



BANK OF ENGLAND

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Stress testing the UK banking system: key elements of the 2016 stress test

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Executive summary

The Bank of England's 2016 stress test has been designed under the new annual cyclical scenario framework. Under this framework, the stress being tested against will generally be severe and broad, in order to assess the resilience of major UK banks to 'tail-risk' events. In addition, where risks are judged to be heightened, the related aspects of the test will be more severe and *vice versa*. As a result, the severity of the test is related systematically to policymakers' assessments of risk levels across markets and regions.

The scenario reflects the judgement of the Financial Policy Committee and Prudential Regulation Authority Board that overall, domestic risks to the UK banking system have risen beyond their subdued levels during the immediate post-crisis period but are not yet elevated. Global risks are judged to be heightened, particularly in China and some other emerging market economies.

The stress test hurdle rate framework has also evolved. The changes improve consistency with the capital framework and increase transparency around individual banks' capital requirements.

The stress-test results will be used by the Prudential Regulation Authority and the Financial Policy Committee as part of their respective evaluations of the capital adequacy of individual institutions and the resilience of the banking system as a whole.

Background

The Bank of England's (hereafter 'the Bank') concurrent stress-testing framework is designed to examine the potential impact of a hypothetical adverse scenario on the health of the banking system and individual institutions within it. Stress tests allow policymakers to assess banks' resilience to a range of adverse shocks and ensure they are sufficiently capitalised, not just to withstand those shocks, but also to support the real economy in a potential future stress.

The Bank's 2016 concurrent stress test (hereafter the '2016 stress test') and methodology have been designed and calibrated by Bank staff, under the guidance of the Financial Policy Committee (FPC) and Prudential Regulation Authority (PRA) Board. The stress test contains three types of stresses, in common with the 2015 exercise:

- A macroeconomic stress scenario, spanning a five-year period to the end of 2020.
- A traded risk stress scenario, which is consistent with the content and calibration of the macroeconomic stress scenario.

- A misconduct costs stress, which is in addition to the macroeconomic and traded risk stress scenarios.

In addition to the stress scenario, the test will assess projections of banks' profitability and capital ratios under a baseline macroeconomic scenario. The UK macroeconomic variables in the baseline scenario have been developed by Bank staff and are broadly consistent with the forecasts published in the February 2016 *Inflation Report*. The international macroeconomic variables are largely consistent with the International Monetary Fund's (IMF's) October 2015 *World Economic Outlook (WEO)* projections.

The seven banks and building societies (hereafter 'banks') covered in the 2016 stress test account for around 80% of the outstanding stock of PRA-regulated banks' lending to the UK real economy. These banks have a diverse range of business models and a number operate in a broad range of international markets.⁽¹⁾

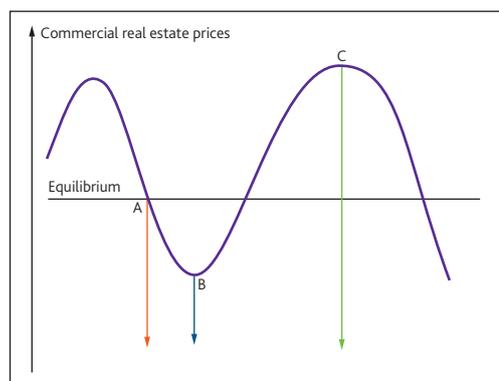
In October 2015 the Bank published *The Bank of England's approach to stress testing the UK banking system* (hereafter the *Approach Document*).⁽²⁾ It set out the Bank's stress-testing framework to 2018, which has been shaped, in part, by lessons learnt during the first two concurrent stress tests, carried out in 2014 and 2015. In line with the vision mapped out in the *Approach Document*, the Bank will run its first annual cyclical scenario (ACS) in 2016. In 2017, the Bank intends to complement the ACS by running an additional scenario intended to probe the resilience of the system to risks that may not be neatly linked to the financial cycle — the 'exploratory scenario'.

The severity of the stress applied under the ACS will reflect the FPC and PRA Board's assessment of imbalances in credit markets, financial and other asset prices, and the associated level of risk facing the UK banking system. When risks are assessed to be around their standard level, that is neither elevated nor subdued, the Bank will run a stress of material severity, reflecting the evidence that shocks can occur even when risks in credit, financial and other asset markets are not elevated. The severity of the stress will increase as risks are judged to build and decrease after those risks crystallise or abate (see Box 1, pages 10–11).

Chart A illustrates how that approach works for a single variable in the stress test (in this example, commercial real estate (CRE) prices):

(1) The seven participating banks and building societies are: Barclays plc, HSBC Holdings plc, Lloyds Banking Group plc, Nationwide Building Society, The Royal Bank of Scotland Group plc, Santander UK plc and Standard Chartered plc.
(2) For more details see www.bankofengland.co.uk/financialstability/Documents/stresstesting/2015/approach.pdf.

Chart A Stylised example of stress severity across the cycle — commercial real estate prices^(a)



(a) This chart plots an example path for imbalances in CRE prices, which are defined as deviations in CRE prices from an estimated equilibrium. In this example detrending is important because equilibrium CRE prices are likely to rise over time.

- If policymakers judge that CRE prices are around equilibrium (point A) — that is risks of a fall in CRE prices are around their standard level, ie neither elevated nor subdued — then the magnitude of the CRE price fall applied in the stress will correspond to the size of stress the FPC and PRA Board judge that banks should ordinarily be able to withstand (the orange arrow). Note that a material stress is still applied, even when CRE prices are assessed to be around equilibrium. This is because shocks can occur when a variable is at equilibrium, and because of the inherent uncertainties in judging what the true equilibrium is.
- If CRE prices were to have fallen and policymakers judged that they were below equilibrium — that is risks of a further fall in CRE prices were subdued (point B) — then the magnitude of the stress applied would be correspondingly smaller (the blue arrow). Note that the trough in the level of prices relative to equilibrium is similar in cases A and B. In case B, some of the stress has already crystallised.
- Finally if policymakers judge that CRE prices are above equilibrium (point C), with elevated risks of a fall, then the drop in CRE prices applied in the stress will be larger than when risks are assessed as around standard (the green arrow). Again, the trough in the stress is similar.

There is a great deal of uncertainty about the equilibrium value of assets, the true extent of risks and hence the precise likelihood of a stress materialising. But the principle of linking the severity of the scenario to policymakers' risk assessments is based on evidence that more severe outcomes can be more likely when imbalances or risks are more elevated.

In practice, the calibration of stresses for individual variables also take into account other factors, including the tendency of some variables to overshoot after periods of being particularly elevated, as well as the interdependencies between different variables. Further details about how the Bank is implementing

the ACS framework are set out in the Bank's October 2015 *Approach Document*, see Box 1 on pages 10–11.

Risk assessment

In its December 2015 *Financial Stability Report (FSR)*, the FPC judged that the UK financial system had moved out of the period of retrenchment from risk-taking and balance sheet repair that followed the financial crisis. It made this judgement based on a broad range of indicators encompassing credit growth, borrower indebtedness, credit conditions and property and other asset prices. The FPC also judged that the global macroeconomic environment remains challenging, with risks having become more centred on emerging market economies (EMEs).

The FPC and PRA Board have considered the evolution of risks since the December 2015 *FSR*, and have assessed that overall risks to global activity associated with risks in credit, financial and other asset markets are currently elevated. But within that assessment there are material divergences across economies. **Table 1** summarises their risk assessments across a range of variables which have informed the calibration of the stress incorporated in the 2016 ACS. For a fuller description of the risk assessment underlying the scenario see Section 2.2.

Table 1 Summary of FPC and PRA Board risk assessments in the 2016 stress test

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

High-level description of the 2016 stress scenario

The stress scenarios incorporated in the Bank's concurrent stress tests are not forecasts. Rather, they are coherent 'tail-risk' scenarios designed to be severe and broad enough to assess the resilience of UK banks to adverse shocks, which can occur even when risks are not elevated. Within that framework, the severity of the shocks in the ACS is related to policymakers' risk assessments.

The following high-level scenario narrative is intended to help explain the stresses explored in the 2016 ACS. A more detailed description of the 2016 stress scenario is provided in Section 2.4.

In the Bank's 2016 stress scenario vulnerabilities across financial markets and the global and UK economies crystallise. The stress scenario incorporates a synchronised global downturn in output growth. Relative to the baseline scenario, growth in China and Hong Kong is particularly adversely affected. Global GDP growth troughs at -1.9%, as it did during the 2008 global financial crisis.

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 with emerging market currencies depreciating against the US dollar. Other asset prices fall sharply. Having fallen significantly during 2015, the price of oil troughs at US\$20 per barrel, reflecting the further slowdown in world demand.

Interest rates facing households and businesses increase in the early part of the stress, partly reflecting a rise in term premia on relatively safe long-term government debt. Credit spreads on more risky assets such as corporate bonds rise sharply too. Bank funding spreads also increase. Although policymakers pursue additional monetary stimulus, which starts to reduce long-term interest rates, the overall cost of credit rises in the short term.

In common with other risky asset prices, property prices fall globally. Falls in Chinese and Hong Kong property prices are particularly pronounced, following rapid recent growth. In the United Kingdom, residential property prices fall by 31% — this is particularly concentrated in regions which have recently experienced more rapid price increases.

UK CRE prices fall by 42%, with materially greater falls in prime CRE prices which have risen robustly since the financial crisis, and were around their pre-crisis peak at the end of 2015. Other CRE prices fall less precipitously, reflecting less rapid growth since the crisis.

The level of UK GDP falls by 4.3%, accompanied by a 4.5 percentage point rise in unemployment. 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. UK productivity growth remains weak, limiting the recovery in UK activity through the latter part of the stress horizon.

An important macroprudential goal of stress testing is to help assess whether the banking system is sufficiently well capitalised to maintain the supply of credit in the face of adverse shocks. To that end, the Bank has calibrated the scenario based on the assumption that banks supply the amount of credit demanded by the UK real economy in the stress test. That is, banks are assumed not to reduce the

supply of credit, although rises in bank funding costs are passed through to borrowers.

Over the five years of the stress scenario, lending to the UK real economy increases by around 4.5% in total. That reflects UK credit demand in the stress scenario. Banks will be expected to submit lending projections which are consistent with this aggregate profile. Over the first two years of the stress scenario, the demand for credit falls as asset prices fall, investment growth declines, and as the initial 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 funding costs come down (see Box 3 on page 20).

Comparisons with previous stress tests and other severity metrics

The orientation of the 2014 and 2015 stress tests were determined by the risks that the FPC and PRA Board identified as significant and in need of further exploration. The 2014 stress test focused on risks to the UK household sector, such as a large fall in house prices and a significant rise in unemployment in part as a result of a sharp rise in interest rates. The 2015 stress test focused more on global risks associated particularly with a pronounced contraction in growth in China, other EMEs and the euro-area periphery, as well as on risks associated with lending to UK corporates.

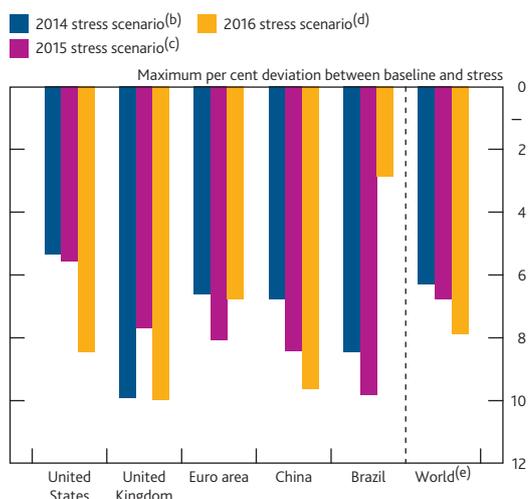
An important motivation for the ACS framework is to help the FPC and PRA Board set capital requirements and buffers for individual firms across the banking system, whether their business models are heavily UK lending focused, or more global or trading focused. That means that stress tests calibrated under the ACS framework will incorporate a broader range of domestic and global risks than the Bank's previous concurrent stress tests. Some global shocks in the 2016 stress test are therefore more comparable to those in the Bank's 2015 test (**Chart B**), while some of the domestic shocks are more akin to those contained in the 2014 stress test.

The change in approach to scenario design in 2016 means it is not possible to infer from the change in the severity of the scenario how risks are assessed to have evolved. For example, the US stress looks more severe in 2016 but it was not an important part of the 2014 or 2015 tests, which focused on other areas. In future years, it will be possible to read across from changes in scenario severity to changes in judgements about risks.

For further discussion of the differences between the 2016 stress and the 2014 and 2015 tests, see Box 2 on pages 15–16.

The FPC and PRA Board have judged that, for a given level of risk, the severity of the UK scenario should be greater than for the world economy. That reflects the evidence that the

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



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

- (a) Chart shows the maximum deviation between calendar-year real GDP in the stress and baseline scenarios, over the three-year (2014 scenario) and five-year (2015 and 2016 scenarios) horizons.
- (b) The 2014 bars are calculated from: (i) the 2014 UK variant scenario (for the United Kingdom) and the 2014 EBA scenario (for foreign economies) in the stress, and (ii) the projections of the MPC as communicated in the February 2014 *Inflation Report* (for the United Kingdom) and the European Commission's Winter 2014 forecast (for foreign economies) in the baseline.
- (c) Baseline projections in 2015, other than for the United Kingdom, are consistent with the IMF's projections in the October 2014 *IMF World Economic Outlook*. Bank staff have quarterly interpolated the original annual series.
- (d) Baseline projections in 2016, other than for the United Kingdom, are largely consistent with the IMF's projections in the October 2015 *IMF World Economic Outlook*. Bank staff have quarterly interpolated the original annual series. The baseline projection for Brazil is based on the IMF's January 2016 *World Economic Outlook Update*, to take account of material news between October and year-end. Bank staff have extended the profile to 2020.
- (e) World GDP is weighted by purchasing power parity.

variation in global GDP is lower than that of UK GDP because it is more diversified in nature. However, adjustment has been made to reflect the evidence that performance of economies becomes more highly correlated in a crisis.

Hurdle rate for stress-test participants and policymaker responses

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

In producing their balance sheet projections under the stress scenario, banks should assume that the FPC will set the UK countercyclical capital buffer (CCyB) rate at zero in the stress.

A bank may be required to take action to strengthen its capital position, depending on the PRA's assessment of the bank's

capital adequacy. A key determinant of the type of action that a bank may be required to take as a result of the stress test is where its capital ratio falls in the stress, relative to the level of capital that banks are expected to maintain — otherwise known as the hurdle rate.

As set out in the *Approach Document*, to improve the consistency between the concurrent stress test and the regulatory capital framework, and to improve the transparency about individual banks' minimum capital requirements, the hurdle rate framework will evolve in two ways, starting with the 2016 ACS.

First, each bank will be expected to meet all of its minimum risk-based CET1 capital requirements in the stress scenario. These comprise both the internationally agreed minima ('Pillar 1') and any uplift to that minimum capital requirement set by the PRA through Pillar 2A.⁽¹⁾ Pillar 2A is intended to correct for risks that are not captured (or not adequately captured) in Pillar 1. As Pillar 2A varies across banks, this will mean there is no longer a common CET1 risk-weighted hurdle rate across all banks. The Tier 1 leverage ratio hurdle rate will continue to be 3% for all participating banks.

A second change is that, in addition to the hurdle rate, the 2016 stress test will include a 'systemic reference point' against which the results will be assessed. From 2016, banks designated as globally systemic (G-SIBs) are beginning to phase in additional common equity Tier 1 (CET1) capital buffers that, by 2019, will range between 1 and 2.5% of risk-weighted assets. The objective of these buffers is to allow systemic banks to withstand greater stress than others, reflecting the greater economic costs in the event of their failure. The systemic reference point will be the sum of the hurdle rate and the phase-in path of a bank's G-SIB buffer. In a real stress, banks would be able to use these G-SIB buffers, like other buffers, to absorb losses. The use of the systemic reference point does not make the G-SIB buffer unusable in practice; it acts to ensure that banks of greater systemic importance would be able to withstand a stress in practice that is even more severe than the Bank's stress scenario. For more details see Section 4.

Publication of results

The results of the 2016 ACS will be published in 2016 Q4. The Bank is committed to disclosing the information necessary to explain the stress-test results. The Bank intends to disclose at least as much bank-specific information about the headline impact of the stress on capital adequacy as it did in the 2015 stress-test results publication.

(1) All participants in the 2016 stress test with December financial year ends have disclosed their current Pillar 2A in their 2015 Annual Reports. Nationwide, which has an April year end, disclosed its current Pillar 2A requirement in its 2015–16 Interim Results.

1 Background

A stress test examines the potential impact of a hypothetical adverse scenario on the health of the banking system and individual institutions within it. Stress tests allow policymakers to assess banks' resilience to a range of adverse shocks and ensure they are sufficiently capitalised, not just to withstand those shocks, but also to support the real economy in a potential future stress.

Following on from an FPC Recommendation in March 2013, the Bank ran its first concurrent stress test of the United Kingdom's largest banks in 2014, followed by a second test in 2015. The results of these tests were used to inform decisions about system-wide policy by the FPC and firm-specific supervisory actions by the PRA, including the setting of capital buffers.⁽¹⁾

The Bank's *Approach Document*, published in October 2015, set out the Bank's stress-testing framework to 2018, which has been shaped, in part by lessons learnt during the 2014 and 2015 tests.

As outlined in the *Approach Document*, between 2016 and 2018 the Bank will:

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

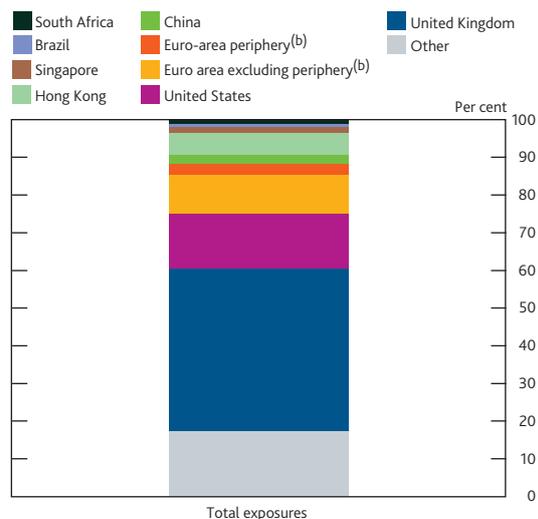
In line with the vision mapped out in the *Approach Document*, the Bank will run the ACS for the first time in 2016. The severity of the stress will generally be severe and broad, in order to assess the resilience of major UK banks to 'tail-risk' events. In addition, where risks are judged to be heightened, the related aspects of the test will be more severe and vice versa. As a result, the severity of the test is related systematically to policymakers' assessments of risk levels across markets and regions. For further details about how the Bank is implementing the ACS framework set out in the *Approach Document*, see Box 1 on pages 10–11.

In addition to concurrent stress testing, the PRA continues to ask banks to perform other individual stress tests as part of

each bank's Internal Capital Adequacy Assessment Process (ICAAP), which is another important tool informing microprudential decision-making.

The seven banks covered in the 2016 stress test account for around 80% of the outstanding stock of PRA-regulated banks' lending to the UK real economy. These banks also have a diverse range of business models and operate in a broad range of international markets (Chart 1).

Chart 1 Geographical composition of participating banks' exposures^(a)



Sources: Bank of England and Bank calculations.

- (a) Data are as at end-2015. Geographical exposures are based on residence of immediate counterparty. Exposures includes loans and advances, claims under sale and repurchase agreements, long and short-term debt securities and claims under financial derivatives.
 (b) Euro-area periphery is defined as Cyprus, Greece, Ireland, Italy, Portugal and Spain.

In 2017, the Bank intends to complement the ACS by running an additional scenario intended to probe the resilience of the system to risks that may not be neatly linked to the financial cycle — the 'exploratory scenario'.

In February 2016, the European Banking Authority (EBA) launched its 2016 EU-wide stress test.⁽²⁾ The EU-wide test seeks to provide supervisors, banks and other market participants with a common analytical framework to consistently compare and assess the resilience of EU banks to economic shocks. As set out by the EBA, the EU-wide test is intended to complement, not substitute, other supervisory stress tests. Four UK banks are participating in the 2016 EU-wide exercise. The Bank's 2016 concurrent stress test is separate from the EBA exercise. The EBA expects to publish the results of the exercise in early 2016 Q3.

(1) For more details see www.bankofengland.co.uk/financialstability/documents/fpc/results011215.pdf.

(2) For more details see the EBA's stress testing website at www.eba.europa.eu/-/eba-launches-2016-eu-wide-stress-test-exercise.

The rest of this document is structured as follows:

Section 2 provides details about the 2016 stress scenario:

- Section 2.1 outlines the key elements of the stress test.
- Section 2.2 explains the FPC and PRA Board's risk assessment and how that links to the calibration of the stress scenario.
- Section 2.3 provides a high-level description of the 2016 macroeconomic stress scenario.
- Section 2.4 provides more detail about the stress scenario.
- Section 2.5 sets the severity of the stress scenario in broader historical context.
- Section 2.6 describes the Bank's approach to traded risk in the stress test.
- Section 2.7 describes the approach to misconduct costs in the stress test.

Section 2 also contains three boxes:

- Box 1 outlines the motivation behind the new ACS framework and how it has been implemented.
- Box 2 compares the 2016 test with the two concurrent stress tests preceding it.
- Box 3 discusses the aggregate UK lending profiles in the stress scenario.

Section 3 describes the baseline scenario for the 2016 test. Section 4 describes the hurdle rate framework for the 2016 stress. And Section 5 outlines plans for publishing the results of the test.

Two further documents published today provide banks with methodological guidance for conducting their own analysis.⁽¹⁾ The full set of variable paths underlying the macroeconomic stress scenario is also available on the Bank's website.⁽²⁾

2 Stress scenario

This section starts by describing the main features of the 2016 stress. It then summarises the context in which the FPC and PRA Board have made their risk assessments and the stress scenario has been designed. The section goes on to outline the scenario narrative before providing further detail on the severity of the stress scenario, including by comparing it to past UK and international episodes of adverse macroeconomic and financial conditions. Box 1 explains the way in which the Bank's ACS framework outlined in the October 2015 *Approach Document* has been implemented. Box 2 explains the key qualitative and quantitative differences between the 2015 and 2016 scenarios. Box 3 discusses the aggregate UK lending profiles in the stress scenario.

The stress scenarios incorporated in the Bank's concurrent stress tests are not forecasts. Rather, they are coherent

'tail-risk' scenarios designed to be severe and broad enough to assess the resilience of UK banks to adverse shocks, which can occur even when risks are not elevated. Within that framework, the severity of the shocks in the ACS is related to policymakers' risk assessments.

2.1 Main elements of the Bank's 2016 stress test

The Bank's 2016 concurrent stress test and methodology have been designed and calibrated by Bank staff, under the guidance of the FPC and the PRA Board. The stress test contains three types of stresses, in common with the 2015 exercise:

- A macroeconomic stress scenario, spanning a five-year period to the end of 2020.
- A traded risk stress scenario, which is consistent with the content and calibration of the macroeconomic stress scenario.
- A misconduct costs stress, which is in addition to the macroeconomic and traded risk stress scenarios.

2.2 Risk assessment

The severity of the stress applied under the ACS each year will reflect the FPC and PRA Board's assessments of imbalances in credit, financial markets, and asset prices, and the associated level of risk facing the UK banking system (see Box 1 on pages 10–11). This means that there is a direct link between the calibration of the 2016 scenario and the FPC and PRA Board's assessment of risks facing individual banks and the UK banking system as a whole.

In its December 2015 *FSR*, the FPC judged that the UK financial system had moved out of the period of retrenchment from risk-taking and balance sheet repair that followed the financial crisis. It made this judgement based on a broad range of indicators encompassing credit growth, borrower indebtedness, credit conditions and property and other asset prices. The FPC also judged that the global macroeconomic environment remains challenging, with risks having become more centred on emerging market economies (EMEs).

The domestic risk environment

Overall, risks stemming from domestic credit have risen beyond their subdued levels during the immediate post-crisis period. However, the FPC judges that they are not yet elevated. Supported by low interest rates, debt-servicing costs remain below historic averages and the proportion of highly indebted households has not increased.

(1) Guidance for participating banks and building societies can be found here: www.bankofengland.co.uk/financialstability/pages/FPC/stresstest.aspx.

(2) The variable paths for the Bank's 2016 stress test can be found here: www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/variablepaths.xlsx.

Risks from credit terms are judged to be around standard. Lending spreads are high relative to their pre-financial crisis averages but are judged to be around their post-crisis equilibria. Likewise, non-price terms of household credit appear to be around normal, though terms in the corporate leverage loan market appear to be a little looser than normal.

Risks from UK asset prices are assessed to be slightly elevated, but have fallen somewhat since the turn of the year as corporate bond and equity prices have decreased. Nevertheless, residential and CRE property prices in the United Kingdom continue to grow faster than nominal GDP. And prices are high relative to incomes and rents respectively. Within that, prime CRE is judged to be a particular pocket of risk, whereas risks are less elevated in the other parts of the market, where prices have risen more modestly.

UK property prices could be forced to adjust in response to a sharp increase in market interest rates that was not accompanied by an increase in real incomes, for example as a result of an increase in the level of term premia, which remain compressed relative to their average levels. An important factor in assessing their riskiness is therefore the extent to which low long-term real rates, and particularly compressed term premia, are likely to persist. Given that compression, the risk associated with an adjustment in term premia are judged to be somewhat elevated.

The global risk environment

The global macroeconomic environment remains challenging, with risks arising from the global environment having shifted in origin from advanced economies to EMEs during the course of 2015.

Since the turn of the year, downside risks to global growth prospects have increased, and forecasts have been lowered, particularly for China and other EMEs. Financial market participants have focused more heavily on the potential for spillovers from indebted EMEs and this has been reflected in global capital flows. China and other EMEs have experienced net capital outflows.

Overall risks to global activity associated with financial conditions are judged to be elevated, in large part reflecting risks in China and other EMEs. But within that assessment there are material divergences across economies.

Risks in China and Hong Kong are judged to be elevated. Corporate leverage is high and rising, and terms of credit — particularly in China — remain accommodative. China has experienced rapid credit growth, with the debt to GDP ratio rising by 85 percentage points between 2008 and 2014. The majority of this growth has been attributable to the corporate, and in particular the real estate and construction

sectors. Household debt is also increasing rapidly, albeit from a low base. Hong Kong is similarly highly leveraged, and appears to be in the advanced stages of an expansionary phase with real house prices rising by 60% in the five years to 2015 Q3.

The level of risk associated with financial conditions in EMEs other than China varies. For other Asian EMEs with large US-denominated debts and material trade linkages to China, the risks are judged to be more elevated than other EMEs. India has just emerged from a period of subdued credit growth. Brazil is currently in a deep recession, with falling property prices, so in this case, risks associated with the state of the financial cycle have started to crystallise.

In the euro area, aggregate credit growth remains subdued in a historical context, as do property prices. But against that, underlying vulnerabilities, including the high level of debt in some euro-area economies, means that risks are not subdued. There are, however, considerable differences across economies within the euro area.

The level of risk to US activity from the state of the financial cycle is judged to be around standard. Within that, risks associated with household lending appear slightly more subdued, and risks associated with corporate lending slightly more elevated. Judged relative to the historical relationship between overall US credit and GDP, the level of credit to GDP appears low, and household deleveraging continues to be in evidence, albeit at a diminished pace over recent quarters, as unsecured lending growth has picked up. Balanced against that, until the start of 2016, credit and asset price growth had been strong, particularly in the corporate sector, with the degree of corporate leverage returning to around the levels observed prior to the financial crisis. Related to that, the terms of corporate credit appear to have loosened somewhat since the financial crisis, although there is some recent evidence of tightening.

Overall, taking their domestic and global risk assessments together, the FPC and PRA Board judged that risks to UK activity are relatively standard. As such, the UK GDP and unemployment stress scenarios in the 2016 ACS are at around standard severity.

Table A summarises the risk-level assessments described above.

Box 1

The annual cyclical scenario framework

The 2016 stress test is the first exercise to be conducted under the Bank's updated approach to stress testing. A central feature of this updated approach is that the Bank will now be running two types of stress scenarios that will be common across participating banks.

The first type of scenario — an annual cyclical scenario (ACS) — will be used to assess risks associated with conditions in credit, financial and other asset markets. The ACS is running for the first time in 2016, and is the focus of this box. The second type of scenario, an exploratory scenario, will be used to probe the resilience of the system to risks that policymakers judge to be emerging threats to financial stability and individual banks, but may not be neatly linked to the financial cycle. The exploratory scenario will run for the first time in 2017.

Principles behind the annual cyclical scenario

Under the new framework, each year, the calibration of the ACS will reflect the assessment of the FPC and PRA Board about the risks facing UK banks in a systematic way. In a standard risk environment, the Bank will run a severe stress, reflecting evidence that shocks can happen even when risks in credit, financial and other asset markets are around standard. The stress scenario will become more severe from year to year when risks are judged to have increased, and similarly less severe when risks are judged to have diminished or crystallised. The underlying risk tolerance of policymakers will not vary from test to test; in other words, given prevailing risks the very low likelihood of the event they want to ensure the banking system is capitalised against will not vary.

The severity of the scenario is likely to be greater in a boom, for example when growth in credit is rapid and policymakers judge that asset prices are more likely to be unsustainably high. In such episodes, financial markets and institutions might believe that risks are low. That risk illusion may cause risk premia to be compressed, which in turn may fuel further growth in credit and asset prices. By leaning against these tendencies, the stress-testing framework will be explicitly countercyclical. This systematic approach should mean that markets and banks will be better able to anticipate the broad shape and severity of the scenario over time.

Practical implementation of the ACS framework

The ACS incorporates both domestic and global elements. The United Kingdom is a highly open economy with an international banking system. Developments in the rest of the world are likely to have a sizable impact on the UK economy and financial sector through a range of channels. The ACS

attempts, therefore, to capture risks in relevant overseas economies, to the extent that they are judged to be material for the UK banking sector. The ACS also includes a traded risk component, which is linked to the macroeconomic aspects of the scenario.

To calibrate the ACS, the FPC and PRA Board assess the level of current risks in particular credit, financial, and other asset markets. In determining whether risks in individual markets are subdued or elevated, the FPC and PRA Board take a range of indicators into account. For example, in assessing whether risks in the housing market are elevated, policymakers consider factors such as the level of house prices relative to trends, household incomes, estimates of rental yields, interest rates and debt serviceability metrics.

In reality, there is a continuum of different risk levels around different variables in particular credit, financial and other asset markets. For tractability, in this document those risk levels are described as ranging from subdued to elevated. For a single market variable, a 'standard' risk assessment, where risks are neither reduced nor elevated, is generally synonymous with that variable being around its historical average, once any trends, structural breaks, and long-run fundamental drivers are taken into account. The risk assessment may also be affected by the risks around other variables thought to have a material influence on the variable in question.

The outturns for key macroeconomic and financial market variables in the stress reflect these risk assessments. Where risks in a particular market are judged to be elevated, the severity of the shock to that market will be increased. And where risks in a particular market are judged to be subdued, the severity of the shock to that market will be reduced. When risks are assessed to be around their standard level, the severity of the stress will be determined by the magnitude of stress that the FPC and PRA Board consider that banks should ordinarily be able to withstand.

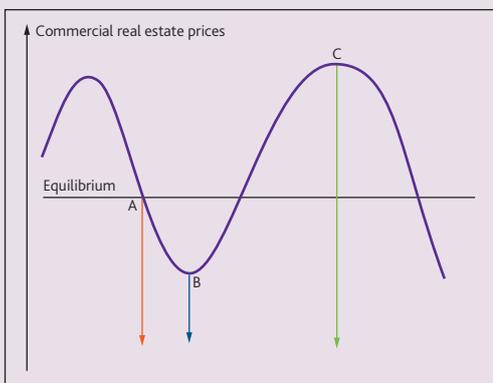
Chart A illustrates how that approach works for a single variable in the stress test (in this example, CRE prices):

- If policymakers judge that CRE prices are around equilibrium (point A) — that is risks of a fall in CRE prices are neither elevated nor subdued — then the magnitude of the CRE price fall applied in the stress will correspond to the size of stress the FPC and PRA Board judge that banks should ordinarily be able to withstand (the orange arrow). Note that under this approach a material stress is still applied, even when CRE prices are assessed to be around equilibrium.
- If CRE prices were to have fallen and policymakers judged that they were below equilibrium — that is risks of a further fall in CRE prices were subdued (point B) — then the

magnitude of the stress applied would be correspondingly smaller (the blue arrow). Note that the trough in the level of prices in the hypothetical stress relative to equilibrium is similar in cases A and B. In case B, some of the stress has already crystallised.

- Finally if policymakers judge that CRE prices are above equilibrium (point C), with elevated risks of a fall, then the drop in CRE prices applied in the stress will be larger than when risks are assessed as around standard (the green arrow). Again, the trough in the stress is similar.

Chart A Stylised example of stress severity across the cycle — commercial real estate prices^(a)



(a) This chart plots an example path for imbalances in CRE prices, which are defined as deviations in CRE prices from an estimated equilibrium. In this example detrending is important because equilibrium CRE prices are likely to rise over time.

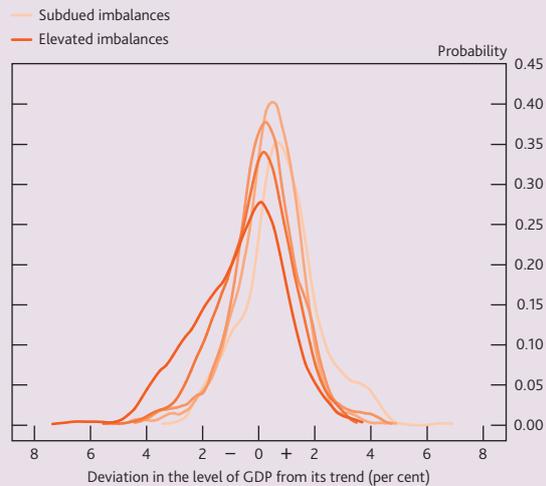
The principle of linking policymakers' risk assessments to the severity of the scenario is based on evidence that more severe outcomes are more likely when imbalances or risks are more elevated in the preceding period. **Chart B** illustrates that point; historical advanced-economy data suggest that when conditions in credit and financial markets are particularly exuberant, the probability of weak macroeconomic outcomes in the future is greater.

Judging the state of risks is not, however, synonymous with forecasting adverse shocks. Policymakers aim to ensure that UK banks are adequately capitalised against shocks that **could** materialise, not just those that they think are most likely.

This process will be symmetric. For example, the calibration of the stressed path for Brazilian GDP in the 2016 test provides an example of how the extent of further stress will be smaller after risks begin to crystallise. In the baseline for the 2015 test and in line with the IMF's October 2014 *WEO* forecast, Brazil's real GDP was projected to increase in 2015, while under the Bank's 2015 stress scenario it fell materially.

Subsequently, Brazil entered recession during the second quarter of 2015 and the IMF expects Brazil to remain in recession in 2016. Reflecting this, the baseline forecast for

Chart B Estimated relationship between imbalances and outturns in advanced-economy GDP growth^(a)



Sources: Bank for International Settlements, national sources, OECD, Thomson Reuters Datastream and Bank calculations.

(a) Each line shows the distribution of outturns in GDP that have occurred historically across advanced economies following a given level of imbalances in credit and financial markets. A simple measure of imbalances has been used to construct this chart — it evenly weights deviations in total credit to GDP, the house price to earnings ratio and the current account from their estimated equilibriums — these metrics are widely available across countries and time. In practice, the FPC and PRA Board take into account a much richer set of information to measure imbalances. The imbalance measure has been divided into quintiles to produce the five lines on the chart. The lines show that as imbalances increase, the left tail of the distribution grows, suggesting that the probability of a weak outturn in GDP is higher at higher levels of imbalances. For example, the darkest line shows GDP outturns that have occurred historically in advanced economies following periods in which imbalances have been very high — in the top 20% of observations. GDP outturns are measured as deviations in the level of GDP from its trend three years after imbalances are measured, where the trend in GDP is calculated using a one-sided HP filter. The chart pools data from 20 advanced economies from 1970 to 2015.

Brazilian GDP in the 2016 ACS has been revised downwards. And given that some of the risks associated with financial conditions in Brazil have started to crystallise the magnitude of remaining risks has diminished. As a result the stressed path for Brazil's GDP in the 2016 ACS is closer to the baseline projection than is the case for some other economies.

What to expect from the ACS framework going forward

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

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

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

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

2.3 High-level description of the 2016 stress scenario

This section provides a summary of the manifestation of the 2016 stress scenario.

The following high-level scenario narrative is intended to help explain the stresses explored in the 2016 ACS. A more detailed description of the 2016 stress scenario is provided in Section 2.4.

In the Bank's 2016 stress scenario vulnerabilities across financial markets and the global and UK economies crystallise. The stress scenario incorporates a synchronised global downturn in output growth. Relative to the baseline scenario, growth in China and Hong Kong is particularly adversely affected. GDP growth troughs at -1.9%, as it did during the 2008 global financial crisis.

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 with emerging market currencies depreciating against the US dollar. Other asset prices fall sharply. Having fallen significantly during 2015, the price of oil troughs at US\$20 per barrel, reflecting the further slowdown in world demand.

Interest rates facing households and businesses increase in the early part of the stress, partly reflecting a rise in term premia on relatively safe long-term government debt. Credit spreads on more risky assets such as corporate bonds rise sharply too. Bank funding spreads also increase. Although policymakers pursue additional monetary stimulus, which starts to reduce long-term interest rates, the overall cost of credit rises in the short term.

In common with other risky asset prices, property prices fall globally. Falls in Chinese and Hong Kong property prices are particularly pronounced, following rapid recent growth. In the United Kingdom, residential property prices fall by 31% — this

is particularly concentrated in regions which have recently experienced more rapid price increases.

UK CRE prices fall by 42%, with materially greater falls in prime CRE prices which have risen robustly since the financial crisis, and were around their pre-crisis peak at the end of 2015. Other CRE prices fall less precipitously, reflecting less rapid growth since the crisis.

The level of UK GDP falls by 4.3%, accompanied by a 4.5 percentage point rise in unemployment. 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. UK productivity growth remains weak, limiting the recovery in UK activity through the latter part of the stress horizon.

2.4 Detailed description of the 2016 stress scenario

This section describes some of the important aspects of the 2016 macroeconomic stress scenario in more detail. It includes description of some aspects of the scenario not included in the set of stressed macroeconomic variable paths, which can be found on the Bank's website.⁽¹⁾ In part, this is intended to help guide stress-test participants in generating their own stressed projections for those aspects.

As in the 2015 stress test, the 2016 stress scenario spans a five-year period. It begins in 2016 Q1 and extends through to 2020 Q4.

Global output contracts by close to 2% over the first year of the stress scenario as economies around the world experience severe and synchronised slowdowns. The magnitude of this contraction is broadly similar to that experienced during the 2008 financial crisis, although the mix of shocks is different, with the Chinese economy, for example, experiencing a larger downturn under the 2016 stress scenario than it did in 2008.⁽²⁾ Subsequently, growth resumes, averaging around 3.3% per annum over the final three years of the stress, but the level of output remains persistently below baseline.

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 170 basis points in 2015 Q4 to around 500 basis points by 2016 Q4, while high-yield US corporate bond spreads rise from around 640 basis points to around 1,690 basis points over the same period. Liquidity conditions deteriorate and liquidity risk premia rise across a number of financial markets.

(1) See www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/variablepaths.xlsx.

(2) According to International Financial Statistics (IFS) data provided by the IMF, the trough in annual PPP-weighted world GDP growth was -1.9%.

Term premia on long-term government debt rise over the first year of the stress before falling back. For example term premia on ten-year US government debt rise by 250 basis points, while term premia on ten-year UK government debt rise by 215 basis points.

The US dollar appreciates as some capital is withdrawn from emerging market economies. The US dollar appreciates by 10% against the Chinese renminbi, though the US dollar/Hong Kong dollar peg holds in the scenario, as the Hong Kong authorities support the peg. The Hong Kong interbank lending rate (Hibor) rises substantially. The dollar appreciates by 10% against EMEs.

Measures of market volatility also rise, with the VIX index averaging 37 during 2016 in the stress. That compares to a quarterly average of around 40 between H2 2008 and H1 2009, during the financial crisis.

UK output contracts by 4.3% over the first year of the scenario. Reflecting the fall in output, unemployment peaks at 9.5% in 2017. 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.

As the economy weakens, long-term interest rates rise and property prices fall. A procyclical withdrawal of buy-to-let investors exacerbates the sharp fall in UK residential property prices, which decrease by 31% from peak to trough. 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 42% from peak to trough.

UK inflation turns negative during 2016, and is close to zero for the first two years of the stress scenario. Meanwhile, nominal household income shrinks by 5.5% and nominal corporate profits contract by 8.5% in 2016. Inflation and nominal household income recover gradually over the final years of the stress scenario though corporate profit growth remains very sluggish.

Monetary policy is assumed to respond. Bank Rate is assumed to be cut to zero, and through further asset purchases under the hypothetical scenario, long-term market interest rates are pushed down, following their initial spike.

Sterling depreciates by 7% against the US dollar in the early part of the stress, while the sterling exchange rate index (ERI) falls by just under 3%. These exchange rate moves then unwind gradually over the remainder of the scenario.

Over the five years of the stress scenario, lending to the UK real economy increases by around 4.5% in total. Banks in the stress test will be expected to submit lending projections

which are consistent with this aggregate profile (see Box 3 on page 20).

Euro-area GDP contracts by 3.0% in 2016, with moderate growth resuming in 2018. Headline euro-area inflation turns negative in 2016 reflecting weaker demand and lower commodity prices, and does not rise above zero until 2017 H2. Meanwhile, core inflation remains weak throughout the scenario. Aggregate unemployment climbs to over 13%, before receding to around 12%, close to its recent peak in 2013.

Residential property prices fall by 15% across the euro area, while CRE prices fall by 25% in the stress. French CRE prices are an outlier, falling by 35%, reflecting rapid recent price increases. 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 further downward pressure on long-term market interest rates.

US GDP contracts by 3% during the first year of the stress scenario while unemployment peaks at 9% in 2017. Thereafter, modest output growth resumes and unemployment falls back.

On a peak to trough basis, US house prices decrease by 19% in the stress, while CRE prices fall by 30%. Residential prices recover somewhat over the final years of the stress horizon ending 11% lower than in 2015 Q4, while CRE prices finish 19% down.

Overall US corporate profitability falls and the cost of corporate credit rises. Spreads on US investment-grade and high-yield corporate bonds rise by around 330 basis points and 1,000 basis points respectively, and equities fall by just over 40%. Corporates involved in the oil and gas extraction industry, and highly leveraged corporates are among those most severely affected.

US government bond yields rise initially as term premia increase. But as the US Federal Reserve injects monetary stimulus by making further large-scale asset purchases, ten-year government bonds fall back to their level at the end of 2015 of around 2.5% by the end of the stress horizon.

China's GDP growth falls from just under 7% a year at the end of 2015 to -0.5% by the end of 2016. Thereafter, it recovers gradually, averaging around 5.3% over the final three years of the stress. This contraction in output is accompanied by a fall in residential property prices of around 35%. Prices recover around half of that fall by the end of 2020.

The slowdown in Chinese economic activity is associated with a weakening in household income growth. Nominal Chinese household income growth slows from around 8.5% in 2015, to an average of 2.4% 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 this stimulus takes time to boost output.

Hong Kong's output, which has been more volatile than China's, over recent decades, contracts by almost 7.5% over the first year of the stress scenario. Risks to property prices in Hong Kong are judged to be elevated. Consistent with that, residential property prices and CRE prices are assumed to fall by 50% and 60% respectively over the first three years of the stress. These falls are accompanied by a widening of the Hibor-Libor spread, as the currency peg to the US dollar comes under pressure. It is assumed that the currency peg holds in the stress.

Economic activity slows similarly in **Singapore, Korea and India** as the downturn in growth becomes more broad-based across Asia. Singapore and Korean GDP contracts by 6.7% and 4.8% respectively, and Indian GDP slows to an annual rate of 2.3%. Actions by authorities support economic recovery from 2017 onwards.

Commodity prices fall in response to the weak global demand conditions. Oil prices fall from US\$43 per barrel at the end of 2015 to around US\$20 per barrel in the stress, and remain around this level until 2018, before rising back to around US\$43 per barrel by the end of the five-year scenario horizon. Other commodity prices also fall and remain weak throughout the scenario.

Falling commodity prices particularly affect economic activity in **Brazil and South Africa**. The current downturn in the Brazilian economy continues in the scenario, with GDP contracting by a further 4.4% over 2016. South African GDP contracts by 3.4% over 2016. Their currencies depreciate by 10% against the US dollar, and this particularly affects companies that have dollar-denominated debt and are not fully hedged financially or do not match their liabilities with dollar assets or revenues.

2.5 Scenario severity

This section places the severity of the macroeconomic scenario into a broader context. In the ACS framework, the severity of stressed paths for key economic variables is directly linked to the FPC and PRA Board's risk assessments associated with those variables (see Box 1 on pages 10–11). Some global shocks in the 2016 stress test are more comparable to those in the Bank's 2015 test, while some of the domestic shocks are

more akin to those contained in the 2014 stress test (see Box 2, pages 15–16).

There is no single variable that summarises the overall severity of the stress scenario. For example, real GDP growth, nominal incomes, unemployment and asset prices are all factors that jointly influence borrowers' capacity to service debt and banks' profitability. Similarly, for any given variable, there is no single measure of severity. For example, it is important to consider how variables develop relative to their starting points in the stress scenario, as well as relative to their baseline projections (see Section 3).

This section covers three areas in turn. First, it considers the assumed shocks to global economic activity across different dimensions. Second, it provides more detail on the shocks to other variables that are important determinants of overall severity. Finally, it compares the stressed path of some of the most significant variables for the UK economy with the MPC's central case projections, as outlined in the February 2016 *Inflation Report*.

Economic activity

The path for world GDP in the stress scenario is a useful summary metric to gauge the severity of the assumed shocks to activity. The annual growth rate of world GDP in 2015 Q4 is estimated to have been 3.2%. In the stress scenario it contracts by 1.9% over 2016, before recovering to grow by 2.5% in 2017. It is clear that the 2016 ACS macroeconomic stress scenario lies firmly at the unlikely end of possible future outcomes. For example, the estimates in the IMF's October 2015 *WEO* suggested that there was around only a 5% chance of global growth being less than 1.5% in 2016.

The contraction in the level of world GDP incorporated in the 2016 ACS is similar to that experienced during the financial crisis (**Chart 2**). However, world growth in the run-up to the 2008 downturn was significantly stronger than it was in 2014 or 2015.⁽¹⁾ In that light, the stress incorporated in the 2016 stress scenario appears a little less severe than the 2008 crisis.

This calibration for world GDP in the stress scenario reflects the FPC and PRA Board's assessment that risks to global activity are elevated.

There is evidence that the correlation between GDP growth in different countries tends to be higher during stressed periods (**Chart 3**). Indeed, the comovement of output during the financial crisis was particularly pronounced. The IMF found that factors such as significant financial interlinkages combined with heightened uncertainty that changed investor perceptions were important contributory factors.⁽²⁾ The

(1) Based on historical PPP-weighted world GDP data from the IFS.

(2) IMF October 2013 *World Economic Outlook*, Chapter 3.

Box 2

Key differences between the Bank's 2016 stress test and the 2014 and 2015 tests

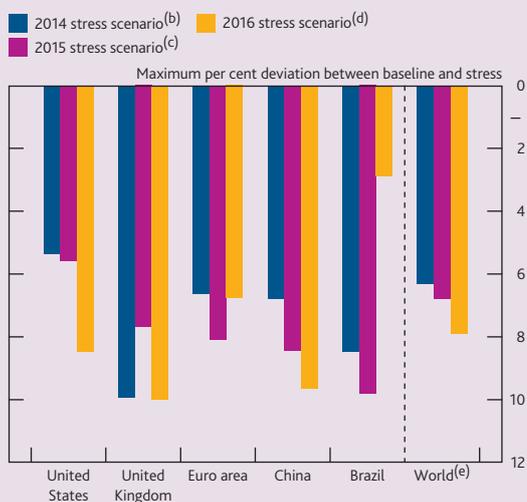
The Bank's 2016 stress test is the first calibrated under its new ACS framework. This box compares the key features of the 2016 test with those of the 2014 and 2015 tests. It discusses the qualitative differences between the exercises and illustrates quantitative differences across key macroeconomic variables.

Qualitative differences between concurrent stress tests

The high-level components of the 2016 and 2015 stress tests are very similar. Both contain a macroeconomic stress scenario, a traded risk stress, which is consistent with the content and calibration of the macroeconomic stress scenario, along with an additional misconduct cost stress. In contrast, the global stress scenario associated with the Bank's 2014 test was designed by the EBA and the exercise did not include an explicit misconduct cost stress.

The orientation of the 2014 and 2015 stress tests was determined by the set of specific risks identified by the FPC

Chart A Differences in severity of GDP stresses across the 2014, 2015 and 2016 exercises^(a)



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

- (a) Chart shows the maximum deviation between calendar-year real GDP in the stress and baseline scenarios, over the three-year (2014 scenario) and five-year (2015 and 2016 scenarios) horizons.
- (b) The 2014 bars are calculated from: (i) the 2014 UK variant scenario (for the United Kingdom) and the 2014 EBA scenario (for foreign economies) in the stress, and (ii) the projections of the MPC as communicated in the February 2014 *Inflation Report* (for the United Kingdom) and the European Commission's Winter 2014 forecast (for foreign economies) in the baseline.
- (c) Baseline projections in 2015, other than for the UK, are consistent with the IMF's projections in the October 2014 IMF *World Economic Outlook*. Bank staff have quarterly interpolated the original annual series.
- (d) Baseline projections in 2016, other than for the United Kingdom, are largely consistent with the IMF's projections in the October 2015 IMF *World Economic Outlook*. Bank staff have quarterly interpolated the original annual series. The baseline projection for Brazil is based on the IMF's January 2016 *World Economic Outlook Update*, to take account of material news between October and year-end. Bank staff have extended the profile to 2020.
- (e) World GDP is weighted by purchasing power parity.

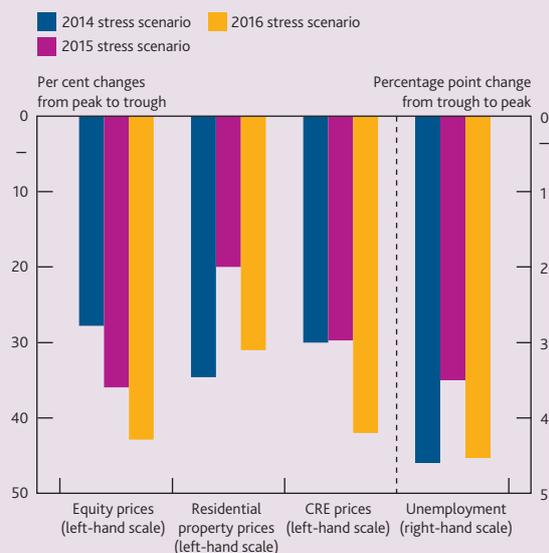
and PRA Board as significant and in need of further exploration. The 2014 stress test focused on risks to the UK household sector, and included a large fall in house prices and a sharp rise in unemployment, triggered in part by a sharp rise in interest rates. The 2015 stress test focused more on global risks, associated particularly with a sharp contraction in growth in China and other EMEs, as well as the euro area, accompanied by a fall in long-term interest rates. In so doing, the 2015 stress test incorporated a less severe stress for banks' UK exposures.

Quantitative differences between the 2016 macroeconomic scenario and previous concurrent stress tests

The 2016 stress scenario incorporates a more severe global stress than either the 2014 or 2015 stress scenarios, relative to the respective baseline forecasts (**Chart A**). Part of the explanation for that larger shock to global output is the severity of the stress to US GDP growth in the 2016 test, which is significantly greater than in the 2014 and 2015 exercises, reflecting the implementation of the new framework. Risks to US activity are judged to be around their standard level.

In line with the FPC and PRA Board risk assessment described in Section 2.2, the stress is slightly more severe for China than it was in 2015, when the stress test focused on exploring risks to UK banks from their Hong Kong, Chinese and other EME exposures. Brazilian GDP growth is much less affected in the 2016 stress than in previous exercises (see Box 1 on pages 10–11 for further discussion).

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



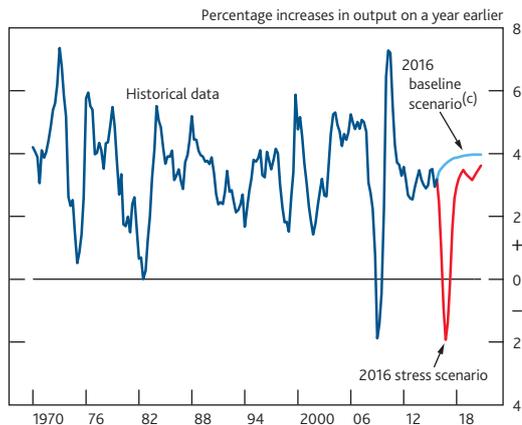
Sources: Halifax, MSCI Investment Property Databank, Nationwide, ONS, Thomson Reuters Datastream and Bank calculations.

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

The 2016 stress test incorporates a domestic stress which is broadly as severe as the 2014 exercise in terms of its impact on GDP and unemployment. That said, there are significant differences between the UK scenarios incorporated in the two tests. The stress to UK residential property prices is slightly less severe in the 2016 test. Other financial market and asset price shocks such as those to UK equity prices and CRE prices are, however, more severe in the 2016 exercise (Chart B).

Overall, the stress incorporated in the 2016 test is broader than either of the stresses in the preceding concurrent tests. That reflects the desire of policymakers to use the stress-test framework to help set capital requirements and buffers for all stress-test participants each year.

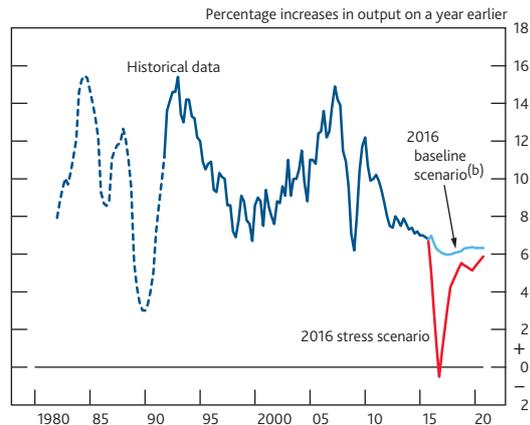
Chart 2 Annual growth in world real GDP^{(a)(b)(c)}



Sources: IMF *International Financial Statistics*, IMF October 2015 *World Economic Outlook (WEO)* and Bank calculations.

- (a) Annual growth is defined as quarterly GDP relative to the same quarter in the previous year.
- (b) Historical data until 2015 Q3 are non seasonally adjusted annual growth rates. The 2015 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 2015 *WEO*. Bank staff have interpolated the original series from annual to quarterly.

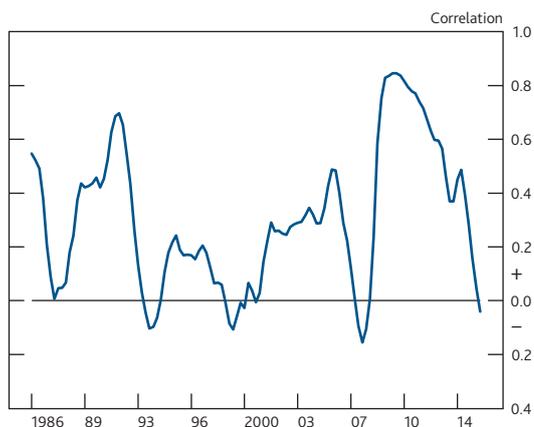
Chart 4 Annual growth in Chinese real GDP^(a)



Sources: IMF October 2015 *WEO*, National Bureau of Statistics of China, Thomson Reuters Datastream and Bank calculations.

- (a) Annual growth is defined as quarterly GDP relative to the same quarter in the previous year. Solid line is data from the National Bureau of Statistics of China. Dashed line is based on annual data from the IMF *WEO* database which has been interpolated by Bank staff from annual to quarterly.
- (b) The baseline projection is consistent with the IMF's projections in the October 2015 *IMF WEO*. Bank staff have interpolated the original series from annual to quarterly.

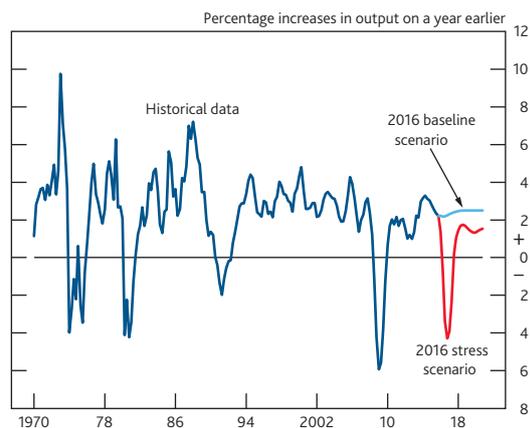
Chart 3 Average correlation between GDP growth rates in selected economies^(a)



Sources: ONS, Thomson Reuters Datastream and Bank calculations.

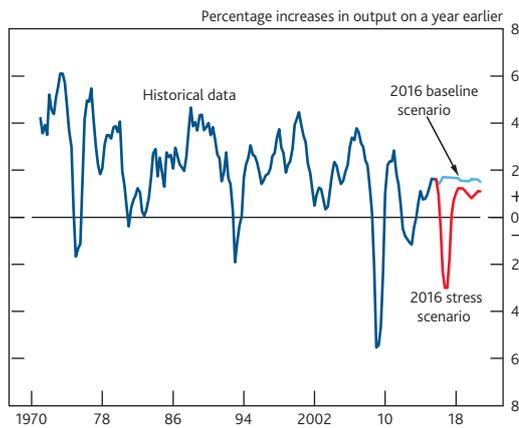
- (a) Chart shows averages of pairwise correlations for Brazil, China, euro area, Hong Kong, India, Singapore, South Africa, South Korea, the United Kingdom and the United States. The pairwise correlations are PPP-weighted, and allow for changing weights over time. Correlations are calculated over four-year rolling windows.

Chart 5 Annual growth in UK real GDP^(a)



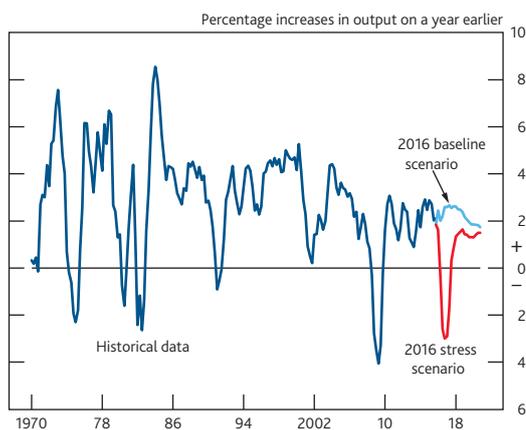
Sources: ONS and Bank calculations.

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

Chart 6 Annual growth in euro-area real GDP^{(a)(b)}

Sources: ECB working paper No. 42: 'An Area-wide Model (AWM) for the euro area' by Gabriel Fagan, Jérôme Henry, and Ricardo Mestre (2001), Eurostat and Bank calculations.

(a) Annual growth is defined as quarterly GDP relative to the same quarter in the previous year.
 (b) Historical data up to end-1994 are taken from the Area-Wide Model dataset described in the ECB working paper No. 42. Historical data from 1995 onwards are taken from Eurostat.

Chart 7 Annual growth in US real GDP^(a)

Sources: Thomson Reuters Datastream and Bank calculations.

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

calibration of the global output stress scenario is consistent with an assumption that these channels would operate again.

Chinese real GDP contracts a little in the scenario. This is substantially weaker than earlier downturns reflecting a lower baseline growth path and the assessment that risks facing the Chinese economy are elevated (**Chart 4**).

For the United Kingdom, euro area and the United States, the decline in economic activity in the stress scenario is within the bounds of historical experience. This is in line with the assessment that overall, risks associated with credit, financial and other asset markets are around their standard level for these economies. **Charts 5 to 7** show growth in real GDP for these economies since 1970, as well as in the stress scenario.

The 4.3% contraction in UK output incorporated in the 2016 ACS is as large, or larger, than all UK downturns observed since the Second World War, with the exception of the recession

associated with the 2008 financial crisis. In aggregate, imbalances in credit, financial and other asset markets were more elevated in the run-up to the financial crisis than they are at present.

The FPC and PRA Board have judged that, for a given level of risk, the severity of the UK scenario should be greater than for the world economy. That reflects the evidence that the variation in global GDP is lower than that of UK GDP because it is more diversified in nature. Adjustment has been made, however, to reflect the evidence that performance of economies becomes more highly correlated in crises (**Chart 3**).

Severity of other macroeconomic variables

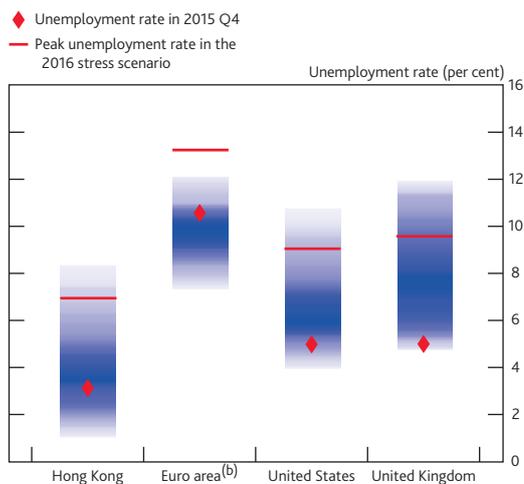
The overall severity of the stress is not only determined by what happens to GDP growth. Several other variables influence borrowers' ability to service debt and banks' profitability. Unemployment and property prices are two such variables, which are likely to materially affect the results of the stress test. This section compares the projections for these variables in the stress scenario with outturns in historical data across selected economies.

The paths for unemployment in the stress scenario are broadly consistent with historical relationships between GDP and unemployment in selected economies. **Chart 8** illustrates how the level of the unemployment rate in the scenario compares to historical outturns in selected countries since the early 1980s. The shading is constructed so that the darkest point represents the median unemployment rate: as many historical outturns have been above that, as they have below. The red line shows the peak unemployment rate in the stress scenario for each economy. The chart does not adjust for changes over time in the natural rate of unemployment. In order to give some indication of that, the red diamond shows the level of unemployment in each jurisdiction in 2015 Q4.

Chart 8 shows that for the United States, the United Kingdom and Hong Kong, the peak unemployment rate in the scenario is within historical experience. But more importantly, the change from current level to the peak level in the stress scenario is large and extremely unlikely by historical standards. The euro area starts the scenario with an unemployment rate that is already high relative to history, reflecting the effect of past economic weakness. Despite that past weakness, however, risks are not judged to be subdued. So the level of unemployment reached in the stress scenario lies at the extreme end of the distribution of past unemployment rates.

Historical cross-country data on the performance of economies following banking crises provide a good benchmark against which to judge the severity of the 2016 stress scenario, as these crises could be considered 'tail-risk' events. Such a cross-country comparison of property price outturns suggests that the residential property price projections incorporated in

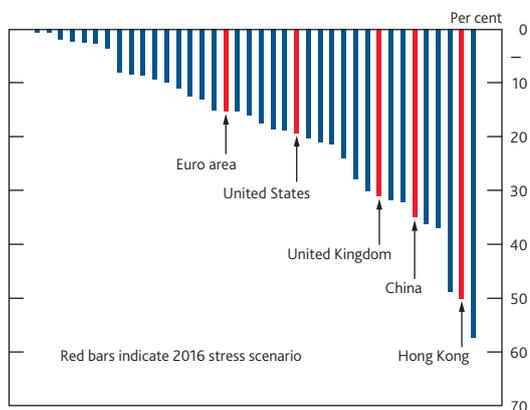
Chart 8 Unemployment in the 2016 stress scenario compared to historical experience since the 1980s^(a)



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

- (a) The shaded diagrams are a graphical representation of the historical distribution of the level of the unemployment rate since 1981. Data are quarterly. The shading is constructed so that the darkest point represents the median: as many historical outturns have fallen above that, as they have below. The shading lightens in either direction to illustrate observations further away from the median. The red lines show the peak unemployment rates in the 2016 stress scenario.
- (b) Up to 1990 Q2, the euro-area unemployment rate is a weighted average across major euro-area countries, interpolated to quarterly frequency (from annual) by Bank staff. Data availability varies over this period; at a minimum eleven countries are included. All euro-area data are sourced from the OECD.

Chart 9 Peak-to-trough falls in residential property prices in international banking crises and in the 2016 stress scenario^{(a)(b)}



Sources: Federal Reserve Board, Halifax, Nationwide, OECD Housing Prices Database, Rating and Valuation Department — the Government of the Hong Kong Special Administrative Region, Statistics Iceland, Thomson Reuters Datastream and Bank calculations.

- (a) Peak-to-trough falls in residential property prices. Data is at a quarterly frequency. Residential property prices are defined in the scenario only for China, the euro area, Hong Kong, the United Kingdom and United States.
- (b) Definition of banking crises as in Laeven, L and Valencia, F (2012), 'Systemic banking crises database: an update' and Caprio, G, Klingebiel, D, Laeven, L and Noguera, G (2005), 'Appendix: banking crisis database' in *Systemic financial crises: containment and resolution*, subject to data availability. Covers banking crises in economies that are currently classified by the IMF as 'advanced economies' and emerging markets that are part of the group of G20 countries. Only crises associated with a fall in residential property prices are shown in the chart. Time from peak to trough is limited to five years.

the 2016 ACS for the United States and euro area are broadly towards the middle of the distribution of relevant historical outturns (Chart 9). By contrast, property price falls in Hong Kong, and to a lesser extent China, are much closer to the top of that distribution, reflecting the assessment that risks in those markets are elevated.

Severity of UK headline macroeconomic variables

This section compares the main UK macroeconomic elements of the 2016 stress scenario to the latest projections of the MPC as communicated in the February 2016 *Inflation Report*.

The paths for UK real GDP and unemployment in the 2016 stress scenario lie outside these fan charts, demonstrating that these outturns are clearly in the tail of the distribution of possible future outcomes (Charts 10 and 11).

The path of UK inflation in the stress lies within the fan chart. This reflects a pickup in the growth of some costs in the stress, despite the fall in demand (Chart 12). For example, import costs rise due to the depreciation of sterling, and productivity growth is weak, putting upward pressure on unit wage costs.

2.6 Approach to traded risk

As in 2015, the 2016 stress test will incorporate a traded risk scenario that has been designed by Bank staff. This element of the 2016 stress test will principally examine the resilience of the investment banking operations of UK banks to a severe financial market shock.

The traded risk component of the 2016 stress test requires banks to apply an instantaneous price shock to their market risk positions as of 19 February 2016.⁽¹⁾ Any available-for-sale (AFS) and fair value option (FVO) positions in the banking book are stressed over the full five-year stress scenario, starting end-2015. The price shock applied to the trading book and the full five-year stress scenario applied to AFS and FVO positions will translate into losses and gains to a firm's capital resources and changes to its risk-weighted assets. In 2015, the traded risk element of the stress test formed an important element of the overall impact of the stress scenario on banks' capital positions.⁽²⁾

The scenario has been designed to be consistent with the macroeconomic scenario — both in terms of the broad movements in market prices and the types and locations of counterparties affected — and to take account of the liquidity of trading book positions.

The calibration of shocks to market prices in the traded risk scenario reflects the FPC and PRA Board's risk assessments concerning financial markets and is in line with the Bank's approach to implementing the ACS framework, described in Box 1, pages 10–11. The FPC and PRA Board have judged it appropriate to allow changes in financial market prices between the start of 2016, the balance sheet cut-off date for the macroeconomic stress, and 19 February to be reflected in the severity of the traded risk shocks applied under the stress.

(1) Other aspects of the stress test use end-2015 as the balance sheet cut-off date. For traded risk, end-year balance sheets may be less representative.
 (2) For more detail on the Bank's traded risk methodology for the 2016 stress test see www.bankofengland.co.uk/financialstability/Pages/fpc/stresstest.aspx.

Chart 10 UK real GDP projection in the stress scenario relative to the February 2016 *Inflation Report* projection

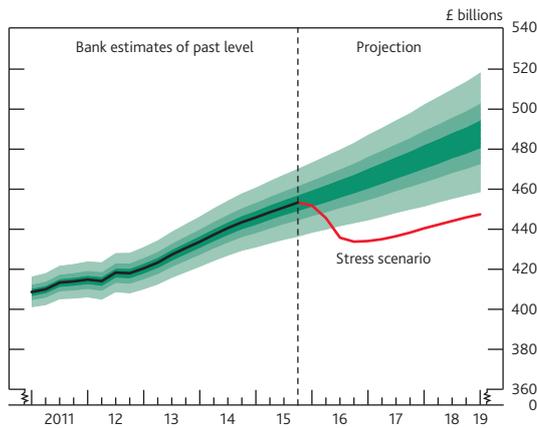


Chart 11 UK unemployment in the stress scenario relative to the February 2016 *Inflation Report* projection

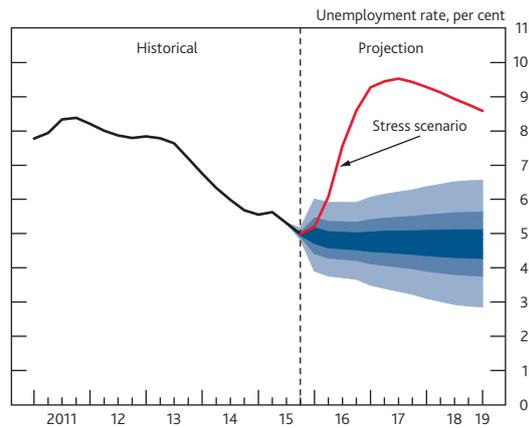
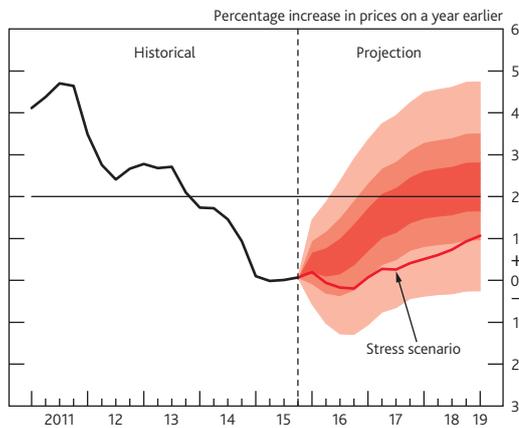


Chart 12 UK inflation in the stress scenario relative to the February 2016 *Inflation Report* projection



Sources: ONS and Bank calculations.

The fan charts depict the probability of various outcomes for real GDP, the unemployment rate and CPI inflation. They have been conditioned on the assumption that the stock of purchased assets financed by the issuance of central bank reserves remains at £375 billion throughout the forecast period and that Bank Rate follows a path implied by market interest rates in the fifteen working days to 27 January 2016. For GDP, to the left of the vertical dashed line, the black line is the Bank's best guess of the level of real GDP over the past. This line and the distribution around it take into account possible revisions to the ONS data in coming years. To the right of the vertical dashed line, for all charts, the distribution reflects uncertainty over the evolution of GDP, CPI inflation or the unemployment rate in the future. For unemployment, the fan begins in 2015 Q4, a quarter earlier than the fan for CPI inflation. That is because Q4 is a staff projection for the unemployment rate. If economic circumstances identical to today's were to prevail on 100 occasions, the MPC's best collective judgement is that CPI inflation, the unemployment rate or the mature estimates of GDP would lie within the darkest central band on only 30 of those occasions. The fan charts are constructed so that outcomes are also expected to lie within each pair of the lighter coloured areas on 30 occasions. In any particular quarter of the forecast period, GDP, CPI inflation or the unemployment rate are therefore expected to lie somewhere within the fan on 90 out of 100 occasions. And on the remaining ten out of 100 occasions they can fall anywhere outside the coloured area of the fan chart. See the box on pages 48–49 of the May 2002 *Inflation Report* for a fuller description of the fan chart and what it represents.

Specifically, if there have been significant changes in market prices prior to 19 February — which would be reflected in firms' actual profit and loss up to that date — then the shocks applied under the stress test will be correspondingly smaller.

The impact of a financial market shock on banks' trading books will be critically dependant on the liquidity of their positions and, in particular, how the liquidity of these positions may be reduced in a stress scenario. This element of the approach to traded risk reflects policymakers' concerns about market liquidity risks, described in Section 2.2. As in 2015, 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.

Consistent with the macroeconomic scenario, the 2016 stress test will examine the ability of banks to withstand the default of seven counterparties that would be vulnerable to the macroeconomic scenario. 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 impact of the default of a portion of counterparties falling within a specific sector vulnerable under the scenario.

2.7 Approach to misconduct costs

In addition to the macroeconomic and traded risk elements of the stress, the 2016 stress test also incorporates stressed projections for potential misconduct fines and other costs

Box 3

Aggregate UK lending profiles 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 for the Bank's 2015 stress test, the Bank has calibrated the scenario based 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.

The Bank has published paths for aggregate lending to UK households and private non-financial corporates (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.⁽¹⁾

Over the five years of the stress scenario, lending to the UK real economy increases by around 4.5% in total (**Chart A**). During the first two years of the stress scenario, lending contracts, as a result of weaker business investment and lower

beyond those paid or provided for by the end of 2015 — the start point of the scenario.

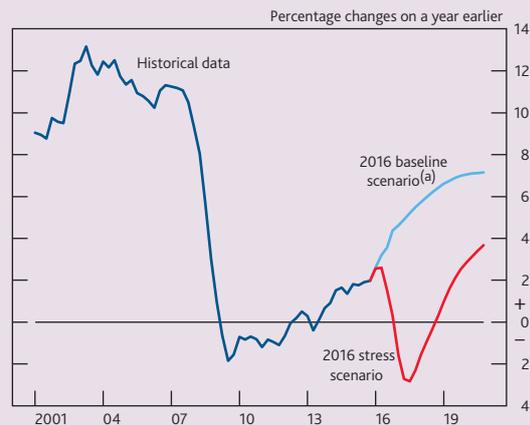
There remains a very high degree of uncertainty around any approach to quantifying misconduct cost risks facing UK banks. Following very similar methodology to that applied in the Bank's 2015 stress test, the stressed projections for misconduct costs over and above those incurred or provided for at end-2015 will 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.

3 Baseline

In addition to the stress scenario, the 2016 test will assess projections of banks' profitability and capital ratios under a baseline macroeconomic scenario. The UK macroeconomic variables in the baseline scenario have been developed by Bank staff and are broadly consistent with the forecasts published in the February 2016 *Inflation Report*. The

Chart A Lending to UK individuals and PNFCs



Sources: Bank of England and Bank calculations.

(a) The baseline projection is designed to be broadly consistent with the forecasts published in the February 2016 *Inflation Report*.

household appetite for borrowing. Loan demand is also dampened in the early part of the stress scenario by a rise in the cost of credit, as increases in bank funding costs are assumed to be passed through into loan rates. Lending recovers somewhat thereafter as the fall in bank funding costs reduces the cost of borrowing, and economic activity increases.

(1) For further guidance on details provided to participating banks on balance sheet modelling see the *Guidance for participating banks and building societies*; www.bankofengland.co.uk/financialstability/Pages/fpc/stresstest.aspx.

international macroeconomic variables are largely consistent with the IMF's October 2015 *WEO* projections. The remainder of this section provides a short summary of the key features of the baseline scenario.

World PPP-weighted GDP has grown at an average rate of around 3.5% a year since its 2009 trough. Having slowed slightly during 2015, world GDP growth is projected to rise from 2016 onwards in the baseline projection, averaging 3.8% through the five-year horizon. This is marginally weaker than the baseline incorporated in the Bank's 2015 stress test, in which world GDP grew by an average of 4%.

Advanced economies continue to recover in the 2016 baseline, albeit at different rates. US growth is expected to peak at 2.6% in 2017. Growth in the euro area is weaker, peaking at 1.7% in 2017. Chinese growth slows to around 6% over the first two years of the projection, before picking back up to around 6.3% by the end of 2020. In the near term, past declines in oil prices push down on inflation globally. Euro-area inflation remains low through the horizon, reaching 1.7% by 2020.

In the United Kingdom, growth remains fairly solid in the near term, averaging 2.2% in 2016 before rising a little thereafter. In common with the baseline for world growth, however, the

UK baseline output projection is slightly weaker than the baseline incorporated in the Bank's 2015 stress test. Unemployment continues to drift down slightly, settling at around 4.7%. Inflation remains low for much of 2016 before picking up to a little above 2% in 2018. These projections are consistent with the modal projections presented in the Bank's February 2016 *Inflation Report*. Asset prices continue to rise throughout the baseline scenario.

4 Hurdle rate

Policy response to the stress test and hurdle rate framework

The results of the stress test, together with the results of stress tests that banks conduct as part of their ICAAPs — which may feature firm-specific tests prescribed by the PRA — provide the FPC and the PRA with a rich information set.⁽¹⁾ These results, and other relevant information are used by each of the FPC and the PRA to co-ordinate their policy responses to ensure that the banking system as a whole, and individual banks within it, have sufficient capital to absorb losses and maintain the supply of credit to the real economy in a stress. They can do so by adjusting a range of regulatory capital buffers, including the UK countercyclical capital buffer, sectoral capital requirements (SCRs) and the PRA buffer. The PRA may also require a bank to take action to strengthen its capital position, depending on the PRA's assessment of that bank's capital adequacy.

4.1 Setting capital buffers

Should the FPC and the PRA decide to change capital buffers following the stress test, the FPC will move first. It will consider the stress-test results as it evaluates the overall capital adequacy and resilience of the UK financial system. In making these judgements, the FPC will be looking at, among other things, the number of institutions that suffer very sharp declines or very low capital or leverage ratios post-stress; indications that system-wide bank behaviour in a stress could adversely affect the macroeconomy or the stability of other parts of the financial system; and widespread sectoral concentrations in losses. If the exercise and other indicators reveal inadequate systemic resilience, the FPC will consider the case for adjusting system-wide capital buffers. In producing their balance sheet projections under the stress scenario, banks should assume that the FPC will set the CCyB rate at zero in the stress.

The PRA will then consider the capital adequacy of each individual bank. In making these judgements, the PRA will take into account all available information, including the results of the stress test, any system-wide buffer that has been set, any steps the bank has taken to strengthen its capital position since the start of the exercise, and the risk management and governance capabilities of the bank, in line with the approach to Pillar 2B set out in the Pillar 2 policy

statement.⁽²⁾ If the exercise reveals a bank's capital position needs to be strengthened further, the PRA will consider the case for adjusting the PRA buffer.

4.2 Hurdle rate framework

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

A key determinant of whether a bank will be required to take action as a result of the stress test is where its capital ratio falls in the stress scenario, relative to the level of capital that banks are expected to maintain in the stress.⁽³⁾ That level of capital is often referred to as the 'hurdle rate'.

In the 2015 stress test, the hurdle rate framework included a threshold set at 4.5% of risk-weighted assets to be met with common equity Tier 1 (CET1) capital and a 3% leverage ratio threshold to be met with Tier 1 capital (of which relevant additional Tier 1 (AT1) instruments would be permitted to comprise up to 25%). There was a strong presumption of action if a bank's capital was projected to fall below these thresholds in the stress.

Banks are permitted to submit a limited set of credible management actions that they could realistically take in a stress to improve their capital positions.⁽⁴⁾ Improving stressed capital ratios through deleveraging (in particular relative to banks' baseline plans) would be constrained (see Box 3 on page 20).

As set out in the *Approach Document*, to improve the consistency between the concurrent stress test and the regulatory capital framework, the hurdle rate framework will evolve in two ways, starting with the 2016 stress test.

First, each bank will be expected to meet its minimum risk-based CET1 capital requirements in the stress scenario. This is comprised of both the internationally agreed minima ('Pillar 1') and any uplift to that minimum capital requirement set by the PRA through Pillar 2A.⁽⁵⁾ Pillar 2A is intended to correct for risks that are not captured (or not adequately captured) in Pillar 1, such as risks associated with banks' own

(1) For more details about the stress testing firms are expected to undertake as part of their ICAAPs, see www.bankofengland.co.uk/prapages/supervision/activities/anchorsscenario.aspx.

(2) For more information see www.bankofengland.co.uk/prapages/Documents/publications/ps/2015/ps1715.pdf.

(3) The hurdle rate framework outlined in this section also applies to banks' baseline projections.

(4) For further details on the guidance issued to participating firms associated with management actions, see www.bankofengland.co.uk/financialstability/Pages/fpc/stresstest.aspx.

(5) All participants in the 2016 stress test with December financial year ends have disclosed their current Pillar 2A requirements in their 2015 Annual Reports. Nationwide, which has an April year end, disclosed its current Pillar 2A requirement in its 2015–16 Interim Results.

pension schemes. Given that, the Bank judges that Pillar 2A CET1 should be treated in the same way as Pillar 1 CET1 requirements, and therefore be explicitly and transparently included in the hurdle rate. As Pillar 2A varies across banks, this will mean there is no longer a common CET1 risk-weighted hurdle rate across all banks. As in 2015, each bank will continue to be expected to meet its minimum 3% Tier 1 leverage ratio requirements.

A second change is that the 2016 stress test will more closely mirror the overall capital framework by considering the results for systemic banks against not just the hurdle rate but also a 'systemic reference point'.

Barclays, HSBC, RBS and Standard Chartered have been designated as global systemically important banks (G-SIBs), with associated risk-weighted G-SIB capital buffers that, by 2019, will range between 1% and 2.5% of CET1 capital. Each of these banks will also have an additional leverage buffer to reflect their systemic importance, set at 35% of their corresponding risk-weighted capital buffer. The phasing in of these buffers began at the start of 2016 and will proceed in equal increments, with the buffers coming into full effect in 2019. The Bank intends to use the sum of the hurdle rate and these G-SIB buffers as they are phased in as an additional systemic reference point against which to assess the impact of the stress scenario on global systemically important banks.⁽¹⁾

The introduction of this systemic reference point balances the desire to hold systemic banks to higher standards with the need to preserve the usability of the G-SIB buffer. All capital buffers are usable in a real stress and serve a macroprudential purpose: by absorbing the impact of the stress they reduce the incentive for banks to withdraw services, such as credit provision to the real economy. The purpose of the G-SIB buffer is to ensure that banks judged to be globally systemically important can withstand a greater stress than those who are not, reflecting the greater economic cost of their failure. The severity of the concurrent stress scenario reflects the FPC and PRA risk tolerance for the banking system as a whole. Using the G-SIB buffer as an additional reference point for global systemically important banks ensures these banks could absorb an even greater stress in practice.

Given the changes to the hurdle rate framework, and the introduction of systemic reference points described above, **Table B** illustrates how the hurdle rate and systemic reference point for an example bank might evolve through the 2016 stress scenario period. In this illustrative example, the bank has Pillar 2A CET1 capital set at 2% of risk-weighted assets — close to the average for stress-test participants as disclosed in banks' annual accounts. The example bank also has a G-SIB buffer which will eventually rise to 1.5% and therefore an additional leverage buffer that will rise to 0.53% in 2019.

Table B Illustrative example of how a hypothetical bank's hurdle rate and systemic reference point would evolve during the 2016 stress-test scenario^(a)

CET1 capital ratio (per cent of risk-weighted assets)					
	Pillar 1	Pillar 2A	Hurdle rate	G-SIB buffer	Systemic Reference Point
2016	4.5	2	6.5	0.38	6.88
2017	4.5	2	6.5	0.75	7.25
2018	4.5	2	6.5	1.13	7.63
2019 and beyond	4.5	2	6.5	1.5	8.00
Tier 1 leverage ratio (per cent of leverage exposure measure)					
2016			3	0.13	3.13
2017			3	0.26	3.26
2018			3	0.39	3.39
2019 and beyond			3	0.53	3.53

(a) Numbers rounded to two decimal places.

For two banks otherwise alike, the supervisory response to a bank projected to fall below its hurdle rate in the stress will be more intensive relative to a bank projected to fall below its systemic reference point. For banks projected to fall below their hurdle rates in the stress, there is a strong presumption that the PRA will require them to take action to strengthen their capital positions. G-SIBs projected to fall below their systemic reference point, but not their hurdle rate, will still be expected to strengthen their capital positions. But the intensity of these actions will, all other things equal, be less intensive across one or more dimensions, including:

- **Time to restore:** the time afforded to stress-test participants to restore their capital positions.
- **Source of capital generation:** whether stress-test participants are expected to raise internal or external capital.
- **Quality of capital to be raised:** whether stress-test participants are expected to raise CET1 or AT1 capital.
- **Extent of the breach:** the supervisory response may take account of extent to which a bank is projected to fall below its systemic reference point or its hurdle rate.

This approach is consistent with the internationally agreed desire to hold systemic banks to higher standards while preserving the usability of the G-SIB buffer in a real-life stress event.

If a bank's capital ratio was projected to remain above both its hurdle rate, and where relevant, its systemic reference point,

(1) A systemic risk buffer, due to be introduced from 2019, will be applied to individual institutions by the PRA. When it comes into effect, it is envisaged that this systemic risk buffer would also form part of the systemic reference point under the ACS framework. For more details see www.bankofengland.co.uk/financialstability/Documents/fpc/srbf_cp.pdf.

the PRA may still require it to take action to strengthen its capital position. Examples of factors the PRA 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; the adequacy and quality of its recovery and resolution plans; and the extent to which potentially significant risks are not quantified adequately or fully as part of the stress.

The Bank judges that these developments are necessary to improve consistency between the assessment criteria used in the stress test and the UK capital framework, as well as to improve transparency about capital requirements. Including

Pillar 2A CET1 capital in the hurdle rate and adding a systemic reference point for global systemically important banks will mean, however, that there is no longer a common hurdle rate across all banks.

5 Publication of results

The results of the 2016 ACS will be published in 2016 Q4. The Bank is committed to disclosing the information necessary to explain the stress-test results. The Bank intends to disclose at least as much bank-specific information about the headline impact of the stress on capital adequacy as it did in the 2015 stress-test results publication.