



Banc Ceannais na hÉireann  
Central Bank of Ireland

Eurosystem

# Systemic Risk Pack

March 2019

Content reflects data available on - or before - 13 February 2019

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# Contents

Introduction.....	3
Heatmaps.....	5
Specific Indicators.....	7
Heatmap glossary.....	11
Chart Metadata.....	16



# Systemic Risk Pack

## March 2019

Both domestic and international experiences have demonstrated the damaging effects brought about by a build-up of systemic risks in financial systems. The collection and reporting of macro-prudential indicators facilitates the assessment of these risks and can help identify the emergence of vulnerabilities within the financial system. Systemic risk can build up from a myriad of sources via a variety of channels over time. As a result, the monitoring of systemic risk requires a multi-faceted approach encompassing a wide range of indicators.

As Ireland's macro-prudential authority, the Central Bank of Ireland (the Central Bank) is responsible for the monitoring of risks to financial stability and the implementation of policies to mitigate the impact of those risks on both the financial system and the real economy.<sup>1</sup> Intermediate objectives are necessary to monitor progress toward achieving these high-level goals. The intermediate objectives of macro-prudential policy are:

1. to mitigate and prevent excessive credit growth and leverage,
2. to mitigate and prevent excessive maturity mismatch and market illiquidity,
3. to limit direct and indirect exposure concentrations,
4. to reduce the potential for systemically important banks to adopt destabilising strategies and to mitigate the impact of such actions.

The Central Bank has developed a Systemic Risk Pack (SRP), which presents indicators and visualisation methods for monitoring systemic risk in the Irish financial system. It builds on existing work regarding the use of macro-prudential indicators in policy setting, as set out in [Ryan \(2017\)](#). This bi-annual publication is created in order to facilitate macro-prudential analysis and to focus policy maker discussion. It complements existing financial stability analysis by providing a comprehensive systemic perspective alongside the detailed approach provided in other publications.<sup>2</sup>

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<sup>1</sup> For more on the Central Bank's approach to macro-prudential policy see [A Macro-Prudential Policy Framework for Ireland](#).

<sup>2</sup> Such as that provided by the [Macro-Financial Review](#), the [SME Market Report](#) and the [Household Credit Market Report](#).

Each edition includes a set of summary heatmaps and a selection of noteworthy or topical charts for consideration. Explanation of indicators used is provided for each section in the form of a glossary and metadata table. The heatmaps aim to distil information and highlight areas of elevated risk by colour coding indicators in line with their deviation from levels associated with financial system stability (thresholds). Red and orange colours highlight indicators moving in a direction associated with a build-up of systemic instability. Darker green colours will generally be associated with subdued financial system activity or the materialisation of systemic risk. As a result, light green and light yellow shades should be more indicative of benign conditions. For further information on the construction of these heatmaps see Ryan (2017).

While the heatmaps provide a useful overview of the systemic risk landscape, they are also a very simple risk assessment tool. For example, they do not take into account dynamics in the broader financial system or real economy which will determine whether or not an indicator's level can be considered excessive or unstable. As such, a number of key indicators and indicators highlighted by the heatmaps are presented in chart form for further consideration in the subsequent sections.<sup>3</sup> It is also important to note that the SRP should not be seen as an automatic warning system or as a policy-setting tool in and of itself. Rather, the pack can inform policy maker judgement.

The indicators presented in this pack are drawn from the broad range of data available to the Central Bank. These include publicly available data such as those found on the Central Bank's [website](#) and those of the [CSO](#) and [ECB](#), as well as commercially sourced data supplied by third parties and data reported by regulated entities.

The approach that has been taken to developing the risk pack makes it a very flexible tool and will allow for it to evolve over time, as new data sources become available, other relevant indicators are identified, and approaches to data visualisation evolve.

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<sup>3</sup> These sections may also be used to examine indicators, which are not compatible with the heatmap structure.

Systemic Risk Heatmap										
		>1.5 SDs below	>1.0 SDs below	>0.5 SDs below	Threshold	>0.5 SDs above	>1.0 SDs above	>1.5 SDs above		
Intermediate objective	Indicators	Threshold			Risk level	Last observation	Latest observation date	6 month change	Annual change	
Objective 1: Mitigate & prevent excessive credit growth and leverage	Aggregate credit and leverage	Standardised credit gap	Lower threshold for CCyB setting (BCBS 2010)				-91.5pps	Sep-18	3.2 pps	-17.2 pps
		Private-sector credit growth	Historical average				-0.1%	Jan-19	0.6 pps	1.0 pps
		National credit-to-GNI* gap	Lower threshold for CCyB setting (BCBS 2010)				-70.3pps	Sep-18	6.9 pps	10.3 pps
		Ratio of total assets to total equity	Historical average (retail banks)				8.28	Sep-18	-0.05	0.31
		Ratio of total assets to total equity	European average				8.66	Jun-18	0.04	-0.20
		Leverage ratio - all banks	European average				11.1%	Dec-18	0.0 pps	0.0 pps
		Leverage ratio - retail banks	European average				8.7%	Dec-18	0.0 pps	0.0 pps
	Asset prices	Residential property price growth	MIP threshold				8.5%	Sep-18	-4.2 pps	-3.5 pps
		Residential property price-to-rent ratio	Historical average				18.31	Sep-18	1.8%	2.1%
		Residential property price-to-income ratio	Historical average				4.19	Sep-18	0.6%	4.1%
		Res. real estate misalignment measure	Zero				-0.5%	Sep-18	-0.1 pps	1.8 pps
		Residential property turnover	European average				3.0%	Dec-17	-	0.3 pps
		Residential property stock / 1,000 adults	European average				422.6	Dec-17	-	0.0 pps
		Residential property completions/stock	European average				1.0%	Dec-17	-	0.2 pps
		Commercial real estate price growth	Historical average				5.3%	Dec-18	1.2 pps	1.8 pps
		CRE price-to-rent index	Historical average				95.42	Sep-18	0.9%	-1.5%
		CRE price misalignment measure	Zero				-5.9%	Sep-18	-0.2 pps	-2.2 pps
		ISEQ 3 month MA QoQ growth	Historical average				-11.0%	Feb-19	-15.1 pps	-13.8 pps
	Sectoral credit and leverage	Total domestic credit - herfindahl	Historical average				0.49	Sep-18	0.5 pps	-0.3 pps
		Household debt gap	Lower threshold for CCyB setting (BCBS 2010)				-43.5pps	Sep-18	3.2 pps	3.2 pps
		Household credit growth	Historical average				0.7%	Jan-19	0.7 pps	0.8 pps
		Domestic NFC debt gap	Lower threshold for CCyB setting (BCBS 2010)				-26.7pps	Sep-18	3.7 pps	7.1 pps
		Domestic NFC credit growth	Historical average				1.7%	Jan-19	0.2 pps	1.3 pps
		Property-related lending (% share of total)	Historical average				67.6%	Sep-18	-0.3 pps	-1.2 pps
		Irish Private Sector Enterprises: CRE credit growth	Historical average				0.5%	Sep-18	3.7 pps	7.3 pps
	Balance sheet mismatch and liquidity	Loan-to-deposit ratio (Domestic Market Group)	Historical average				92.4%	Dec-18	0.6 pps	-1.7 pps
		Non-deposit funding	European average				46.1%	Dec-17	-	-4.1 pps
Share of funding from ESCB		Pre-crisis average (pre-2008)				0.5%	Dec-18	-0.4 pps	-0.9 pps	
Overnight interbank borrowing volume 1M avg.		No threshold established				0.0%	Jun-17	-	-100.0%	
Overnight interbank borrowing intrate 1M avg.		No threshold established				-0.4%	Nov-16	0.0 pps	-0.3 pps	
Overnight interbank borrowing spread 1M avg.		No threshold established				0.0%	Nov-16	0.0 pps	-0.1 pps	
Liquidity coverage ratio - all banks		Historical average				158.4%	Dec-18	-5.1 pps	-10.3 pps	
Liquidity coverage ratio - retail		Historical average				139.8%	Dec-18	-3.6 pps	1.2 pps	
EURIBOR OIS 3M Spread - 1 quarter average (bps)		Historical average				4.8pps	Feb-19	1.1 pps	2.7 pps	
Irish composite stress index - 1 quarter max		Historical average				0.07	Dec-18	66.4%	54.3%	
Market conditions		CISS euro area - 1 quarter max	Historical average				0.12	Dec-18	-0.2 pps	0.9 pps
	Euro NFC spreads - 1 quarter avg (bps)	Historical average				140.7pps	Feb-19	36.4 pps	60.8 pps	
	Euro financials spreads - 1 quarter avg (bps)	Historical average				136.8pps	Feb-19	34.8 pps	63.8 pps	
	Irish gov bond spreads - monthly avg (bps)	Historical average				73.2pps	Jan-19	50.5 pps	53.3 pps	
	Euro gov spreads - 1 quarter avg (bps)	Historical average				78.8pps	Feb-19	11.3 pps	33.8 pps	
	Total LE / own funds - All banks	European average				365%	Sep-18	-15.0 pps	47.1 pps	
	Total LE / own funds - Retail banks	European average				239%	Sep-18	-	19.8 pps	
10 largest LE / own funds - All banks	No threshold established				106%	Sep-18	-0.6 pps	1.7 pps		
10 largest LE / own funds - Retail banks	No threshold established				139%	Sep-18	-8.9 pps	5.0 pps		
LE to NFCs / own funds - All banks	No threshold established				17%	Sep-18	-4.0 pps	1.5 pps		
LE to NFCs / own funds - Retail banks	No threshold established				9%	Sep-18	-0.8 pps	3.2 pps		
LE to credit inst. / own funds - All banks	No threshold established				89%	Sep-18	-14.1 pps	-8.6 pps		
LE between dom. retail banks / own funds	No threshold established				3%	Sep-18	0.3 pps	-0.2 pps		
LE between dom. retail banks	No threshold established				60.7 bn	Sep-18	0.1 pps	-0.2 pps		
Sectoral concentration & interconnections	Total domestic credit - herfindahl	Historical average				0.49	Sep-18	0.5 pps	-0.3 pps	
	Property-related lending (% share of total)	Historical average				67.6%	Sep-18	-0.3 pps	-1.2 pps	
	Interbank loans/total financial assets	European average				6.0%	Dec-17	-	0.2 pps	
	% funding from interbank deposits	European average				6.2%	Dec-17	-	-1.7 pps	
	UK Credit exposure - all banks	Historical average				25.8%	Sep-18	0.7 pps	0.3 pps	
	UK Credit exposure - retail banks	Historical average				26.7%	Sep-18	0.4 pps	-0.2 pps	
	Systemic banking crises likelihood	Historical average				1.2%	Sep-18	1.0 pps	0.7 pps	
	Static delta coVaR	Historical average				0.01	Jun-18	566.4%	151.0%	
	Size	Domestic bank assets-to-GNI*	European average				117.5%	Jun-18	-13.1 pps	-26.4 pps
		Total O-SII assets to GNI*	European average				178.9%	Jun-18	-	-32.7 pps
LE to credit institutions - All banks		No threshold established				€47.5 bn	Sep-18	-12.4%	-10.3%	
LE to credit institutions - Retail banks		No threshold established				€10.9 bn	Sep-18	-12.0%	-19.0%	
LE to Irish gov - All banks		No threshold established				€39.5 bn	Sep-18	-5.1%	1.7%	
LE to Irish gov - Retail banks		No threshold established				€25.5 bn	Sep-18	-7.0%	-12.5%	
Net debt liabilities of Irish retail banks/GNI*		Historical average				-16.1%	Sep-18	-0.8 pps	-1.9 pps	
Interbank loans/total financial assets		European average				6.0%	Dec-17	-	0.7 pps	
% funding from interbank deposits		European average				6.2%	Dec-17	-	-1.7 pps	
Concentration		Market share top 5 inst: priv sector lending	Post-crisis average				87.4%	Dec-18	-1.1 pps	-0.6 pps
		Market share top 5 inst: priv sector deposits	Post-crisis average				84.4%	Dec-18	1.3 pps	2.0 pps
		Market share top 5 inst: NFC lending	Post-crisis average				89.0%	Dec-18	-0.8 pps	-0.7 pps
		Market share top 5 inst: SME lending	Post-crisis average				97.8%	Sep-18	1.1 pps	0.1 pps
	Market share top 5 inst: HH lending	Post-crisis average				94.1%	Dec-18	0.1 pps	-0.4 pps	
	Market share top 5 inst: OFI lending	Post-crisis average				78.3%	Dec-18	-3.0 pps	-2.9 pps	
	Share of the 5 largest inst: total assets	European average				45.5%	Dec-17	-	1.2 pps	
Complexity	Total LE / own funds - All banks	European average				364.8%	Sep-18	-15.0 pps	47.1 pps	
	Derivatives (notional value) to total assets	European average				1.18	Dec-17	-	0.4 pps	
	Share non-loan assets	European average				0.38	Dec-17	-	-1.5 pps	
Share non-interest income	European average				0.36	Dec-17	-	-7.2 pps		

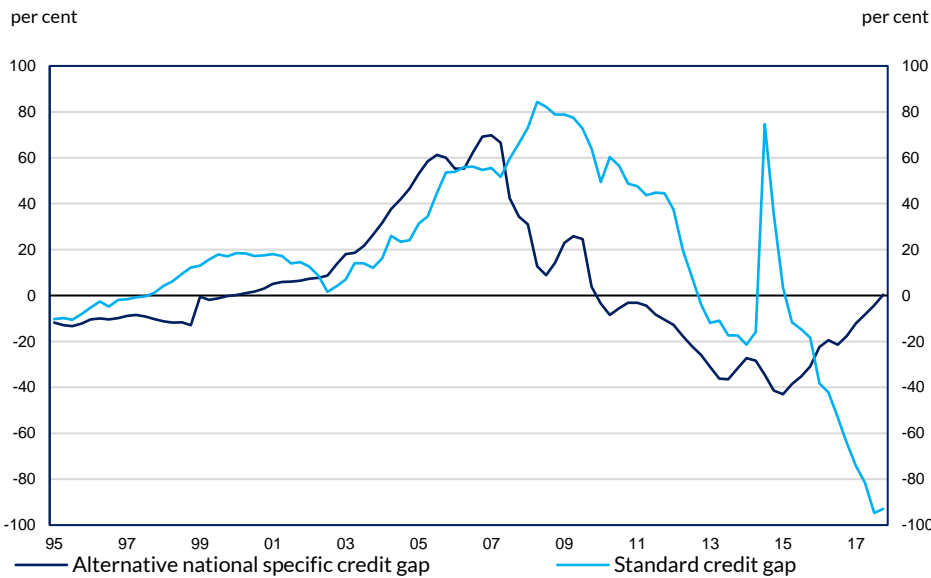
**Note:** A grey fill is used where heatmap colour coding cannot be constructed or data are not available. The latter may be due to the length of a time series or its reporting frequency (e.g. six monthly growth rates cannot be calculated for annual series). The six month and annual change columns are coloured green when an indicator is decreasing and red when it is increasing. For more details on individual indicators see Heatmap Glossary on page 11.

The primary focus of the Systemic Risk Pack is to examine the build-up of risks to the Irish financial system and its participants. For banking sector indicators, the sample of banks focuses on those institutions that interact with the Irish economy, unless otherwise specified. However, due to the nature of the indicator and the availability of data, banking samples may vary between indicators. For example, data on credit exposures are drawn from published resident statistics data available on the Central Bank's website and include branches of foreign institutions active in Ireland. Indicators based on supervisory data reflect banks that are licensed by the Central Bank of Ireland and are compiled for Irish retail banks i.e., Allied Irish Banks, Public Limited Company, KBC Bank Ireland plc, Permanent TSB plc, the Governor and Company of the Bank of Ireland and Ulster Bank Ireland Designated Activity Company.

Systemic Risk Heatmap (Time Series)			1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018				
Intermediate objective	Indicator	Threshold																												
Objective 1: Mitigate & prevent excessive credit growth and leverage	Aggregate credit and leverage	Standardised credit gap	Lower threshold for CCyB setting (BCBS 2010)																											
		Private-sector credit growth	Historical average																											
		National credit-to-GNI* gap	Lower threshold for CCyB setting (BCBS 2010)																											
		Ratio of total assets to total equity	Historical average (retail banks)																											
		Leverage ratio - all banks	European average																											
		Leverage ratio - retail banks	European average																											
	Asset prices	Residential property price growth	MIP threshold																											
		Residential property price-to-rent ratio	Historical average																											
		Residential property price-to-income ratio	Historical average																											
		Res. real estate misalignment measure	Zero																											
		Residential property turnover	European average																											
		Residential property stock / 1,000 adults	European average																											
		Residential property completions/ stock	European average																											
		Commercial real estate price growth	Historical average																											
		CRE price-to-rent index	Historical average																											
		CRE price misalignment measure	Zero																											
		ISCO 3 month MA QoQ growth	Historical average																											
		Sectoral credit	Total domestic credit - herfindahl	Historical average																										
			Household debt gap	Lower threshold for CCyB setting (BCBS 2010)																										
			Household credit growth	Historical average																										
			Domestic NFC debt gap	Lower threshold for CCyB setting (BCBS 2010)																										
Domestic NFC credit growth	Historical average																													
Property-related lending (% share of total)	Historical average																													
Irish Private Sector Enterprises: CRE credit growth	Historical average																													
Residential fixed cap. formation/GNI*	European average																													
Objective 2: Prevent excessive maturity & market illiquidity	Balance sheets	Loan-to-deposit ratio (Domestic Market Group)	Historical average																											
		Non-deposit funding	European average																											
		Share of funding from ECB	Pre-crisis average (pre-2008)																											
		Liquidity coverage ratio - all banks	Historical average																											
		Liquidity coverage ratio - retail	Historical average																											
		Market conditions	EURIBOR OIS 3M Spread - 1 quarter average (bps)	Historical average																										
	Irish composite stress index - 1 quarter max		Historical average																											
	CISS euro area - 1 quarter max		Historical average																											
	Euro NFC spreads - 1 quarter avg (bps)		Historical average																											
	Euro gov spreads - 1 quarter avg (bps)		Historical average																											
	Euro financials spreads - 1 quarter avg (bps)		Historical average																											
	Objective 3: Limit direct and indirect exposure concentration	Total LE / own funds - All banks	European average																											
Total LE / own funds - Retail banks		European average																												
Share of the 5 largest inst: total assets		European average																												
Total domestic credit - herfindahl		Historical average																												
Property-related lending (% share of total)		Historical average																												
Interbank loans/total financial assets		European average																												
% funding from interbank deposits		European average																												
UK Credit exposure - all banks		Historical average																												
UK Credit exposure - retail banks		Historical average																												
Systemic banking crises likelihood		Historical average																												
Static delta coVaR		Historical average																												
Objective 4: Reduce the potential for systemically important risks to adopt destabilising concentration actions		Domestic bank assets-to-GNI*	European Average																											
		Total O-SII assets to GNI*	European average																											
	Net debt liabilities of Irish retail banks/GNI*	Historical average																												
	Interbank loans/total financial assets	European average																												
	% funding from interbank deposits	European average																												
	Market share top 5 inst: priv sector lending	Post-crisis average																												
	Market share top 5 inst: priv sector deposits	Post-crisis average																												
	Market share top 5 inst: NFC lending	Post-crisis average																												
	Market share top 5 inst: SME lending	Post-crisis average																												
	Market share top 5 inst: CFI lending	Post-crisis average																												
	Market share top 5 inst: HI lending	Post-crisis average																												
	Total LE / own funds - All banks	European average																												
	Derivatives (notional value) to total assets	European average																												
	Share non-loan assets	European average																												
	Share non-interest income	European average																												

## OBJECTIVE 1<sup>4</sup>: To mitigate and prevent excessive credit growth and leverage.

Chart 1: Standard & alternative national specific credit gaps

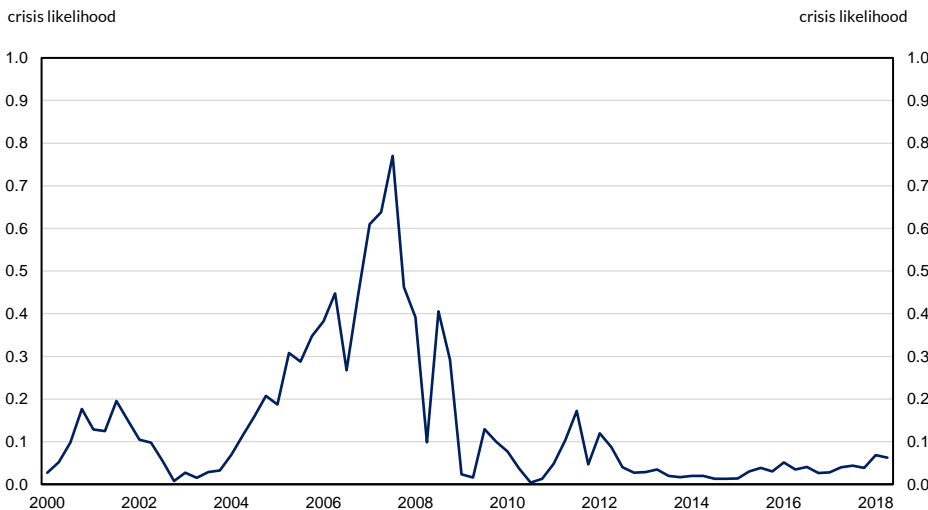


Source: BIS and Central Bank of Ireland Calculations

Note: The alternative measure presented adjusts for the impact of the unsustainable credit boom in the mid-2000s. See [O'Brien et al \(2018\)](#) for more. Data as at 2018Q2.

The Basel (standard) credit gap for Ireland remains significantly negative. However, an alternative national specific measure, which incorporates other cyclical indicators (e.g. estimated house price misalignment and Irish sovereign bond spreads), indicates that the gap has closed considerably in recent quarters

Chart 2: Systemic banking crisis likelihood



Source: Central Bank of Ireland calculations

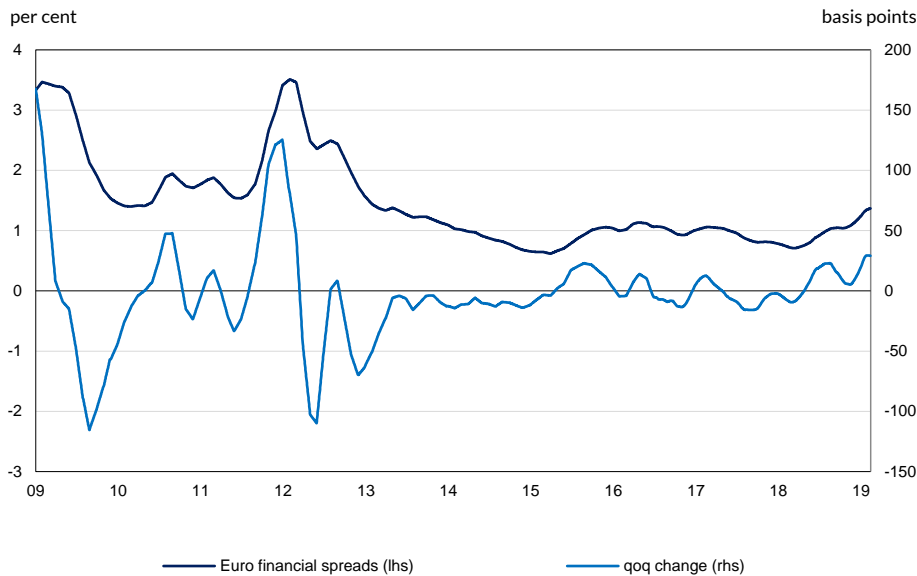
Note: Series depicts the EWS (Early Warning System) crisis likelihood of a systemic banking crisis emerging within the coming 8 quarters. See [O'Brien et al \(2018\)](#) for more. Data as at 2018Q2

There has been a marginal increase in the indicator of systemic banking crisis probability, in-line with broader market tensions. The current estimate however, is still well below the levels seen in advance of the global financial crisis.

<sup>4</sup> For Metadata see Chart Metadata on page 16

## OBJECTIVE 2: To prevent excessive maturity mismatch and market illiquidity

Chart 3: Euro financials spreads – quarterly moving average & quarter-on-quarter change

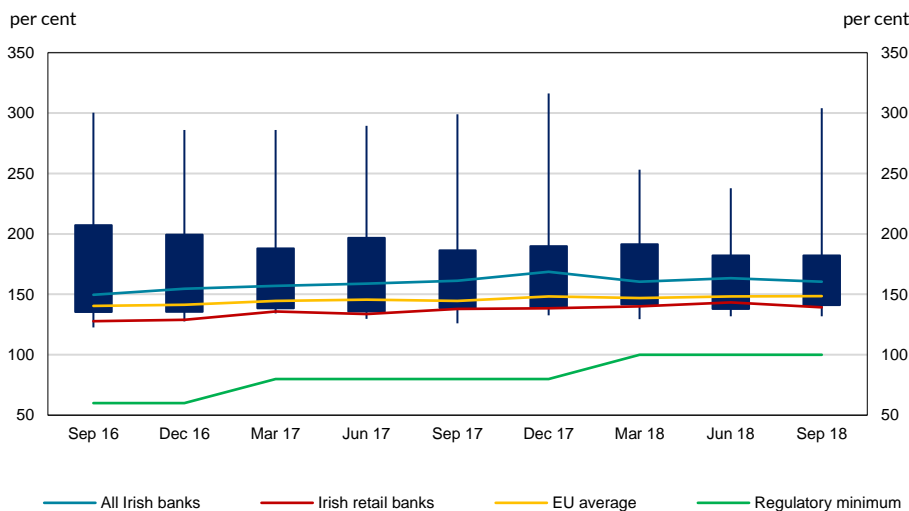


Trade tensions, political uncertainty and concerns surrounding the global economic outlook; have contributed to a recent increase in bond spreads across financial markets, including for financial institutions.

Source: Bloomberg and Central Bank of Ireland calculations

Note: The Barclays Euro Corporate Financials Senior Average Option Adjusted Spread measures the spread of fixed income securities issued by financial institutions (adjusted to take account of the embedded option) and can be used to measure stress in the market for these securities. Data as at 13 February 2019.

Chart 4: Liquidity coverage ratio



Despite the rise in funding costs, the LCR of the European banking sector remained substantially above the minimum requirement. The Irish banking system's LCR is broadly unchanged in the six months to 2018Q3 and continues to be in line with international peers, well above minimum requirements.

Source: EBA Risk Dashboard and Central Bank of Ireland calculations.

Note: The liquidity coverage ratio (LCR) is defined in accordance with EBA guidelines as liquidity buffers as a percentage of net liquidity outflows. The dark blue box plot presents the 10<sup>th</sup>, 25<sup>th</sup>, 75<sup>th</sup> and 90<sup>th</sup> percentile range for European aggregates. The minimum LCR requirements of 100 per cent was introduced on a phased basis. Last observation as at 2018 September.



## OBJECTIVE 3: To limit direct and indirect exposure concentrations.

Chart 5: Property-related lending as a share of total loans

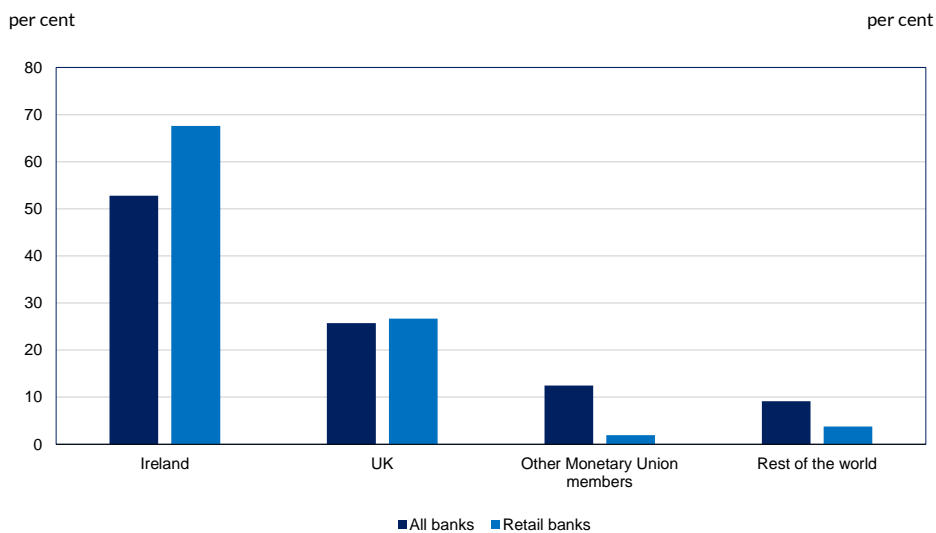


Property-related lending accounts for 68 per cent of Irish banks loan book, highlighting a concentration risk amongst Irish resident banks. This compares to a long run average of 62 per cent and a European average of approximately 60 per cent measured at 2018Q2.

Source: Central Bank of Ireland, Residential statistics

Note: Last observation 2018Q3. Please note the chart above has been revised from the original published version.

Chart 6: Geographical breakdown of credit exposures



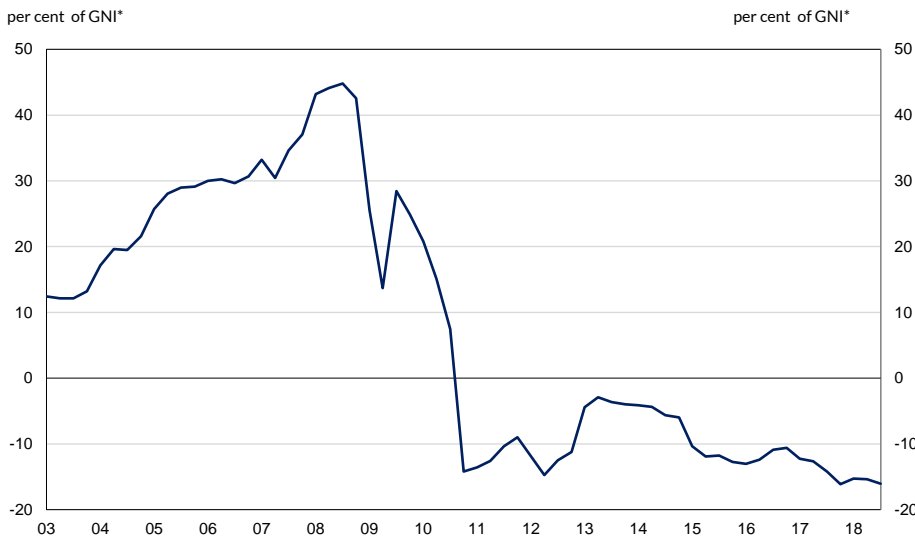
Outside of domestic exposures, the UK remains the second largest market for Irish banks. Counterparties in the UK account for 25 per cent of all banks credit exposures. The figure is slightly higher for retail banks. The impact of Brexit on the UK could affect Irish banks.

Source: Central Bank of Ireland

Note: Data are defined in accordance with EBA guidelines. Country/region refers to the residency of counterparties. Data relates to 2018Q3.

## OBJECTIVE 4: To reduce the potential for systemically important banks to adopt destabilising strategies and to mitigate the impact of such action.

Chart 7: Net-external liabilities of Irish retail banks

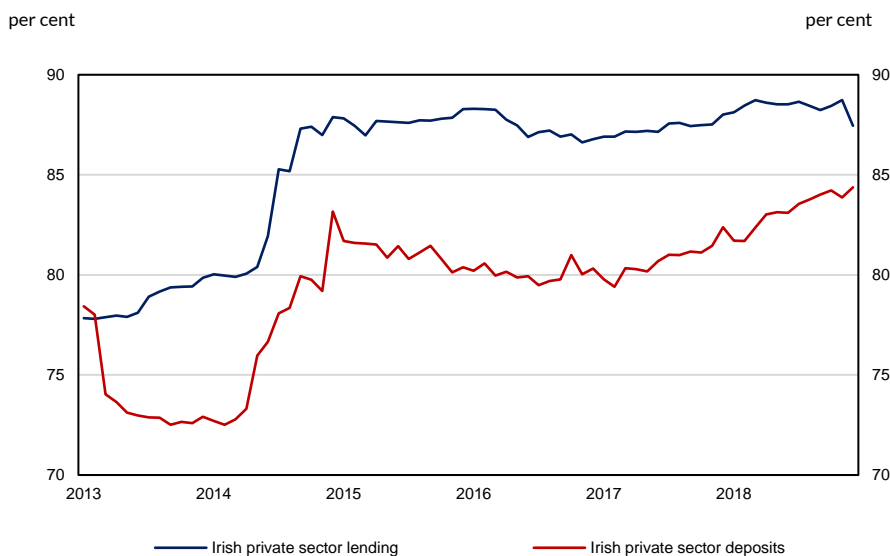


Irish retail banks remain net lenders rather than net borrowers from outside the State.

Source: Central Bank of Ireland, Residential statistics

Note: Net-external liabilities are the difference between foreign liabilities and foreign assets. A positive number implies banks foreign liabilities exceed foreign assets. Last observation 2018Q3.

Chart 8: Irish private-sector lending & deposit taking - share of 5 largest institutions



Private sector lending and private sector deposit taking remain heavily concentrated within 5 banking groups. A negative shock among some or all of these firms could permeate through the financial sector and impact the real economy.

Note: Adjusted for group structure and relate to assets held with Irish counterparts only. Credit unions are treated as a single entity. Last observation: December 2018.

# Heatmap glossary<sup>5</sup>

## Objective 1

<b>Credit-to-GDP gap</b>	The credit-to-GDP gap is defined as the difference between the current level of the credit-to-GDP ratio and its estimated trend level. The trend level of the credit-to-GDP ratio is calculated using a recursive Hodrick-Prescott (HP) filter with a smoothing parameter of 400,000. In all cases, credit refers to private sector non-financial credit and excludes lending to governments and financial credit. The indicator is widely used in Countercyclical Capital Buffer (CCyB) setting for the identification of periods of excess credit growth.
<b>Standard credit-to-GDP gap</b>	The standard credit-to-GDP gap is calculated in line with ESRB Recommendation 2014/1. It uses a broad measure of credit, including credit from any source to resident households and NFCs. A standard GDP measure is used.
<b>National credit</b>	The national specific credit measure is discussed in <a href="#">Creedon and O'Brien (2016)</a> and uses credit from resident banks to resident non-financial corporations (NFCs) as a proxy for domestic NFC credit. This removes the substantial MNC driven component of the standard measure and produces one which is less volatile and more directly relevant to the domestic economy.
<b>GNI*</b>	GNI* is produced by the CSO to more accurately reflect activity in the domestic economy by excluding significant effects of globalisation that disproportionately affect GDP figures. The series used to construct the indicators in the heatmap is interpolated using Modified Domestic Demand (as calculated by the CSO) and extended back to 1980 using changes in the standard GDP measure. GNI* is used throughout the heatmap in place of Irish GDP. In calculating peer group averages, standard GDP measures are used for other countries.
<b>Private sector credit growth</b>	Private sector credit refers to credit to households and bank credit to NFCs.
<b>Ratio of total assets to total equity – European Comparison</b>	The ratio of total assets to total equity is a financial indicator of leverage that assesses the ability of a company to meet its financial obligations. This ratio is calculated as the value of total assets relative to the value of total equity. Total equity is the value left in the company after subtracting total liabilities from total assets. The data are sourced from the Consolidated Banking Data available on the European Central Bank Statistical Data Warehouse. The data are specific to domestic institutions whose ultimate parent entity is resident in the country specified.
<b>Ratio of total assets to total equity: Irish retail banks</b>	The ratio of total assets to total equity is a financial indicator of leverage that assesses the ability of a company to meet its financial obligations. This ratio is calculated as the value of total assets relative to the value of total equity. The sample of banks are the five main retail banks.
<b>Residential property price growth</b>	This indicator measures the annual growth rate in residential property prices as per the CSO's Residential property price indicator. Threshold as per the EU's Macroeconomic Imbalance Procedure ( <a href="#">see here for more information</a> ).
<b>Residential property price-to-rent ratio</b>	The house price-to-rent ratio is a common method of assessing residential property values. Typically, it is calculated as the ratio of average house prices to average annual rents for a given location. At a basic level, the house price-to-rent ratio indicates whether house prices are rising faster than rents or vice versa.

<sup>5</sup> Indicators appear in the glossary in the same order as they appear in the heatmaps. Indicators which appear twice in the heatmaps are included once under the first objective where they appear.

<b>Residential property price-to-income ratio</b>	The house price-to-income ratio is a basic measure of housing affordability in a given location. It is generally expressed as the ratio of average house prices to average annual disposable income of an average Irish household. A rise in the ratio signifies a reduction in housing affordability and vice versa.
<b>Residential real estate misalignment measure</b>	This residential real estate price misalignment indicator is based on the average value of 3 econometric models used as part of a suite of indicators to gauge the extent of house price value misalignment. Estimates of misalignment are calculated using simple reduced form models from the empirical housing literature to identify a fundamental house price series against which actual developments can be benchmarked. Model 1 includes disposable income, the level of housing stock per capita and average mortgage interest rates, Model 2 includes data on employment, the share of the population in the household formation cohort and average mortgage interest rates and Model 3 is based on an annual measure of mortgage affordability and the level of housing stock per capita. See <a href="#">Kennedy, O'Brien &amp; Woods (2016)</a> for more detail.
<b>Residential property turnover</b>	The rate of residential property turnover is calculated by expressing the number of annual residential property transactions as a percentage of the total housing stock. It is a simple measure of housing market activity.
<b>Residential property stock / 1,000 adults</b>	This indicator monitors the number of properties in the country per 1,000 population and is another useful housing activity indicator, which provides information on whether the level of residential construction is adequate in light of population, migration and demographic trends.
<b>Residential property completions / stock</b>	The rate of residential property completions as a share of housing stock is an indicator of the level of residential building activity.
<b>Growth in residential mortgage drawdowns</b>	This indicator measures the annual change in the number of residential mortgages drawn down (on a rolling 4 quarter total basis) as per Banking and Payments Federation Ireland data. It is a simple measure of mortgage market activity.
<b>Commercial real estate price growth</b>	This indicator measures the annual growth rate in commercial property capital values as per MSCI/IPD's Irish commercial property capital value index.
<b>Commercial real estate price-to-rent index</b>	The commercial real estate (CRE) price-to-rent index is a relatively simplistic method of assessing commercial property values. In this case it is calculated as the ratio of the commercial property capital values index to the commercial property rental values index. At a basic level, this index indicates whether CRE capital values are rising faster than CRE rents.
<b>Commercial real estate price misalignment measure</b>	This indicator presents the average deviation of 5 commercial property ratio indices - CRE capital values to CRE rents, CRE yields, CRE capital values to GNI*, CRE capital values to consumption and CRE capital values to employment - from their individual long-run averages. See Box 6 in FSR, ECB, December 2011.
<b>ISEQ three-month moving average quarter-on-quarter growth rate</b>	This indicator is a measure of Irish equity returns. A three-month moving average is applied so that the indicator reflects developments across the full quarter as opposed to just its final day.
<b>Herfindahl index</b>	A Herfindahl index is a measure of concentration. In the context of sectoral lending, an increasing index suggests that credit exposures are becoming more concentrated in specific types of lending. An increase in lending concentration can increase the risk of a sector specific event propagating through the banking sector.
<b>Household/NFC gap</b>	The sectoral (household and domestic NFC) credit gaps are constructed in the same way as the national credit-to-GNI* gap. They examine the deviation of the ratio of credit to a given sector to GNI* from its estimated trend level.
<b>Property-related lending</b>	The indicator measures the share of property-related lending advanced to the non-financial private-sector Irish resident. Property-related credit includes construction, real estate, land and development activities and loans

	for house purchase. Data are taken from the Central Bank of Ireland's A.1 and A14 Credit and Banking Statistics. An increase in lending concentration can increase the risk of a sector specific event propagating through the banking sector.
<b>Residential fixed capital formation</b>	Gross fixed capital formation is a measure of gross net investment in fixed capital assets by enterprises, households and government in the domestic economy within a period. This element of GFCF tracks the construction of residential housing and is another indicator of housing market/residential construction activity
<b>Objective 2</b>	
<b>Loan-to-Deposit Ratio</b>	A Loan-to-Deposit ratio is used to assess a bank's liquidity by calculating the total outstanding loans relative to deposits received. An increasing ratio implies increased reliance on non-deposit funding, and this may lead to an increase in liquidity risk during a stressed event. The bank then may not have sufficient liquidity at hand to meet unforeseen requirements.
<b>Non-deposit funding</b>	Non-deposit funding is funding sourced from sources other than customer deposits. These generally include: debt-securities issued, Interbank borrowing (which may include central bank support) and other types of financial liabilities.
<b>Funding from ESCB</b>	ESCB or European system of central banks refers to the collection of central banks that along with the ECB form part of the Eurosystem. A higher share of funding from the ESCB suggests that banks' funding positions are strained.
<b>Overnight interbank borrowing</b>	Overnight interbank borrowing by Irish banks is examined using Irish payments system data (TARGET2-IE). Excess reliance on this more volatile type of funding may reduce banks' resilience to shocks. The heatmap provides the one-month average volume, interest rate and interest rate spreads over the ECB deposit facility rate for this type of lending. Limited borrowing is occurring at present so interest rates and spreads are provided for the most recent available observations.
<b>Liquidity coverage ratio</b>	The liquidity coverage ratio is a supervisory requirement for banks operating in the EU. It requires institutions to hold a minimum level of qualifying liquid assets in order to meet net-cash outflows in a stressed environment. By January 2018, EU banks are required to have an LCR in excess of 100 per cent. The higher the number the more resilient an institution is likely to be in the event of a stressed situation. As a result observations below the EU average will be coloured green in the heatmaps.
<b>Euribor OIS 3 month spread</b>	Is the spread between the Euro interbank offer rate (the benchmark rate of the large euro money market) and the euro overnight indexed swap. The spread between these two interest rates is considered a key measure of credit risk in the banking system.
<b>Irish Composite Stress Index (ICSI)</b>	The ICSI presents a coincident measure of systemic risk conditions in financial markets for Ireland. The indicator ranges from 0 to 1. See Box: 5 "Indicators of systemic stress and financial conditions" from <a href="#">MFR 2016:I</a> for further details.
<b>Euro composite indicator of systemic stress (CISS)</b>	Developed by <a href="#">Hollo et al (2012)</a> the indicator uses modern portfolio theory to summarise stress across five market-specific sub-indices into a contemporaneous measure of systemic stress. The indicator of systemic stress ranges from 0 to 1. Country-specific indices are available via the ECB's Statistical Data Warehouse.
<b>Euro NFC spreads</b>	This indicator (the Barclays Euro Aggregate Corporate Excluding Financials Average Option Adjusted Spread) measures the spread of NFC fixed income securities over the risk free rate (adjusted to take account of the embedded option) and can be used to measure stress in the market for these securities. A three-month moving average is applied so that the indicator reflects developments across the full quarter as opposed to just its final day.
<b>Euro financial spreads</b>	This indicator (the Barclays Euro Corporate Financials Senior Average Option Adjusted Spread), measures the spread of senior fixed income securities issued by financial institutions over the risk free rate (adjusted to take account of the

	embedded option) and can be used to measure stress in the market for these securities. A three-month moving average is applied so that the indicator reflects developments across the full quarter as opposed to just its final day.
<b>Euro government spreads</b>	This indicator (the Barclays EuroAgg Government Average Option Adjusted Spread), measures the spread of sovereign fixed income securities over the risk-free rate (adjusted to take account of the embedded option) and can be used to measure stress in the market for these securities. A three-month moving average is applied so that the indicator reflects developments across the full quarter as opposed to just its final day.
<b>Objective 3</b>	
<b>Large exposure (LE)</b>	A large exposure is defined as an exposure that is 10 per cent or more of a bank's eligible capital base. Banks whose parent institution is licenced in Ireland (Irish headquartered banks) also report any exposures that are greater than €300 million. These exposures consist largely of loans but also include derivatives, guarantees and debt or equity holdings. Large exposure indicators are used throughout the SRP to examine exposure concentration at an individual exposure level and to examine interlinkages between Irish retail banks.
<b>Own funds</b>	Own funds is a broad measure of bank capital calculated as the sum of Tier 1 and Tier 2 capital. It reflects an institution's ability to absorb losses in a going or in a gone concern situation.
<b>Retail banks</b>	Retail banks are i.e., Allied Irish Banks plc, KBC Bank Ireland plc, Permanent TSB plc, the Governor and Company of the Bank of Ireland and Ulster Bank Ireland Designated Activity Company.
<b>All banks</b>	Large exposure indicators aiming to examine both domestic and internationally focussed banks operating in Ireland use data from all institutions licenced in Ireland.
<b>Interbank lending</b>	Refers to loans advanced by one bank to another. An increase in interbank lending can increase interconnectedness and potentially strengthen the channel through which risks are transmitted.
<b>Interbank deposits</b>	Deposits sourced from financial institutions and in some instances central banks. Interbank deposits tend to be more volatile in nature than other forms of funding. A higher reliance on interbank deposits may lead to an increase in liquidity risk during a stressed event.
<b>Static Delta CoVaR</b>	Delta CoVaR measures the percentage change in the 5% value-at-risk of the financial system (represented by the Stoxx 600 Banks Index) that takes place when the Irish banking system experiences a large financial shock. Thus, the systemic impact of a shock involving Irish banks is quantifiable at the European financial system level. The ISEQ Financial Index is treated as a single institution. A Delta CoVaR value of .07 is interpreted as representing a 7% shift to the left of the conditional value-at-risk (with 95% certainty) of the financial system when the Irish Financial Services sector has moved from experiencing median returns to a threshold breach of its own value-at-risk threshold measured over the course of the rolling window. Returns are calculated as weekly growth rates of the relevant indices based upon adjusted closing prices.
<b>Objective 4</b>	
<b>O-SII</b>	Other systemically important institutions (O-SIIs) are institutions that, due to their systemic importance, are more likely to create risks to financial stability. Whilst maximising private benefits through rational decisions, these institutions may bring negative externalities into the system and contribute to market distortions
<b>Domestic bank assets-to-GNI*</b>	This indicator highlights the importance of the 5 Irish domestic banks relative to the domestic economy. The higher the ratio, the greater the potential negative spillover effects to the domestic economy should an institution within this group fail. The ratio is calculated using GDP for countries other than Ireland.
<b>Total O-SII assets-to-GNI*</b>	This indicator highlights the importance of the O-SII institutions relative to the domestic economy. The higher the ratio, the greater the potential negative spillover effects to the domestic economy should an institution within this group fail. The ratio is calculated using GDP for countries other than Ireland.

<b>Market share top 5 institutions</b>	These indicators measure the level of concentration in certain lending and deposit categories. A higher number implies that the market is more concentrated. An increase in lending concentration can increase the sensitivity of the Irish economy to certain banking entities. The underlying data are taken from resident offices of banks operating in Ireland. Individual institutions are grouped according to their ultimate parent i.e., branches and subsidiaries are combined where they are part of a wider financial group. Credit unions are treated as a single group. The sectors examined are total-private sector lending to Irish resident, loans to Irish non-financial corporates (NFC), Loans to small and medium size enterprises (SME), loans to households (HH), loans to other financial institutions, insurance corporations and pension funds (OFI), as well as private-sector deposits from Irish residents.
<b>Share of five largest institutions: total assets indicator</b>	This indicator provides a European comparison of banking sector concentration. A higher number implies that the market is more concentrated. The data are unconsolidated data collected by the ECB. Unlike the market share indicators, the international data does not control for banking group structures. However, Chart 1 of Objective 4 shows the impact of controlling for banking groups structures.
<b>Derivatives (notional value)</b>	The notional value of derivatives is the contract value, which are used to price payments on that derivative. A larger amount, all other things being equal, would suggest that traditional banking activities such as retail banking is a smaller share of banks business.
<b>Non-loan assets</b>	Non-loan assets refer to financial assets other than customer loans. These include holdings of debt securities, interbank lending and other types of financial assets banks may hold. A larger amount, all other things being equal, would suggest that traditional banking activities such as retail banking is a smaller share of banks business. The sample of banks relate to those banks identified as O-SII and for which published data are available.
<b>Non-interest income</b>	Non-interest income refers to income generated from sources other than interest-earning assets. These may include fee and commission income, trading income and income sourced from other activities. A larger amount, all other things being equal, would suggest that traditional banking activities such as retail banking is a smaller share of banks business.

## Chart Metadata

Indicator	Notes	Source	Threshold	Last Observation
<b>Objective 1</b>				
Standard & alternative national specific credit gaps	The standard credit-to-GDP gap is calculated in line with ESRB Recommendation 2014/1. It uses a broad measure of credit, including credit from any source to resident households and NFCs. A standard GDP measure is used. The national specific credit measure is discussed in <a href="#">Creedon and O'Brien (2016)</a> and uses credit from resident banks to resident non-financial corporations (NFCs) as a proxy for domestic NFC credit. This removes the substantial MNC driven component of the standard measure and produces one which is less volatile and more directly relevant to the domestic economy. Credit measures are expressed as a percentage of GNI*	Central bank of Ireland calculations	Lower threshold for CCYB setting (BCBS2010)	2018Q2
Systemic banking crisis likelihood	This is an indicator of the probability that a systemic banking crisis (as defined by Laeven and Valencia (2012)) will occur at any time within the coming 8 quarters.	Central bank of Ireland calculations	Historical average	2018Q2
<b>Objective 2</b>				
Euro financials spreads – quarterly moving average and quarter-on-quarter change	This indicator (the Barclays Euro Corporate Financials Senior Average Option Adjusted Spread), measures the spread of senior fixed income securities issued by financial institutions over the risk free rate (adjusted to take account of the embedded option) and can be used to measure stress in the market for these securities. A three-month moving average is applied so that the indicator reflects developments across the full quarter as opposed to just its final day.	Barclays (via Bloomberg)	Historical average	February 2019
Liquidity coverage ratio	The liquidity coverage ratio is a supervisory requirement for banks operating in the EU. It requires institutions to hold a minimum level of qualifying liquid assets in order to meet net-cash outflows in a stressed environment. By January 2018, EU banks are required to have an LCR in excess of 100 per cent. The higher the number the more resilient an institution is likely to be in the event of a stressed situation. As a result observations below the EU average will be coloured green in the heatmaps.	EBA Risk Dashboard and Central Bank of Ireland calculations.	Historical average	2018Q3
<b>Objective 3</b>				
Property-related lending as a share of total loans	The indicator measures the share of property-related lending advanced to the non-financial private-sector Irish resident. Property-related credit includes construction, real estate, land and development activities and loans for house purchase. Data are taken from the Central Bank of Ireland's A.1 and A14 Credit and Banking Statistics. An increase in lending concentration can increase the risk of a sector specific event propagating through the banking sector.	Central bank of Ireland calculations	Historical average	2018Q3
Geographical breakdown of credit exposures	This indicator presents a breakdown of Irish banks' credit exposures by location (Ireland, the UK Other Monetary Union members and Rest of the World). Country/region refers to residency of counterparties.	Central bank of Ireland calculations	Historical average	2018Q3
<b>Objective 4</b>				
Net-external assets of Irish retail banks	Net-external assets are the difference between foreign assets and foreign liabilities. A positive number implies banks foreign assets exceed foreign liabilities	Central bank of Ireland calculations	Historical average	2018Q3



<b>Irish private-sector lending and deposit taking - share of 5 largest institutions</b>	Data show the aggregate share of loans and deposits to Irish households accounted for by the 5 largest credit institutions. Data are adjusted for group structure and relate to liabilities held with Irish counterparts only. Credit unions are treated as a single entity	Central bank of Ireland calculations	Post-crisis average	November 2018
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