) Under the Capital Requirements Directive (CRD) 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 2017 test is comprised of the countercyclical capital buffer (CCyB), the capital conservation buffer (CCoB) and, for global systemically important institutions (G-SIIs), the G-SII 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) of they would fail to meet their combined buffer as a result. Stress test results include the impact of these restrictions. For further details see Annex 1 **Table A1.D** and Annex 4 **Table A4.B**.

variable remuneration, dividends and other discretionary coupons.

Third, 'strategic' management actions, which would be likely to entail significant involvement from banks' Boards (for example, departures from banks' published dividend policies). As has been the case in previous stress tests, 'strategic' management actions were only accepted if they were judged by the Bank to be plausible given the stress.(1)

Cuts to dividends help 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, dividends paid out for 2016 amounted to around £8 billion and in the baseline projection (which does not include misconduct costs) they pay £26 billion in the first two years. Banks are assumed to pay out no such dividends in the first two years of the stress. This retention of £26 billion, relative to the baseline, helps mitigate the fall in the aggregate CET1 capital ratio by 1.4 percentage points at the low point of the stress.

RBS did not pay a dividend in 2016 and this continues throughout the stress scenario. Lloyds Banking Group and Santander UK cut their dividends to zero in the first two years of the stress in line with their published payout policies.(2) Barclays, HSBC 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.

Nationwide does however continue to make distributions on its Core Capital Deferred Shares (CCDS) (**Table A1.D**).

Banks also cut variable remuneration and additional Tier 1 coupons in the stress.

The stress also involves banks significantly reducing the amount of variable remuneration and other distributions they pay out over the first two years of the stress. In aggregate, variable remuneration falls from £4.4 billion in 2016 to £0.5 billion over the two years to end-2018. Relative to baseline projections of £9.0 billion this boosts the aggregate CET1 capital ratio by 0.5 percentage points.

Other distributions are reduced from £2.9 billion in 2016 to £1.3 billion over 2017 and 2018. Within that, AT1 discretionary coupons fall from £2.1 billion in 2016 to £1.1 billion in the first two years of the stress. Barclays, HSBC and RBS make no discretionary AT1 coupon distributions in 2017 and 2018. Lloyds Banking Group and Standard Chartered do so only in the first year of the stress. Nationwide and Santander continue to make distributions in the first two years of the stress.

No bank's CET1 capital ratio falls below 7% in the stress and no AT1 capital instruments are converted into CET1 capital.(3)

The overall impact of dividend and CRD IV distribution restrictions is to increase the low point of the aggregate CET1 capital ratio by around 1.5 percentage points. The overall impact of non-dividend strategic management actions is to increase the low point by 0.3 percentage points.

Modelling of feedback and amplification channels in the 2017 annual cyclical scenario

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.

As set out in the October 2015 *Approach Document,* 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 section explains the steps the Bank has taken towards this goal and how it has built on the progress outlined in Box 3 of the 2016 results publication.

In the 2017 ACS, Bank staff have applied three feedback models to the results. This compares with one model in the 2016 results.

Solvency contagion risk.

The Bank's **solvency contagion model** examines how deteriorating capital positions lead to revaluation of interbank debt claims, which in turn can affect banks' capital positions further. This model was first used in 2016.(4)

Bank staff's judgement is that the results of the 2017 ACS show that the solvency contagion risk between participating banks has increased relative to the 2016 ACS, but the overall impact on the system via this channel remains immaterial.

A key reason for the increase, relative to the 2016 test, is an increase in interbank lending.

Wholesale funding costs.

A **wholesale funding cost model**, which maps changes in banks' leverage ratios to increases in wholesale funding costs, has been used for the first time in the Bank's analysis of the 2017 ACS.(5)

(1) 'Strategic' management actions taken by individual banks are described in Annex 5.
(2) These cuts are classified as business as usual as opposed to 'strategic' management actions.
(3) All AT1 instruments currently in issue by UK banks have a 7% trigger.
(4) See Bank of England, *Staff Working Paper No. 662*, 'The decline of solvency contagion risk', June 2017, www.bankofengland.co.uk/-/media/boe/files/working-paper/2017/the-decline-of-solvency-contagion-risk.pdf.
(5) See Bank of England, *Staff Working Paper No. 681*, 'Solvency and wholesale funding cost interactions at UK banks', October 2017, www.bankofengland.co.uk/-/media/boe/files/working-paper/2017/solvency-and-wholesale-funding-cost-interactions-at-uk-banks.pdf.

Table A1.D Dividends, variable remuneration, AT1 coupons and other distributions in the 2017 ACS[a]

£billions	Ordinary dividends[a]		Variable remuneration[b]		AT1 discretionary coupons and other distributions[c]	
	Actual 2016	To end-2018 in the stress	Actual 2016	To end-2018 in the stress	Actual 2016	To end-2018 in the stress
Barclays	0.5	0.0	1.0	0.0	0.9	0.0
HSBC[d]	4.9	0.0	1.9	0.0	0.9	0.1
Lloyds Banking Group	2.2	0.0	0.3	0.0	0.3	0.4
Nationwide[e]	0.1	0.1	0.1	0.1	0.1	0.1
The Royal Bank of Scotland Group	0.0	0.0	0.2	0.0	0.5	0.0
Santander UK	0.6	0.0	0.1	0.3	0.1	0.3
Standard Chartered[e]	0.0	0.0	0.7	0.2	0.2	0.4
Aggregate	**8.2**	**0.1**	**4.4**	**0.5**	**2.9**	**1.3**

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

(a) Ordinary dividends shown net of scrip payments, and are in respect of the year noted.
(b) Variable remuneration reflects discretionary distributions only (ie upfront cash awards awarded in the current year, paid in the current year only), pre-tax.
(c) Other distributions includes preference Dividends, and Other Discretionary distributions.
(d) HSBC and Standard Chartered pay dividends in US dollars. These dividends have been converted using exchange rates consistent with the stress scenario.
(e) Figures for Nationwide refer to distributions relating to its Core Capital Deferred Shares, a CET1 capital instrument.

Bank staff's judgement is that the projections of the Bank's wholesale funding costs model suggest that participating banks' long-term wholesale funding cost projections in the 2017 ACS are consistent with the impact of the stress on their solvency positions. The risks around this amplification channel are therefore judged to be contained in the stress.

Contagion via sales of commonly held assets.

The Bank has also considered the risks of **amplification through sales of commonly held assets**. The Bank has adapted the methodology developed by Cont and Schaanning (2017), which seeks to quantify a) the impact of the sales of traded securities on the prices of those securities, and b) the realised and mark-to-market losses that result from asset sales. Contagion occurs when one or more banks sell assets held by other banks, leading to a fall in asset values and mark-to-market losses for those banks.[1]

Banks did not submit significant sales of liquid assets nor sales of less liquid assets in the 2017 ACS, so the model was not used to adjust the results. Furthermore, the data collected in order to run the model suggests that common holdings are highly concentrated in more liquid asset classes, reducing the risk of spill overs. This conclusion was supported by some hypothetical 'what if' experiments.

Next steps

The Bank remains committed to further, ongoing, work to monitor and assess systemic risks. Bank staff are continuing to develop additional feedback and amplification models with the aim of enhancing the Bank's capability of assessing the resilience of the banking sector. Further details of the Bank's plans in this area will be set out in the next update of the Bank's approach to stress testing.

(1) For further details of the methodology developed by Cont and Schaanning (2017), see 'Fire Sales, Indirect Contagion and Systemic Stress Testing', *Norges Bank Working Paper 02/2017*. Available at www.norges-bank.no/en/Published/Papers/Working-Papers/2017/22017/.

Annex 2: Background to the 2017 ACS and bank-specific hurdle rates and results

This section sets out further background information on the Bank's hurdle rate framework and the results of the 2017 ACS.

Hurdle rate framework

As well as informing the appropriate size of regulatory capital buffers, the 2017 ACS also examines whether a bank currently has adequate capital resources. If it does not, it may be required to take action to strengthen its capital position over an appropriate timeframe.

Performance in the 2017 ACS 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 PRC. There is no automatic link between the results and the 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 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. This is applied to all participating banks.

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 do the CET1 hurdle rates. The inclusion of Pillar 2A in the Bank's hurdle rate serves to increase the aggregate hurdle rate and also boosts transparency. For stress participants in aggregate, the weighted average CET1 ratio hurdle rate was 6.7%.

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-SIIs), this adds to the hurdle rate an amount equal to each bank's G-SII capital buffers. These buffers are currently being phased in and will, by 2019, be between 1% and 2% of risk-weighted assets.(1) That means for some banks, the capital standard against which they are judged in the 2017 ACS is rising over time (and is higher than it was in the 2016 ACS). The weighted average systemic reference point was 7.7% at the low point in 2018.

The part of the hurdle rate framework relating to leverage ratios also has two elements.

The Tier 1 leverage ratio hurdle rate in the 2017 ACS is 3.25% for all participating banks. This adjusted hurdle rate, relative to the 3% hurdle in the 2016 ACS, reflects the FPC's recommendation in September 2017 and subsequent policy statement from the PRA that the PRA's rules on the leverage ratio should: (i) exclude from the calculation of the total exposure measure those assets constituting claims on central banks, where they are matched by deposits accepted by the firm that are denominated in the same currency and of identical or longer maturity; and (ii) require a minimum leverage ratio of 3.25%.(2)

The Tier 1 leverage systemic reference points vary across banks. G-SII capital buffers for CET1 capital are scaled by 35% to convert into Tier 1 leverage ratio terms. For example, a bank with a CET1 capital ratio G-SII buffer of 1% would have a Tier 1 leverage ratio systemic reference point of 3.6%. Further details of individual banks' hurdle rates and systemic reference points can be found in **Table A2.A**.

In addition, developments in banks' capital positions after the ACS reference date are also taken into consideration when their performance in the test is assessed.

The PRC also considers other factors when deciding how to respond to stress-test results. Examples of factors the PRC might take into consideration in deciding whether action is needed include, but are not limited to: the bank's Tier 1 and total capital ratios under stress; the extent to which the bank had used up its capital conservation buffer in the stress; and the adequacy and quality of its recovery and resolution plans.

Bank specific results

Table A2.B sets out further details of the projected capital ratios and Tier 1 leverage ratios in the stress scenario. The first column shows the CET1 capital and Tier 1 leverage ratios for participating banks at end-2016, the start point of the ACS. The second column shows their stressed ratios, at the low point, before the impact of strategic management actions or AT1 conversion. The next two columns show how these low point ratios evolve once strategic management actions and the impact of CRD IV restrictions are applied. The fifth column shows the impact of AT1 conversion on the low point stressed ratios. In the 2017 ACS, however, no AT1 instruments are triggered. The next two columns show the hurdle rates and systemic reference points for each bank, demonstrating the extent to which these are met in the stress. The final column shows the 2017 Q3 CET1 capital and Tier 1 leverage ratios for each bank, which illustrates how they have evolved since the start point of the test.

(1) The systemic reference points used in the 2017 ACS are consistent with the G-SII buffers published by the Financial Stability Board (FSB).
(2) See *PRA Policy Statement PS21/17*, 'UK leverage ratio: treatment of claims on central banks'; www.bankofengland.co.uk/prudential-regulation/publication/2017/consultations-by-the-fpc-and-pra-on-changes-to-the-uk-leverage-ratio-framework.

Table A2.A Hurdle rates and systemic reference points for the Bank's 2017 ACS[a][b][c]

		Systemic reference point				
	Hurdle rate	2017	2018	2019	2020	2021
CET1 ratios						
Barclays	6.8	7.8	7.9	8.3	8.3	8.3
HSBC	6.5	7.7	8.0	8.5	8.5	8.5
Lloyds Banking Group	7.5	n.a	n.a	n.a	n.a	n.a
Nationwide	8.4	n.a	n.a	n.a	n.a	n.a
The Royal Bank of Scotland Group	6.7	7.2	7.4	7.7	7.7	7.7
Santander UK	7.6	n.a	n.a	n.a	n.a	n.a
Standard Chartered	6.2	6.7	7.0	7.2	7.2	7.2
Aggregate	**6.7**	**7.5**	**7.7**	**8.0**	**8.0**	**8.0**
Tier 1 leverage ratios						
Barclays	3.25	3.6	3.6	3.8	3.8	3.8
HSBC	3.25	3.7	3.8	4.0	4.0	4.0
Lloyds Banking Group	3.25	n.a	n.a	n.a	n.a	n.a
Nationwide	3.25	n.a	n.a	n.a	n.a	n.a
The Royal Bank of Scotland Group	3.25	3.4	3.5	3.6	3.6	3.6
Santander UK	3.25	n.a	n.a	n.a	n.a	n.a
Standard Chartered	3.25	3.4	3.5	3.6	3.6	3.6
Aggregate	**3.25**	**3.5**	**3.6**	**3.7**	**3.7**	**3.7**

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 2017 G-SIB list published by the Financial Stability Board.
(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.

Table A2.B Projected CET1 capital ratios and Tier 1 leverage ratios in the stress scenario[a][b][c][d]

	Actual (end-2016)	Minimum stressed ratio (*before* the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1		Minimum stressed ratio (*after* the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2017 Q3)
			Non-dividend 'strategic' management actions only[e]	All 'strategic' management actions including CRD IV distribution restrictions				
CET1 ratios								
Barclays	12.4	6.2	6.2	7.4	7.4	6.8	7.9	13.1
HSBC	13.6	6.0	6.3	8.9	8.9	6.5	8.0	14.6
Lloyds Banking Group[f]	13.6	7.5	7.8	7.9	7.9	7.5	n.a.	14.1
Nationwide	24.4	11.6	12.3	12.3	12.3	8.4	n.a.	29.6
The Royal Bank of Scotland Group	13.4	6.4	6.4	7.0	7.0	6.7	7.4	15.5
Santander UK	11.6	9.6	9.7	9.7	9.7	7.6	n.a.	12.1
Standard Chartered	13.6	6.4	6.9	7.6	7.6	6.2	7.0	13.6
Aggregate	**13.4**	**6.5**	**6.8**	**8.3**	**8.3**	**6.7**	**7.7**	**14.4**
Leverage ratios								
Barclays	5.0	3.0	3.1	3.6	3.6	3.25	3.6	5.1
HSBC	5.7	3.8	3.9	4.5	4.5	3.25	3.7	6.1
Lloyds Banking Group[g]	5.2	3.8	3.9	3.9	3.9	3.25	n.a.	5.4
Nationwide	4.3	4.3	4.5	4.5	4.5	3.25	n.a.	4.9
The Royal Bank of Scotland Group	5.6	3.7	3.7	4.0	4.0	3.25	3.5	6.0
Santander UK	4.1	3.3	3.3	3.3	3.3	3.25	n.a.	4.4
Standard Chartered	6.0	4.6	4.6	4.7	4.7	3.25	3.4	5.9
Aggregate	**5.4**	**3.5**	**3.6**	**4.3**	**4.3**	**3.25**	**3.6**	**5.7**

Sources: Participating banks' published accounts and STDF 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 percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement 21/17*.
(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 2018. 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 2018.
(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.
(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.
(f) The end-2016 CET1 ratio of 13.6% includes 80 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 80 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.
(g) The end-2016 Tier 1 leverage ratio of 5.2% includes 30 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 30 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario.

Calibration of the UK countercyclical capital buffer (CCyB) rate

The aggregate CET1 capital ratio falls 5.2 percentage points to the low point of the 2017 ACS. Around 1.5 percentage points of this is accounted for by the UK economic element of the scenario. However, the FPC have judged that only part of this impact should be considered relevant to the setting of the system-wide buffer, with the remainder dealt with through the setting of PRA buffers.

In line the with the FPC statement from September 2017, the part of UK consumer credit losses in the stress relating to the FPC's judgement on credit quality will be reflected in capital buffers for individual banks (PRA buffers), rather than being factored into the UK CCyB rate. Other contributors to the overall UK economic impact are also excluded where these relate to risks facing just one or two banks.

Taking those considerations into account, the impact of the UK economic stress is 1% of overall risk-weighted assets, which is equivalent to around 3.5% of relevant risk-weighted UK credit assets. This suggests that the 2.5% conservation buffer should be supplemented with a 1% UK countercyclical buffer rate.

Annex 3: How the Bank of England's stress test reflects markets' views of banks

This annex discusses how the Bank of England's stress-test results reflect the current low equity 'price to book' ratios for some banks.

There can be circumstances when low market valuations imply that banks' capital ratios should be adjusted downwards even before the stress is applied. The Bank judges that this would not be appropriate at present.

To do so would double count two factors already incorporated into the test results.

- First, banks' starting capital positions are already based on a deliberately conservative measure of regulatory capital rather than accounting measures of shareholders' equity.

- Second, the low market valuations of some banks do not appear to reflect a different perception of current asset quality. They are consistent with bank profitability projections already captured in the test.

UK banks' price to book ratios

A bank's 'price to book ratio' compares the market value of shareholders' equity in the bank to the accounting or 'book' value of that equity.

Major UK banks'(1) price to book ratios are currently 0.8 on average. This is a significant recovery from their recent low of 0.5 in 2016. Some banks' price to book ratios are now close to one, while others' remain substantially lower (**Table A3.A**).

Table A3.A UK banks' price to book ratios

	Price to book ratio
Barclays	0.6
HSBC	1.0
Lloyds Banking Group	1.1
The Royal Bank of Scotland Group	0.7
Standard Chartered	0.6
Weighted average	**0.8**

Sources: Bloomberg Finance L.P., participating banks' STDF submissions, Bank analysis and calculations.

In general, there are two classes of explanation for why banks' price to book values could be below one:

- First, investors have concerns about the valuation of assets in published accounts (ie they are concerned that the book value overstates the true position perhaps because current non-performing loans have not been adequately provisioned).

- Second, investors perceive banks to have poor or uncertain future profit prospects. In this case, a lower market value is needed to increase expected returns and attract new investors.

The starting point of capital in stress tests

Where price to book ratios are below one, some commentators have suggested that banks' starting capital positions in the stress test should be adjusted downward by their price to book ratio,(2) to ensure that the test is based on what they consider to be a more accurate assessment of the bank's loss-absorbing capacity. This hinges on the idea that low market valuations more accurately reflect the true valuation of bank assets.

If the Bank had judged that banks' assets were overvalued at the start of the test, it would incorporate into the stress-test projections a write-down of the value of those assets, even before taking into account the effect of the stress on the value of those assets. In November 2012, the FPC asked the PRA to make such an adjustment when assessing the adequacy of banks' capital.(3)

However, no such adjustment is included in these test results. There are two reasons why it would currently be inappropriate:

First, the definition of capital used to calculate the stress test starting position differs to that used in the price to book ratio and already marks it down below the book value.

The stress test uses the regulatory definition of equity capital (common equity Tier 1 (CET1)). This is a deliberately conservative measure, as it involves large deductions from the book value of shareholders' equity to reflect items that cannot absorb losses in practice, such as goodwill or deferred tax credits.

For the banks considered here, these deductions amount to 30% of total shareholders' equity. In aggregate, the stress test starting point for regulatory capital is £230 billion — well below the current market valuation of major banks of £280 billion. Any further downward adjustment to starting point capital risks double-counting some of the deductions already made.

Second, at present, the low price to book ratio of some UK banks appears to be explained by market expectations of low profitability or 'return on equity' (RoE), rather than

(1) Throughout this box, 'major UK banks' refers to the five banks in the stress test that are listed: Barclays, HSBC, Lloyds, RBS and Standard Chartered. The weighted averages are based on the relative size of shareholders' equity.
(2) See for example John Vickers' written evidence for the Treasury Committee's Capital Inquiry; http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/treasury-committee/capital-and-resolution/written/48205.html.
(3) See November 2012 *Financial Stability Report*; www.bankofengland.co.uk/-/media/boe/files/financial-stability-report/2012/november-2012.pdf.

concerns over current asset quality (see Bank Resilience chapter of the November 2017 *Financial Stability Report*).(1)

In general, there is a strong positive correlation between UK and international banks' price to book ratios and expected RoE (see Box 2 in Section 2). But the correlation between UK and European banks' price to book ratios with their Texas ratios (an asset quality indicator) has remained much weaker

The average consensus forecast of underlying RoE (ie excluding one-off items) between 2017 and 2019 for the major UK banks equals 7.2%. This is equivalent to 5.4% after adjusting for market expectations of misconduct costs, which is the appropriate measure to assess market valuations.(2) The corresponding price to book ratio will reflect the difference between this RoE and the rate of return that equity investors require, or the 'cost of equity'.

Bank staff estimate a cost of equity of 11.5%. On this basis, UK banks would trade at around 0.8 times their book value, close to the prevailing levels. The variation in banks' valuations can also be explained, in broad terms, using this method.

Estimates of cost of equity are inevitably uncertain as it is not directly observable and must be inferred. The current Bank staff central estimate of 11.5% is built up from the following components:

- A risk-free interest rate of 1.3%.
- An economy-wide equity risk premium. This is estimated to be in the range 7%–9%, based on a dividend discount model incorporating equity analysts' dividend forecasts.(3)
- A 'beta' for the banking sector, constructed from the relative volatility of bank equity prices relative to those of the economy as a whole. On average across banks this is 1.1 to 1.4, depending on which estimation window is used.

The market outlook for future profitability is reflected in stress-test results

Despite reflecting future profitability rather than current asset quality, the information in market equity valuations is still relevant for the stress test.

A bank's resilience to stress relies not just on its starting capital position, but also on its ability to offset losses (from credit impairments, for example) with operating profit. Other things equal, a bank with lower operating profits will experience a bigger fall in its capital ratio in the stress test because it will not be able to offset its losses.

Banks' *baseline* projections for operating profit (that is, the projections to which the stress is then applied) are consistent with current market expectations.

- In the baseline projections, the banking system makes profits of £21 billon per year on average between 2017 and 2019,(4) equivalent to 7.0% underlying RoE. This does not include misconduct costs.
- The baseline is almost identical to the equivalent average consensus estimate of 7.2% over the same period.
- The results for individual banks' baseline projections are also consistent with consensus forecasts.

By factoring this weak outlook for operating profits into baseline projections, banks have less capacity to offset the losses in the stress and therefore, at the margin, experience more pronounced falls in capital ratios as a result of the stress.

(1) www.bankofengland.co.uk/-/media/boe/files/financial-stability-report/2017/november-2017.pdf.
(2) The consensus forecasts of RoE available on Bloomberg are specifically of underlying RoE and so do not include erratic one off items like misconduct costs. For the calculations reported here, Bank staff have made an adjustment using equity analyst forecasts specifically of bank misconduct costs; they have not made any adjustments for other one-off items.
(3) The model is set out in 'An improved model of equity prices'; www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2017/an-improved-model-for-understanding-equity-prices.pdf.
(4) Net income attributable to shareholders less AT1 interest payments (after tax).

Annex 4: 2017 annual cyclical scenario: bank-specific results

Barclays plc

Table A4.A Projected consolidated solvency ratios in the stress scenario

	Actual (end-2016)	Minimum stressed ratio (*before* the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: Non-dividend 'strategic' management actions only[i]	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: All 'strategic' management actions including CRD IV related restrictions	Minimum stressed ratio (*after* the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2017 Q3)	Submit revised capital plan?
Common equity Tier 1 ratio[a][b]	12.4%	6.2%	6.2%	7.4%	7.4%	6.8%	7.9%	13.1%	Not required
Tier 1 capital ratio[c]	15.6%	8.4%[f]	8.5%[f]	9.7%[f]	9.7%			16.9%	
Total capital ratio[d]	19.6%	12.0%[f]	12.1%[f]	13.2%[f]	13.2%			21.2%	
Memo: risk-weighted assets (£ billion)	366	455[f]	453[f]	454[f]	454			324	
Memo: CET1 (£ billion)	45	28[f]	28[f]	34[f]	34			42	
Tier 1 leverage ratio[a][e]	5.0%	3.0%	3.1%	3.6%	3.6%	3.25%	3.6%	5.1%	
Memo: leverage exposure (£ billion)	1,050[g]	1,148[h]	1,115[h]	1,116[h]	1,116[h]			1,002	

(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 'strategic' management actions.
(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) 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 Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(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 plc

Barclays is a retail, corporate and investment bank with trading operations, focused in the United Kingdom and United States. The results show that Barclays' capital position remains above its CET1 ratio hurdle rate of 6.8% and its Tier 1 leverage ratio hurdle rate of 3.25% in the hypothetical stress scenario with a low point of 7.4% CET1 ratio and 3.6% Tier 1 leverage ratio in 2018 after 'strategic' management actions. The results show that Barclays' capital position fell below its CET1 ratio systemic reference point and marginally below its Tier 1 leverage ratio systemic reference point in 2018. At this point, its systemic reference point was 7.9% CET1 ratio and 3.6% Tier 1 leverage ratio. **The PRC judged that Barclays did not meet its CET1 or Tier 1 leverage ratio systemic reference points.**

Impairments increased significantly relative to last year's exercise, driven largely by Barclays' credit card portfolios. An increase in market risk and counterparty credit risk losses also contributed to the deterioration, though these recover in outer years. This is offset by an increase in net interest income over the stress and favourable sterling depreciation. Credit risk RWAs increased during the stress, driven largely by foreign exchange effects. The assessment includes stressed projections of misconduct costs. As Barclays becomes loss making and is within its CRD IV buffers in 2017 and 2018 (the CET1 low point) it pays no dividends 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 PRC judged Barclays could realistically take in the stress scenario.

Since December 2016, Barclays has issued £2.5 billion of AT1. This issuance is not included in the results above. The Interim Management Statement published on 26 October 2017 showed CET1 and leverage ratios of 13.1% and 5.1%, respectively. Since December 2016, Barclays sold down its majority shareholding in Barclays Africa Group Limited (BAGL) and subsequently was given permission to proportionally consolidate its risk exposure for prudential purposes. The Bank judged that this sale would occur in the stress conditions albeit at a stress price which Barclays had incorporated in its results. **In light of the steps that Barclays has already taken to strengthen its capital position, the PRC did not require Barclays to submit a revised capital plan.**

Table A4.B Projected consolidated solvency ratios in the stress scenario

	Actual (end-2016)	Minimum stressed ratio (*before* the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: Non-dividend 'strategic' management actions only[i]	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: All 'strategic' management actions including CRD IV related restrictions	Minimum stressed ratio (*after* the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2017 Q3)	Submit revised capital plan?
Common equity Tier 1 ratio[a][b]	13.6%	6.0%	6.3%	8.9%	8.9%	6.5%	8.0%	14.6%	Not required
Tier 1 capital ratio[c]	16.1%	7.8%[f]	8.1%[f]	10.7%[f]	10.7%[f]			17.4%	
Total capital ratio[d]	20.1%	11.0%[f]	11.3%[f]	13.9%[f]	13.9%[f]			21.0%	
Memo: risk-weighted assets (US$ billion)	857	1021[f]	993[f]	998[f]	998[f]			889	
Memo: CET1 (US$ billion)	117	62[f]	62[f]	89[f]	89[f]			130	
Tier 1 leverage ratio[a][e]	5.7%	3.8%	3.9%	4.5%	4.5%	3.25%	3.7%	6.1%	
Memo: leverage exposure (US$ billion)	2,220[g]	2,185[h]	2,153[h]	2,155[h]	2,155[h]			2,378	

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

(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 'strategic' management actions.
(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) 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 Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(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 Holdings plc

HSBC is a global, universal bank. The results show that HSBC's capital position remains above its CET1 ratio hurdle rate of 6.5% and Tier 1 leverage ratio hurdle rate of 3.25% in the hypothetical stress scenario with a low point of 8.9% CET1 ratio and 4.5% leverage ratio in 2018 after 'strategic' management actions. The results show that HSBC's capital position remains above its CET1 and leverage ratio systemic reference points throughout the test. **The PRC judged that this stress test did not reveal capital inadequacies for HSBC given its balance sheet at end-2016.**

The scenario for the 2017 stress test included 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. Loan impairments and trading book losses were higher than in the 2016 exercise due to increased scenario severity. This was partially offset by higher net interest income due to rising UK and Hong Kong interest rates in the scenario. The assessment includes stressed projections of misconduct costs. As HSBC becomes loss making and is within its CRD IV buffers in 2017 and 2018 (the CET1 low point) it pays no ordinary 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 PRC judged HSBC could realistically take in the stress scenario, including cost and asset reductions.

Since December 2016, HSBC has issued US$5.2 billion of AT1. This issuance is not included in the results above. The Interim Management Statement published on 30 October 2017 showed CET1 and Tier 1 leverage ratios of 14.6% and 6.1% respectively. HSBC completed the sale of a US mortgage portfolio in March 2017. The Bank judged that this sale would occur in the stress conditions albeit at a stress price which HSBC had incorporated in its results. **The PRC did not require HSBC to submit a revised capital plan.**

Lloyds Banking Group plc

Table A4.C Projected consolidated solvency ratios in the stress scenario

	Actual (end-2016)	Minimum stressed ratio (*before* the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: Non-dividend 'strategic' management actions only[i]	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: All 'strategic' management actions including CRD IV related restrictions	Minimum stressed ratio (*after* the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2017 Q3)	Submit revised capital plan?
Common equity Tier 1 ratio[a][b]	13.6%	7.5%	7.8%	7.9%	7.9%	7.5%		14.1%	Not required
Tier 1 capital ratio[c]	17.0%	9.9%[f]	10.2%[f]	10.3%[f]	10.3%[f]			17.2%	
Total capital ratio[d]	21.4%	14.7%[f]	15.0%[f]	15.1%[f]	15.1%[f]		n/a	21.2%	
Memo: risk-weighted assets (£ billion)	216	260[f]	260[f]	260[f]	260[f]			217	
Memo: CET1 (£ billion)	29	20[f]	20[f]	21[f]	21[f]			31	
Tier 1 leverage ratio[a][e]	5.2%	3.8%	3.9%	3.9%	3.9%	3.25%		5.4%	
Memo: leverage exposure (£ billion)	666[g]	660[h]	661[h]	661[h]	661[h]			664	

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

(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 'strategic' management actions.
(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) 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 Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(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 plc

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 ratio hurdle rate of 7.5% and Tier 1 leverage ratio hurdle rate of 3.25% in the hypothetical stress scenario with a low point of 7.9% CET1 ratio and 3.9% leverage ratio in 2018 after 'strategic' management actions. **The PRC judged that this stress test did not reveal capital inadequacies for Lloyds Banking Group given its balance sheet at end-2016.**

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 interest rates, unemployment and house price falls. The impact of impairments was seen across all major portfolios, but particularly impacted buy-to-let and retail mortgages, and corporate and SME lending. RWAs on wholesale lending also contributed to increased capital consumption. The assessment includes stressed projections of misconduct costs. In the stress scenario, LBG does not pay a dividend for 2017 or 2018 (when it reaches its CET1 low point) as a result of the operation of the firm's published dividend policy and it is subject to CRD IV restrictions on other distributions for 2018. The assessment also incorporates the impact of 'strategic' management actions that the PRC judged LBG could realistically take in the stress scenario, including cost reductions.

The Interim Management Statement published on 25 October 2017 showed CET1 and leverage ratios of 14.1% and 5.4% respectively. The end-2016 CET1 ratio of 13.6% includes 80 basis points of capital retained to pre-fund the MBNA acquisition. This was released on completion of the transaction in June 2017. 80 basis points of the start-to-low point delta therefore relates to the impact of the acquisition, and not to the impact of the stress scenario. Similarly, 30 basis points of the start-to-low point leverage ratio delta relates to the impact of the acquisition, and not to the impact of the stress scenario. The results above include an assessment of MBNA. **The PRC did not require Lloyds Banking Group to submit a revised capital plan.**

Nationwide Building Society

Table A4.D Projected consolidated solvency ratios in the stress scenario

	Actual (end-2016)	Minimum stressed ratio (*before* the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1		Minimum stressed ratio (*after* the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2017 Q3)	Submit revised capital plan?
			Non-dividend 'strategic' management actions only[i]	All 'strategic' management actions including CRD IV related restrictions					
Common equity Tier 1 ratio[a][b]	24.4%	11.6%	12.3%	12.3%	12.3%	8.4%		29.6%	Not required
Tier 1 capital ratio[c]	28.1%	13.2%[f]	13.9%[f]	13.9%[f]	13.9%[f]			32.5%	
Total capital ratio[d]	35.9%	17.7%[f]	18.4%[f]	18.4%[f]	18.4%[f]		n/a	42.7%	
Memo: risk-weighted assets (£ billion)	34	73[f]	73[f]	73[f]	73[f]			33	
Memo: CET1 (£ billion)	8	8[f]	9[f]	9[f]	9[f]			10	
Tier 1 leverage ratio[a][e]	4.3%	4.3%	4.5%	4.5%	4.5%	3.25%		4.9%	
Memo: leverage exposure (£ billion)	217[g]	221[h]	221[h]	221[h]	221[h]			221	

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

(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 'strategic' management actions.
(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) 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 Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(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 Building Society

Nationwide is a UK building society. The results show that Nationwide's capital position remains above its CET1 ratio hurdle rate of 8.4% and Tier 1 leverage ratio hurdle rate of 3.25% in the hypothetical stress scenario with a low point of 12.3% CET1 ratio and 4.5% leverage ratio in 2018 after 'strategic' management actions. **The PRC judged that this stress test did not reveal capital inadequacies for Nationwide given its balance sheet at end-2016.**

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 interest rates, unemployment and house price falls. 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 Nationwide's use of a 'point in time' based modelling approach for these portfolios. The assessment includes stressed projections of misconduct costs. Despite these factors, Nationwide remains profitable in each year of the stress as it benefits from higher net interest income from rising interest rates. Nationwide continues to make annual distributions on its Core Capital Deferred Shares (CCDS) for 2017 and 2018 (when it reaches its CET1 low point) in the stress scenario. This assessment incorporates the impact of 'strategic' management actions that the PRC judged Nationwide could realistically take in the stress scenario, including cost reductions.

In September 2017, Nationwide issued 5 million CCDS of total value of £807 million CET1 capital. This issuance is not included in the results above. The half-year results published on 17 November 2017 showed CET1 and UK leverage ratio of 29.6% and 4.9% respectively. **The PRC did not require Nationwide to submit a revised capital plan.**

The Royal Bank of Scotland Group plc

Table A4.E Projected consolidated solvency ratios in the stress scenario

	Actual (end-2016)	Minimum stressed ratio (*before* the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: Non-dividend 'strategic' management actions only[i]	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: All 'strategic' management actions including CRD IV related restrictions	Minimum stressed ratio (*after* the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2017 Q3)	Submit revised capital plan?
Common equity Tier 1 ratio[a][b]	13.4%	6.4%	6.4%	7.0%	7.0%	6.7%	7.4%	15.5%	Not required
Tier 1 capital ratio[c]	17.7%	9.0%[f]	9.1%[f]	9.7%[f]	9.7%[f]			19.1%	
Total capital ratio[d]	22.9%	13.2%[f]	13.2%[f]	13.8%[f]	13.8%[f]			23.1%	
Memo: risk-weighted assets (£ billion)	228	298[f]	298[f]	298[f]	298[f]			211	
Memo: CET1 (£ billion)	31	19[f]	19[f]	21[f]	21[f]			33	
Tier 1 leverage ratio[a][e]	5.6%	3.7%	3.7%	4.0%	4.0%	3.25%	3.5%	6.0%	
Memo: leverage exposure (£ billion)	615[g]	621[h]	621[h]	622[h]	622[h]			609	

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

(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 'strategic' management actions.
(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) 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 Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(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 plc

The Royal Bank of Scotland Group (RBS) has retail, commercial and trading businesses predominately in the United Kingdom. The results show that RBS's capital position remains above its CET1 ratio hurdle rate of 6.7% and its Tier 1 leverage ratio hurdle rate of 3.25% in the hypothetical stress scenario, with a low point of 7.0% CET1 ratio and 4.0% leverage ratio in 2018 after 'strategic' management actions. The results show that RBS's capital position fell below its CET1 ratio systemic reference point in 2018. At this point its CET1 ratio systemic reference point was 7.4%. **The PRC judged that RBS did not meet its CET1 ratio systemic reference point in this scenario.**

RBS'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 interest rates, unemployment and house price falls. In the scenario, higher income from rising interest rates was offset by an increase in impairments relating to RBS's corporate and retail lending books. Increased RWAs contributed to higher capital consumption in the scenario, particularly in RBS's secured retail and wholesale portfolios. This assessment also includes stressed projections of misconduct costs. RBS pays no dividends and is subject to CRD IV restrictions on other distributions for 2017 and 2018. The assessment incorporates the impact of 'strategic' management actions that the PRC judged RBS could realistically take in this stress scenario, including cost reductions.

The Interim Management Statement published on 27 October 2017 showed CET1 and leverage ratios of 15.5% and 6.0% respectively. **In light of the steps that RBS has already taken to strengthen its capital position, the PRC did not require RBS to submit a revised capital plan.**

Table A4.F Projected consolidated solvency ratios in the stress scenario

	Actual (end-2016)	Minimum stressed ratio (*before* the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: Non-dividend 'strategic' management actions only[i]	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: All 'strategic' management actions including CRD IV related restrictions	Minimum stressed ratio (*after* the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate[j]	Systemic reference point	Actual (2017 Q3)	Submit revised capital plan?
Common equity Tier 1 ratio[a][b]	11.6%	9.6%	9.7%	9.7%	9.7%	7.6%		12.1%	Not required
Tier 1 capital ratio[c]	14.0%	11.9%[f]	12.0%[f]	12.0%[f]	12.0%[f]			14.9%	
Total capital ratio[d]	17.3%	15.9%[f]	16.0%[f]	16.0%[f]	16.0%[f]		n/a	17.7%	
Memo: risk-weighted assets (£ billion)	88	91[f]	91[f]	91[f]	91[f]			88	
Memo: CET1 (£ billion)	10	9[f]	9[f]	9[f]	9[f]			11	
Tier 1 leverage ratio[a][e]	4.1%	3.3%	3.3%	3.3%	3.3%	3.25%		4.4%	
Memo: leverage exposure (£ billion)	290[g]	276[h]	276[h]	276[h]	276[h]			287	

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

(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 'strategic' management actions.
(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) 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 Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(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.
(j) The hurdle rate includes the PRA's latest assessment of Pillar 2A, which remains subject to joint decision process for firm-specific prudential requirements according to Directive 2013/36/EU.

Santander UK Group Holdings plc

Santander UK Group Holdings Plc (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 ratio hurdle rate of 7.6% and Tier 1 leverage ratio hurdle rate of 3.25% in the hypothetical stress scenario with a low point of 9.7% CET1 ratio in 2017 and 3.3% leverage ratio in 2018 after 'strategic' management actions. The results also show that Santander UK's capital position remains above its CET1 ratio hurdle rate throughout the test. **The PRC judged that this stress test did not reveal capital inadequacies for Santander UK given its balance sheet at end-2016.**

Santander UK's UK-centric business model meant it faced increases in impairments as a result of the UK macroeconomic stress, driven by higher interest rates, unemployment and house price falls. Net interest income increases in the stress driven by higher interest rates. This assessment includes stressed projections of misconduct costs. Santander UK does not pay ordinary dividends in 2017 and 2018 as it is loss making, which is in line with its published dividend policy. The assessment incorporates the impact of 'strategic' management actions that the PRC judged Santander UK could realistically take in the stress scenario, including cost reductions.

Since December 2016, Santander UK has issued £500 million of AT1. This issuance is not included in the results above. The Interim Management Statement published on 26 October 2017 showed CET1 and leverage ratios of 12.1% and 4.4% respectively. **The PRC did not require Santander UK to submit a revised capital plan.**

Table A4.G Projected consolidated solvency ratios in the stress scenario

	Actual (end-2016)	Minimum stressed ratio (*before* the impact of 'strategic' management actions or AT1 conversion)	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: Non-dividend 'strategic' management actions only[i]	Minimum stressed ratio after 'strategic' management actions and before the conversion of AT1: All 'strategic' management actions including CRD IV related restrictions	Minimum stressed ratio (*after* the impact of 'strategic' management actions and conversion of AT1)	Hurdle rate	Systemic reference point	Actual (2017 Q3)	Submit revised capital plan?
Common equity Tier 1 ratio[a][b]	13.6%	6.4%	6.9%	7.6%	7.6%	6.2%	7.0%	13.6%	Not required
Tier 1 capital ratio[c]	15.7%	8.2%[f]	8.8%[f]	9.5%[f]	9.5%[f]			16.0%	
Total capital ratio[d]	21.3%	11.4%[f]	12.2%[f]	12.8%[f]	12.8%[f]			21.0%	
Memo: risk-weighted assets (US$ billion)	269	364[f]	346[f]	346[f]	346[f]			280	
Memo: CET1 (US$ billion)	37	23[f]	24[f]	26[f]	26[f]			38	
Tier 1 leverage ratio[a][e]	6.0%	4.6%	4.6%	4.7%	4.7%	3.25%	3.4%	5.9%	
Memo: leverage exposure (US$ billion)	674[g]	629[h]	633[h]	634[h]	634[h]			725	

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

(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 'strategic' management actions.
(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) 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 Tier 1 leverage ratio is Tier 1 capital expressed as a percentage of the leverage exposure measure excluding central bank reserves, in line with the *PRA's Policy Statement PS21/17*.
(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 plc

Standard Chartered is a retail and commercial bank with a trading business, mainly operating in Asia, Africa and the Middle East. The results show that Standard Chartered's capital position remains above its CET1 ratio hurdle rate of 6.2% and Tier 1 leverage ratio hurdle rate of 3.25% in the hypothetical stress scenario with a low point of 7.6% CET1 ratio in 2018 and 4.7% leverage ratio in 2017 after 'strategic' management actions. The results also show that Standard Chartered's capital position remains above its CET1 and leverage ratio systemic reference points throughout the test. **The PRC judged that this stress test did not reveal capital inadequacies for Standard Chartered given its balance sheet at end-2016.**

The scenario for the 2017 stress test included a synchronised global downturn and traded risk shock in many of the economies where Standard Chartered operates, with a particularly severe impact on China, as well as a generalised downturn in emerging market economies. Compared to the 2016 ACS, wholesale loan impairments were a less material driver of stress, reflecting improvements in credit quality. Traded risk losses and higher risk weights were also key drivers of the deterioration in Standard Chartered's CET1 ratio in this year's scenario. Net interest income offsets some of these impacts due to interest rate increases in Hong Kong. The assessment includes stressed projections of misconduct costs. As Standard Chartered is loss making and is within its CRD IV buffers in 2017 and 2018 (the CET1 low point) it pays no ordinary dividend and is subject to CRD IV restrictions on other distributions for those years. The assessment incorporates the impact of 'strategic' management actions that the PRC judged Standard Chartered could realistically take in the stress scenario, including cost and asset reductions.

Since December 2016, Standard Chartered has issued an additional US$1 billion of AT1. The Interim Management Statement published on 1 November 2017 showed CET1 and Tier 1 leverage ratios of 13.6% and 5.9% respectively. **The PRC did not require Standard Chartered to submit a revised capital plan.**

Annex 5: 2017 annual cyclical scenario: bank-specific projected impairment charges and traded risk losses

Table A5.A 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	0.9	36.8	5.4	8.1
HSBC	0.6	18.0	7.2	8.7
Lloyds Banking Group	3.4	28.8	7.5	10.1
Nationwide	1.0	29.1	8.1	-
The Royal Bank of Scotland Group	1.0	21.8	6.4	9.0
Santander UK	1.7	19.9	7.3	10.4
Standard Chartered	-	-	-	7.6

Sources: Participating banks' STDF 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 2016, 2017, 2018, 2019, 2020 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 A5.B 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	1.2	10.1	0.3	4.0
HSBC	0.6	2.4	0.7	6.2
Lloyds Banking Group	9.3	9.7	1.2	4.7
Nationwide	1.7	1.3	0.2	-
The Royal Bank of Scotland Group	1.5	2.8	0.8	5.4
Santander UK	2.6	2.3	0.6	1.4
Standard Chartered	-	-	-	0.2

Sources: Participating banks' STDF 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 A5.C 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	7.1	-	29.5	6.8	5.0	7.8	-	8.7	2.7	5.7
HSBC	2.8	5.3	4.9	0.6	9.0	8.5	6.9	7.8	4.9	5.5
Lloyds Banking Group	6.1	-	-	4.2	-	9.4	-	5.3	-	-
Nationwide	1.6	-	-	-	-	8.0	-	-	-	-
The Royal Bank of Scotland	2.7	-	-	4.8	2.6	8.6	-	10.9	5.8	7.0
Santander UK	3.0	-	-	-	-	9.2	-	-	-	-
Standard Chartered	-	5.8	-	-	7.4	7.3	9.0	5.6	4.3	5.8

Sources: Participating banks' STDF 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 2016, 2017, 2018, 2019, 2020 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 A5.D 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	11.3	-	9.7	1.0	0.7	4.3	-	1.9	0.1	0.9
HSBC	3.0	5.1	1.1	0.1	7.4	6.8	11.4	4.6	2.4	9.4
Lloyds Banking Group	19.1	-	-	0.6	-	5.9	-	0.2	-	0.0
Nationwide	3.0	-	-	-	-	0.2	-	-	-	-
The Royal Bank of Scotland	4.4	-	-	0.9	0.1	6.2	-	0.2	0.8	0.8
Santander UK	5.0	-	-	-	-	2.1	-	-	-	-
Standard Chartered	-	2.3	-	-	4.2	0.2	2.1	0.2	0.3	5.1

Sources: Participating banks' STDF 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 A5.E Projected traded risk losses in 2017 of the stress scenario[a][b][c]

	£ billions
Barclays	5.2
HSBC	14.3
Lloyds Banking Group	0.3
The Royal Bank of Scotland Group	1.1
Santander UK	1.3
Standard Chartered	6.2

Sources: Participating banks' STDF 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 and fair valuation adjustments; 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 SCB are converted to sterling using exchange rates consistent with the annual cyclical scenario for comparability with other banks.

Table A5.F Projected traded risk losses in 2017 of the stress scenario as percentage of traded risk RWAs as at end-2016[a][b][c][d]

	Per cent
Barclays	6.6
HSBC	9.3
Lloyds Banking Group	1.5
The Royal Bank of Scotland Group	2.6
Santander UK	13.3
Standard Chartered	9.9

Sources: Participating banks' STDF 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 and fair 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) Loss rates for HSBC and SCB are calculated in the banks' reporting currency, US dollars, for consistency with published accounts.
(d) Traded risk RWAs also incldue RWAs for available-for-sale and fair value option positions.

Glossary

ACS – annual cyclical scenario.
AFS – available-for-sale.
AISP – account information service provider.
API – application programme interface.
AT1 – additional Tier 1.
BAGL – Barclays Africa Group Limited.
BES – biennial exploratory scenario.
BHPS – British Household Panel Survey.
CCDS – Core Capital Deferred Shares.
CCoB – capital conservation buffer.
CCyB – countercyclical capital buffer.
CET1 – common equity Tier 1.
CMA – Competition and Markets Authority.
CRD IV – Capital Requirements Directive IV.
CRE – commercial real estate.
CRR – Capital Requirements Regulation.
CVA – credit valuation adjustment.
EU – European Union.
FCA – Financial Conduct Authority.
FinTech – financial technology.
FPC – Financial Policy Committee.
FSB – Financial Stability Board.
FTSE – Financial Times Stock Exchange.
FVO – fair value option.
GDP – gross domestic product.
G-SIIs – global systemically important institutions.
IBES – Institutional Brokers' Estimate System.
ICAAP – Internal Capital Adequacy Assessment Process.
IMF – International Monetary Fund.
IRB – internal ratings based.
IT – information technology.
LBG – Lloyds Banking Group.
LCR – liquidity coverage ratio.
LGD – loss given default.
LTV – loan to value.
MDA – Maximum Distributable Amount.
MFI – Monetary Financial Institutions.
NIM – net interest margin.
ONS – Office of National Statistics.
PISP – payment initiation service providers.
PNFCs – private non-financial corporations.
PPI – payment protection insurance.
PRA – Prudential Regulation Authority.
PRC – Prudential Regulation Committee.
PSD2 – The European Union's second payment services directive (PSD2).
PVA – prudential valuation adjustment.
RBS – The Royal Bank of Scotland Group.
RoE – return on equity.
RTGS – real-time gross settlement.
RWAs – risk-weighted assets.
SMEs – small and medium-sized enterprises.
STDF – Stress Testing Data Framework.
XVA – X-valuation adjustment.
WEO – IMF *World Economic Outlook*.