BANK OF ENGLAND

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Stress testing the UK banking system: key elements of the 2018 stress test

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Executive summary

The 2018 annual cyclical scenario (ACS) tests the resilience of the UK banking system to deep simultaneous recessions in the UK and global economies, large falls in asset prices and a separate stress of misconduct costs.

The 2018 scenario

The stresses applied to the economic and financial market prices and measures of activity in the 2018 ACS will be the same as in the 2017 test. This means the scenario remains more severe than the global financial crisis and, in the judgement of the Financial Policy Committee (FPC), encompasses a wide range of UK macroeconomic outcomes that could be associated with Brexit.

Running the same stress scenario will allow the Bank to isolate, as far as possible, the impact on the stress-test results of the new accounting standard which came into effect on 1 January 2018 (International Financial Reporting Standard 9, or IFRS 9). The calibration of the stress scenario remains appropriate given the current risk environment. In 2019 the stress-test scenario will be updated in line with the Bank's usual approach.

The consistency of the scenario also recognises the deployment of resources both within the Bank and at private institutions in 2018 to prepare for Brexit and the introduction of ring-fencing requirements on 1 January 2019. The FPC and Prudential Regulation Committee (PRC) are minded to include the ring-fenced bank sub-groups of the existing stress-test participants separately in the annual stress test from 2020.

Hurdle rates

The hurdle rates for the 2018 test will evolve from those used in earlier years in four important ways:

1) The Bank will hold banks of greater systemic importance to higher standards.

Each participating bank will be assessed against a single risk-weighted common equity Tier 1 (CET1) ratio hurdle rate and a single Tier 1 leverage ratio hurdle rate that incorporate their minimum capital requirement and any buffers to reflect their systemic importance.

In a change from previous years, systemically important banks falling below their hurdle rate in the stress test will be required to take action to improve their capital position that is as intensive as that expected of non-systemic banks that fall below their minimum capital requirements in stress tests. In previous tests, systemic banks that did not meet the higher standards expected of them, but that remained above their minimum capital requirements in the stress test, were permitted to take less intensive actions.

In a real stress, capital buffers to reflect systemic importance are, like all other capital buffers, useable to absorb losses. Their inclusion in the stress-test hurdle rate ensures that systemic banks could withstand a real stress that is even more severe than that against which they are assessed in the test. That reflects the additional costs their failure would impose on the wider economy.

2) Hurdle rates will incorporate buffers to capture domestic systemic importance as well as global systemic importance.

On a risk-weighted CET1 basis, the hurdle rate will include each bank's minimum capital requirement (Pillar 1 plus Pillar 2A) and the capital buffers that will apply to reflect its systemic importance. In previous years, only buffers that reflect global systemic

importance have been included. This year, for the first time, the uplift to group capital arising from the application of buffers reflecting domestic systemic importance (the 'systemic risk buffer') will also be included in hurdle rates.

Similarly, on a Tier 1 leverage basis, the hurdle rate will incorporate the 3.25% minimum leverage ratio and additional leverage ratio buffers that reflect banks' systemic importance. The FPC has previously indicated its intention to apply a supplementary leverage ratio buffer for firms subject to a systemic risk buffer (to reflect their domestic systemic importance). The Bank expects leverage hurdle rates will reflect this intention, in parallel with the risk-weighted hurdle rate.

3) The calculation of minimum capital requirements incorporated in the hurdle rates will more accurately reflect how they would evolve in a real stress.

In previous tests, the 'Pillar 2A' element of minimum capital requirements has been expressed as a constant share of risk-weighted assets.

However, many of the risks reflected in Pillar 2A, such as pension risks, are not related to the size of a bank's risk-weighted assets. Pillar 2A capital requirements for risks which remain constant under stress should therefore be expected to fall as a proportion of risk-weighted assets as risk-weighted assets increase in a stress. Because risk weights typically increase under the stress scenario, this fall should be reflected in the hurdle rate for the stress test.

The PRC intends to refine the approach to specifying Pillar 2A requirements in the stress test in order to reflect more closely the probable impact of the stress on the risks captured in Pillar 2A.

4) Adjustments will be made to reflect the increased loss absorbency that will result from higher provisions in stress under the new IFRS 9 accounting standard.

The introduction of IFRS 9 in January 2018 will have implications for participating banks' stress-test results. It means that provisions against loan losses will typically be made earlier in an economic downturn. As a result, banks' capital ratios are likely to fall more sharply than they did in previous tests.

The change in accounting standard does not, other things equal, change the total amount of losses a bank would incur through a given stress.

Recognising the increased loss absorbency that will result from higher provisions in stress under IFRS 9, the FPC and PRC intend to use the information provided by the 2018 stress test to make adjustments to the hurdle rates against which banks' performance in this year's test is assessed. Applying the same stress scenario as in the 2017 ACS will allow the Bank to estimate the impact of this accounting change.

Any adjustments to hurdle rates will be subject to the constraints that: the effect of adjustments on system-wide capital requirements will be no bigger than the impact in aggregate of changing the accounting standard; and no bank should have a hurdle rate after any adjustment that is below its minimum risk-weighted (Pillar 1 plus Pillar 2A) capital and leverage ratio requirements.

An important consideration in determining the scale of adjustments will be the degree to which provisions made early in a stress, in anticipation of future losses, provide additional loss-absorbing capacity for banks. This will be the focus of analysis in the 2018 stress test.

Transitional capital arrangements are in place, which allow banks to 'add back in' a portion of the increase in expected credit loss provisions resulting from the introduction of IFRS 9 to their CET1 capital. These arrangements will be phased out by 2023.

The Bank intends to publish the 2018 stress-test results both with and without these transitional arrangements. The results without transitional arrangements will be used to help calculate the size of any adjustments to hurdle rates in response to the new accounting standard. The publication of results without transitional arrangements means this judgement — and the information behind it — will be transparent.

The Bank will assess participating banks' results on a transitional basis. It will phase in any adjustment to hurdle rates between the 2018 and 2023 stress tests as transitional arrangements are gradually removed.

Background

The Bank of England's (hereafter 'the Bank') annual stress test is designed to examine the potential impact of a hypothetical adverse scenario on the health of the banking system and individual institutions within it.(1)

In 2018, the Bank will conduct one stress test, the annual cyclical scenario (ACS). The seven banks and building societies (hereafter 'banks') taking part in the 2018 test account for around 80% of the outstanding stock of Prudential Regulation Authority (PRA) regulated banks' lending to the UK real economy.(2) These banks have a diverse range of business models and some operate in a broad range of international markets.

The Financial Policy Committee (FPC) and Prudential Regulation Committee (PRC) are minded to include the ring-fenced bank subgroups of the existing stress-test participants in the annual stress test from 2020. The test will continue to cover the banking groups of existing participants, which will incorporate both ring-fenced and non ring-fenced entities.(3)

The Bank's 2018 scenario and guidance have been designed and calibrated by Bank staff, under the guidance of the FPC and PRC.

Pages 8–15 provide more detail on the 2018 baseline and stress scenarios. More background on the Bank's approach to stress testing, detailed guidance for stress-test participants, along with the projections data underlying the 2018 baseline and stress scenarios can be found on the Bank of England website.(4)

2018 annual cyclical scenario

The 2018 ACS tests the resilience of the UK banking system to a severe shock.

In common with previous exercises, the 2018 ACS contains three types of severe stress, which are assumed to be synchronised:

- A UK and global macroeconomic stress.
- A traded risk stress, linked to a financial market scenario consistent with the content and calibration of the macroeconomic stress scenario.
- An independent misconduct costs stress, which is additional to the macroeconomic and traded risk stress scenarios.

The stress applied under the scenario is not a forecast. Rather, it is a coherent 'tail-risk' scenario designed to be severe and broad enough to assess the resilience of UK banks to adverse shocks.

An important macroprudential goal of stress testing is to help assess whether the banking system is sufficiently well capitalised to maintain the supply of credit in the face of adverse shocks. To that end, banks participating in the ACS stress test are expected to meet the projected demand for credit from UK households and businesses in the stress. Over the five years of the 2018 stress scenario, lending to UK households and businesses is projected to grow by around 2%.

The stresses to economic and financial market prices and measures of activity in the 2018 ACS are the same as those incorporated in the 2017 ACS.

The introduction of International Financial Reporting Standard 9 (IFRS 9) in January 2018 will have implications for banks' stress-test results in terms of the timing of losses incurred during a stress. The Bank expects this to result in a larger capital impact for a given stress. Further details of the Bank's approach to IFRS 9 this year are set out on page 6 and in Box 1.

Running the same scenario will allow the Bank to isolate, as far as possible, the impact of IFRS 9 on the results.

This represents a one-off change to the Bank's usual approach to calibrating the ACS, under which: the sizes of the shocks applied to different sectors and economies in the test are adjusted each year to deliver a similar stressed outcome, unless the assessment of vulnerabilities warrants a change to that outcome; and when vulnerabilities are judged to have increased (decreased), the stressed outcome becomes more (less) severe.

The Bank judges maintaining the stresses applied under the 2017 ACS to be appropriate given the focus of IFRS 9 this year and the current risk environment. The consistency of the scenario also recognises the deployment of resources both within the Bank and at private institutions in 2018 to prepare for Brexit and the introduction of ring-fencing requirements on 1 January 2019. The Bank will return to updating the ACS in line with its usual approach in 2019.

Calibration of the 2018 ACS

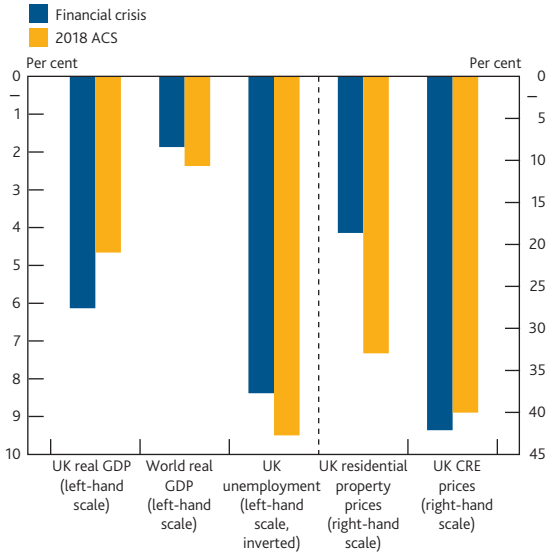
Overall, the 2018 stress scenario is more severe than the financial crisis.

The 2018 scenario incorporates deep simultaneous recessions in the UK and global economies, and large falls in asset prices (**Chart 1**). On a start-to-trough basis:

(1) Unless otherwise stated, references to the Bank of England throughout this document include the Prudential Regulation Authority.
(2) 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.
(3) For more information about UK banking sector structural reform, see www.bankofengland.co.uk/prudential-regulation/key-initiatives/structural-reform.
(4) These are available at www.bankofengland.co.uk/stress-testing.

- World GDP falls by 2.4%.
- UK GDP falls by 4.7%.
- UK residential property prices fall by 33%.
- UK commercial real estate (CRE) prices fall by 40%.
- UK unemployment peaks at 9.5%.
- Bank Rate rises to 4%.

Chart 1 Peak-to-trough falls in key variables: financial crisis and 2018 ACS[(a)]



Sources: Halifax, IMF International Financial Statistics, MSCI Investment Property Databank, Office for National Statistics (ONS) and Bank calculations.

(a) Unemployment is the peak level.

The global stress sees vulnerabilities across financial markets and the global economy crystallise.

The stress scenario incorporates a synchronised global downturn in output growth. Relative to the baseline scenario, growth in China, Hong Kong and Singapore is particularly adversely affected.

Investors' risk appetite diminishes and financial market participants attempt to de-risk their portfolios, generating modest safe-haven capital flows and substantial increases in risk premia in financial and property markets. There is volatility in financial markets and emerging market currencies depreciate against the US dollar. The prices of other assets, including property, fall sharply. Falls in Chinese and Hong Kong property prices are particularly pronounced.

Interest rates facing overseas households and businesses increase in the early part of the stress, partly reflecting increases in bank funding costs. Although policymakers pursue additional monetary stimulus, which starts to reduce market interest rates, the overall cost of credit rises in the short term.

The United Kingdom macroeconomic shock is particularly severe.

The United Kingdom is further impacted by a UK-specific risk premium shock, which is associated with a large depreciation in sterling. Monetary policy responds, as higher import prices feed through to inflation and inflation expectations rise. Long-term gilt yields also rise as a consequence. Related to these rises in interest rates, banks face material increases in their wholesale and retail funding costs.

There is a sharp fall in UK residential property prices, which is particularly concentrated in regions that have recently experienced more rapid price increases. Likewise, a fall in UK CRE prices is concentrated in the prime sector of the market.

The combined impact of increases in the cost of credit, the contraction in world demand, falls in asset prices and heightened uncertainty have a pronounced impact on domestic growth and unemployment. UK productivity growth remains weak, limiting the recovery in UK activity through the latter part of the stress horizon.

The scenario also includes a separate stress of misconduct costs.

There remains a very high degree of uncertainty around any approach to quantifying misconduct risks facing UK banks. For the 2018 scenario, the Bank is employing the same methodology as that applied in the 2016 and 2017 tests. That means the test will incorporate stressed projections for potential misconduct fines and other costs beyond those paid or provided for by the end of 2017. These should relate to known misconduct issues, such as mis-selling of payment protection insurance and misconduct in wholesale markets. Banks are asked to provide stressed projections for misconduct costs that have a low likelihood of being exceeded.

Hurdle rate

The hurdle rates for the 2018 test will evolve from those used in earlier years.

The Bank's ACS stress test helps examine whether a bank has sufficient capital resources. A key determinant of whether a bank may be required to take action in light of the results is the level its capital ratio falls to in the stress, relative to the level of capital that banks are expected to maintain in the scenario — known as the hurdle rate.

For the 2018 test, participating banks will continue to be assessed on the basis of their common equity Tier 1 (CET1) capital and Tier 1 leverage ratios. However, there are four ways in which the hurdle rate has evolved this year.

First, the Bank will hold banks of greater systemic importance to higher standards.

Each participating bank will be assessed against a single risk-weighted CET1 ratio hurdle rate and a single Tier 1 leverage ratio hurdle rate that incorporate both their minimum capital requirement and any buffers to reflect their systemic importance.

In a change from previous years, systemically important banks falling below their hurdle rate, but remaining above their minimum requirement, in the stress test will be required to take action to improve their capital position that is as intensive as that expected of non-systemic banks that fall below their minimum capital requirements in stress tests. In previous tests, systemic banks that did not meet the higher standards expected of them (previously referred to as the 'systemic reference point'), but that remained above their minimum capital requirements in the stress test, were permitted to take less intensive actions.

In a real stress, capital buffers to reflect systemic importance are, like all other capital buffers, useable to absorb losses. Their inclusion in the stress-test hurdle rate ensures that systemic banks could withstand a real stress that is even more severe than that against which they are assessed in the test. That reflects the additional costs their failure would impose on the wider economy.

Second, hurdle rates will incorporate buffers to capture domestic systemic importance as well as global systemic importance.

On a risk-weighted CET1 basis, the performance of each major bank will be judged against a single hurdle rate that incorporates each bank's minimum capital requirement (Pillar 1 plus Pillar 2A) and the capital buffers that will apply to reflect its systemic importance. In previous years, only buffers that reflect global systemic importance have been included. In the 2018 test, for the first time, buffers that reflect domestic systemic importance (the 'systemic risk buffer') will be included in the risk-weighted hurdle rate, alongside buffers to reflect global systemic importance (the G-SII buffer) (**Table A**). The uplift to group hurdle rates arising from the application of the systemic risk buffer will reflect the proportion of group activities that are ring-fenced.

Table A Illustrative example of the evolution of the hurdle rate framework[a]

Per cent

		Bank 1 — Global systemically important bank	Bank 2 — Domestic systemically important bank
2017 ACS	Hurdle rate	6.5	6.5
	Systemic reference point	7.5	n.a.
2018 ACS	Hurdle rate	7.5	7.5[b]
	Systemic reference point	n.a.	n.a.

Source: Bank of England.

(a) This illustrative example does not take account of any IFRS 9 offset.
(b) This example assumes that for this hypothetical bank, the systemic risk buffer when converted into group capital space adds 1 percentage point to its hurdle rate.

Similarly, on a Tier 1 leverage basis, the hurdle rate will incorporate the 3.25% minimum leverage ratio and additional leverage ratio buffers that reflect banks' systemic importance.

In previous years additional leverage ratio buffers have only been included for global systemically important banks. The FPC has previously indicated its intention to apply a supplementary leverage ratio buffer to firms subject to a systemic risk buffer (to reflect their domestic systemic importance). The Bank expects leverage hurdle rates will reflect this intention, in parallel with the risk-weighted hurdle rate. Separately, the Basel III leverage ratio standard has now been finalised and EU legislation, taking this into account is under negotiation. The FPC will conduct a review of the UK leverage ratio framework in 2018, taking these developments into account.

The approach to including domestic systemic risk buffers will be consistent with the approach taken by the Bank in relation to global systemic buffers previously. In practice, this involves calibrating participating banks' hurdle rates in the following way. In the first year of the stress (2018) both the risk-weighted CET1 and Tier 1 leverage ratio hurdle rates will take account of existing G-SII capital buffers for those banks required to have them. From the second year of the test (2019) onwards it will also take account of any uplift to group capital buffers resulting from the systemic risk buffer that will be applied to ring-fenced banks and building societies at the level of the ring-fence.

Third, the calculation of minimum capital requirements incorporated in the hurdle rates will more accurately reflect how they would evolve in a real stress.

In previous tests, the 'Pillar 2A' element of minimum capital requirements has been expressed as a constant share of risk-weighted assets.

However, many of the risks reflected in Pillar 2A, such as pension risks, are not related to the size of a bank's risk-weighted assets. Pillar 2A capital requirements for risks which remain constant under stress should therefore be expected to fall as a proportion of risk-weighted assets as risk-weighted assets increase in a stress. Because risk weights typically increase under the stress scenario, this fall should be reflected in the hurdle rate for the stress test.

The PRC intends to refine the approach to specifying Pillar 2A requirements in the stress test in order to reflect more closely the probable impact of the stress on the risks captured in Pillar 2A.

Fourth, adjustments will be made to reflect the increased loss absorbency that will result from higher provisions in stress under the new IFRS 9 accounting standard.

The introduction of IFRS 9 in January 2018 will have implications for participating banks' stress-test results. It means that provisions against loan losses will typically be

made earlier in an economic downturn. As a result, banks' capital ratios are likely to fall more sharply than they did in previous tests.

This change in accounting standard does not, other things equal, change the total amount of losses a bank would incur through a given stress. To the extent that the introduction of IFRS 9 means banks' capital is depleted more than in past tests, it will be because they have set aside more provisions for future losses earlier in the stress, not because the stress implies more losses overall.

Recognising the increased loss absorbency that will result from higher provisions in stress under IFRS 9, the FPC and PRC intend to use the information provided by the 2018 stress test to make adjustments to the hurdle rates against which banks' performance in this year's test is assessed. Applying the same stress scenario as in the 2017 ACS will allow the Bank to estimate the impact of this accounting change.

Any adjustments to hurdle rates will be subject to the constraints that: the effect of adjustments on system-wide capital requirements will be no bigger than the impact in aggregate of changing the accounting standard; and no bank should have a hurdle rate after any adjustment that is below its minimum risk-weighted (Pillar 1 plus Pillar 2A) capital and leverage ratio requirements.

An important consideration in determining the scale of adjustments will be the degree to which provisions made early in a stress, in anticipation of future losses, provide additional loss-absorbing capacity for banks. This will be the focus of analysis in the 2018 stress test. The information obtained from this year's test will then help inform the Bank's approach to IFRS 9 in future years.

Transitional capital arrangements are in place, which allow banks to 'add back in' a portion of the increase in credit loss provisions resulting from the introduction of IFRS 9 expected credit loss accounting to their CET1 capital. These arrangements will be phased out by 2023.

The Bank intends to publish the 2018 stress-test results both with and without these transitional arrangements. The results without transitional arrangements will be used to help calculate the size of any adjustments to hurdle rates in response to the new accounting standard. The publication of results without transitional arrangements means this judgement — and the information behind it — will be transparent.

The Bank will assess participating banks' results on a transitional basis. It will phase in any adjustment to hurdle rates between the 2018 and 2023 stress tests as transitional arrangements are gradually removed.

As in previous tests, banks participating in the stress test will be judged against their hurdle rate based on their capital positions before the conversion of contingent capital instruments such as additional Tier 1 (AT1). This reflects the CRR's requirement that capital buffers should be held in CET1 capital.

Policy responses

The FPC and PRC consider how banks perform in the stress test to determine what actions, if any, are required.

Banks that fall below their hurdle rate will generally be required to take action to strengthen their capital positions, if they have not already done so. If a bank's capital ratio was projected to remain above its hurdle rate the PRC may still require it to take action to strengthen its capital position. 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.

The stress-test results, and other relevant information, are used by the FPC and PRC to co-ordinate their policy responses to ensure that the banking system as a whole, and individual banks within it, maintain sufficient capital to absorb losses and continue to supply credit to the real economy even in a stress. They can do so by adjusting a range of regulatory capital buffers, including the system-wide UK countercyclical capital buffer (CCyB) rate, sectoral capital requirements and the bank-specific PRA buffer.

The setting of the UK CCyB rate will take account of the stress-test results and the FPC's prevailing risk assessment.

When the FPC sets the UK CCyB rate it takes into account its assessment of prevailing conditions as well as other factors including the results of the ACS. For example, even though the 2016 ACS implied a UK CCyB rate in the region of 1%, the FPC maintained the rate at 0% until June 2017 given greater uncertainty around the UK economic outlook. The FPC will continue to take this approach as it considers the results of the 2018 ACS.

The PRC will then consider any bank-specific actions that are required.

After the FPC has set the UK CCyB rate, the PRC considers the capital adequacy of each individual bank. In making these judgements, the PRC considers all available information, including the results of the ACS. In doing so it takes account of the level of the system-wide UK CCyB rate implied by the results of the test, and where applicable, how that differs from the UK CCyB rate the FPC has decided to set. It does so to avoid inadvertently reducing or increasing the level of system-wide capital buffer set by the FPC.

The PRC also considers any steps banks have taken to strengthen their capital positions since the balance sheet cut-off date of the test, as well as banks' risk management and governance capabilities.(5)

If the exercise reveals a bank's capital position needs to be strengthened further, the PRC will consider the case for requiring additional capital actions.

Publication of results

The results of the 2018 ACS will be published in 2018 Q4. This year the aggregate results will be incorporated into the Bank's *Financial Stability Report*, with bank-specific disclosures published separately on the Bank of England website. As in previous years, the Bank is committed to disclosing the information necessary to explain the results of the ACS. This will include at least as much bank-specific information about the headline impact of the stress on capital adequacy as was in the 2017 ACS results publication.

2018 baseline macroeconomic scenario

In addition to the stress scenario, the 2018 ACS will assess banks' profitability and capital ratios under a baseline macroeconomic scenario.

As in previous tests, the paths for UK macroeconomic prices and measures of activity in the baseline scenario have been developed by Bank staff and are broadly consistent with the central projections published in the February 2018 *Inflation Report*. Similarly, the international macroeconomic variables are largely consistent with the IMF's October 2017 *World Economic Outlook* projections.

Table B Summary of macroeconomic variables in the five-year baseline scenario

Per cent

	Average over five-year baseline
Annual UK GDP growth	1.7
Annual global GDP growth[a]	3.7
Annual euro-area GDP growth	1.7
Annual US GDP growth	1.9
Annual Chinese GDP growth	6.2
UK unemployment rate	4.1

Sources: Bank of England, IMF *World Economic Outlook* 2017 and Bank calculations.

(a) Purchasing power parity weighted.

In the United Kingdom, real GDP growth falls slightly from 1.9% in 2017 to 1.8% in 2018 and then to 1.7% in 2019 where it remains for the rest of the scenario.

The UK unemployment rate falls slightly over 2018 and 2019. It reaches 4.1% in the second half of 2019 and remains there until the second half of 2022 when it rises slightly again to 4.2%. Inflation falls throughout the scenario, reaching the target of 2.0% in 2022. CRE prices continue to fall throughout 2018 and 2019. UK residential property prices continue to rise throughout the baseline scenario.

World GDP averages around 3.7% between 2019 and the end of the scenario. In the United States, growth peaks at 2.8% at the start of 2018 before weakening. It slows to 1.7% by 2020 and remains at that level for the rest of the scenario. Euro-area growth peaks in 2018 before slowing to 1.6% in 2020 and 1.4% by the end of the scenario. In China, annual GDP growth averages 6.2% across the scenario.

(5) This is in line with the approach to Pillar 2B set out in the PRA Statement of Policy 'The PRA's methodologies for setting Pillar 2 capital'; www.bankofengland.co.uk/prudential-regulation/publication/2015/the-pras-methodologies-for-setting-pillar-2-capital.

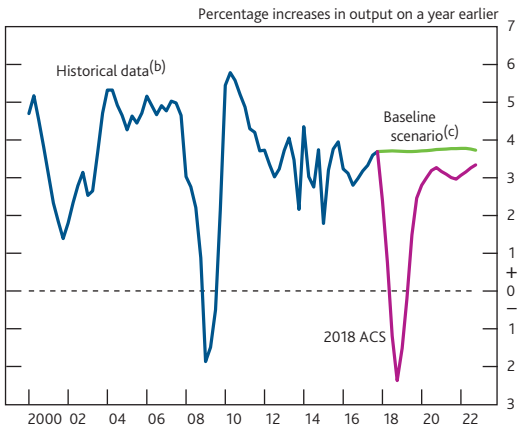
Further details of the 2018 annual cyclical scenario

This section describes some of the important aspects of the 2018 macroeconomic stress scenario in more detail. It includes a description of some aspects of the scenario not included in the set of published stressed macroeconomic variable paths. In part, this is intended to help guide stress-test participants in generating their own stressed projections for those aspects. As in previous tests, the ACS spans a five-year period. It begins in 2018 Q1 and extends through to 2022 Q4.

The global stress

Global output contracts by 2.4% over the first year of the stress scenario as economies around the world experience severe and synchronised slowdowns (**Chart 2**). The trough in global GDP growth is lower than the 1.9% fall in the financial crisis. The mix of shocks in the stress is slightly different than in the financial crisis however, with the Chinese economy, for example, experiencing a larger downturn. Growth resumes in 2019 and averages 3.1% over the final three years of the stress, but remains persistently below the baseline.

Chart 2 Annual growth in world real GDP in the 2018 ACS[a]



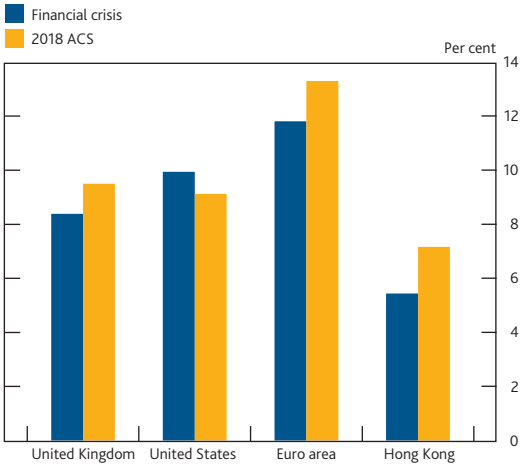
Sources: IMF International Financial Statistics, IMF *WEO* October 2017 and Bank calculations.

(a) Annual growth is defined as quarterly GDP relative to the same quarter in the previous year.
(b) Historical data until 2017 Q3 are non seasonally adjusted annual growth rates. The 2017 Q4 historical data point is estimated from interpolated annual data.
(c) The baseline projection is consistent with the IMF's projections in the IMF October 2017 *WEO*. Bank staff have interpolated the original series from annual to quarterly.

Euro-area GDP contracts by 3.6% in 2018, with moderate growth resuming in late 2019. While this is shallower than the fall seen in the financial crisis, euro-area unemployment peaks at over 13% in 2019, higher than in the crisis (**Chart 3**). It then falls to under 12% by the end of the scenario. Headline euro-area inflation turns negative in 2018 reflecting weaker demand and lower commodity prices, and does not rise above zero until 2019 H2. Meanwhile, core inflation remains weak throughout the scenario.

Residential property prices fall by 17% across the euro area, while **CRE prices** fall by 27% in the stress (**Chart 4**). French

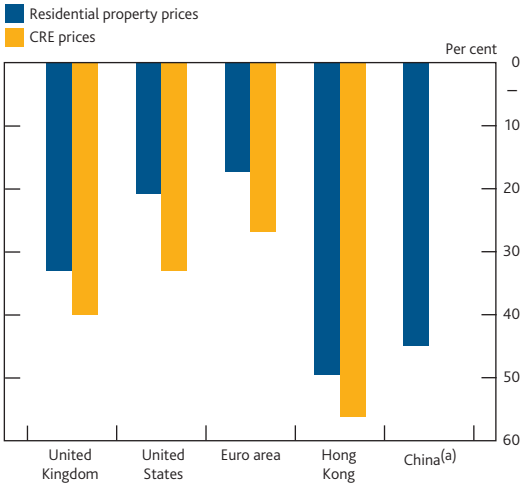
Chart 3 Peak unemployment rates in the 2018 ACS and financial crisis[a]



Sources: OECD Employment and Labour Market Statistics Database, ONS, Thomson Reuters Datastream and Bank calculations.

(a) Financial crisis bars show peak unemployment rates between 2008 and 2012.

Chart 4 Peak-to-trough fall in commercial real estate and residential property prices in the 2018 ACS



Source: Bank calculations.

(a) Due to a lack of reliable historical data, the Bank does not publish a projection for Chinese CRE prices.

CRE prices fall by more than the euro average. Aggregate euro-area property prices recover modestly over the final years of the stress.

The European Central Bank is assumed to pursue significant further monetary stimulus under the stress scenario, putting downward pressure on long-term market interest rates.

US GDP contracts by 3.5% during the first year of the stress, while unemployment peaks at just over 9% in 2019. Thereafter, modest output growth resumes and unemployment falls back.

On a peak-to-trough basis, US house prices decrease by around 21% in the stress, while CRE prices fall by 33%. Residential property prices recover somewhat over the final

years of the stress horizon, ending 13% lower than in 2017 Q4, while CRE prices finish around 23% down.

Overall **US corporate profitability** falls and the cost of corporate credit rises. Highly leveraged corporates and those involved in the oil and gas extraction industry are among those most severely affected, given the weakness of commodity prices in the stress.

Ten-year US government bond yields rise initially as term premia increase, peaking at 3.5%. But as the US Federal Reserve injects monetary stimulus by making further large-scale asset purchases, ten-year government bonds fall back to 2.4% by the end of the stress horizon, similar to their level at the start of the stress. The US policy rate is also cut from 1.5% to 0.25% by the end of 2018.

China's GDP growth falls from just under 7% a year at the end of 2017 to -1.2% by the end of 2018. Thereafter it recovers gradually, averaging around 4.8% over the final three years of the stress. The contraction in output is accompanied by a fall in residential property prices of around 45%. Prices recover around a third of that fall by the end of 2022.

The slowdown in Chinese economic activity is associated with a weakening in household income growth. Nominal Chinese household income growth slows from over 8% in 2017, to an average of 3% over the first two years of the stress. It is assumed that the Chinese authorities support China's banking sector throughout the stress, as well as providing additional stimulus to economic activity but that stimulus takes time to boost output.

Hong Kong's output, which has been more volatile than China's over recent decades, contracts by almost 8% over the first year of the stress scenario — more than during the financial crisis. Residential property prices and CRE prices are assumed to fall by 50% and 56% respectively from peak to trough. These falls are accompanied by a widening of the Hibor-US$ Libor spread, as the currency peg to the US dollar comes under pressure, although it is assumed that the currency peg holds in the stress.

Hibor peaks at around 5% at the start of the stress before falling back to around 1.9% by the end of 2020. Average Hong Kong bank funding costs follow a similar profile to three-month Hibor in the stress.

Economic activity slows similarly in **Singapore** and **India** as part of a broad-based downturn in growth across Asia, though this is not as severe as that seen during the financial crisis. Singaporean GDP contracts by 7.2% and Indian GDP slows from over 6% in 2017 to an annual rate of 2.2% in the first year of the scenario. Actions by authorities support economic recovery from 2019 onwards.

Commodity prices fall in response to weak global demand conditions. Oil prices fall from over US$60 per barrel at the end of 2017 to US$29 per barrel in the stress, and remain around this level until 2020, before rising back to around US$55 per barrel by the end of the five-year scenario horizon. Other commodity prices also fall and remain weak throughout the scenario.

Financial market participants' perceptions of risk increase, and their risk appetite diminishes. Risk premia rise in a number of markets. Investment-grade US corporate bond spreads increase from around 100 basis points in 2017 Q4 to 480 basis points by 2018 Q4, while high-yield US corporate bond spreads rise from around 360 basis points to around 1,510 basis points over the same period. Liquidity conditions deteriorate and liquidity risk premia rise across a number of financial markets.

The US dollar appreciates as some capital is withdrawn from emerging market economies. The US dollar appreciates by 11% against the Chinese renminbi. The dollar also appreciates by more than 10% against EMEs.

Measures of market volatility also rise, with the VIX peaking at a quarterly average of around 39 during 2018 in the stress. That compares to a quarterly average of around 40 between 2008 H2 and 2009 H1, during the financial crisis.

The domestic stress

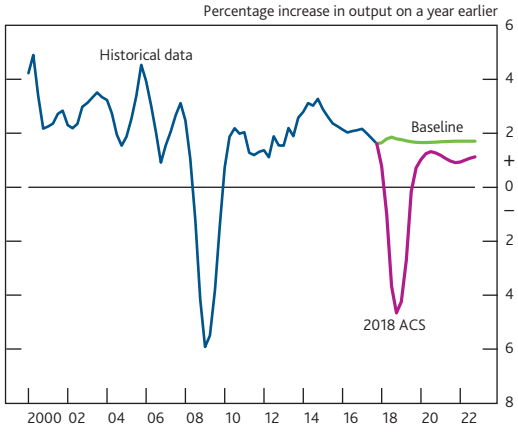
UK output contracts by 4.7% over the first year of the scenario (**Chart 5**). Unemployment rises by 5.2 percentage points to peak at 9.5% — a greater rise than that observed following the financial crisis (**Chart 3**). Although growth returns and unemployment falls back, the level of output remains persistently below the baseline path. That reflects a weakening of potential supply through the course of the stress.

There is a UK-specific risk premium shock, which is associated with a large depreciation of sterling. The sterling exchange rate index (ERI) falls by 27%, with sterling depreciating by 32% against the US dollar. The exchange rate troughs around the end of 2018.

UK inflation rises to over 5% by the end of 2019, pushed up by higher import prices and elevated inflation expectations. Monetary Policy Committee (MPC) action to tighten policy helps to bring inflation back to target in the final two years of the scenario. Nominal household income and corporate profits contract by around 2.4% and 6.8%, respectively, over the first year of the scenario.

Bank Rate is assumed to rise to 4% by the end of 2018. After inflation starts falling back towards target over the final two years of the stress, the MPC then reduces Bank Rate,

Chart 5 Annual growth in UK real GDP in the 2018 ACS[(a)]



Sources: ONS and Bank calculations.

(a) Annual growth is defined as quarterly GDP relative to the same quarter in the previous year.

which reaches around 3% by the end of 2022. This contrasts with the financial crisis when Bank Rate was cut by 5 percentage points between the beginning of 2008 and March 2009.

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 2019 Q1, before falling back over the final three years of the scenario.

Banks' wholesale funding spreads also rise materially. The rise in banks' wholesale funding costs spills over to retail funding costs. For example, five-year senior unsecured bond yields rise by more than 2 percentage points relative to five-year OIS rates over the first year of the stress, before falling back.

As the economy weakens, and interest rates rise, property prices fall. A withdrawal of buy-to-let investors exacerbates the sharp fall in UK residential property prices, which decrease by 33% from peak to trough on an aggregate basis — the largest fall on record and significantly more than in the financial crisis. Falls are more pronounced in areas of the United Kingdom in which house prices have risen most over recent years and appear most elevated. Similarly, a pull back by overseas investors contributes to the pronounced fall in CRE prices in the scenario. In aggregate, UK CRE prices fall by 40% from peak to trough — a little lower than that seen in the financial crisis. The fall is greater in the prime CRE sector where prices remain close to their pre-financial crisis peak.

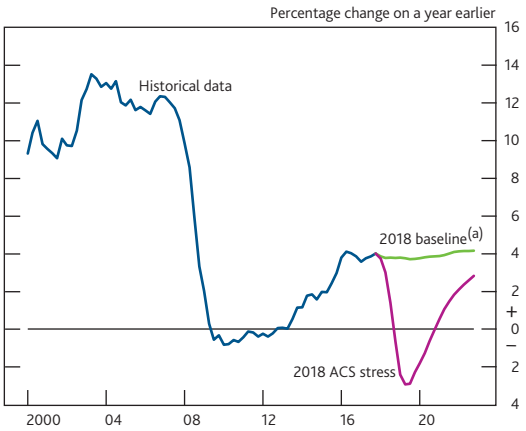
UK lending in the stress

An important macroprudential goal of stress testing is to help the FPC assess whether the banking system is sufficiently well capitalised to support the real economy in the face of severe adverse shocks.

To that end, and in line with the approach taken in previous stress tests carried out by the Bank, the 2018 ACS is calibrated on the assumption that banks satisfy the demand for credit from the UK real economy throughout the stress scenario. That is, banks are assumed not to reduce the supply of credit, although rises in bank funding costs are passed through to borrowers. And the Bank has published paths for aggregate lending to UK households and private non-financial corporations (PNFCs) based on that assumption. Stress-test participants will be expected to submit projections for lending under the stress which are consistent with those aggregate paths.

Over the five years of the stress scenario, lending to the UK real economy increases by around 2% in total (**Chart 6**). That reflects projected UK credit demand in the stress scenario. Over the 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 6 Lending to UK individuals and PNFCs in the 2018 ACS



Sources: Bank of England and Bank calculations.

(a) The baseline projection is designed to be broadly consistent with the forecasts published in the February 2018 *Inflation Report*.

Box 1
IFRS 9 in the 2018 ACS

January 2018 saw the introduction of a new accounting standard — International Financial Reporting Standard 9 (IFRS 9). This box explains how the introduction of this new accounting standard will generally interact with the Bank's stress test. It also sets out the specific approach the Bank will adopt for IFRS 9 in the 2018 ACS.

IFRS 9 means losses are recognised and provided for more quickly

IFRS 9 requires banks to set aside provisions for expected credit losses on all loans, not just where a loan is past due or has already fallen into default. The new approach aims to address concerns that during the financial crisis credit losses were not recognised and provisioned for early enough.

Under IFRS 9, banks are required to categorise their financial assets into one of three stages (**Figure 1**):

- **Stage 1:** Financial assets that are classed as 'performing as expected' are placed in this category. For these loans provisions equal to the 12-month expected loss are taken.
- **Stage 2:** This covers financial assets where credit risk has increased significantly since the date of origination, but no loss has taken place. Provisions equal to the lifetime expected credit loss on the loan are taken. Interest revenues are recognised based on the gross carrying amount of the financial asset.
- **Stage 3:** This is where the financial asset is credit impaired. This means a credit event has happened, for example a significant financial difficulty of the borrower, or a default event. The treatment is equivalent to an incurred loss event under the previous International Accounting Standard 39 (IAS 39) standard — provisions equal to the full lifetime expected credit loss are taken. Interest revenue is based on the amortised cost carrying amount.

It is the introduction of stages 1 and 2 that means banks must recognise losses more rapidly than under the previous accounting standard.

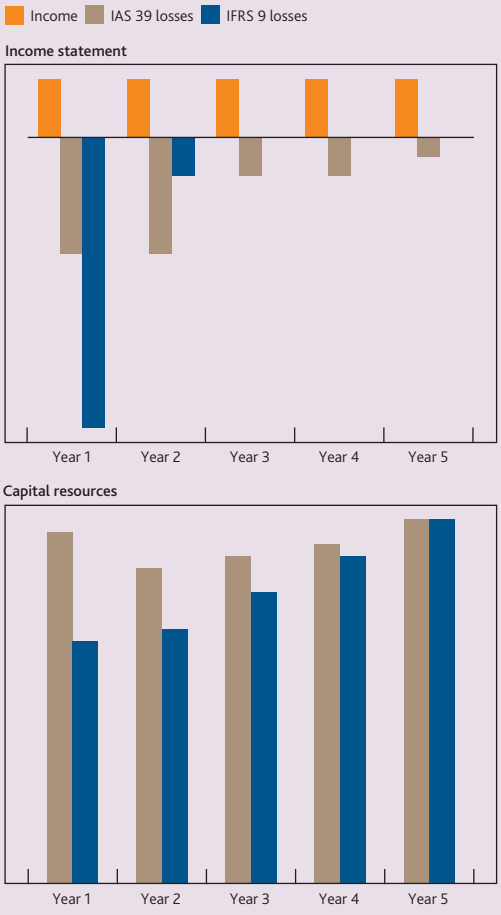
Figure 2 illustrates the same bank conducting the same activities under two different accounting standards. Under IFRS 9, losses will be recognised at an earlier stage than under the existing IAS 39 accounting regime. The cumulative losses over the entire stress period are the same under both accounting standards. The blue bars in **Figure 2** show the credit losses under IFRS 9, the grey bars show how the same total credit losses would be recorded under IAS 39 accounting.

Figure 1 Three-stage model for impairments under IFRS 9

Stage 1	Stage 2	Stage 3
Performing assets	Underperforming assets	Non-performing assets
Provisions equal to 12-month expected credit loss	Provisions equal to the lifetime expected credit loss	Provisions equal to the lifetime expected credit loss
Interest revenue based on gross carrying amount	Interest revenue based on gross carrying amount	Interest revenue based on amortised cost carrying amount

Source: Bank of England.

Figure 2 An illustration of the impact of IFRS 9 on a bank's capital resources during a stress scenario



Source: Bank of England.

The time at which income, eg from performing loans, is recognised is unchanged by the move to the new accounting standard. It is the net profit — the difference between losses and income — that drives the change in a bank's capital resources, shown in the bottom panel to the left. As both income and cumulative losses over the stress period are

unaffected by the move to the new accounting standard, a bank will eventually end up with the same capital resources as it would have under IAS 39. But its capital will fall more sharply and then recover more rapidly.

Earlier recognition of losses should increase transparency and support financial stability

Not only will this earlier recognition of losses ensure greater transparency about banks' exposure to a downturn, IFRS 9 will also support financial stability. 'Expected loss' accounting means that provisions for potential credit losses will be made in a timely way. As identified by the then Financial Stability Forum and endorsed by the G20 Leaders, banks' provisions during the financial crisis lagged market expectations of likely credit losses.(1) This caused investors to question banks' true underlying strength. In contrast, under the new accounting standard, a bank with a given capital ratio ought to be more resilient to credit stresses.

But there are implications for stress testing

The introduction of IFRS 9 means that provisions against loan losses will typically be made earlier in an economic downturn. As a result, banks' capital ratios are likely to fall more sharply than they did in previous tests.

The change in accounting standard does not, other things equal, change the total amount of losses a bank would incur through a given stress.

The policy response to the 2018 test will take into account the impact of IFRS 9

In line with the Q3 2017 FPC statement,(2) for the 2018 ACS specifically, the Bank has evolved its approach to take account of IFRS 9.

The FPC and PRC intend to use the information provided by the 2018 stress test to make adjustments to the hurdle rates against which banks' performance in this year's test is assessed. Applying the same stress scenario as in the 2017 ACS will allow the Bank to estimate the impact of this accounting change.

Any adjustments to hurdle rates will be subject to the constraints that: the effect of adjustments on system-wide capital requirements will be no bigger than the impact in aggregate of changing the accounting standard; no bank should have a hurdle rate after any adjustment that is below its minimum risk-weighted (Pillar 1 plus Pillar 2A); capital and leverage ratio requirements.

An important consideration in determining the scale of adjustments will be the degree to which provisions made early in a stress, in anticipation of future losses, provide additional loss-absorbing capacity for banks. This will be the focus of analysis in the 2018 stress test.

As a temporary measure, transitional capital arrangements are in place, which allow banks to 'add back in' a portion of the increase in expected credit loss provisions resulting from the introduction of IFRS 9 expected credit loss accounting to their CET1 capital. These arrangements will be phased out by 2023.

The Bank will assess participating banks' results taking account of these transitional arrangements, but to bolster transparency intends to publish results on both a transitional and end-point basis. It will phase in any adjustment to hurdle rates between the 2018 and 2023 stress tests as transitional arrangements are gradually removed.

Additional guidance has been issued to participating banks

As well as requiring banks to incorporate forward-looking macroeconomic information, IFRS 9 also requires banks to consider a 'range of possible outcomes' in making provisions. These requirements overlap with the concepts of stress testing, where a forward-looking economic scenario is also assumed. Because of this overlap, the Bank has introduced two key methodological principles for calculating provisions under IFRS 9 in the test:

- **Perfect foresight:** Banks should assume the economy evolves in line with ACS from the start of the stress, rather than assuming uncertainty.
- **Single scenario:** Rather than considering a range of more and less severe possible outcomes, banks should only consider what the ACS would mean for provisions.

These two principles have three aims. First, they should support the core motivation behind the revisions to the accounting standard, namely that provisions are raised earlier, specifically when entering a period of economic stress. Second, they should help reduce unnecessary complexity. And third, they should ensure a level playing field for participating banks.

Participating banks will also need to extend the baseline and ACS stress scenarios beyond the published five-year horizon and the Bank is publishing guidance on how this should be done.(3)

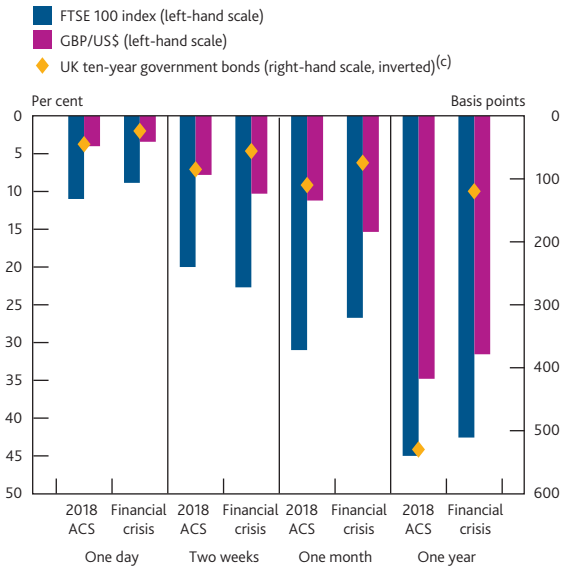
(1) See Financial Stability Forum, 'Report of the Financial Stability Forum on addressing procyclicality in the financial system', April 2009; www.fsb.org/wp-content/uploads/r_0904a.pdf.
(2) See 2017 Q3 FPC statement, September 2017; www.bankofengland.co.uk/statement/fpc/2017/financial-policy-committee-statement-september-2017.
(3) For more details see 'Guidance for participating banks and building societies'; www.bankofengland.co.uk/-/media/boe/files/stress-testing/2018/stress-testing-the-uk-banking-system-2018-guidance-for-participating-banks-and-building-societies.

Traded risk scenario

The 2018 ACS includes a traded risk scenario, which will principally examine the resilience of the investment banking operations of UK banks to a severe financial market shock.

The market risk factors that are likely to have a material impact on banks' profit and loss (such as credit spreads and equity indices) have been calibrated to past periods of financial market turbulence, such as the financial crisis, which are judged to be broadly consistent with the macroeconomic scenario (**Chart 7**).

Chart 7 Selected variables in the 2018 traded risk scenario and how they compare to the financial crisis[a][b]



Sources: Bank of England, Bloomberg and Bank calculations.

(a) All shocks are applied to the spot values prevailing on the effective date of 26 January 2018.
(b) Financial crisis numbers refer to maximum change over specified liquidity window in the period 2008 Q3 to 2009 Q2.
(c) Absolute change, in basis points.

The traded risk component of the 2018 ACS requires banks to apply a price shock to their market risk positions as of 26 January 2018.[6] The Bank's approach to traded risk takes account of different liquidity horizons of banks' traded risk positions by imposing larger shocks on positions that banks would take longer to close out, and smaller shocks for those positions that could be sold or hedged within shorter time frames.

Taking the shock to UK equity prices as an example, in the 2018 test banks should apply a price shock of -11% to their most liquid UK equities positions, whereas banks should apply a -45% price shock to their least liquid positions. The maximum size of the shock, -45%, also corresponds to the UK equity price trough in the macroeconomic ACS scenario.

The value of banks' fair value through other comprehensive income (FVOCI), fair value option (FVO) and non-trading book fair value through profit and loss (FVTPL) positions are also subject to a market price stress. While banks' trading books are stressed over a one-year period only, these non-trading book positions are stressed over a five-year horizon.

Consistent with the macroeconomic scenario, the 2018 ACS will examine the ability of banks to withstand the default of seven counterparties that would be vulnerable to the macroeconomic scenario — five uncollateralised and two collateralised.[7] In determining the counterparties to default, banks are instructed to consider both the current creditworthiness of their counterparties, and how that creditworthiness might deteriorate under the stress scenario.

In addition to examining the impact of the default of specific counterparties, the scenario will also test the broader portfolio impact from the default of a portion of counterparties that are below a certain rating, and that are vulnerable under the scenario.

Banks are also expected to calculate stress scenario revenue and cost projections for their Investment Banking Divisions or activities where relevant. In the stress scenario, banks should assume that financial market volumes fall as a result of reduced economic activity. Banks should not assume an increase in revenues, as was observed in some business lines in the years following the collapse of Lehman Brothers in 2008, or any reduction in the aggregate investment banking sector capacity as a consequence of the stress.

(6) For more details see 'Guidance for participating banks and building societies'; www.bankofengland.co.uk/-/media/boe/files/stress-testing/2018/stress-testing-the-uk-banking-system-2018-guidance-for-participating-banks-and-building-societies.
(7) Banks should 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 should default two of their top-30 collateralised global counterparties.

Misconduct cost stress

In addition to the macroeconomic and traded risk elements of the stress, the 2018 ACS also incorporates stressed projections for potential misconduct fines and other costs beyond those paid or provided for by the end of 2017 — the start point of the scenario.

There remains a very high degree of uncertainty around any approach to quantifying misconduct cost risks facing UK banks. For the 2018 ACS the Bank is employing the same methodology as that applied in the 2016 and 2017 tests.

Banks should submit stressed projections for misconduct costs over and above those incurred or provided for at end-2017. These should relate to known misconduct issues, such as mis-selling of payment protection insurance and misconduct in wholesale markets, and will be in addition to the macroeconomic element of the test.

Banks are asked to provide stressed projections for misconduct costs which have a low likelihood of being exceeded. Partly because they relate only to known issues, however, they cannot be considered a 'worst case' scenario.

Glossary

ACS – annual cyclical scenario.
AT1 – additional Tier 1.
CCyB – countercyclical capital buffer.
CET1 – common equity Tier 1.
CRE – commercial real estate.
CRR – capital requirements regulation.
EME – emerging market economy.
ERI – exchange rate index.
FPC – Financial Policy Committee.
FVO – fair value option.
FVOCI – fair value through other comprehensive income.
FVTPL – fair value through profit and loss.
GDP – gross domestic product.
G-SIIs – global systemically important institutions.
Hibor – Hong Kong interbank offered rate.
IAS 39 – International Accounting Standards 39.
IFRS 9 – International Financial Reporting Standard 9.
IMF – International Monetary Fund.
Libor – London interbank offered rate.
MPC – Monetary Policy Committee.
OECD – Organisation for Economic Co-operation and Development.
OIS – overnight index swap.
ONS – Office for National Statistics.
PNFCs – private non-financial corporations.
PRA – Prudential Regulation Authority.
PRC – Prudential Regulation Committee.
VIX – CBOE Volatility Index.
WEO – IMF *World Economic Outlook*.