



Banc Ceannais na hÉireann
Central Bank of Ireland

Eurosystem

Systemic Risk Pack

April 2023

Content reflects data available on – or before – 08 March 2023

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Systemic Risk Pack

April 2023

The purpose of the Systemic Risk Pack (SRP) is to facilitate discussion on the systemic risk environment. The SRP is a core part of the Central Bank's assessment of the current risk landscape, the outcome of which informs the preparation and drafting of the [Financial Stability Review \(FSR\)](#).

The contents of the pack are as follows:

- i. The SRP heatmaps.
The indicators are grouped around four categories of risk –
 - a. Cyclical,
 - b. Structural,
 - c. Real-estate and,
 - d. Non-banks¹.
- ii. Some detail on the background to the SRP, and
- iii. A glossary of the indicators included in the heatmaps.

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¹ The addition of the non-bank heat map reflects the growing role of the sector in the domestic macro-financial landscape. It is envisaged that the list of indicators will be expanded in future editions.

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		
Cyclical Risk Heatmap								
Indicators	Threshold	Risk level	Last observation	Latest observation date	6 month change	Annual change		
Credit								
Standardised credit gap	Lower threshold for CCyB setting (BCBS 2010)		-92.3pps	Sep-22	1.8 pps	9.4 pps		
Private-sector credit growth	Historical average		0.9%	Jan-23	0.6 pps	1.4 pps		
Growth in residential mortgage drawdowns	MIP threshold		6.8%	Dec-22	-8.7 pps	-14.3 pps		
Mortgage lending to disposable income	Model Benchmark (2003Q1-2018Q1)		7.6%	Sep-22	0.4 pps	1.0 pps		
Household credit growth	Historical average		-0.7%	Jan-23	0.6 pps	0.9 pps		
Domestic NFC credit growth	Historical average		6.3%	Jan-23	0.6 pps	3.1 pps		
Irish private sector enterprises: CRE credit growth	Historical average		5.0%	Sep-22	2.9 pps	1.3 pps		
Ratio of total assets to total equity	Historical average (retail banks)		10.97	Sep-22	0.78	0.61		
Asset prices								
Residential property price growth	MIP threshold		10.7%	Sep-22	-4.3 pps	-1.8 pps		
Residential property price-to-rent ratio	Historical average		18.76	Sep-22	-2.0%	-0.8%		
Residential property price-to-income ratio	Historical average		4.75	Sep-22	0.02	0.32		
Commercial real estate price growth	Historical average		-6.2%	Dec-22	-6.3 pps	-5.1 pps		
CRE yields	Historical average		5.4%	Dec-22	0.3 pps	0.2 pps		
CRE price misalignment measure	Zero		-18.9%	Sep-22	-3.4 pps	-6.0 pps		
Commercial real estate price at risk	Historical average		-13.0%	Sep-22	0.0 pps	0.0 pps		
Commercial real estate vacancy rates	Historical average		6.8%	Dec-22	0.0 pps	0.0 pps		
Financial markets								
ISEQ 3 month MA QoQ growth	Historical average		12.6%	Mar-23	19.3 pps	15.6 pps		
EURIBOR OIS 3M Spread - 1 quarter average (bps)	Historical average		-8.1 bps	Mar-23	-15.2 bps	-7.3 bps		
Irish composite stress index	Historical average		8.1%	Mar-23	-0.8 pps	-0.6 pps		
CISS euro area - 1 quarter max	Historical average		51.7%	Dec-22	0.3 pps	3.9 pps		
Financial condition indices	Historical average		19.9%	Feb-23	0.6 pps	-4.4 pps		
High yield corporate bond spreads	Historical average		4.2%	Feb-23	-0.2 bps	-0.1 bps		
Euro NFC spreads - 1 quarter avg (bps)	Historical average		130.7 bps	Mar-23	-42.4 bps	27.9 bps		
Euro financials spreads - 1 quarter avg (bps)	Historical average		179.1 bps	Mar-23	-27.4 bps	71.5 bps		
Euro gov spreads - 1 quarter avg (bps)	Historical average		60.3 bps	Mar-23	-10.4 bps	10.3 bps		
Irish gov bond spreads - monthly avg (bps)	Historical average		47.3 bps	Feb-23	-19.5 bps	35.1 bps		
Systemic banking crises likelihood	Historical average		21.8%	Sep-22	19.5 pps	-6.0 pps		
Dynamic delta coVaR	Historical average		5.7%	Mar-23	0.0 pps	0.0 pps		
Domestic macroeconomy								
Employment rate	Historical average		73.2%	Dec-22	-0.3 pps	0.2 pps		
Unemployment rate	Historical average		4.5%	Dec-22	0.2 pps	-0.7 pps		
Domestic inflation	Historical average		7.7%	Jan-23	-1.4 pps	2.7 pps		
Business cycle indicator	Deviation from average growth		0.4%	Jan-23	0.1 pps	-3.1 pps		
Purchasing Managers' Index (PMI)	Index = 50		54.5	Feb-23	4.0	2.4		
GNI* growth at risk	Historical average		-8.6%	Sep-22	-5.1 pps	-4.7 pps		
International macroeconomy								
World GDP growth	Historical average		2.9%	Dec-23		-0.5 pps		
Growth in global indebtedness	Historical average		-4.2%	Dec-21		-13.1 pps		
World trade growth	Historical average		-2.3%	Dec-22	-6.8 pps	-9.4 pps		
Euro area inflation	Historical average		8.7%	Jan-23	-0.2 pps	3.6 pps		

Note: The risk level column is categorised as follows: Orange, red and dark red colours highlight indicators moving in a direction associated with a build-up of systemic risk. 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. Where appropriate the colour spectrum is inverted. Where a build-up of risks are associated with an indicator being below its threshold the heatmap is orange, red and dark red. For example relatively low bond spreads can reflect an under-pricing of risk. 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 dark blue when an indicator is decreasing and light blue when it is increasing. The list of indicators can vary over time depending on the suitability and availability of data. The SRP is reviewed regularly to ensure new risk indicators are included, as they are developed and refined. Care should be taken when interpreting some indicators as a short time series or limited number of observations may produce spurious results. For more details on individual indicators see [Heatmap Glossary on page 12](#).

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 indicators 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 licenced by the Central Bank and are compiled for Irish retail banks 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.

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
Structural Risk Heatmap						
Indicators	Threshold	Risk level	Last observation	Latest observation date	6 month change	Annual change
Financial system structure						
Leverage ratio - all banks	European average		9.1%	Dec-22	0.3 pps	-0.6 pps
Leverage ratio - retail banks	European average		7.6%	Dec-22	0.4 pps	0.1 pps
Share non-loan assets	European average		53%	Sep-22		3.3 pps
Share non-interest income	European average		21%	Dec-21		3.7 pps
UK Credit exposure - all banks	Historical average		26.1%	Dec-22	-1.6 pps	-1.0 pps
UK Credit exposure - retail banks	Historical average		27.1%	Dec-22	-2.0 pps	-3.0 pps
Total domestic credit - herfindahl	Historical average		53.8%	Sep-22	-1.2 pps	3.1 pps
Property-related lending (% share of total)	Historical average		68.9%	Sep-22	-0.4 pps	3.6 pps
Loan-to-deposit ratio (domestic market group)	Historical average		78.9%	Dec-22	2.5 pps	-1.5 pps
Share of funding from ESCB	Historical average		0.0%	Jan-23	-2.1 pps	-2.9 pps
Interbank loans/total assets	European average		3.3%	Dec-22		1.2 pps
interbank deposits/total liabilities	European average		4.9%	Dec-22		1.9 pps
Liquidity coverage ratio - all banks	Historical average		169.9%	Jan-23	-9.5 pps	-3.4 pps
Liquidity coverage ratio - retail	Historical average		178.0%	Jan-23	-40.1 pps	-17.0 pps
Net debt liabilities of Irish retail banks/GNI*	Historical average		-14.8%	Dec-22	1.2 pps	2.5 pps
Irish CRE funds leverage	European average		82.2%	Dec-22	-1.0 pps	-2.0 pps
Irish CRE funds liquidity	Historical average		7.0%	Dec-22	0.1 pps	0.5 pps
Market concentration						
Share of the 5 largest inst: total assets	European average		60.0%	Dec-21		4.3 pps
Market share top 5 inst: priv sector lending	Post-crisis average		88.5%	Jan-23	-1.0 pps	-2.1 pps
Market share top 5 inst: priv sector deposits	Post-crisis average		79.2%	Jan-23	3.5 pps	4.6 pps
Market share top 5 inst: NFC lending	Post-crisis average		90.7%	Jan-23	-1.0 pps	-1.5 pps
Market share top 5 inst: SME lending	Post-crisis average		99.3%	Sep-22	-0.1 pps	-0.3 pps
Market share top 5 inst: household lending	Post-crisis average		94.2%	Jan-23	-0.2 pps	-0.6 pps
Non-banks share of new lending to SMEs	Historical average		27.6%	Jun-22	-7.5 pps	-8.7 pps
Non-banks share of residential mortgage lending	Historical average		19.7%	Jun-22		8.0 pps
Irish funds holding of Irish bank debt	European average		3.9%	Sep-22	1.2 pps	1.8 pps
Irish funds holding of Irish Government debt	European average		0.8%	Sep-22	0.1 pps	0.2 pps
Irish funds holding of Irish NFC debt	European average		2.1%	Sep-22	-0.3 pps	-0.4 pps
Domestic bank assets-to-GNI*	European average		113.7%	Sep-22	-1.5 pps	-11.6 pps
Total O-SII assets to GNI*	European average		240.0%	Dec-21		-3.1 pps
Macroeconomy structure						
Concentration in net tax receipts	Historical average		18.3%	Dec-21		1.0 pps
Corporate tax revenue share of net tax receipts	Historical average		22.7%	Dec-21		1.6 pps
Share of exported goods: pharmaceutical products	Historical average		38.4%	Dec-22		0.6 pps
Share of exported services: computer services	Historical average		58.9%	Dec-21		4.9 pps

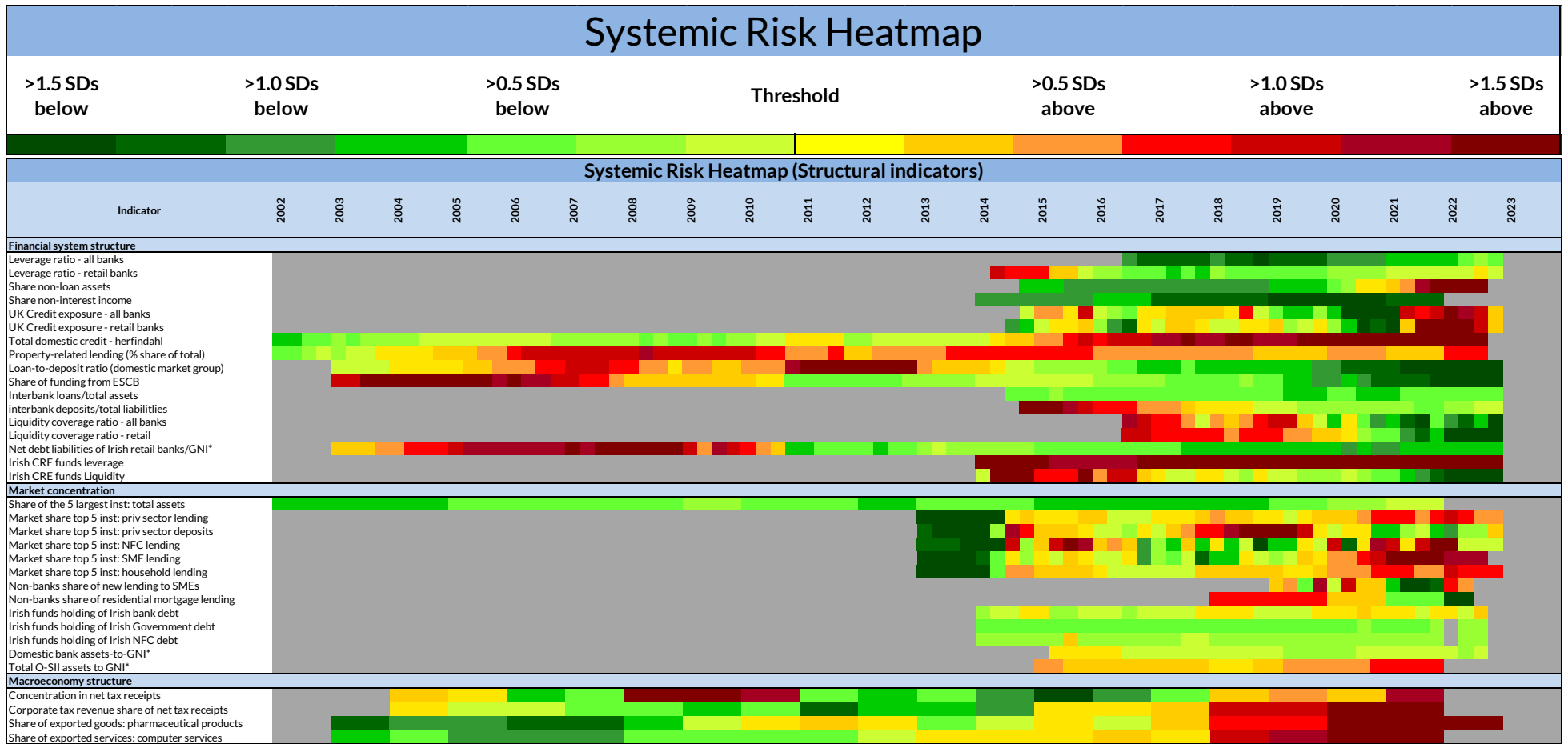
Note: The risk level column is categorised as follows: Orange, red and dark red colours highlight indicators moving in a direction associated with a build-up of systemic risk. Darker green colours will generally be associated with subdued financial system activity or the materialisation of systemic risk. As a result, light green and light yellow shades should be more indicative of benign conditions. Where appropriate the colour spectrum is inverted. Where a build-up of risks are associated with an indicator being below its threshold the heatmap is orange, red and dark red. For example relatively low liquidity coverage ratios reflect a potential build-up in liquidity risk. 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 dark blue when an indicator is decreasing and light blue when it is increasing. The list of indicators can vary over time depending on the suitability and availability of data. The SRP is reviewed regularly to ensure new risk indicators are included, as they are developed and refined. Care should be taken when interpreting some indicators as a short time series or limited number of observations may produce spurious results. **For more details on individual indicators see Heatmap Glossary on page 12.**

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 indicators 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 licenced by the Central Bank and are compiled for Irish retail banks 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. Market concentration indices are based on banking data only and do not include non-bank activity.

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	
Real-Estate Risk Heatmap							
Indicators	Threshold	Risk level	Last observation	Latest observation date	6 month change	Annual change	
Credit							
Growth in residential mortgage drawdowns	MIP threshold		6.8%	Dec-22	↓ -8.7 pps	↓ -14.3 pps	
Mortgage lending to disposable income	Model Benchmark (2003Q1-2018Q1)		7.6%	Sep-22	↑ 0.4 pps	↑ 1.0 pps	
Non-banks share of residential mortgage lending	Historical average		19.7%	Jun-22	→ 0.0 pps	↑ 8.0 pps	
Property-related lending (% share of total)	Historical average		68.9%	Sep-22	↓ -0.4 pps	↑ 3.6 pps	
Asset price							
Residential property price growth	MIP threshold		10.7%	Sep-22	↓ -4.3 pps	↓ -1.8 pps	
Residential property price-to-rent ratio	Historical average		18.76	Sep-22	↓ -0.02	↓ -0.01	
Residential property price-to-income ratio	Historical average		4.75	Sep-22	↑ 0.02	↑ 0.32	
Commercial real estate price growth	Historical average		-6.2%	Dec-22	↓ -6.3 pps	↓ -5.1 pps	
CRE yields	Historical average		5.4%	Dec-22	↑ 0.3 pps	↑ 0.2 pps	
CRE price misalignment measure	Zero		-18.9%	Sep-22	↓ -3.4 pps	↓ -6.0 pps	
Commercial real estate price at risk	Historical average		-13.0%	Sep-22	↓ 0.0 pps	↑ 0.0 pps	
Commercial real estate vacancy rates	Historical average		6.8%	Dec-22	↓ 0.0 pps	↓ 0.0 pps	
Market activity							
Residential property turnover	European average		2.9%	Dec-22		↑ 0.1 pps	
Residential property stock / 1,000 adults	European average		411	Dec-22		↑ 0.3%	
Residential property completions/ stock	European average		1.4%	Dec-22		↑ 0.4 pps	

Non-Bank Risk Heatmap							
Indicators	Threshold	Risk level	Last observation	Latest observation date	6 month change	Annual change	
Non-bank system structure							
Irish CRE funds leverage	European average		82.2%	Dec-22	↓ -1.0 pps	↓ -2.0 pps	
Irish CRE funds Liquidity	Historical average		7.0%	Dec-22	↑ 0.1 pps	↑ 0.5 pps	
Market concentration							
Non-banks share of new lending to SMEs	Historical average		27.6%	Jun-22	↓ -7.5 pps	↓ -8.7 pps	
Non-banks share of residential mortgage lending	Historical average		19.7%	Jun-22	→ 0.0 pps	↑ 8.0 pps	
Irish funds holding of Irish bank debt	European average		3.9%	Sep-22	↑ 1.2 pps	↑ 1.8 pps	
Irish funds holding of Irish Government debt	European average		0.8%	Sep-22	↑ 0.1 pps	↑ 0.2 pps	
Irish funds holding of Irish NFC debt	European average		2.1%	Sep-22	↓ -0.3 pps	↓ -0.4 pps	

Note: The addition of the non-bank heat map reflects the growing role of the sector in the domestic macro-financial landscape. It is envisaged that the list of indicators will be expanded in future editions. The risk level column is categorised as follows: Orange, red and dark red colours highlight indicators moving in a direction associated with a build-up of systemic risk. 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. Where appropriate the colour spectrum is inverted. Where a build-up of risks are associated with an indicator being below its threshold the heatmap is orange, red and dark red. 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 dark blue when an indicator is decreasing and light blue when it is increasing. The list of indicators can vary over time depending on the suitability and availability of data. The SRP is reviewed regularly to ensure new risk indicators are included, as they are developed and refined. Care should be taken when interpreting some indicators as a short time series or limited number of observations may produce spurious results. For more details on individual indicators see [Heatmap Glossary on page 12](#).



What is the Systemic Risk Pack?

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 monitoring of macroprudential 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 macroprudential 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.²

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 macroprudential indicators in policy setting, as set out in [Ryan \(2017\)](#). This document is created in order to facilitate macroprudential 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.³

Each edition includes a set of summary heatmaps. The data are categorised according to four broad risk categories. These are:

1. Cyclical risks, which relate to developments in credit, asset markets, risk-taking behaviour, the broader economic cycle and external imbalances, which are reflective of the gradual build-up of vulnerabilities in the macro-financial environment.
2. Structural risks which exist within the financial system independent of the financial and economic cycles. These stem from slow-moving features of the financial system or economy, such as market or exposure concentration, the degree of financial system

² For more on how the Central Bank assesses the systemic risks in Ireland see [Hallissey et al \(2022\)](#). Further information on the Central Bank's approach to macroprudential policy can be found [here](#).

³ Such as that provided by the [Financial Stability Review](#) and [Financial Stability Notes](#).

- interconnectedness and systemic importance, and the scope for structural macroeconomic shocks.
3. Real-estate risks, which pertain to cyclical and structural risks that stem from property-related exposures. Real-estate related assets and liabilities represent an important class of exposure for households, corporates, banks and non-bank financial institutions in Ireland. Property prices and related debt have contribute to economic booms and busts in the past. The build-up of such vulnerabilities can transmit through the financial system where exposures are material.
 4. Non-bank sources of risk, which relate to the increasing role of non-bank financial entities in the domestic economy. Non-banks, through their activities in the financial system, can contribute to the build-up of vulnerabilities which can amplify shocks to the domestic economy.

An explanation of indicators used is provided for each section in the form of a glossary. 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 risk. 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. It is 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 publically 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 SRP 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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Heatmap glossary	
All banks	All banks, both domestic and internationally-focussed banks operating in Ireland with a banking licence granted by the Central Bank of Ireland.
Business cycle Indicator	The Central Bank's Business Cycle Indicator (BCI) is a statistical measure of economic activity used to help provide a timely assessment of the current state of the economy. The indicator uses a large panel of relevant economic data from a variety of monthly data releases. The combination of high-frequency data and a mix of hard and soft data allows the indicator to identify potential turning points in the economy. For more see Conefrey and Walsh (2018) .
Commercial real-estate price growth	This indicator measures the annual growth rate in commercial property capital values as per MSCI/IPD's Irish commercial property capital value index.
Commercial real-estate price misalignment measure	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 ECB FSR, December 2011.
Commercial real-estate yields	This indicator presents the latest value of the (MSCI) gross rent passing yield on Irish commercial property, which is calculated as the gross rent passing at the end of a period expressed as a percentage of the (net) capital value at the same date.
Concentration in net tax receipts	Herfindahl index of net tax receipts by taxhead.
Corporate tax revenue share of net tax receipts	Corporate tax revenues as a percentage share of total net tax receipts.
CRE at risk (commercial real estate)	Similar to GNI* at risk, except based on forecasts for possible very weak (typically 5 th percentile) growth forecasts in the capital values of commercial real-estate based off current prevailing key input variables. The latter comprise current (one year) growth of CRE, financial conditions (ICSI), cyclical systemic risk (alternative credit to GDP gap) and a CRE misalignment indicator. In addition to the growth rate, the likelihood of that growth rate occurring is also estimated. For more see Kennedy et al (2021) .
Credit-to-GDP gap	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.
Domestic bank assets-to-GNI*	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.
Domestic inflation	Annual percentage change in the consumer price index.
Domestic NFC credit growth	This indicator measures year-on-year growth in lending to Irish non-financial corporations by Irish resident banks. This series is sourced from the Central Bank's data table A.1 .
Dynamic delta CoVaR	This series shows the dynamic time varying Delta CoVaR of an institution. This is a systemic risk measure detailing the contribution to the risk of the financial system by the institution. It measures how the value at risk (VaR) of the financial system changes when the institution moves from generating normal or expected stock market price returns to a situation where the institution is generating very poor or distressed returns (the latter being measured by the fifth percentile returns of the institution). The change (Delta) in the financial system's value at risk, conditional on state variables such as market volatility and liquidity and bond spreads, amongst others, (Conditional Value At Risk or CoVaR) is the institution's Delta CoVaR. The dynamic component reflects the fact that this systemic risk measure changes over time.
Employment rate	The employment rate is the number of employed aged 15 to 64 expressed as a percentage of the total population aged 15 to 64. See www.cso.ie for more.
Euro area inflation	Annual percentage change in the harmonised index of consumer prices for the euro area
Euribor OIS 3 month spread	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.
Euro composite indicator of systemic stress (CISS)	Developed by Hollo et al (2012) 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.
Euro financial spreads	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.

Euro government spreads	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.
Euro NFC spreads	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.
Export concentration	Export data relating to the concentration of export goods in medicinal and pharmaceutical products and concentration of export services in computer services are published by the CSO.
Financial Conditions Index	The index is a measure of tightening/easing in overall financial conditions. An increase in the index suggests a tightening in financing conditions, while a decrease suggests an easing in financing conditions. The index is comprised of both long and short-term government bond rates, corporate bond spread, price-earnings ratio and the nominal effective exchange rate (NEER), all of them equally weighted.
GNI*	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.
GNI* at risk	A forward looking forecast of possible very low (typically the 5 th percentile) growth rates for GNI* based off current prevailing growth rates, financial conditions (ICSI) and cyclical systemic risk (alternative credit to GNI* ratio). If presented in a series these represent historical forecasts of 5 th percentile growth rates based on data conditions prevailing at the time. For more see O'Brien and Wosser (2021) .
Growth in Global indebtedness	Annual change in global private non-financial debt as a percentage of global GDP.
Growth in residential mortgage drawdowns	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.
Herfindahl index	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. Data refers to credit institutions only and exclude activities of non-banks.
High yield corporate bond spreads	This data represents the Option-Adjusted Spread (OAS) of the ICE BofA Euro High Yield Index tracks the performance of Euro denominated below investment grade corporate debt publicly issued in the euro domestic or eurobond markets.
Household credit growth	This indicator measures year-on-year growth in lending to Irish households by Irish resident banks, inclusive of loans which have been securitised but continue to be serviced by the credit institution. This series is sourced from the Table A6 .
Interbank deposits	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.
Interbank lending	Interbank lending represents one channel of contagion between credit institutions
Irish Composite Stress Index (ICSI)	The ICSI presents a coincident measure of systemic risk conditions in financial markets for Ireland. The indicator ranges from 0 to 1. For more see Parla (2021)
Irish CRE funds leverage	This indicator refers to the ratio of total assets under management divided by total net asset value for Irish resident investment funds which invest in CRE.
Irish CRE funds liquidity	This indicator assesses the liquidity buffers of Irish resident funds, which fulfil typical redemption flows without the need to sell real-estate assets. A liquidity buffer is defined as (liquid assets/total assets). The majority of Irish CRE funds give investors at most one opportunity per year to redeem their investments. Most Irish funds can also limit large redemption requests with "gates" (temporary periods when funds do not allow redemptions) and redemption fees. This reduces the risk that CRE funds may have to sell properties quickly at discounts to meet redemptions.
Irish funds holding of Irish bank debt	Refers to the share of total Irish bank debt held by Irish resident funds. An increase in this figure is indicative of a rise in concentration risk and a greater level of interconnectedness between resident non-bank financial intermediaries and the Irish banking sector.
Irish funds holding of Irish government debt	Refers to the share of total Irish government debt held by Irish resident funds. An increase in this figure is indicative of a rise in concentration risk and a greater level of interconnectedness between resident non-bank financial intermediaries and the Irish sovereign.
Irish funds holding of Irish NFC debt	Refers to the share of total Irish NFC debt held by Irish resident funds. An increase in this figure is indicative of a rise in concentration risk and a greater level of interconnectedness between resident non-bank financial intermediaries and the Irish corporate sector.

Irish Government bond spreads – monthly average	This indicator measures the difference between 10-year Irish compared to German bond yields. It is presented as a monthly average of a daily data series underlying the ICSI (see glossary entry above).
Irish Private Sector Enterprises: CRE credit growth	Lending to Irish resident enterprises by branches and offices of banks resident in the State. CRE credit growth refers to the combined lending for the purposes of construction, real-estate land and development activities. See Table A14 for more details.
ISEQ three-month moving average quarter-on-quarter growth rate	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.
Leverage ratio banks	This indicator refers to the ratio of total exposures as a percentage of fully phased in Tier 1 capital.
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.
Loan-to-deposit Ratio	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.
Macroeconomic Imbalance Procedure (MIP)	The Macroeconomic Imbalance Procedure (MIP) is a surveillance mechanism developed by the European Commission. It aims to identify potential macroeconomic risks early on. It consists of a combination of stock and flow indicators which can capture both short-term rapid deteriorations as well as the long-term gradual accumulation of imbalances.
Market share top 5	Data are collected on a residency basis for credit institutions and do not include the activities of non-banks. The five largest banking groups are calculated per category and may not be the same across markets or points in time.
Mortgage lending to disposable income	This indicator represents the ratio of new mortgage lending to disposable income, both seasonally adjusted. Mortgage lending is sourced from quarterly BPF1 mortgage drawdown data (summing First-time Buyers, Second/Subsequent-time Buyers and Buy-to-let) and disposable income is sourced from the CSO's institutional sector accounts for households.
National credit	The national specific credit measure is discussed in Creedon and O'Brien (2016) 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.
Net debt liabilities of Irish retail banks/GNI*	Share of non-domestic based liabilities as a percentage of GNI*
Non-banks	Those financial entities that provide a range of financial services, most notably lending, to the domestic economy without a banking license.
Non-banks share of new lending to SME's	Quarterly new non-bank lending to Irish SMEs as a share of total new SME lending (banks and non-bank) to SMEs bank as reported in the CCR and bank balance sheet data. For the purposes of this indicator a low value is associated with a build-up of concertation risks.
Non-banks share of new residential mortgage lending	Annual new non-bank lending for Irish residential mortgages as a share of total new mortgage lending (banks and non-bank) as reported to the Central Bank as part of the mortgage measures Monitoring Template. For the purposes of this indicator a low value is associated with a build-up of concertation risks.
Non-interest income	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. Irish banks in the sample are retail banks. International comparison draws on the list of published O-SII banks.
Non-loan assets	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. Irish banks in the sample are retail banks. International comparison draws on the list of published O-SII banks.
O-SII	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. For more see www.centralbank.ie
PMI index	Purchasing Managers' Index (PMI): The composite Purchasing Managers' Index (PMI) is an indicator of economic health for manufacturing and service sectors. The purpose of the PMI is to provide information about current business conditions to company decision makers, analysts and purchasing managers. Each

	country PMI survey for the manufacturing or service sector is based on questionnaire responses from panels of senior purchasing executives (or similar) at over 400 companies. The composite PMI is a number from 0 to 100. A PMI above 50 represents an expansion when compared with the previous month. A PMI reading under 50 represents a contraction, and a reading at 50 indicates no change.
Private sector credit growth	Private sector credit refers to credit to households and bank credit to NFCs.
Property-related lending	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.
Ratio of total assets to total equity: Irish retail banks	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.
Residential fixed capital formation	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
Residential property completions/stock	The rate of residential property completions as a share of housing stock is an indicator of the level of residential building activity.
Residential property price growth	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 (see here for more information).
Residential property price-to-income ratio	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.
Residential property price-to-rent ratio	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.
Residential property price at risk	Similar to GNI* at risk, except based on forecasts for possible very weak (typically 5 th percentile) growth forecasts in residential property prices based off current prevailing key input variables. The latter comprise a house price misalignment indicator (based on house price-to-income ratios), financial conditions (ICSI) and the prevailing level of systemic risk (alternative credit to GDP gap) as well as market structure which is captured via a country fixed effects variable. In addition to the growth rate, the likelihood of that growth rate occurring is also estimated. For more see Box C in FSR 2020:II
Residential property stock/1,000 adults	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.
Residential property turnover	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.
Retail banks	The five retail banks: 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.
Share of funding sourced from ESCB	Borrowing from the Eurosystem relating to monetary policy operations of Irish resident credit institutions.
Share of the 5 largest institutions: total assets	Share of five largest credit institutions as defined by the ECB's banking structural Financial Indicators (SSI) series.
Systemic banking likelihood	This indicator tracks the probability of a systemic banking crisis occurring within a forecast horizon "h" from 1 to 8 quarters ahead and is the primary output of the Early Warning System currently used within the Bank. Typically, the results for a horizon of "h=8" are reported for Ireland although up to 26 additional countries crisis probabilities are tracked. Details of the model are outlined in O'Brien and Wosser (2018) . There are 8 core input variables, which have been shown to demonstrate good signal to noise ratios in terms of signalling prior systemic banking crises as outlined in Laeven and Valencia (2013) and the ECBs financial crisis database (see Lo Duca et al. (2017)). The model forms a guide to the potential build-up of systemic banking risk and the trend in the series is as important as the actual probability recorded.
UK Credit exposure	Share of total loans and advances of Irish banks extended to UK counterparties.
Unemployment rate	The unemployment rate is calculated as the number of unemployed expressed as a percentage of the total labour force aged 15 to 74. The series is seasonally adjusted. See www.cso.ie for more.
World GDP growth	Estimated and forecast growth in world GDP as published by the IMF in its World Economic Outlook.
World trade growth	Annual growth in world trade volumes, seasonally adjusted. See www.cpb.nl for more.



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