

BOX 1: A CYCLICAL SYSTEMIC RISK INDICATOR FOR MALTA¹

The conduct of macroprudential policy includes the monitoring of both structural and cyclical systemic risk. Structural systemic risk is associated with the accumulation of vulnerabilities in the financial sector that can potentially intensify unfavourable economic shocks. Cyclical systemic risk is related to the build-up of macro-financial imbalances related to the dynamic developments of the financial cycle (Hodula et al., 2021).² Several studies provide evidence that cyclical risk builds up before a financial crisis (Minsky, 1982; Kindleberger, 1996; Schularick & Taylor, 2012; Mandler & Scharnagl, 2021).³ During a financial cycle upturn, growth in credit, and prices of financial and real estate assets surge, leading to higher collateral values and private sector debt via collateral channels (Hodula et al., 2021). The financial cycle reaches a peak when unsustainability concerns materialise via a drop in demand for these assets. This can drive fears of a correction, and impinges further on the value of collateral, potentially making debt underwater. A financial crisis ensues, leading to serious financial distress and economic dislocations (Borio, 2014).⁴

Macroprudential policy requires a time-dependent systemic risk framework to monitor the existence of risks, and quantify the likelihood of their eventual occurrence. The countercyclical capital buffer (CCyB) for Malta is guided *inter alia* by the deviation of the credit-to-GDP ratio from its long-term trend – known as the “Basel gap” – which proxies cyclical risk accumulation in the financial system. The Basel gap is a useful starting point to characterise the cyclical systemic risk present before a financial crisis. This measure is based on a trend extracted using a one-sided Hodrick-Prescott (HP) filter, and is argued to offer reliable early warning signals for a systemic banking crisis (Borio & Lowe, 2002; Borio & Drehmann, 2009; Detken et al., 2014).⁵ However, the Basel gap has several weaknesses, which primarily stem from the use of the HP filter (Hamilton, 2018; Lang et al., 2019).^{6,7} In light of these weaknesses, complementary cyclical systemic risk measures have been developed by central banks. In setting the CCyB for Malta, a spectrum of quantitative indicators (such as measures of property price overvaluation and household indebtedness) are monitored to assess the build-up of systemic risk and excessive credit growth.⁸

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² Hodula, M., et al. (2021). *Interaction of Cyclical and Structural Systemic Risks: Insights from Around and After the Global Financial Crisis*. Czech National Bank, Economic Research Division.

³ Minsky, H. P. (1982). The Financial Instability Hypothesis: Capitalist Processes and the Behavior of the Economy. In C. P. Kindleberger & J. P. Laffargue, *Financial Crises: Theory, History, and Policy* (pp. 13-39). Cambridge University Press.

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Mandler, M., & Scharnagl, M. (2022). Financial Cycles in Euro Area Economies: A Cross-Country Perspective Using Wavelet Analysis. *Oxford Bulletin of Economics and Statistics*, 84(3), 569-593.

⁴ Borio, C. E. (2014). The financial cycle and macroeconomics: What have we learnt?. *Journal of Banking & Finance*, 45, 182-198.

⁵ Borio, C. E., & Lowe, P. (2002). Assessing the risk of banking crises. *BIS Quarterly Review*, 7(1), 43-54.

Borio, C. E., & Drehmann, M. (2009). Assessing the risk of banking crises – revisited. *BIS Quarterly Review*, March 2009.

Detken, C., et al. (2014). Operationalising the countercyclical capital buffer: indicator selection, threshold identification and calibration options. *ESRB: Occasional Paper Series*, (2014/5).

⁶ Hamilton, J. D. (2018). Why you should never use the Hodrick-Prescott filter. *Review of Economics and Statistics*, 100(5), 831-843.

Lang, J. H., et al. (2019). *Anticipating the bust: a new cyclical systemic risk indicator to assess the likelihood and severity of financial crises*. ECB Occasional Paper, (219).

⁷ Three main weaknesses are highlighted by Lang et al. (2019). After a credit boom, the credit expansions spill into the trend, causing it to remain persistently high and the resulting gap to stay negative for a substantial period of time. Second, the gap is influenced by the length of the time series used, decreasing the measure's robustness for countries that have short credit time series. Third, concerns related to the ease of communicating results may emerge when the credit-to-GDP data and its trend are both increasing but the trend is increasing at a faster rate, causing the gap to narrow down.

⁸ See Central Bank of Malta. Source: <https://www.centralbankmalta.org/countercyclical-capital-buffer>.

Apart from the shortcomings of the Basel gap, practical evidence, and academic literature show that monitoring solely credit variations may not be sufficient to capture the cyclical risk present in a financial system (Tölö, 2020).⁹ It is also fundamental to condense and amalgamate a wide range of financial cycle information into one or a few measures, due to the vast number of indicators that can be used to monitor risks in practice. The synthetisation of data as a composite indicator aids macroprudential policymakers to monitor and analyse the dynamics of the financial cycle more easily.

A cSRI for euro area countries has been developed that has early warning features that can predict vulnerable periods before a systemic crisis (Constâncio et al., 2019).¹⁰ However, Constâncio et al. (2019) show that there is significant cross-country heterogeneity in the cSRI across the euro area and emphasize the importance of having country-specific macroprudential policies, together with a country-specific risk indicator. Moreover, the relevance of the cSRI as applied to Malta may be questioned as the methodology behind the cSRI presented in Constâncio et al. (2019) draws from past systemic crises experienced by other countries, whereas Malta did not experience crises in its recent macroeconomic history. Any periods that can be considered to have been characterised by notable systemic stress in Malta were significantly more short-lived and of limited impact on the macroeconomy.

This box focuses on the construction of a domestic cyclical systemic composite indicator for Malta, based on a subset of variables that are judged to be suitable early warning indicators. The main objective of this summary indicator is to convey further information about the accumulation of cyclical systemic risk over time. It also serves as a useful input in the policymaking process, whilst complementing other macroprudential tools in use.

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The variables that are included in the computation of the cSRI for Malta are based on an ECB early warning system that can predict financial crises (Lang et al., 2019). The cSRI is calculated based on four sub-indicators, drawn from a list of variables based on the ESRB Recommendation ESRB/2014/1.¹¹ These include the two-year real bank credit growth rate, the one-year change in the debt service-to-income (DSTI) ratio for the whole economy, the house price-to-income per capita ratio, and the two-year growth rate in real total debt (which includes both private and public sector debt). Hence, measures of credit developments, private sector debt burden, affordability of property prices, and overall imbalances are captured respectively. The four sub-indicators are combined into a composite indicator by employing weights using a statistical technique, and the signs of these weights are then assessed against expectations based on economic theory.

The country-specific weights for the cSRI are obtained using Principal Component Analysis (PCA), after the variables are standardised. This technique summarizes the co-movement among a potentially large set of variables in a few principal components, and is also behind other indicators used by the Bank, such as the Financial Conditions Index for the analysis of monetary conditions, and transmission of monetary policy.¹² The cSRI presented in this box is based on the first principal component, which captures 63% of the variation amongst the set of variables listed above.¹³ The weights for the sub-indicators that result from PCA analysis are displayed in Table 1. Real bank credit has the largest

⁹ Tölö, E. (2020). Predicting systemic financial crises with recurrent neural networks. *Journal of Financial Stability*, 49(3).

¹⁰ Constâncio, V., et al. (2019). *Macroprudential policy at the ECB: Institutional framework, strategy, analytical tools and policies*. ECB Occasional Paper, (227).

¹¹ ESRB (2014). Recommendation of the European Systemic Risk Board on guidance for setting countercyclical buffer rates. European Systemic Risk Board 2014/C 293/01.

¹² See Micallef, B. and Borg, I. (2017). Box 1: A Financial Conditions Index for the Maltese Economy, *Annual Report 2017*, 32-36. Central Bank of Malta.

¹³ During the research process, various principal components were extracted, which consisted of a broader set of macro-financial variables, different data transformations and various sample periods. Two important necessary conditions were considered during such exercise: the concordance of the index with judgement on the history of cyclical systemic risk in Malta; and the consistency of the sign of factor loadings with economic theory. More technical details can be found in a forthcoming working paper.

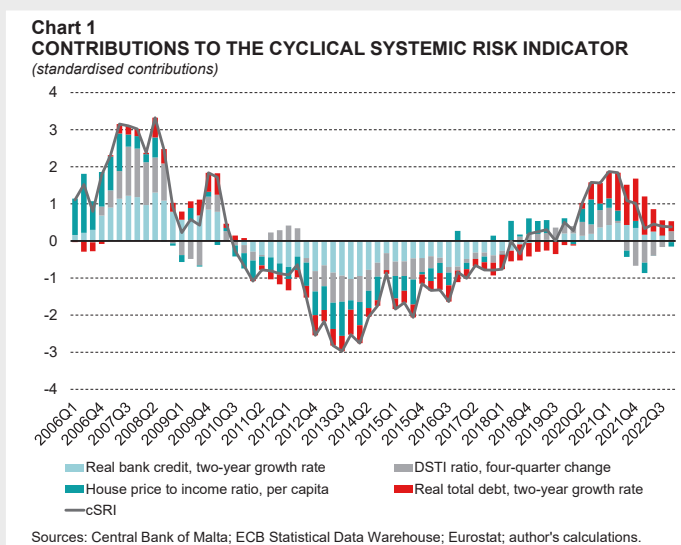
Table 1
CONTRIBUTIONS TO THE CYCLICAL SYSTEMIC RISK INDICATOR

Variables	Factor loadings	Weights %
Real bank credit, two-year growth rate	0.60	36.0
DSTI ratio, four-quarter change	0.48	23.4
House price to income ratio, per capita	0.48	22.9
Real total debt, two-year growth rate	0.42	17.7

Source: Author's calculations.

relative weight, reflecting the fundamental role that banks play in Malta's financial system. The other three sub-indicators have approximately equal weights, contributing positively to domestic cyclical systemic risk.

Chart 1 plots the cSRI and the contributions of the underlying sub-indicators from 2006Q1 to 2022Q4.¹⁴ Positive contributions of a variable indicate that it is higher than its historical average, and vice versa. Consequently, the cSRI indicates a build-up in cyclical systemic risk when it is above zero, and a winding-down of cyclical risk when it is below zero.



During the sample period considered, the cSRI reached its highest value during 2008Q2 and its lowest value during 2013Q3. This peak coincides with the onset of the Global Financial Crisis (GFC), and is characterised by rising house prices, followed by strong credit growth and rising debt burden. However, the Maltese economy proved to be resilient during the GFC due to a robust banking sector characterised by conservative lending practices. Most banks managed to retain healthy returns and liquidity, despite increasing regulations during such global turmoil. Almost all sub-indicators contributed positively to the cSRI up to 2010, except for the DSTI ratio, which fell in mid-2009 following the pass-through of the ECB's monetary policy loosening.

A period of low cyclical systemic risk was experienced for several years until 2019. As seen in Chart 1, over this period, real bank credit growth moderated substantially, the DSTI ratio declined, while the house price-to-income ratio declined until 2013, after which it resumed an upward trajectory. Findings from the BLS show tighter bank lending standards were in force between 2011 and 2013,

¹⁴ The cSRI starts from 2006Q1 onwards due to the lack of data availability prior to 2004Q1 for some of the sub-indicators. The two-year transformation for real bank credit and total real debt uses the first two years of data.

stabilising financing demands by NFC.¹⁵ The importance of bank credit as a financing source for NFCs also declined somewhat over time, as alternative sources of finance such as intragroup and wholesale funding were sought. Public debt grew, albeit at low levels for the first part of this period, with high economic growth eventually leading to favourable government finances, and to a reduction in the stock of outstanding public debt. Nevertheless, the strong economic growth contributed to keep cyclical systemic risks low for some time.

The cSRI peaked in 2021, at the height of the COVID-19 pandemic. A significant driver was the growth in total debt, attributed to the rise in public debt because of the fiscal support measures put in place at the time. However, house prices relative to income continued their upward trend, as did total bank credit, which exerted further upward pressure on the cSRI. This heightened cyclical systemic risk was phased downwards due to a strong economic recovery. COVID-19 related support measures, such as moratoria and the Wage Supplement Scheme, allowed the retention of employment in sectors severely hit by the pandemic, reducing the likelihood of default on bank loans and debt securities.

Financial stability risks remained contained as other support schemes were implemented, such as the MDB COVID Guarantee Scheme (CGS). The additional borrowing required to finance the shortfall in government revenue elevated the stock of general government debt drastically when compared to 2019.¹⁶ From early 2021 onwards, the cSRI was following a downward trend, signalling lower systemic risk as the consequences of the pandemic waned. Particularly, the DSTI contributed negatively to the cSRI due to a strong recovery in GDP, which is used as a measure of income. By 2022Q4, the cSRI indicates relatively low and stable cyclical risks, following an adjustment process to the pandemic shock.

Policy implications

The cSRI is equipped with macro-financial variables which are closely aligned with the movement of cyclical systemic risks in Malta. The early warning features of the cSRI can signal a systemic crisis ahead of time, providing policymakers with an opportunity to build resilience in the financial system, and counter the financial cycle by deploying the necessary macroprudential tools in a timely manner.

The cSRI is not meant to be used mechanically, and other complementary tools and expert judgement will be referred to for policy considerations. Having a suite of instruments as part of a cyclical risk analysis framework means that decisions are supported by a broad information set. In this context, the cSRI acts as another quantitative indicator that can be monitored and considered when assessing the appropriate CCyB level, as well as guiding Malta's macroprudential policy stance more generally.

¹⁵ See Zerafa, S. (2017). Access to finance for firms in Malta: Estimating the impact of reduced credit. *Policy Note*, July 2017, Central Bank of Malta.

¹⁶ See Attard, J. and Farrugia, J. (2022). Box 4: The Fiscal Response to the COVID-19 Pandemic, *Quarterly Review* 2022:2, 72-77. Central Bank of Malta.