TECHNICAL ASSISTANCE REPORT

CURAÇAO AND SINT MAARTEN

Financial Stability Report

MARCH 2025

Prepared By
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Executive Summary

The mission focused on enhancing the CBCS (Central Bank of Curaçao and Sint Maarten) Financial Stability Report (FSR). It reviewed the latest available FSR (2023) and discussed the composition of the report as well as the related financial stability analyses, assessments, and analytical toolkit. In particular, the mission helped the Financial Stability Division of the CBCS to estimate sectoral credit risk models to enhance the forward-looking element of the FSR.

The estimated credit risk models will allow the CBCS to project the impact of different macroeconomic scenarios on banks' balance sheets. The mission explained the Bayesian Model Averaging (BMA) approach as an alternative methodology to address model uncertainty. It provided R script with an initial estimate for eight sectoral credit risk models – mortgages to households, personal loans, corporate mortgages, and other corporate loans for both countries - Curaçao and Sint Maarten. The estimated models allow the team to make NPL ratio projections employing the macroeconomic forecasting framework available to the CBCS. Moreover, the mission discussed financial stability indicators, credit risk, stress testing, insurance & pension economic balance sheets and corresponding financial stability risks, basic elements of climate risk, interconnectedness and contagion risk.

The CBCS has started publishing the FSR since 2022. The report provides clear and structured messages, containing a macro-financial narrative on key risks and covering developments in the real sector. Those facts make it better quality compared to many peers. It captures the macro-financial developments, banks, insurers, pension funds, interconnectedness, outlook, and policies, providing clear charts presenting the composition of the financial system. Apart from key risks and vulnerabilities, it also covers policy initiatives. The external profile is boosted by the Foreword with the key messages from the President.

To further enhance the report, the mission provided several recommendations to the CBCS. They covered the content and structure of the FSR, its related financial stability analytical toolkit and processes, CBCS's internal and external communication, data sources, and their management. Those outcomes reflect both the structure of the organization in the CBCS with respect to the financial stability agenda as well as the composition of the financial system in Curaçao and Sint Maarten corresponding to 319% of GDP that is dominated by commercial banks (156% of GDP, 49% of the total financial system assets [TFA]), but also other segments of the financial system are significant – pension fund (105% GDP, 33% of TFA) and insurance companies (58% of GDP, 18% of TFA) in 2022.

The text of the FSR could be streamlined to avoid repetition and focus on key risk drivers. Nominal values reported in the text should be substantially reduced, either replaced by relative indicators or moved to the statistical annex. The mission statements/themes could be added for each paragraph to help readers navigate throughout the text. The number of pages of the basic text without annexes could be substantially reduced. The objective/financial stability definition could be stated at the beginning of the report rather than in the policy chapter, and some clarification on supervisory responsibility could be added.

The FSR and the corresponding toolkit should be strengthened to be more forward-looking. Credit risk and market risk analysis should be improved. The outcome of econometric modeling to project key financial stability variables should be included in the report. In this context, the initial estimates of sectoral credit risk models developed during the mission should be further improved. Moreover, the CBCS should explore the option of setting up housing price statistics. as essential information to monitor potential imbalances in the real estate market.

Financial stability indicators need to be communicated together with the key aspects of the existing regulatory framework. This is the case for all segments of the financial system, not only banks but also insurance companies and pension funds, where liabilities might be reported as not being fully market-consistent. Hence,

some indicators may not capture underlying risks when calculated. The report should focus on identifying key risk drivers and their discussion rather than providing a simple description. In this context, the analysis on non-bank sectors should be improved considering the upcoming IFRS17 reporting for the insurance sector.

Moreover, the CBCS should also consistently cover new emerging risks, such as cyber and climate risks in the report. Currently, those risks are mentioned in the first chapter on macrofinacial development and risks. However, they are not further elaborated on in the subsequent text. The report needs to be self-sustained. Even if some topics might be covered in the previous releases, they should still include some brief discussions on the latest developments, including a reference to the previous discussion.

The internal and external communication of the FSR could be further enhanced by active promotion of the report. A structural cross-departmental discussion before starting the report drafting and during the drafting process could be further enhanced. An internal distribution mailing list with all potential stakeholders could be set up to inform about the publication and the main highlights of the report. The press conference on the publication day could be followed by several interviews with key media and/or YouTube videos with the management and experts. Towards this aim, the communication strategy for the report could be further elaborated.

The CBCS should organize all data in one data warehouse and fully utilize them for analytical purposes to support the financial stability analytical toolkit. A copy of the database (mirroring database) should be set up for analytical purposes. The statistical mirroring database needs to support analytical tools to process large data (e.g., R), as data should be processed directly at the server. Any chosen data management solution needs to provide full flexibility to conduct any complex analysis that might not be possible to foresee when setting up the CBCS data management system. Moreover, the CBCS should explore how to set up a centralized credit register at the bank as a rich data source for analytical purposes to calculate important financial stability indicators such as default rates or average loss given defaults (LGDs). This data has already been reported by banks to private credit registers and would, therefore, not entail any substantial costs for them. In the meantime, any existing data gaps could be covered by different surveys. Moreover, the cut-off dates for different data sources should be clearly communicated in the report, and all existing data sources not employed so far should be explored., e.g., insolvency data.

Recommendations and Authority Responsible for Implementation	**Priority**	**Timeframe[1]**
The content of the report including the analytical toolkit		
1. The text of the FSR could be streamlined to avoid repetition and focus on key risk drivers.	High	Near-term
2. The FSR and the corresponding toolkit should be strengthened to be more forward-looking.	High	Medium-term
a. Credit risk and market risk analysis should be improved.	High	Medium-term
b. The initial estimates of sectoral credit risk models developed during the mission should be further improved.	High	Medium-term

[1]Near term: < 12 months; Medium term: 12 to 24 months.

Recommendations and Authority Responsible for Implementation	Priority	Timeframe[1]
c. The CBCS should explore the option of setting up housing price statistics.	High	Medium-term
d. The CBCS should collect data on debt service to income and use these data to complement monitoring household and corporate debt burdens.	High	Medium-term
3. Financial stability indicators need to be communicated together with the key aspects of the existing regulatory framework.	High	Near-term
4. New emerging risks, such as cyber and climate risks, should be consistently covered in the FSR.	High	Near-term
5. The definition of financial stability could be stated at the beginning of the report rather than in the policy chapter, and some clarification on supervisory responsibility could be added.	High	Near-term
The organizational and operational setup of the report and its communication		
6. Enhance structural cross-departmental discussion(s) before starting the report drafting and during the drafting process.	High	Near-term
7. The external communication of the FSR could be further enhanced by active promotion of the report.	High	Near-term
Data and their management		
8. The CBCS should organize all data in one data warehouse and fully utilize them for analytical purposes to support the financial stability analytical toolkit.	High	Medium-term
9. The CBCS should explore how to set up a centralized credit register.	Medium	Medium-term
10. Clearly communicate the cut-off dates for different data sources in the FSR.	Medium	Medium-term
11. Explore all existing data sources not employed so far for the FSR, e.g., insolvency data. Initiate surveys with the industry to cover the existing data gaps.	High	Near-term

Table of Contents

Acronyms and Abbreviations

BMA	Bayesian Model Averaging
CARTAC	Caribbean Regional Technical Assistance Centre
CCBS	Central Bank of Curaçao and Sint Maarten
FSR	Financial Stability Report
GDP	Gross Domestic Product
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
LGD	Loss Given Default
LTV	Loan-to-value ratio
NIM	Net Interest Margin
NPLs	Non-performing Loans
PD	Probability of Default
ROA	Return on Assets
ROE	Return on Equity
TFA	Total financial assets
TA	Technical assistance

Preface

At the request of the Central Bank of Curaçao and Sint Maarten (CBCS), a CARTAC mission was organized in person from October 3 to October 12, 2023, to assist the authorities to enhance its financial stability report (FSR).

The mission was conducted by Mr. Petr Jakubik. It met with the CBCS President Mr. Richard Doornbosch, CBCS Executive Director, Mr. José Jardim, CBCS Financial Stability Division manager Mr. Kelvin Kleist, CBCS Head of Macro-Prudential Policy and Financial Architecture Department Mr. Ryan Prince and the staff of the Financial Stability Division. The mission wishes to thank all CBCS staff for their cooperation, and productive discussions.

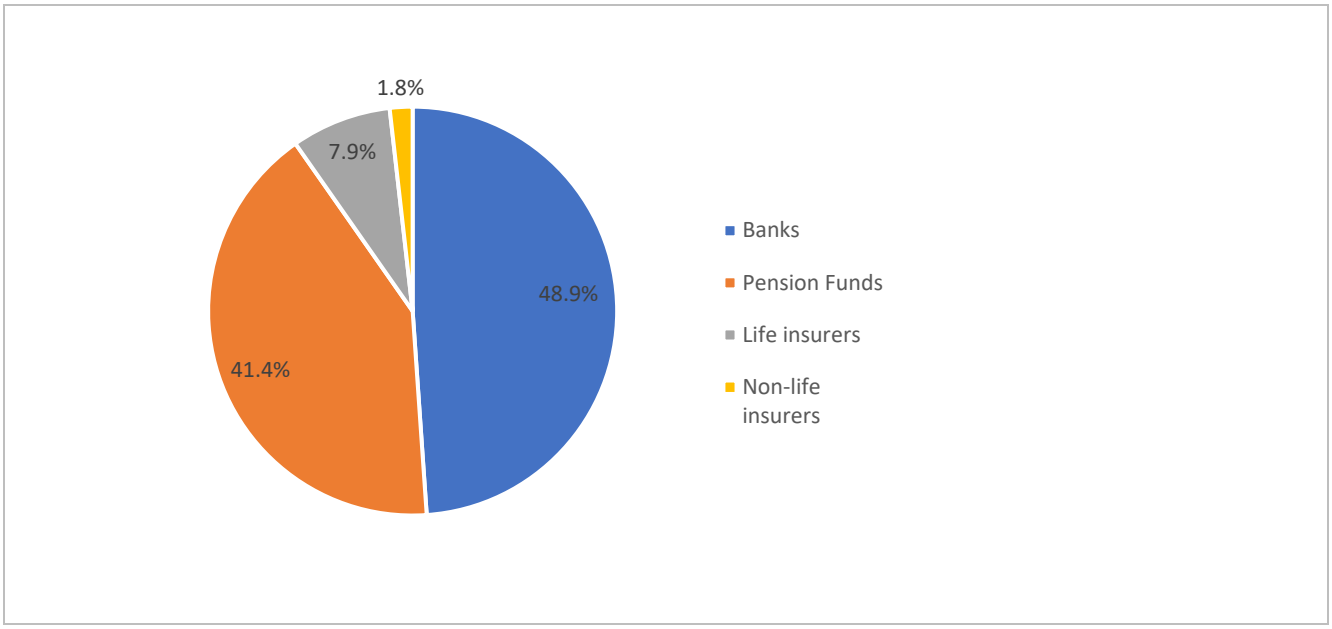
I. Introduction

1. **The CBCS is responsible for financial stability in the monetary union composed of Curaçao and Sint Maarten.** Despite the union, economic developments and some key indicators related to the financial system of those two countries are different. Therefore, some of the aggregate statistics covering the whole union must be carefully assessed as they could hide significant risks and vulnerabilities.

2. **The aim of the mission was to enhance the FSR of the CBCS.** Since 2022, the bank has published FSR on an annual basis. Overall, setting up an FSR as a regular publication provides a positive signal to market investors and the public. The key objectives of the mission were (i) to review the latest report and the respective financial stability analyses and assessments, (ii) to build CBCS's capacity to strengthen the FSR, and (iii) to identify potential gaps in financial stability analyses and assessments and issues to be addressed by future technical assistance (TA) missions. The mission reflected on the latest available FSR release published at the time of the mission, i.e., the one published in May 2023 covering the year 2022.

3. **The financial system of Curaçao and Sint Maarten is dominated by bank, but non-bank financial firms compose about half of the total assets.** Total assets of the financial sector corresponded to 319% of the union's GDP in 2022. It is compiled by a total of 49 local financial institutions, in particular, eight banks, ten life insurance companies, nineteen non-life insurance companies, and twelve pension funds. The local banking sector is characterized as relatively concentrated, with total assets making up 156 % of the union's GDP in 2022. The top three banks correspond to half of the total banking assets. Two banks have related party connections with non-bank financial companies. Three banks are foreign-owned (two by a Canadian bank and one by a bank from Trinidad and Tobago), and one is minority foreign-owned. Moreover, the offshore banks (much bigger in total size) are completely disconnected from local deposit and loan markets. The pension and insurance sector corresponded to 132% and 31% of the union GDP in 2022, respectively.

FIGURE 1. Distribution of Financial Sector Assets



Source: CBCS, end-2022 data.

4. **The CBCS's organizational structure was reflected in the mission's objectives.** The bank is headed by the President and supported by two Executive Directors. The financial stability role is allocated to the Financial

Stability Division, which is also responsible for the FSR. The Financial Stability Division manager is accountable for the division. In addition, the division is composed of the Macroprudential & Financial Architecture Unit and the Research and Modeling Unit, with eleven staff in total. The team has preconditions possessing a necessary technical background to proceed with more complex analytical work. It is well balanced in terms of seniority, having both more experienced and junior staff with the potential to develop their skills further.

5. **The review of the latest FSR ahead of the mission formed the basis for the targeted workshop and meetings.** The workshop on the findings of the FSR review and best practices in financial stability analyses and assessments was complemented by targeted sessions with the relevant experts. The preliminary findings were discussed with the senior management in the middle of the mission. The final wrap-up meeting with the senior management was conducted online after the mission due to a business trip by the CBCS President on the last day of the mission.

II. Macroeconomic and Financial Sector Background

6. **Despite robust growth in 2021-22 in Curaçao, both GDP and employment are still below 2019 levels.** Real GDP grew by 7.9% in 2022 as tourism posted a strong recovery but is projected to moderate to 3.5 % in 2023 and 3% in 2024 as the output gap narrows. Inflation is projected to decline to 3.3% in 2023, based on lower imported inflation. The external current account deficit in 2023 is projected to narrow, thanks to strong tourism performance, but remains large at 24.5 percent of GDP.

7. **Fiscal balances and public debt of Curaçao continued to improve in 2023, but the fiscal outlook critically depends on the resolution strategy for Ennia, a large insurance group.** The overall fiscal balance is expected to improve to a surplus of 1.1% of GDP in 2023 from 0.4% of GDP in 2022 on account of strong revenue performance, while capital expenditure remains subdued. Government debt is projected to subside to 72% of GDP in 2023 from 77% of GDP in 2022, mostly due to higher nominal GDP.

8. **Strong tourism performance in Sint Maarten continues to support growth as inflation declines.** Growth is projected to decelerate to 4% in 2023 from a high of 10% in 2022 as the economy recovers from the pandemic. Inflation is projected to subside to 3% in 2023 from 3.8% in 2022, reflecting lower external price pressures. Following positive tourism developments, the current account is expected to improve, leading to a small surplus.

9. **The overall fiscal balance of Sint Maarten will continue to improve.** The overall deficit is expected to narrow to 0.3%of GDP from 1% of GDP last year. Public debt is envisaged to continue to decline to 48% of GDP from 50% of GDP in 2022. Sint Maarten is refinancing Covid-related loans at the Dutch capital market yields (currently at around 3.4%).

10. **However, the global slowdown remains the key financial stability risk for the union.** Banks in the union are relatively risk-averse, applying high credit standards. However, as the economy is highly dependent on tourism, the global economic slowdown affects the financial system via increased credit risk. Moreover, high inflation drives down equity and bond prices, negatively impacting investment portfolios, especially pension funds. This scenario affects banks as pension funds might withdraw money from their deposits. This has already been observed in the financial system.

11. **The profitability of the local banks in the union has been under pressure for several years.** However, it improved in 2021 and continued to improve in 2022, with net income after taxes increasing by 47.5%.[2] Nevertheless, the growth in profitability was primarily driven by recoveries from loan losses. Credit risk in the commercial banking sector continues to be a concern given the consistently high volume of NPLs, even though total NPLs decreased at the end of 2022. There is one dominant market player, and small banks compete with each other. Low profitability and the trend towards de-risking also drive some trends for foreign banks withdrawing from the local market and moving for lower risk countries (advanced economies) or countries with higher level of profitability. However, this trend has been stabilized.

12. **Profitability and solvency remain challenging for the life insurance sector in the union.** On the contrary, non-life insurers are expected to remain stable. Although non-life insurers face increasing claims due to the economy picking back up and claims inflation, premiums are steadily increasing.

[2] ROA was 2%, ROE 13.5%, NIM 4.8% and NPL ratio 9% (7.2% for business loans, 6.5% for consumer loans and 5.9% for mortgage loans).

III. Organizational and Operational Setup of the Report and its Communication

13. **The FSR is the flagship product of the CBCS in terms of financial stability.** The report has been published on an annual basis since 2022. It is primarily the responsibility of the Financial Stability Division, in particular the Macroprudential Unit. Moreover, the Economic and Statistics Division of the Economic and Research Department provides macroeconomic data and projections. They could provide macroeconomic scenarios in the future when moving from sensitivity analysis-type stress tests to macro stress tests using macro-financial consistent scenarios.

14. **The production plan is prepared by the head of the Macroprudential Unit and discussed with the team.** The production process starts with the initial identification of the key financial stability risks by the Head of the Macroprudential Unit and subsequent brainstorming discussion with the team. Moreover, the legislation changes are considered for the FSR. The publication day is fixed between the end of April and the beginning of May. Based on this date, a more detailed production plan is elaborated, providing planning for drafting different chapters driven by the availability of data inputs.

15. **The internal interaction related to the FSR among relevant departments in the CBCS could be further enhanced.** A structural cross-departmental discussion(s) before starting the report drafting and during the drafting process could be further enhanced. Despite the report being drafted primarily by the Financial Stability Divisions, it might be better to have more extensive structural interaction with other departments, especially supervision.

16. **The CBCS could further enhance its communication strategy by promoting FSR as the key communication tool for financial stability.** The report is currently published on the fixed date on the website, and the CBCS organizes subsequently a press conference that could be further followed by interviews with key media and/or YouTube videos with the management and experts. Moreover, all data displayed in the report in the form of charts or tables could be provided together with the report on the website.

IV. Structure and Content of the Report

17. **The report provides clear, structured messages containing a macro-financial narrative on key risks and vulnerabilities.** It is better quality than most FSRs published by Caribbean central banks and financial services commissions. The FSR covers the macro-financial development, including development in the real sector, banks, insurers, pension funds, interconnectedness, financial sector outlook, and undertaken policies. It uses clear charts on the composition of the financial system, providing key vulnerabilities and risks, including policy initiatives. Moreover, the foreword with the key messages from the president of the CBCS is included.

18. **However, the text of the FSR could be further streamlined, avoiding repetition and focusing on key risk drivers, following the central story with the key financial stability messages**. The report should follow the best international practices – see Annex I. Overall, the FSR is based mainly on backward-looking indicators. The definition of objective/financial stability could be stated at the beginning of the report rather than in the policy chapter, and some clarification on supervisory responsibility could be added. Moreover, nominal values reported in the text should be substantially reduced, either replaced by relative indicators or moved to a statistical annex. The mission statements/themes could be added for each paragraph to navigate readers throughout the text, and the cut-off date for different data sources employed should be clearly stated at the beginning of the report. The number of pages of the text without annexes could be substantially reduced.

19. **A description of the relevant element of the existing regulatory framework for different segments of the financial system should be added.** Interpreting the reported indicators may be challenging for readers who are not familiar with the financial system in Curaçao and Sint Maarten. A description of the relevant aspects of the regulatory framework, such as the extent to which the framework is market-sensitive with a risk-based capital approach is absent. This aspect is particularly relevant for non-bank financial institutions, where regulations vary among the Caribbean countries, compared to banks. For example, the provided nominal values of assets and liabilities without explaining the extent to which a market-sensitive valuation applies does not bring any added value. Moreover, all ratios and indicators used should be accompanied by their definitions, which is not always the case (e.g., the liquidity asset ratio for commercial banks or transferable deposits).

20. **Discussion on new emerging risks, such as climate and cyber risks in the FSR, could be more elaborated, especially in terms of what the CBCS is doing/planning to do.** The Caribbean's vulnerability to climate-related disasters is an existential threat. Caribbean countries are disproportionately affected by the impacts of climate change, with the increased frequency and intensity of natural catastrophes such as hurricanes posing a substantial threat to the economies. This risk is also crucial for Curaçao and Sint Maarten. Hence, the CBCS must work on its strategy and necessary steps to include climate risk in the existing financial stability analytical toolkit. In this respect, the regional climate workshop held in February 2024 and the peer-to-peer visit of the Central Bank of Barbados to learn about climate risk in the context of financial stability in April 2024 should help the CBCS to proceed better with this work. Similarly, cyber risk is the area that requires more attention, especially with the higher sophistication of cyber-attacks over time.

21. **The FSR and the corresponding toolkit should be strengthened to be more forward-looking.** Credit risk and market risk analysis should be improved. This needs to capture trends in average PD or LGD for different segments/ sectors. Granular banking data should be used to monitor credit risk models for different segments of loans, such as mortgages, consumer loans, or loans to industry-specific sectors. In addition to NPLs, data on PD and LGD and on average LTV ratios by financial institutions allowing computing cross-sector averages and monitor trends within brackets should be collected. In terms of market risk, data on duration needs to be collected. For insurance and pension funds, this needs to cover not only assets but also liabilities. While banks typically have positive duration mismatches negatively affecting market risk with increased yields, balance

sheets of pension funds and life insurers with usual negative duration mismatch are negatively affected by market risk with decreased yields.

22. **Given the crucial role of housing prices for financial stability, the CBCS should explore the options of setting up housing price statistics.** Accurate and timely data on housing prices are essential for monitoring potential imbalances in the real estate market, which could pose significant risks to the broader financial system if left unchecked. By establishing a comprehensive housing price index, the CBCS can better assess the dynamics of the housing market, including price trends, affordability, and regional disparities. This information would enable policymakers to identify early warning signs of overheating in the housing market, allowing for the implementation of preemptive measures to mitigate risks. Additionally, such data published in the FSR would provide valuable insights for both lenders and borrowers, contributing to more informed decision-making and ultimately enhancing the resilience of the financial system.

23. **The CBCS should collect data on debt service to income and use these data to complement monitoring household and corporate debt burdens.** This metric provides a more nuanced view of financial health by revealing how much income is dedicated to debt repayment, indicating potential stress points that raw debt levels alone might not capture. By integrating this data into the bank's financial stability assessments, the CBCS can better identify vulnerabilities, allowing for more targeted interventions and policy measures to mitigate the risk of over-indebtedness. Furthermore, tracking debt service to income ratios over time would enable the CBCS to monitor the impact of economic changes, such as interest rate fluctuations or income variations, on the debt-carrying capacity of households and businesses to better understand household and corporate debt sustainability in relation to their exposures to banks.

24. **Insurance-related analysis should be enhanced.** The assessment provided in the FSR covers development in assets, premium written, benefits and claims, investment allocation, solvency, profitability, and capital over total assets. It is based on a basic descriptive aggregate statistic without providing essential information on the valuation framework. Given the significant role of interest rates in the sector, it is essential to discuss how the expected development in yields may affect the industry. In this respect, the discounting of liabilities by insurers needs to be clarified. Furthermore, information about the prevailing types of reinsurance (i.e., proportional or non-proportional) should be added, as these have different risk implications. In addition, related to climate risk, the climate protection gap (share of non-insured economic losses in total losses after climate-related catastrophe events) for the domestic economy could be calculated as the wider gap would have a negative impact on financial stability. Moreover, the possibility of reducing the six-month lag in insurance data reporting should be considered to make the analytical work more up-to-date.

25. **Similarly, the discussion on the pension sector should be strengthened.** The pension chapter covers development in assets, investment allocation, funding ratio, and profitability. However, the reported statistics are not complemented with some essential information on the valuation framework. Information about type of pension plans (defined benefit (DB) vs. defined contribution (DC)) or type of pension fund with potential analysis of sponsors (when applicable) should be provided. Moreover, the FSR should clarify the discounting of liabilities and discuss the impact of changes in yields.

26. **Analysis of interconnectedness could also consider exposures via bonds and equities.** The FSR analyzes interconnectedness as a potentially important transmission channel of financial instability. It focuses on deposit and funding channels since the concentration of deposits at other financial institutions can become a transmission and contagion risk channel. Banks with limited resources may be exposed to liquidity constraints or severe stress in the event of a single or multiple large withdrawals. The network has been constructed for local banks, pension funds, and insurance companies for the last two years to see the current setup and potential changes. The CBCS could also add exposures via bonds and equities. Despite banks having limited trading books compared to banks' books, this channel is more significant for pension funds and insurance companies.

27. **Some clarification on the employed methodology and related assumptions could be added.** The FSR includes bank solvency stress test results based on a simple static methodology for stress testing. The results are correctly presented in the banking chapter, but the methodology and assumptions are not sufficiently described. Moreover, the drawback of this methodology is that it does not link the development of banks' balance sheets with any macro-financial scenario. Hence, it is a sensitivity analysis rather than a stress testing. The framework could be further elaborated towards a dynamic balance sheet approach. This could be facilitated via the foreseen CARTAC TA mission on macro stress testing, which aims to develop a multi-factor, multiperiod solvency stress testing tool. In addition, heatmaps and composite indicators used in the FSR should be explained better. In particular, the definitions of the thresholds for heatmaps and compositions of all sub-indicators and their weights for composite indicators could be added with more extensive details in annexes and/or a reference to some earlier methodological papers.

IV. Financial Stability Analytical Toolkit

28. **The CBCS regularly conducts bank solvency and liquidity stress tests using a simple static methodology.** The exercise is conducted on an annual basis. It includes the capital adjustment stress test, the large exposure stress test, the deposit run-off stress test, and the large deposit stress test. The stress tests are performed using two scenarios: moderate and severe. The capital adjustment test starts by assessing the stock of nonperforming loans in the banking books and the adequate level of provisions. The moderate scenario assumes that 10% of the performing loans become nonperforming, whereas the severe scenario assumes that 30% become nonperforming. The assumption for additional provisioning of 50% follows international best practices and considers the bank's loan portfolio quality. The stress test shows whether the capital adequacy ratio (CAR) exceeds the supervisory requirement of 10.5% after the shocks. The large exposure test assesses the impact on the CAR when large loans become nonperforming and require additional provisions for loan losses. The moderate scenario assumes that three large loans become nonperforming, and the severe scenario assumes that five large loans become nonperforming. With the additional provisioning for the large loans becoming nonperforming, the stress test will show whether the CAR is adequate. The deposit run-off stress test assesses the impact on the liquidity position when there is a run-off of 20% of the deposits (moderate scenario) and a run-off of 40% (severe scenario). The stress test shows whether the liquid assets to required liquidity after the run-off is above 100 percent. The large deposit stress test assumes a withdrawal of three large deposits under the moderate scenario and five large deposits under the severe scenario. It shows whether the resulting liquid assets to total assets will be adequate and above the supervisory regulation of 20%.

29. **The mission further discusses how to design macroeconomic scenarios for financial stability purposes.** The Economic Analysis and Research Department is responsible for the macroeconomic outlook produced quarterly (March, June, September, and December). The CBCS model generates a 5-year forecast of key macroeconomic variables based on the past CARTAC TA. The framework is used not only for the outlook but also for policy scenarios to simulate the impact of different potential measures. The model could also be used to generate adverse scenarios for financial stability assessment, especially stress testing. The mission stressed the importance of the detailed FSR production plan, including the cooperation between the financial stability and macroeconomic teams, in preparing stress test scenarios reflecting the key identified financial stability risks. The current macroeconomic model can generate key variables to project sector NPL ratios. The path of the NPLs would then depend on the severity of the assigned shocks. The scenario that could replicate the 2008-2009 Global Financial Crisis, focusing on the main trading partners, the Netherlands and the US, was discussed. This shock can be considered as a global demand shock, affecting the economies of Curaçao and Sint Maarten. After the mission, in line with this discussion, the CBCS constructed the demand shock scenario based on the following assumptions: (i) The real GDP of the Netherlands and the US will contract by 5 percent in 2024 and 2 percent in 2025. As a result of weakened demand, inflation in both the Netherlands and the US will decline by 2% in 2024 and 1% in 2025. (ii) The main trading partners' economic deterioration adversely affects the domestic tourism sectors, GDP growth, and employment. On the other hand, inflation subdues.

30. **The CBCS should strengthen the financial stability analytical toolkit.** The CBCS should work on econometric models to project key financial stability variables such as expected nonperforming loans and net interest rate income for banks. This would also allow the CBCS to move from the currently employed stress testing framework to a multi-period, multi-factor stress test using consistent macroeconomic scenarios. In this context, the mission explained the BMA approach as an alternative methodology to address model uncertainty. BMA's flexibility in considering multiple models helps handle uncertainty in predictions and parameter estimates due to model specification. It addresses issues like variable selection and dynamic

relationships, making it a valuable approach for making informed inferences.[3] With short time series, it is often difficult to determine the correct model specification. BMA's ability to consider multiple models helps account for the uncertainty in model specification, which could be pronounced with limited data. However, it is important to note that while BMA can help mitigate some issues associated with short time series, it does not inherently overcome the limitations of having a small sample size.

31. **The CBCS should become familiar with the provided R script for the sectoral credit risk models and further work on improvements to the initial estimates.** The mission provided R script with an initial estimate for eight sectoral credit risk models – mortgages to households, personal loans, corporate mortgages, and other corporate loans for both countries - Curaçao and Sint Maarten. NPL ratio was used as a proxy for credit risk modeling for all mentioned sectors and both union countries. The potential explanatory variables considered were real GDP growth, unemployment, inflation, and number of tourist arrivals used as year-on-year change. All mentioned time series and sectoral NPL ratios were available quarterly. Additional variables available in the future should be considered.[4] The estimated model for household mortgages for Curaçao and Sint Maarten suggests that the NPL ratio rises with lower GDP growth, higher unemployment, and lower tours arrivals. The model for household loans without mortgages shows the same pattern, but the impact of tourist arrivals was non-significant. For commercial mortgages and other loans, the pattern was the same for unemployment and tourist arrivals, but the effect of inflation was negative. It is probably driven by the fact that higher inflation might help to increase profit in the tourism business as costs might increase less than revenues. The initial results for the models for Sint Maarten were less convincing than those for Curaçao, as Saint Marteen is a very small and highly volatile economy severely dependent on tourism and heavily affected by COVID-19. However, NPL ratios did not increase significantly due to extensive fiscal measures.

32. **The CBCS further revised the sectoral credit risk model and simplified it to two models per country.** The team worked on the models after the mission. It replaced the explanatory variable capturing a number of tourist arrivals with exports of goods and services that have better statistical properties and are correlated with tourist arrivals. In addition, to improve the statistical properties of the models, the dependent variable – NPL ratio – was transformed using logit transformation.[5] Moreover, to reduce the level of complexity, the CBCS reduced the number of sectors per country to household and corporate sectors only. The results for those models are provided in Annex II. The models should be further tested and included (with potential adjustments if needed) in the multi-factor, multi-period stress testing framework that will be developed with the support of CARTAC.

[3] See e.g., Hoeting, J. A., Madigan, D., Raftery, A. E., and Volinsky, C. T. (1999): Bayesian Model Averaging: A Tutorial, Statistical Science, 14(4), 382-401; Raftery, A. E., Madigan, D., and Hoeting, J. A. (1997): Bayesian Model Averaging for Linear Regression Models, Journal of the American Statistical Association, 92(437), 179-191; Fragoso, T. M., Bertoli, W., and Louzada, F. (2018): Bayesian Model Averaging: A Systematic Review and Conceptual Classification, International Statistical Review, 86(1), 1-28; Clyde, M., and George, E. I. (2004): Model Uncertainty, Statistical Science, 19(1), 81-94; Steel, M. F. J. (2020): Model Averaging and its Use in Economics, Journal of Economic Literature, 58(3), 644-719.

[4] Interest rate which is typically an important determinant of credit risk was not considered as it is not part of the current CBCS macroeconomic projection model and the transmission of global interest rates to domestic interest rates is rather limited given the none-existence of the domestic sovereign market and current banking practices keeping rather fixed-interest rate on mortgages.

[5] See Sorge, M., and Virolainen, K. (2006): A Comparative Analysis of Macro Stress Testing Methodologies with Application to Finland, Journal of Financial Stability, 2(2), 113-151.

IV. Data Sources and their Management

33. **The CBCS has a data warehouse containing only external sector statistics.** The CBCS uses several data sources that are organized differently. While external sector statistics are stored in a data warehouse, financial & monetary statistics and insurance data are stored separately in another two databases, which are not data warehouses, and data manipulation is more complicated despite having some data analytics. However, for those databases, there are still some controls over the submission. Many other data sources are stored out of the mentioned systems in a simple EXCEL spreadsheet. Moreover, pension data are not even stored in a database format as it is saved in pdf format.

34. **The CBCS aims to centralize all data in one platform, but Excel is still the most commonly used platform to process data.** Information is typically downloaded in Excel and manipulated using Excel database tools such as pivot tables. This fact reduces the potential and efficiency of the financial stability work where several data sources must be combined and processed.

35. **The CBCS should organize all data in one data warehouse and fully utilize them for analytical purposes to support the financial stability analytical toolkit.** A copy of the database (mirroring database) should be set up for analytical purposes. The statistical mirroring database needs to support analytical tools to process large data, as data should be processed directly at the server. Any chosen data management solution needs to provide complete flexibility to conduct any complex analysis that might not be possible to foresee when setting up the CBCS data management system.

36. **Moreover, the CBCS should explore how to set up a centralized credit register at the bank as a rich data source to be utilized for analytical purposes.** This data has already been reported by most banks and some financial specialized institutions to a private credit register and would, therefore, not entail any substantial costs for them. Like the data warehouse, a fully flexible solution for data processing using an analytical mirrored database must be set up. This solution would allow the calculation of crucial credit risk parameters such as default rates and average LGDs for different segments of credit portfolios (e.g., mortgages, consumer loans, etc.). In this respect, it needs to be set up so that a complex analytical work could be conducted. Moreover, the system should allow combining data from the credit register and the data warehouse for analytical purposes.

37. **In the meantime, different surveys with financial institutions/market participants could cover any existing data gaps.** In the current absence of credit register information, this could cover the information related to credit risk, given its prominent role in the financial system, for example, by a bank-lending survey. Such a survey could cover especially the following information:
    - Average PDs/default rates for corporate loans, consumer loans, and mortgages;
    - Average LGDs for corporate loans, consumer loans, and mortgages;
    - Average lending rates for corporate loans, consumer loans, and mortgages;
    - Information for corporates could potentially be further broken down to SME, and large corporates;
    - Information on the type of collateral – real estate, other assets, etc.;
    - Average deposit rates.

38. **Another potential survey could address the lack of information on cyber risk.** It could cover, for example, the following information:
    - Number of cyber incidents with impact exceeding the defined threshold;
    - Total losses related to cyber incidents;
    - This could be potentially broken down by type of cyber incidents e.g., malware attacks, phishing attacks, insider threats, etc.

39. **Any other information/survey that would address the existing data gap based on the risk identified could be considered.** Such a survey could reflect any potential new emerging risks or any current data gaps beyond the mentioned examples. Moreover, all relevant existing data sources not currently employed by the CBCS should be explored., e.g., insolvency data.

V. Conclusions

40. **The CARTAC TA mission encompassed a comprehensive review of all relevant aspects aimed at enhancing the joint FSR.** This review covered the organizational and operational setup, communication strategies, report structure, content, analytical tools, and data sources. The mission's objective was to provide recommendations that could influence the report, both directly and indirectly, by enhancing the quality of analyses and risk assessments. In particular, the mission helped the CBCS estimate sectoral credit risk models using the BMA approach as an alternative methodology to address model uncertainty.

41. **The internal and external communication of the FSR could be further enhanced by active promotion of the report.** The CBCS could further enhance a structural cross-departmental discussion before and during the drafting of the report. Moreover, the bank could strengthen its communication strategy further to promote FSR as the key communication tool and flagship product for financial stability.

42. **The FSR could be further streamlined, avoiding repetition, and focusing on key risk drivers, following the central story with the key financial stability messages.** Relative indicators should be used in place of the nominal values stated in the text or relocated to the statistical annex. Mission statements/themes could be included in each paragraph to help readers navigate the text. The number of pages of main text without annexes might be significantly lowered. A description of the relevant element of the existing regulatory framework for different segments of the financial system should be added. Furthermore, a discussion on new emerging risks, such as climate and cyber risks, needs to be expanded, particularly about what the CBCS is currently doing and plans to accomplish. The methodological aspects of the employed stress test or other analytical outputs need to be clearly described in the report. Moreover, the cut-off dates for different data sources should be clearly communicated in the report.

43. **The FSR and the corresponding toolkit should be strengthened to be more forward-looking.** The CBCS should elaborate mainly on credit and market risk assessments. In this respect, the CBCS should become familiar with the provided R script for the sectoral credit risk models and further work on improvements to the initial estimates. Moreover, insurance and pension-related analysis should be enhanced to provide solvency market-consistent assessment.

44. **The future follow-up CARTAC TA can help develop a multi-factor, multi-period solvency stress testing tool.** Such a framework would allow for more complex financial stability assessments of the banking sector. The developed sectoral credit risk models enable linking different macroeconomic scenarios generated by the CBCS macroeconomic model with the stress testing exercise.

45. **The CBCS should organize all data in one data warehouse and fully utilize them for analytical purposes to support the financial stability analytical toolkit.** Any chosen data management solution needs to provide complete flexibility to conduct any complex analysis that might be impossible to foresee when setting up the CBCS data management system. Moreover, the CBCS should explore how to set up a centralized credit register at the bank as a rich data source for analytical purposes to calculate crucial financial stability indicators such as default rates or average LGDs. In the meantime, any existing data gaps could be covered by different surveys. Moreover, all existing data sources not employed so far should be explored., e.g., insolvency data.

Annex I - Key Elements of Financial Stability Reports

46. **The mission highlighted the key elements of good financial stability reports based on the best international practices.**[6] The most important aspects and the gaps of the current report were discussed. In this respect, the following elements were covered: aims, objectives, and reasons; overall assessments; coverage of issues; data, assumptions, and tools; structure and other features.

47. **FSRs should explicitly state their objectives.** The reports should aim to inform the public and encourage a constructive debate about financial sector developments and policies, holding public authorities accountable for their surveillance of the financial system. The information provided should facilitate a proper assessment of risks by investors active in the market.

48. **FSRs should be clear about what is meant by financial stability.** The definition should include a dynamic perspective: a financial system is stable not only when it is carrying out its essential functions and services, but when it is also capable of withstanding the shocks and strains that can be reasonably expected to affect it in the short and medium term. It is important that the report clarify the operational benchmarks used to assess whether the system is stable, explaining what data, indicators, and type of information would be monitored for this purpose.

49. **The executive summary should be brief and easy to read.** A well-articulated executive summary is critical to inform and guide public opinion. A reader should not have to sift through the entire report to distill the main conclusions of the analysis and should be able to understand the key messages of the report even if the reader is not financially sophisticated. More advanced and technical material should be covered in the analytical chapters, preferably in boxes or annexes. The function of the executive summary is to bring together the various strands of analysis developed in the rest of the report, presenting a panoramic and honest view of risks and vulnerabilities, including politically sensitive risks. The executive summary should also discuss how these risks have evolved since the previous issue of the report and provide a summary of the key recommendations.

50. **FSRs should integrate macroeconomic and financial analysis.** This analysis should flow in both directions, assessing the key macroeconomic trends that can have an impact on the stability of the financial sector as well as the key financial sector developments that can, in turn, have an impact on the real economy. The report should identify the main transmission channels that link the financial and real economy and assess in quantitative terms how shocks in one area could reverberate in the other areas.

51. **FSRs should not only explain, but also properly justify the assumptions used.** This is especially relevant in the case of stress tests, whose meaning and interpretation depends critically on the assumptions made regarding the severity of the shocks, the speed and scale of the impact of shocks on default probabilities, the hurdle rates on capital and liquidity, dividend distribution, and other parameters of the test. Ideally, stress tests should be computed within a general equilibrium framework with the support of satellite econometric models that link macroeconomic and financial conditions. Simpler, partial-equilibrium, or even *ad hoc* tests can also be appropriate, and could be the inevitable consequence of capacity or data constraints, but any limitations of this choice should be described and explained.

52. **FSRs should indicate the data and methodology used and make them easily available.** The sources and cut-off date of the data should be indicated clearly and in an easily identifiable place. The data displayed

[6] See Lim, Ch. H., Klemm, A. D., Ogawa, S., Pani, M. and Visconti, C. (2017) Financial Stability Reports in Latin America and the Caribbean, IMF Working Paper, 17/73.

in the reports should also be made available to the public on the internet, on the same website where the reports are published. The methodology used for projections, sensitivity analyses, and stress tests should be explained in clear and simple terms in the text, with more technical details provided in special boxes or annexes. In analyzing the data, the report should consider not only aggregate and average measures but also distributional indicators and, where appropriate, extreme, or individual values (with proper safeguards to preserve confidentiality), highlighting, for instance, the position of the weakest or most vulnerable institutions or asset classes.

53. **The reports should follow a logical and integrated structure with unifying themes centered on the key risks.** The structure should enable the reader to identify which parts of the report contain specific information about different topics, while also facilitating the discussion of cross-cutting topics. The structure should be consistent over time to allow the reader to compare the assessments and should contain boxes or appendices dedicated to issues that either evolve slowly over time or reflect passing concerns. The reports should have an executive summary, several chapters devoted to external and domestic developments that affect the financial sector and changes in the financial infrastructure, including on the regulatory and supervisory framework, and should preferably include a table of acronyms, a glossary of technical terms, a methodological annex, and a statistical annex.

54. **The publication of the reports should be supported by a well-designed communication strategy.** The current and past issues of the reports should be made available on the internet in a dedicated webpage that is easy to navigate and easy to find on the home page of the publishing authority; this page should also contain a database containing the data used as well as links to other relevant publications and to other agencies and sources of information. The launch of the report should be supported by an outreach campaign aimed at disseminating the main messages and recommendations through audiovisual broadcasts, press releases, public presentations, and press conferences. The format and medium of the communication should be adapted depending on the intended audience. The publication of the report should follow a timely, regular, and predictable schedule. As financial sector conditions can change very rapidly, reports should be published within three months of the cutoff date for the data, preferably at least two times a year. The publication date should be announced in advance, so that the readers know when to expect the next issue; and should not change frequently. The past publication dates should also be clearly indicated on the website, to enable the readers to know what information was available to the public at different times.

Annex II - Results of the Sectoral Credit Risk Models

Table 1: Credit risk model for household loans in Curaçao

	c	gdpag(HH,1)	inf	unp	exp	df	logLik	BIC	delta	weight
model1	-0.389	-0.523	0.848	NA	NA	NA	4.000	29.702	-46.862	0.000	0.565
model7	-1.979	NA	0.400	NA	3.372	NA	4.000	29.209	-45.875	0.987	0.345
model2	-1.894	NA	0.424	-0.174	3.235	NA	5.000	29.226	-42.774	4.088	0.073
model5	-0.004	NA	0.972	-1.825	NA	NA	4.000	25.858	-39.174	7.689	0.012
model6	-0.001	NA	1.002	NA	NA	-0.043	4.000	24.340	-36.138	10.725	0.003
model4	0.013	NA	0.981	-1.725	NA	-0.009	5.000	25.882	-36.087	10.775	0.003

Note: Models ranked by BIC. GDP = year-on-year change of the gross domestic product, HH = logit transformation of total household NPLs, inf = inflation, unp = unemployment rate, Exp = year-on-year change of the exports of goods and services. All variables are stationary.

Table 2: Credit risk model for household loans in Sint Maarten

	c	gdpag(HH,1)	inf	unp	exp	df	logLik	BIC	delta	weight
model1	-0.568	-0.377	0.748	NA	NA	NA	4.000	25.723	-38.905	0.000	0.626
model7	-2.239	NA	0.151	NA	3.734	NA	4.000	24.458	-36.374	2.531	0.177
model2	-2.117	NA	0.195	-2.492	3.946	NA	5.000	25.995	-36.312	2.593	0.171
model6	-0.151	NA	0.931	NA	NA	-0.024	4.000	21.710	-30.879	8.026	0.011
model5	-0.141	NA	0.923	-2.070	NA	NA	4.000	21.699	-30.856	8.049	0.011
model4	-0.046	NA	0.967	-1.591	NA	-0.019	5.000	22.143	-28.609	10.296	0.004

Note: Models ranked by BIC. GDP = year-on-year change of the gross domestic product, HH = logit transformation of total household NPLs, inf = inflation, unp = unemployment rate, Exp = year-on-year change of the exports of goods and services. All variables are stationary.

Table 1: Credit risk model for corporate loans in Curaçao

	c	gdpag(CT,1)	inf	unp	exp	df	logLik	BIC	delta	weight
model5	-0.205	NA	0.864	-2.485	NA	NA	4.000	21.889	-31.236	0.000	0.340
model2	-0.807	NA	0.695	-2.312	1.542	NA	5.000	23.308	-30.938	0.298	0.293
model7	-0.798	NA	0.761	NA	1.748	NA	4.000	20.890	-29.238	1.999	0.125
model6	0.013	NA	1.014	NA	NA	-0.074	4.000	20.807	-29.073	2.164	0.115
model4	-0.149	NA	0.897	-2.098	NA	-0.025	5.000	22.005	-28.332	2.904	0.080
model1	-0.221	-0.212	0.908	NA	NA	NA	4.000	19.902	-27.262	3.975	0.047

Note: Models ranked by BIC. GDP = year-on-year change of gross domestic product, CT = logit transformation total corporate NPLs, inf = inflation, unp = unemployment rate, Exp = year-on-year change of exports of goods and services. All variables are stationary.

Table 2: Credit risk model for corporate loans in Sint Maarten

	c	gdpag(CT,1)	inf	unp	exp	df	logLik	BIC	delta	weight
model7	-2.428	NA	-0.037	NA	4.638	NA	4.000	13.786	-15.030	0.000	0.788
model2	-2.424	NA	-0.036	-0.058	4.640	NA	5.000	13.786	-11.896	3.135	0.164
model1	-1.076	-0.401	0.433	NA	NA	NA	4.000	10.641	-8.741	6.290	0.034
model6	-1.038	NA	0.453	NA	NA	0.015	4.000	9.003	-5.465	9.566	0.007
model5	-1.020	NA	0.464	0.500	NA	NA	4.000	8.906	-5.271	9.760	0.006
model4	-1.043	NA	0.452	0.068	NA	0.015	5.000	9.004	-2.330	12.701	0.001

Note: Models ranked by BIC. GDP = year-on-year change of gross domestic product, CT = logit transformation total corporate NPLs, inf = inflation, unp = unemployment rate, Exp = year-on-year change of exports of goods and services. All variables are stationary.