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Measuring France's Financial Vulnerability

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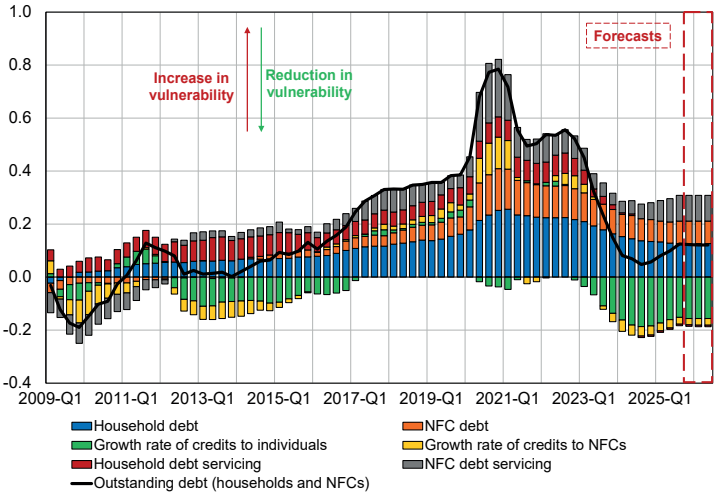
- Macroprudential policy strives to limit imbalances in the financial system with an eye to forestalling financial crises or mitigating their severity. In France, the High Council for Financial Stability (HCSF) has been tasked with managing this policy since 2013. To do so, it has a number of resources at its disposal, one of which is the countercyclical capital buffer. To determine its measures, the HCSF examines a set of quantitative indicators and relies on expert judgment.

- In looking to enhance its monitoring and analysis of financial stability, the French Treasury (DG Trésor) has established a composite indicator of the vulnerability of the French financial system which incorporates 17 macro-financial variables in five categories – using a machine learning process – tying them in with previous periods of extreme stress.

- The indicator accurately captures both identified periods of vulnerability that have affected France's financial landscape (subprime and euro area crises, COVID-19 pandemic) and the vulnerability caused by recent resurgence of inflation.

- In recent times, France's financial vulnerability indicator has not flagged up major upward pressure on the aggregate risk. Private debt-related risks have diminished although they remain a source of vulnerability. However, since 2024, financing conditions on the markets and real estate market have played an accommodative role. It should be noted that some data for the period subsequent to Q3 2025 has not yet been published. This means that the forecasts do not capture the full effects of the conflict in the Near and Middle East.

Indicator of France's financial vulnerability



Sources: Bloomberg, BIS, Banque de France, ECB data. DG Trésor calculations.

Note: Most recent data point, Q3 2025, forecasts up to Q2 2026 (data as at 4 May 2026).

How to read this chart: An uptick in the indicator shows an accumulation of risks whilst a downturn indicates a reduction. For Q3 2025, the indicator does not point to clear momentum with the upward contribution of the "outstanding debt of households and non-financial corporations" category being offset by the "real estate market" and "financing conditions on the markets" categories.

1. How does macroprudential policy counter financial vulnerability?

1.1 Macroprudential policy has ramped up since the 2008 financial crisis and is determined by the HCSF in France

Systemic financial risk is defined as the likelihood that a disruption affecting a stakeholder or segment of the financial system will escalate to the entire system and ultimately threaten financing conditions for the real economy. The 2007-2008 financial crisis highlighted the need to reduce this risk. The interplay between, and systemic features of, certain vulnerable financial stakeholders (e.g. Lehman Brothers) heightened the shocks caused by individual collapses. In the wake of the crisis, regulators decided to bolster the surveillance and resilience of financial systems as a whole.

As a result, macroprudential policy strives to safeguard financial stability by reducing this risk. It works at macroeconomic level by positing that the systemic risk is not simply the sum total of individual risks and aims to mitigate it before it occurs. In this respect, it supplements the microprudential policy that ensures the financial robustness of individual institutions.

The institutional macroprudential framework was formed at European Union (EU) level when the European Systemic Risk Board (ESRB) was set up in 2010. This body monitors the risk for the financial system throughout the EU. Each Member State also has a national authority with the HCSF having taken up this role in France in 2013. It is tasked with "overseeing the financial system as a whole, with the aim of preserving its stability and ability to make a sustainable contribution to economic growth".[1]

The HCSF comprises eight members, five of whom are ex-officio members – the Minister for the Economy and Finance (HCSF Chair), the Governor of the Banque de France, the Deputy Chair of the Prudential Supervision and Resolution Authority, the Chair of the Autorité des marchés financiers (French Financial Markets Authority) and the Chair of the Accounting Standards Authority – and three appropriately qualified individuals appointed by the Minister and the Presidents of the National Assembly and the Senate. The secretariat is the joint responsibility of the Banque de France and the French Treasury. The HCSF's decisions draw on the principle of "guided discretion",[2] meaning that they are based on a set of quantitative indicators and qualitative information to inform its assessments, without being systematically connected to an automatic rule.

1.2 The countercyclical capital buffer is one of the macroprudential policy's key mechanisms

The predominant aim of macroprudential regulations is to heighten financial institutions' resilience. The European Systemic Risk Board also advises national authorities to work towards achieving intermediate objectives so as to manage the macroprudential policy in a more operational manner.[3] These objectives relate to mitigating and preventing excessive credit growth and leverage to avoid asset bubbles, requiring banks to have sufficient liquidity to address a potential liquidity crisis and limiting the interconnectedness of financial institutions to help reduce the possible domino effect. The HCSF has incorporated these objectives into its strategy that was updated in March 2026.[4] These measures are geared towards reducing moral hazard which in this context refers to when institutions that are deemed to be "too big to fail" take "unreasonable" risks in the knowledge that the public authorities will intervene to avoid economic meltdown, and ensuring the technical and operational resilience of market infrastructure to cope with crises.

The HCSF has a whole range of instruments to carry out its work ranging from communication initiatives and non-binding recommendations to measures that are, in fact, legally binding. Among the latter, and to prevent excessive credit growth, the HCSF has capital-based instruments that require banks to build up resources earmarked to absorb losses should a systemic risk emerge.

The countercyclical capital buffer (CCyB)[5] or credit-protection reserve is an instrument that was unveiled as part of the Basel III framework (the final phase of international banking agreements) and has been effective within the EU[6] since 2016. The CCyB involves

(1) Article L.631-2-1 of the Monetary and Financial Code.
(2) The HCSF's 2022 Annual Report (in French only).
(3) ESRB (2013), Recommendation of the European Systemic Risk Board of 4 April 2013, *Official Journal of the European Union.*
(4) The HCSF's strategy (in French only).
(5) HCSF (2018), Note on the countercyclical capital buffer (in French only).
(6) It was enacted in EU law under the CRD IV Directive (2013).

building up an additional capital reserve during the expansion phase of the financial cycle that can be released in the event of a downturn to buttress the banks' ability to continue financing the economy. Its steering is asymmetrical as banks have a 12-month timeframe in which to comply with an increase in the CCyB but are able to immediately benefit from a reduction.

The EU framework[7] is grounded in the principle of "guided discretion". The guidance is provided by the credit-to-GDP gap, i.e. the difference between the credit-to-GDP ratio and its long-run trend. At EU level, this measure is seen as the most reliable sign of the ramping up of the pro-cyclical risks that the CCyB is supposed to mitigate and it is the basis for an almost automatic rule: when the gap exceeds two percentage points, the Basel framework recommends a positive buffer, which rises to 2.5% when the gap reaches 10 percentage points. However, the discretionary element relies on the ESRB Recommendation expressly acknowledging the limits of this single indicator and encouraging the national authorities to supplement their analysis with additional variables and with expert judgment. The current situation in France provides a shining example of this interaction: while the credit-to-GDP gap is negative, the HCSF keeps the buffer at 1%, thus demonstrating that the Basel rule is not applied automatically and that other vulnerability indicators call for macroprudential headroom to be maintained. The HCSF's 2022 Annual Report provides details of its current analytical framework for setting the CCyB rate.[8] In practice the HCSF set the CCyB rate at 0.25% in July 2018, raised it to 0.5% in April 2019 before lowering it to 0% in March 2020 during the COVID-19 pandemic. The rate subsequently rose gradually to an effective rate of 0.5% in April 2023 and then 1% since January 2024.

Monitoring the extent of vulnerability of the French financial sector, which is factored in when the CCyB rate is set, can be complicated, on the one hand, by the plethora of indicators which may diverge over time and, on the other, by uncertainty as to the weighting to be given to each variable. In response, the French Treasury, as adviser to the Minister who is the HCSF's Chair, sought to introduce a composite indicator to measure the vulnerability afflicting the French financial system in a continuous and aggregated manner. This indicator is an analytical instrument intended to enhance the French Treasury's monitoring of financial vulnerability, even outside the specific context of the HCSF's work. In this manner, it can help inform discussions on setting the CCyB rate or on the overall state of the financial system.

2. Assessing the extent of the financial sector's vulnerability

2.1 The vulnerability indicator supplements financial cycle and early warning indicators

The macroprudential approach factors in two aspects to assess the financial sector's vulnerability. First, there is a time dimension connected with changes to the financial cycle and, second, a cross-cutting dimension that relates to sector-based vulnerability. The first is covered by financial cycle indicators that are calculated either by the Banque de France or the French Treasury.[9] Financial cycles differ from business cycles in that they encapsulate the self-reinforcing interactions between perceptions of value and risk, risk-taking and financing constraints.[10] Although there is no consensus on a definition, the financial cycle can be said to comprise cyclical co-movements in variables that gauge general financial conditions. The cycle can be broken down[11] into five phases: boom, euphoria, climax and crisis, ebb and pessimism, followed by an adjustment stage and the elimination of financial imbalances. The economic literature has flagged up indicators to give a picture of the overall changes to the financial cycle, meaning its expansion and contraction phases.

(7) Taken from the ESRB Recommendation (ESRB/2014/1).
(8) HCSF (2022), Annual Report (in French only).
(9) R. Russo (2022), "An Indicator of the Financial Cycle in France Since the Beginning of the 2000s", *Tresor Economics*, No. 317.
(10) Bank for International Settlements – 84th Annual Report (2014).
(11) C. Kindleberger (2006), "Histoire mondiale de la spéculation financière", *Valor Editions Paris* (Title in English: "Manias, Panics and Crashes: A History of Financial Crises").

For their part, early warning indicators[12] aim to detect an accumulation of systemic risks prior to the occurrence of a financial crisis. The credit-to-GDP gap, debt servicing[13] and real estate prices are highly relevant for signalling the ramping up of financial vulnerability,[14] especially when combined.[15]

This paper aims to gauge the current level of vulnerability of the financial system and to place it in an historical context. It sails close to the logic of early warning indicators in the choice of variables but differentiates itself owing to the final objective. Whilst early warning indicators are designed to predict the occurrence of a crisis over a given timeline, the indicator we put forward provides an assessment of the extent of the risk at a precise instant. This means that it also differs from financial cycle indicators that cover major growth and recession trends that are solely financial. The indicator has also been formed so as to be both composite and decomposable.

2.2 The rationale for using a composite indicator

A composite indicator provides an overall and summarised view of the extent of the risk and enables the level of vulnerability to be placed in an historical context, which is central to countercyclical logic. EU recommendations expressly encourage macroprudential authorities to consider "other relevant variables or models that combine variables".

2.3 A multidimensional indicator of vulnerability in the financial cycle

The French Treasury's indicator of the financial sector's vulnerability is built to represent the weighted average of sub-indicators grouped in macro-categories. As a result, it allows for identification of the risk factors that contribute the most to the extent of vulnerability at a given instant, on the basis of the 17 variables used. Each data point is standardised and this guarantees the comparability of the series expressed at different scales. The data is then consolidated into a weighted average so as to transform a diverse dataset into a single vulnerability score.

The weighting structure reveals the overriding clout of credit variables, especially those concerning households, and market indicators (see Table 1).

Table 1: Sub-components of the indicator of financial vulnerability and their weighting based on a random forest model

Categories	Variables	Weighting	By category
Outstanding debt of households and non-financial corporations (NFCs)	Households' debt-to-GDP-ratio	16.6%	55.2%
	Growth in loans to households	10.1%	
	NFCs' debt servicing	8.0%	
	Households' debt servicing	7.7%	
	NFCs' debt-to-GDP-ratio	7.4%	
	Growth in loans to NFCs	5.4%	
Credit financing conditions	Average interest rate for new loans to households	4.1%	13.8%
	Average interest rate for new loans to NFCs	3.4%	
	Tightening of lending conditions for NFCs	2.8%	
	Tightening of lending conditions for households	1.9%	
	Proportion of credit-constrained firms	1.6%	
Real estate market	Real estate prices/household income ratio	7.4%	12.1%
	Over-valuation of real estate prices	4.7%	
Financing conditions on the markets	High yield/mid swaps spread	15.6%	16.7%
	OAT/Bund spread	1.1%	
Market valuation	Price/earnings ratio	1.7%	2.2%
	Average credit default swap premium of the CAC 40 Index	0.5%	

Source: DG Trésor calculations.

(12) M. Drehmann and M. Juselius (2013), "Evaluating early warning indicators of banking crisis: Satisfying policy requirements", B*IS Working Papers* no. 421.
(13) M. Drehmann, M. Juselius and S. Quincy (2024), "Aggregate debt servicing and the limit on private credit", *Bank of International Settlements*.
(14) M. Terrones, A. Kose and S. Claessens (2011), "Financial cycles: What? How? When?", *IMF Working Papers*, no. 11/76, April.
(15) C. Borio and P. Lowe (2002), "Asset prices, financial and monetary stability: exploring the nexus", *BIS Working Papers*, no. 114, July.

Box 1: Weighting the variables to measure the risks of severe financial strain

1. The indicator's overall composition

The 17 variables were selected according to macroprudential practices and on the basis of the academic literature. To allow for a comparison of the data between itself and over a given past period, each series has been standardised as shown below, with μ being the rolling average and σ standard deviation for the series:

$$Z_i = \frac{x_i - \mu}{\sigma}$$

The final composite indicator is the weighted average of these z-scores for each quarter:

$$Final\_Indicator = \sum_{i=1}^{17} w_i Z_i$$

2. Choice of the weighting of each variable based on a random forest model

For each variable, this indicator shows and aggregates the deviation between the current findings and their historical average calculated from all statistics available. The historical timeline varies depending on the indicator but the full sample can be used as from Q1 2009.

The aim of the indicator is to predict instances of severe tension in the French financial system that are modelled as a binary state – the system is either under stress or not – and, especially, non-linear in relation to the chosen variables. Machine learning models and, in particular, ensemble models, allow for more robust and stable outcomes by aggregating the results of several algorithms, in this case random trees. The model obtained (random forest) has been trained to predict the "crisis" variable which is a binary variable built using the ESRB's European financial crises database. The selected stress-generating events were those having occurred in France. So, during the period under review, five major macro-financial stress and heightened vulnerability episodes were identified: the lasting period of real estate price adjustment and bank fragility between 1991 and 1999, that was triggered by the economic downturn in 1990, the dot-com bubble in 2002 and 2003, the financial crisis from 2008 to 2011, the sovereign debt crisis from 2011 and 2012 and the systemic shock relating to the COVID-19 pandemic between 2020 and 2021.

The missing values for the variables with a shorter timespan, at the start of the period, are managed directly by the algorithm which learns how to process these observations without using arbitrary value imputation during the training. The model is estimated on 70% of observations (training) and assessed on the remaining 30% (testing). Out of this test sample, it is accurate at 96.8%; Cohen's Kappa coefficient is 0.9 which confirms that the performance level is not attributable to imbalances in classes. Sensitivity is 100%, meaning that no vulnerability episode is missed. This is desirable in a context where the cost of a false negative is significantly higher than that of a false positive. The area under the ROC curve (0.97) points to adequate discrimination ability between the two states. These outcomes should nevertheless be interpreted with caution due to the limited size of the available historical sample and the small number of stress-generating events.

The weighting is deduced from the variable importance, which is calculated according to Mean Decrease Accuracy (MDA)[a] which evaluates how much prediction accuracy drops when a variable's values are permuted. This measurement captures the variable importance for predicting an event, in this case systemic stress. To calculate the weighting, the MDA are normalised so that the total weighting equals one. However, this approach does not allow for a direct link to be established, for instance in the form of a threshold, between the level of the indicator and the model's prediction. In fact, the model's prediction relies on non-linear logic which is not limited to a linear combination of input variables. In addition, permutation importance measures the prediction contribution of a variable without qualifying the effect: the composite indicator therefore summarises the extent of the historical deviations weighted according to their predictive relevance without reproducing the model's predictive function.

a. Hong Han, Xiaoling Guo and Hua Yu (2016), "Variable selection using Mean Decrease Accuracy and Mean Decrease Gini based on Random Forest", 2016, 7th *IEEE International Conference on Software Engineering and Service Science* (ICSESS), Beijing, pp. 219-224.

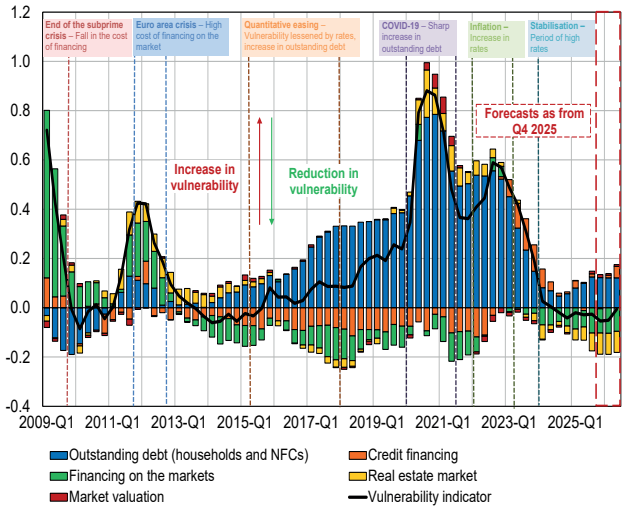
3. How can the past be reviewed from an economic perspective in light of the indicator, and how can today's financial vulnerability be analysed?

3.1 Exiting the global financial crisis (2009-2012)

The indicator series starts in Q1 2009 during the financial crisis, when all the data became avaialble. Its high level (0.7) was mainly driven by the "Financing conditions on the markets" category. At the time, the wide credit spreads represented the overriding vulnerability factor. On the other hand, the contribution of debt was negative owing to the credit crunch during the crisis.

The indicator contracted rapidly until late 2009 as market conditions normalised. There was a fresh hike in 2011-2012 during the sovereign debt crisis in the euro area, with a local maximum of 0.4 in Q1 2012, spurred principally by financing conditions on the markets, both high yield and the OAT/Bund spread.

Chart 1: Indicator of financial vulnerability



Sources: Bloomberg, BIS, Banque de France, ECB data. DG Trésor calculations.

Note: Most-recent data point, Q3 2025, forecasts up to Q2 2026 (latest data as at 4 May 2026).

How to read this chart: An uptick in the indicator shows an accumulation of risks whilst a downturn indicates a reduction.

3.2 Quantitative easing: low risk from 2015 to 2018

The risk was contained by low interest rates and was incrementally increased by the outstanding debt of households and NFCs. As from 2013, the overall indicator fluctuated at around zero which was a record-low level over the period under review. Behind this apparent stability lie diverging underlying trends that can be identified thanks to the breakdown of the indicator.

The "outstanding debt" category has risen continuously from zero in Q2 2013. This increase demonstrates an ongoing hike in the outstanding debt of households and NFCs against a backdrop of highly favourable credit financing conditions. Indeed, the categories relating to these conditions and to financing conditions on the markets apply a negative offsetting effect. The ECB's key interest rates, which were kept at an extraordinarily low level, before becoming negative, as well as quantitative easing, compressed borrowing rates and credit spreads and automatically dragged these categories down.

As a result, a simple consultation of the aggregated indicator for this period fails to reveal the diversity of the underlying trends. The breakdown shows a reverse change in the risks concerning financing conditions which fall and those relating to debt which increase. These findings confirm the pertinence of a macroprudential analysis broken down by category, as a supplement to aggregated monitoring.

3.3 The COVID-19 pandemic: a shock on outstanding debt, slightly mitigated by exceptional financing conditions

The 2020 pandemic caused a sharp rise in the indicator, up from 0.2 (Q4 2019) to 0.9 (Q3 2020), a record high for the period under review. This increase was mainly attributable to the category relating to the outstanding debt of households and NFCs which jumped from 0.4 to 0.8 in the space of four quarters. This change points to a denominator effect connected to the contraction of GDP, which inherently increases the debt ratios for these two groups of stakeholders. However, the uptick in credit granted to businesses through government-backed loans heightened the trend with regard to NFCs. The latter's debt servicing ratio also deteriorated markedly due to the increase in debt stock. The real estate market category also made a positive contribution, a reflection of rising prices during this period. Any analysis of the pandemic should be made with caution as it was exogenous to the financial sector.

3.4 The return of higher inflation in 2022: a reverse trend with gradual normalisation of the risk relating to outstanding debt but an increase in the rate-related risk

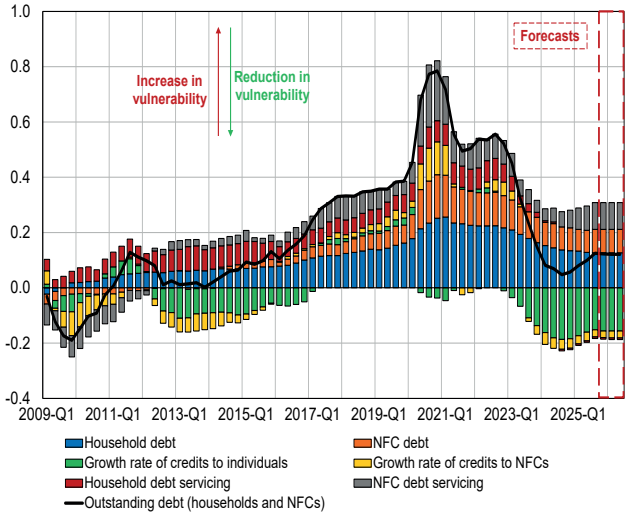
Starting in 2022, the rapid rise in interest rates under the ECB's monetary policy normalisation process altered the structure of vulnerability. The overall indicator rose temporarily from 0.3 to 0.6 between Q3 2021 and Q3 2022. Financing conditions on the markets were no longer accommodative after having mitigated vulnerability over a long period of time. At the same time, the increase in rates triggered normalisation of the outstanding debt of households and NFCs (contribution of 0.5 in Q3 2022 which was close to zero by Q3 2024): the slowdown in lending, the recovery of nominal growth and the progressive reduction of NFC debt all contributed to the decline of the category; it began to rise again in late 2024.

3.5 Current risk-related momentum is stable overall

It should be noted that the only variables that are fully available subsequent to Q3 2025 are those relating to financing on the markets and the measures for tighter restrictions on loans to households and NFCs. This means that the overall indicator only covers part of the vulnerability caused by the conflict in the Near and Middle East. It gradually returned to slightly negative levels in 2024, reverting to a rather low level during the period under review. The category covering outstanding debt still constitutes the only major positive contribution besides, to a lesser extent, the market valuation category. This reflects continued high debt levels for households and NFCs (see Chart 2) which are higher than their long-term averages, just like NFC debt servicing. Vulnerability has nevertheless been tempered by lower growth rates in loans to households and, to a lesser degree, NFCs, which remain below their long-term average.

On the other hand, the "financing conditions on the market" category, which is fully observed, generates a major downward effect in spite of the impact of the conflict in the Near and Middle East. Although the spread between French and German sovereign yields makes a positive contribution to the indicator, the bond yield spreads on so-called high yield markets[16] are tight by historical standards and help reduce financial stakeholders' financing risk. Similarly, the "real estate market" category has a downward impact which points to the recent normalisation, or even under-valuation, of real estate prices, and interest rates.

Chart 2: Breakdown of the "outstanding debt of households and NFCs" category



Sources: Sources: Bloomberg, BIS, Banque de France, ECB data. DG Trésor calculations.

Note: Most recent data point, Q3 2025, forecasts up to Q2 2026.

How to read this chart: An uptick in the indicator shows an accumulation of risks whilst a downturn indicates a reduction.

This assessment of a period of balance between rising and falling risk factors driven by substantial outstanding debt is consistent with the HCSF's decision to keep the CCyB at 1% in the absence of credit supply restrictions.

This indicator mirrors the vulnerability of the financial system commensurate with its impact on the main financial variables. Whilst it may inform macroprudential decisions, it is not a decision-making instrument as such. Translating a vulnerability assessment in macroprudential decision-making would require a judgment based on broader information incorporating the banking system's absorption capacity, macroeconomic conditions and interaction with other government policies.

Ultimately, the indicator is part of the French Treasury's analytical approach and aims to enhance, without replacing, the overall analysis framework used to implement the macroprudential policy.

(16) The high yield category is comprised of lower-quality credit issuers with ratings between BB+ and D.

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