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2021 COMPREHENSIVE SURVEILLANCE—BACKGROUND PAPER ON SYSTEMIC RISK AND MACROPRUDENTIAL POLICY ADVICE IN ARTICLE IV CONSULTATIONS

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2021 COMPREHENSIVE SURVEILLANCE REVIEW—BACKGROUND PAPER ON SYSTEMIC RISK AND MACROPRUDENTIAL POLICY ADVICE IN ARTICLE IV CONSULTATIONS

EXECUTIVE SUMMARY

Since the global financial crisis, the Fund has strengthened its financial surveillance, including by stepping up integration of macrofinancial analysis in Article IV consultations, as recognized by the 2019 Independent Evaluation Office's (IEO) report on the Fund's financial surveillance. However, considerable room for improvement remains. Further deepening and integration of macrofinancial analysis in Article IV consultations, including systemic risk analysis to better inform macroprudential policy advice, is vital given rising financial vulnerabilities following the COVID-19 shock.

This paper assesses progress made in deepening and integrating systemic risk analysis and macroprudential policy advice in Article IV consultations following up on the findings of the IEO evaluation. The assessment informs the Comprehensive Surveillance Review and the FSAP Review in their recommendations to strengthen these areas in Article IV consultations. The findings point to notable improvements made since the launch of the macrofinancial mainstreaming initiative, particularly in staff reports for advanced economies and in covering bank and credit-related risks. However, the paper also finds scope to further improve in the following areas:

- Setting expectations for Article IV staff reports to include a well-articulated view about systemic risk, grounded on a rigorous analysis of vulnerabilities, to better anchor macroprudential policy advice, consistent with the operational guidance;
- Stepping up integration of FSAP findings and recommendations;
- Making the systemic risk analysis more forward-looking, including by going beyond Financial Soundness Indicators and expanding the analysis beyond bank and credit-related risks, which, inter alia, requires reducing data gaps;
- Deepening knowledge on the intended and side effects of macroprudential policy and its interactions with other policies;
- Expanding the pool of macrofinancial talent; and
- Developing approaches to assess risks from new cross-cutting areas, such as climate change, fintech, and cybersecurity, as experience and expertise evolves.

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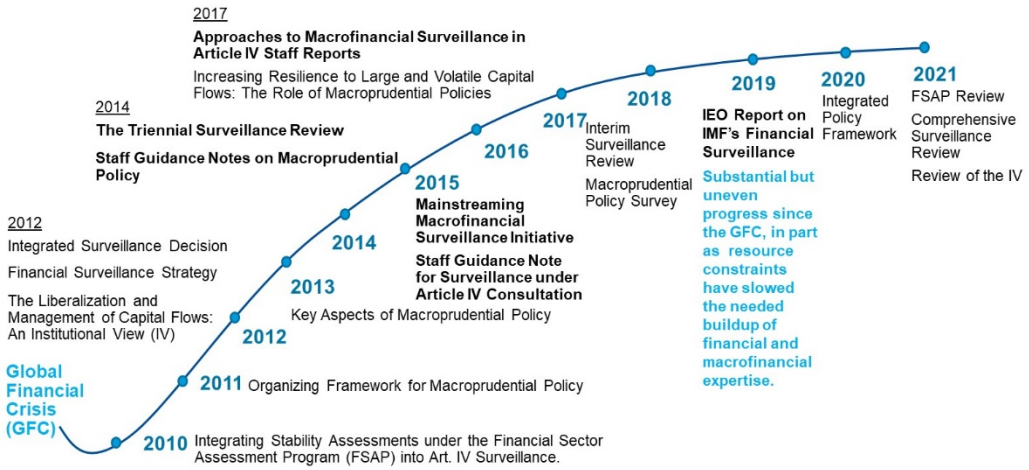
INTRODUCTION

1. Effective Article IV surveillance requires a well-integrated analysis of systemic risk and macrofinancial linkages. Recognizing the strong interlinkages of the financial sector with the rest of the economy, an important lesson from the global financial crisis was the need for a more integrated approach to financial and macroeconomic analyses in surveillance. To this end, the Fund has embarked on several initiatives to strengthen its financial surveillance (Figure 1). The 2014 Triennial Surveillance Review (TSR, IMF, 2014a) noted that the Fund had made progress in strengthening financial surveillance but additional efforts were needed to fully integrate macrofinancial analysis into Article IV consultations and to strengthen surveillance of macroprudential policies. Drawing on the Executive Board discussions, the work by international standard setters, and country experiences with macroprudential policy, the Fund published the guidance notes to operationalize the macroprudential policy framework (IMF, 2014b). It also released updated guidance for surveillance under Article IV consultations (IMF, 2015a); and launched the macrofinancial mainstreaming initiative.[1]

Figure 1. Key Milestones to Upgrade Financial and Macrofinancial Surveillance since the Global Financial Crisis



Source: IMF staff.

2. Both a 2017 staff paper[2] and a 2019 Independent Evaluation Office (IEO) evaluation found progress while identifying areas for improvement in integrating macrofinancial analysis into Article IV consultations. The former paper assessed the initial progress under the mainstreaming initiative and noted improvements for a wide range of countries. However, it saw scope for the Fund to deepen its understanding of the macroeconomic effects of financial shocks, to

[1] The initiative started with 24 pilot countries in 2015. It expanded to 67 countries in 2016, 128 countries in 2017, and to the full membership in 2018.

[2] "Approaches to Macrofinancial Surveillance in Article IV Reports" (IMF, 2017a).

better adapt microprudential and macroprudential policy advice with an assessment of macro-critical risks including systemic risk, and to deepen the analysis of outward spillovers. Furthermore, the 2019 IEO evaluation of the Fund's financial surveillance (IEO, 2019) recognized that the integration of macrofinancial analysis in Article IV consultations had expanded but progress in raising the quality and impact of the IMF's financial surveillance has been uneven, in part as resource constraints have slowed the needed buildup of financial and macrofinancial expertise. The IEO noted that significant additional resources will be required to increase the IMF's capacity to fulfill its responsibility for high quality and effective financial surveillance. The IEO recommended, as the highest priority, to further strengthen financial and macrofinancial analysis in Article IV consultations, which the IEO noted requires augmenting the pool of macrofinancial talent.

3. Following up on the IEO recommendations, this paper seeks to advance the depth and integration of systemic risk analysis and macroprudential policy advice—core elements of macrofinancial analysis—in bilateral surveillance. It complements the results from the broader IEO evaluation through a more granular assessment of staff reports to identify specific steps to strengthen systemic risk analysis and macroprudential policy advice in Article IVs. It also follows up on one of the findings of the 2017 staff paper (IMF, 2017a) on the need to better adapt macroprudential policy advice with an assessment of macro-critical risks including systemic risk. Further strengthening systemic risk analysis and advice on mitigating policies has become even more important in the context of elevated financial vulnerabilities due to the COVID-19 shock (IMF, 2020a).

4. The paper informs the Comprehensive Surveillance Review (CSR) and the FSAP Review in formulating their recommendations to deepen macrofinancial analysis in Article IV consultations. The paper starts with clarifying expectations from Fund policy and operational guidance, followed by a description of the assessment methodology in the subsequent section. The paper then presents the assessment's findings and its main conclusions.

EXPECTATIONS FROM POLICY AND GUIDANCE

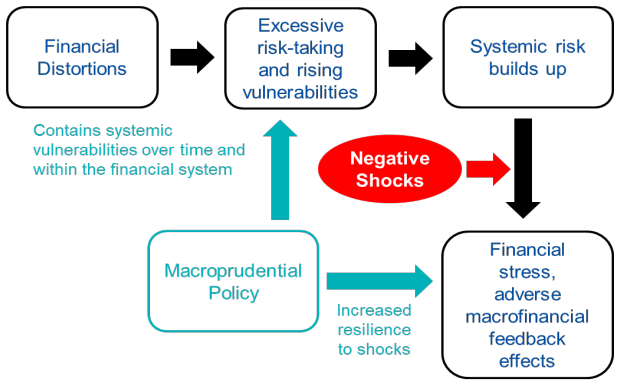
5. The Fund policy and operational guidance set expectations for the analysis of systemic risk and for the advice on macroprudential policy (MPP).[3] The TSR called for macrofinancial analysis to be an integral part of Article IV consultations, which the operational guidance defines as a fully integrated analysis of macrofinancial linkages and systemic risk.[4] Systemic risk analysis is a critical step to formulate advice on macroprudential policy, defined as the use of primarily prudential tools to limit systemic risk (IMF, 2013). Systemic risk emerges from the presence of financial distortions that can lead to a build-up of vulnerabilities over time and/or to structural vulnerabilities within the financial system (IMF, 2014b). These vulnerabilities could amplify negative

[3] The operational guidance includes the Staff Guidance Note on Macroprudential Policy (IMF, 2014b) and the Guidance Note for Surveillance under Article IV Consultation (IMF, 2015a).

[4] Systemic risk is defined as the risk of disruption in the provision of financial services caused by an impairment of the financial system with serious negative effects for the real economy (IMF-FSB-BIS, 2009)

aggregate shocks, increase financial stability risks, and have serious adverse effects for the real economy through negative feedback loops. Macroprudential policy seeks to contain those vulnerabilities and increase the resilience of the system to aggregate shocks, and ultimately to reduce the frequency and severity of financial crises (Figure 2).[5] Given this primary role, the assessment focuses on staff's advice on macroprudential policy, while other policies can also influence systemic risk. Ongoing work under the Integrated Policy Framework (IMF, 2020b) seeks to understand the role of various policies used jointly in ensuring macroeconomic and financial stability but its operationalization is still under development.

Figure 2. Rationale for Systemic Risk Analysis and Macroprudential Policy

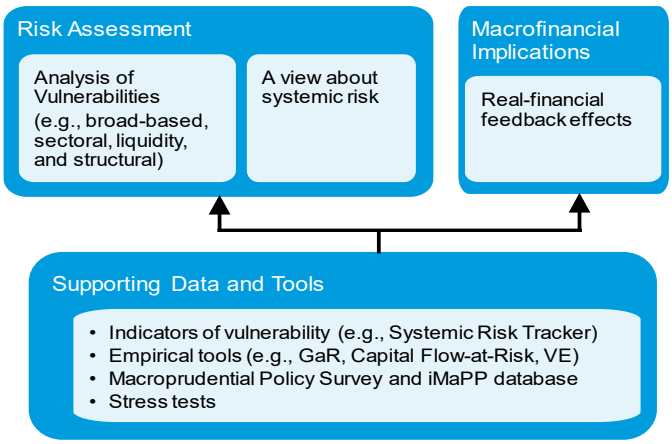


Source: IMF staff.

Systemic Risk Analysis

6. Macroprudential policy advice should be anchored in a solid risk assessment informed by a view about systemic risk (IMF, 2017a). Systemic risk is multi-dimensional: it can be rising in one dimension while falling in another dimension. Therefore, staff's advice on macroprudential policy should start with a comprehensive and rigorous analysis of systemic vulnerabilities (IMF, 2014b) to form a view about the extent of systemic risk and its sources. These vulnerabilities can be time-varying or structural and can be broad-based or sectoral (Figure 3). To assess the build-up of

Figure 3. Systemic Risk Analysis Framework



Source: IMF staff.

[5] It is important to distinguish macroprudential policy, designed to limit systemic risk, from microprudential policy, which is designed to mitigate risks at individual institutions. The focus of this paper is on the former and the systemic risk analysis that informs advice in this specific aspect of macrofinancial surveillance.

systemic vulnerabilities over time, the analysis should consider, where relevant: (i) economy-wide vulnerabilities from an excessive growth in total credit; (ii) sectoral vulnerabilities (e.g., balance sheet health of households, financial and non-financial corporates, and governments) and the potential for macrofinancial feedback loops ; and (iii) vulnerabilities from excessive maturity and currency mismatches. To assess structural vulnerabilities (such as those arising from contagion and concentration), the analysis should consider domestic and cross-border linkages within and across financial intermediaries, financial markets, and market infrastructures (IMF, 2015a). And it should look beyond banks, for macroprudential policy needs to be geared to contain systemic risk in the financial system as a whole (IMF, 2014b). This is, however, not a checklist. Country teams should focus on the issues and themes that are relevant for financial stability to anchor clear advice on an appropriate mix of policies.

7. The analysis should consider the financial system's ability to generate, propagate, and amplify adverse aggregate shocks, including through two-way real-financial feedback effects. The case for macroprudential policy stems from: (i) the financial system's ability to generate, propagate, and amplify adverse aggregate shocks, where vulnerabilities develop endogenously as lenders and borrowers respond to a low price of risk in the presence of financial frictions and act as amplifiers of shocks (Adrian and others, 2019); (ii) macrofinancial feedback mechanisms that can increase exposure to such adverse aggregate shocks; and (iii) linkages within the financial system that increase the vulnerability of the system to idiosyncratic or aggregate shocks (IMF, 2014b). Understanding these relationships enables a forward-looking risk analysis that can provide an early warning and an integration of macrofinancial perspectives more fully into advice on the overall policy mix in the Fund's surveillance (IMF, 2017a).

8. There are many analytical approaches available to staff to support the various elements of the above systemic risk analysis framework. Systemic risk is a multidimensional concept and there is no single metric that can summarize all its dimensions. Thus, the analysis of its sources needs to rely on multiple approaches including judgment. The macroprudential guidance note proposes a list of core and additional indicators for each type of time-varying vulnerabilities, including financial conditions (e.g., asset prices, cost of funding) and balance sheet indicators (e.g., leverage, maturity and liquidity mismatches, and currency mismatches) (IMF, 2014b). There are also metrics that can help assess structural vulnerabilities stemming from interconnectedness, complexity, and spillovers, such as Conditional Value-at-Risk, Balance Sheet Analysis (BSA), and network analysis (see Annex I for an expanded discussion of tools to assess systemic risk). Of those, it is useful to highlight a few recent and upcoming additions to the toolkit:

- **Systemic Risk Tracker.** Central repository of quarterly macrofinancial indicators for most of the Fund membership that facilitates cross-country and temporal analysis of financial vulnerabilities, including many indicators used in the Staff Guidance Note for Macroprudential policy, and provides indicative heatmaps of cyclical sources of systemic risk (Iossifov and Dutra, 2021).

- **Growth-at-risk (GaR).** This framework links current macrofinancial conditions to the distribution of future real GDP growth, and are now used in the Fund's bilateral and multilateral surveillance. It allows users to assess the entire distribution of future GDP growth; quantify

downside macrofinancial risks in terms of growth; monitor the evolution of these risks over time as a function of financial conditions and vulnerabilities; and monitor the inter-temporal trade-off between growth and build-up of vulnerabilities (Prasad and others, 2019).

- **Capital-flows-at-risk.** The tool allows users to predict the entire future probability distribution of capital flows to emerging markets, based on current domestic structural characteristics, policies, and global financial conditions (Gelos and others, 2019).

- **Stress testing tools.** A new excel-based Global Stress Test tool (IMF, 2020c) is available to Article IV teams and allows users to conduct bank solvency stress tests, using publicly available individual bank data for major 33 banking systems. New user-friendly tools in the pipeline will also include simpler bank stress testing tools applicable to the wider membership based on aggregate data and tools for corporate stress testing (IMF, 2021a). These stress testing tools will not require the same level of granularity as FSAP stress tests, which are more resource and data intensive exercises. However, they can help inform views about systemic risk in Article IVs and offer a useful reference for discussions with the authorities on banking sector resilience, especially during the period between FSAPs, or for countries that have not benefited from one.

9. The range of approaches facilitates accommodating country-specific circumstances. The Fund policy and operational guidance emphasize a flexible and pragmatic approach when conducting the analysis, reflecting the diversity and evolution of financial systems across countries, as well as uneven data availability (IMF, 2017a; IMF, 2014b). The analysis also requires judgment as some risks remain difficult to quantify (e.g., cybersecurity). Simple analytical approaches may be preferred in data constrained environments. In data-rich environments, where the financial system is large, interconnected, or concentrated, there is greater need for a combination of approaches.

Macroprudential Policy Advice

10. The guidance lays out key elements for the staff's macroprudential policy advice (IMF, 2014b). They include an assessment of existing macroprudential tools (e.g., costs and benefits, effectiveness, leakages); mapping from systemic vulnerabilities to specific tools; calibration (e.g., deployment, tightening or relaxing); an appropriate policy mix and communication; and the institutional framework. Article IV teams should focus on the issues relevant for financial stability and take account of country specific circumstances:

- **Assessment of existing macroprudential tools.** The staff's advice on implementation of macroprudential policy should aim to ensure the effective and efficient use of tools. This implies weighing benefits against costs and assessing the potential for leakages—the migration of financial activity outside the scope of application and enforcement of macroprudential tools—which could reduce the effectiveness of macroprudential policy. Staff could also advise strategies to address such leakages (e.g., an expansion of the regulatory perimeter).

- **Mapping from systemic vulnerabilities to specific tools.** The advice should be tailored to prevailing source(s) of vulnerabilities and focus on the type of tools that are most efficient.

- **Calibration.** Macroprudential policy tools can be deployed preemptively, before vulnerabilities become elevated or adverse macrofinancial dynamics set in (IMF, 2017b). More broadly, even when systemic risk is low and a crisis seems distant, staff should encourage the establishment of a macroprudential toolkit, so that tools can be activated if needed (IMF, 2014b).

- **Policy mix.** Staff advice should be mindful of how macroprudential policy fits within the overall policy framework, considering its interactions with other policies and that macroprudential policy should not substitute for appropriate policies in other areas.

- **Communication.** Clear communication of policy intentions can help achieve effective transmission of macroprudential actions. Communication can also promote public understanding of the need for macroprudential measures, counter biases in favor of inaction, and enhance legitimacy and accountability of macroprudential policy.

- **Institutional framework.** Staff should develop recommendations to establish and/or strengthen the framework when relevant. Advice could seek to ensure willingness and ability to act, as well as cooperation with other agencies in risk assessment and mitigation, and coordination to address leakages. Where relevant, staff should encourage to fill data gaps and enhance the risk monitoring capacity.

- **Country-specific circumstances.** Weak supervisory capacity and limited data availability, commonly observed in low-income countries, can constrain the conduct of macroprudential policy (IMF, 2014c). In such cases, simple approaches, combined with judgement, can be preferred rather than an active (re)calibration of macroprudential measures in response to the build-up of vulnerabilities. Where the financial system is large and interconnected, there might be greater need for structural macroprudential tools to contain concentration and contagion risks.

ASSESSMENT APPROACH

11. The assessment undertaken in this paper is based on a review of Article IV staff reports. The sample of staff reports comprises all 93 Article IV consultations concluded by the Executive Board during calendar year 2019. For comparison, staff also assessed the Article IV staff reports for these jurisdictions for the years 2014 and 2017. Overall, the sample covers 86 percent of all Article IV consultations concluded by the Executive Board during 2014, 2017, and 2019. It covers one year before and two and four years after the 2015 launch of the mainstreaming initiative. The sample includes countries from all regions and income levels, countries that participated in the mainstreaming initiative pilots as well as those that have not, and countries that have benefited from a recent FSAP as well as those that have not (Figure 4).

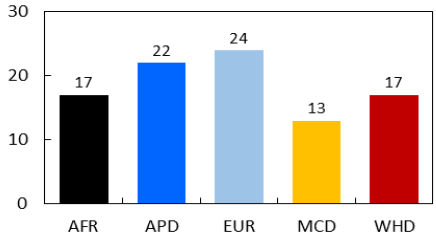
12. Specifically, the assessment draws on an analytical review of staff reports and interviews with Article IV teams. Staff conducting the assessment ("assessors") used text mining to identify and extract relevant financial sector text relating to recent developments, risks, and policies. Assessors then reviewed the text to make an informed judgement on the elements of systemic risk

analysis and macroprudential policy advice (Annex II). Each staff report was reviewed by at least two assessors independently to reduce possible subjectivity in the analysis. Staff also interviewed Article IV teams, including countries from all regions and income groups, to augment and verify the results from the assessment.

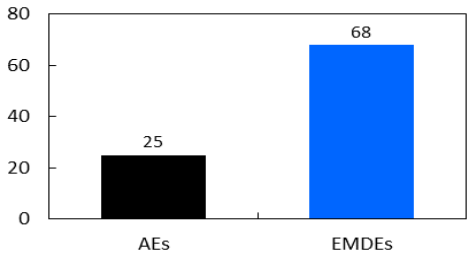
13. The assessment started by setting parameters to determine the integration of systemic risk analysis in staff reports. Article IV teams may use different approaches for systemic risk analysis, reflecting its multi-dimensional nature and they may express views about systemic risk in different ways. The starting point involved defining a "well-articulated view about systemic risk" for the operational purpose of undertaking this assessment. It set flexible criteria to accommodate circumstances with single or multiple sources of systemic risk, without necessarily requiring the use of the words "systemic risk." The assessment considered a staff report as having a well-articulated view about systemic risk if it included a statement or view on any of the following: (i) an explicit mention of systemic risk, including its level (for example, "high" or "low"), direction (for instance, "rising" or "falling"), and sources; (ii) the overall vulnerabilities in the financial system and its resilience to aggregate shocks; or (iii) how shocks (from the financial system, the rest of the economy, or abroad) could cause an impairment of all or parts of the financial system and their consequences for the real economy given underlying vulnerabilities. Also, these views had to be supported by data or tools (e.g., financial soundness indicators, econometric analysis, stress tests), as discussed in the previous section.

Figure 4. Sample Composition of Jurisdictions[1/]

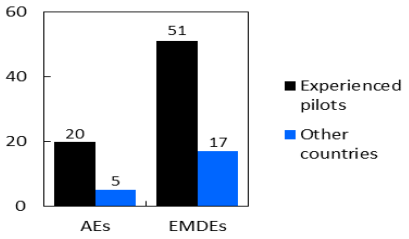
By Area Department
(Number of jurisdictions)



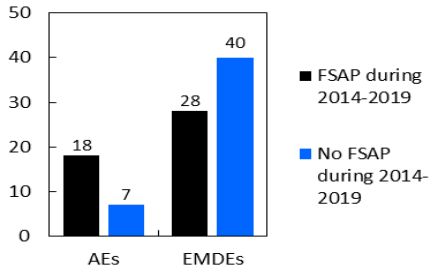
By Income Group
(Number of jurisdictions)



By Participation in Mainstreaming Initiative[2/]
(Number of jurisdictions)



By FSAP participation during 2014-2019
(Number of jurisdictions)



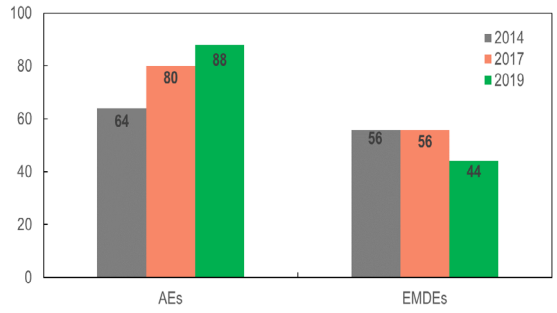
Source: IMF staff calculations.
1/ AFR: African, APD: Asian and Pacific, EUR: European; MCD: Middle East and Central Asian; WHD: Western Hemisphere; AEs: advanced economies; EMDEs: emerging market and developing economies.
2/ Experienced pilots are the jurisdictions included in the initiative during 2015-2017.

KEY FINDINGS

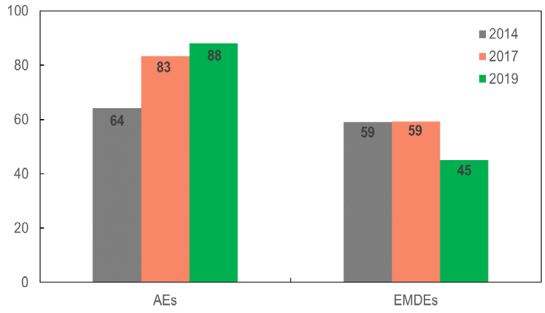
14. An increased fraction of staff reports for advanced economies (AEs) included a well-articulated view about systemic risk and its link to macroprudential policy advice, but gaps remain in emerging market and developing economies (EMDEs). Most staff reports for AEs included a well-articulated view about systemic risk as defined in the previous section (Figure 5, left chart), showing also a marked increase since 2014. However, this result reflects a stark contrast with the average outcome from staff reports for EMDEs, particularly for 2019, where, on average, fewer staff reports included a well-articulated view than in the earlier years. The assessment then examined whether and how macroprudential policy advice was anchored on the analysis. To this end, it checked if staff reports stated anything about specific vulnerabilities raising systemic risk concerns and put forward macroprudential policy recommendations that were explicitly linked to these vulnerabilities. The results were in line with those on the inclusion of a well-articulated view about systemic risk (Figure 5, right chart).

Figure 5. Macroprudential Policy Advice and its Anchoring on Systemic Risk Analysis

Staff Reports with a Well-Articulated View about Systemic Risk
(Percent of staff reports in each income group, 2014-2019)



Staff Reports with Macroprudential Policy Advice Anchored on a Well-Articulated View about Systemic Risk
(Percent of staff reports with macroprudential policy advice in each income group, 2014-2019)



Source: IMF staff calculations.

15. The above difference relative to AEs persisted even for EMDEs with relatively more systemically important financial sectors within the group. Among the subgroup of EMDEs with systemically important financial sectors and those with higher levels of financial depth,[6] a much lower fraction of staff reports included a well-articulated view about systemic risk than those for AEs (63 percent in the former group and 44 percent in the latter for 2019). This additional disaggregation suggests that the overall difference between AEs and EMDEs is not driven by the less financially developed countries within the EMDE group.

[6] Approximated by those above the 66th percentile of the ratio of total credit to the private sector to GDP within the group.

16. The difference between AEs and EMDEs reflects a combination of factors. These include often larger and systemic financial sectors in AEs that warrant more scrutiny; more off-the shelf analysis that AE teams can draw on, which includes work produced as part of multilateral surveillance (such as the GFSR) and external analyses (such as authorities' financial stability reports); still developing macroprudential policy frameworks in some EMDEs; and a relatively wider set of tools to conduct systemic risk analysis in AEs due mainly to greater data availability. During interviews, Article IV teams also noted more urgent but different policy priorities and lack of expertise in some of the systemic and structural issues. Competing priorities also appear to explain the drop in 2019 among EMDEs.

17. Nonetheless, the assessment identified many good examples among both AEs and EMDEs. Some staff reports clearly spell out the source and the extent of systemic risk backed by analysis. These examples include the 2017 staff report for China (IMF, 2017c) which noted the growth in non-financial sector debt as a source of concern for medium-term macroeconomic stability drawing on credit gap analysis and full integration of macrofinancial variables into the baseline projections; and the 2018 staff report for Hong Kong SAR (IMF, 2019a) which referred to elevated systemic risk from overvalued house prices and continued inflows from non-residents. The China and Hong Kong SAR staff reports also benefited from previous or ongoing assessments under the FSAP. These views were supported by the GaR analysis including property prices and credit aggregates. Another example is the 2019 staff report for Chad (IMF, 2019n), which stressed the build-up of vulnerabilities from the tight sovereign-bank nexus, especially in the two large public banks, supported by stress tests. It is also important that the analysis informs macroprudential policy advice: for example, the 2019 staff report for Korea (IMF, 2019b) noted that, given risks from high household debt and potential leakages, the macroprudential policy stance should be kept tight and assessed the extension of debt service ratio limits to non-bank financial institutions as appropriate. Similarly, the 2017 staff report for Hong Kong SAR (IMF, 2018a) considered appropriate the introduction and progressive increase of the countercyclical capital buffer, given the large credit-to-GDP gap and overvalued housing prices. In these examples, macroprudential policy advice was explicitly linked to the analysis and identified systemic vulnerabilities.

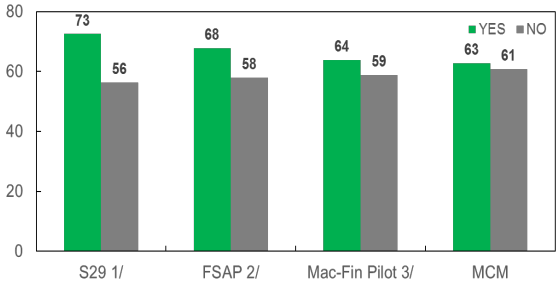
18. The assessment found several factors associated with staff reports including macroprudential policy advice linked to a well-articulated view about systemic risk. These factors corresponded to: jurisdictions with systemically important financial sectors; those benefiting from a recent FSAP; those that participated in the pilots to mainstream macrofinancial surveillance; and those benefiting from MCM participation in Article IV missions (Figure 6). The FSAP risk analysis, particularly conclusions from stress tests, is an important resource used by Article IV teams, albeit only available to countries that have benefited from recent FSAPs.[7] However, there is space for a more consistent follow-up of FSAP findings and recommendations in Article IV staff reports. For example, already one year after the publication of the Financial System Stability Assessment (FSSA),

[7] The Financial Sector Stability Review was introduced in 2017, targeted towards low and lower-middle-income countries. It is a technical assistance instrument which delivers a diagnostic review of key components of the financial sector including regulation, supervision and safety nets; a review of financial statistics; a technical assistance roadmap; and follow-up technical assistance to help countries strengthen financial stability frameworks.

references to the conclusions from the FSAP stress tests in Article IV staff reports decline sharply (Figure 7). Many FSAP recommendations are structural in nature that involve institution building and introduction or improvement of existing systems that can take several years to materialize. Therefore, many FSAP recommendations remain valid for many years and should be followed up in subsequent Article IV consultations. Simple stress testing tools, such as those mentioned earlier in this paper, can support Article IV teams' efforts to update FSAP risk analysis, notwithstanding their lower level of granularity than the original FSAP analysis.

Figure 6. Macroprudential Policy Advice Linked to a Well-Articulated View about Systemic Risk

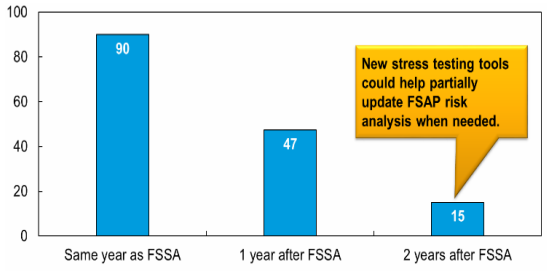
(Percent of staff reports corresponding "Yes" or "No" to the X-axis category, average over 2014-2019)



Source: IMF staff calculations.
1/ Jurisdictions with systemically important financial sectors (subject to mandatory financial stability assessments).
2/ Whether an FSAP took place in the previous three years.
3/ 2015-16 Macrofinancial pilot.

Figure 7. References to Conclusions from FSAP Stress Tests

(Percent of staff reports with an FSSA published in the corresponding year)

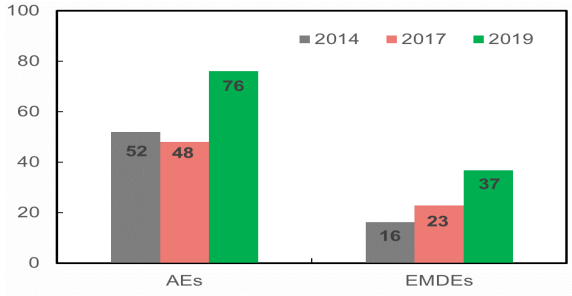


Source: IMF staff calculations.
Note: Excludes staff reports issued while the FSAP was ongoing.

19. The assessment found increased attention to real-financial feedback effects across the board. As discussed in the 2014 TSR, integrating macrofinancial linkages into the baseline macroeconomic framework is a prerequisite for an integrated approach to risk analysis. Staff reports have increased attention to real-financial linkages across AEs and EMDEs (Figure 8), including due to advances in the analytical toolkit. However, during interviews, Article IV teams referred to the need for more expertise to deepen macrofinancial analysis in some areas, including utilizing some of the analytical tools as this also requires judgment. Therefore, strengthening macrofinancial expertise Fund-wide is vital to further deepening all dimensions of macrofinancial analysis.

Figure 8. Staff Reports Discussing Real-Financial Feedback Effects

(Percent of staff reports in each income group, 2014-2019)

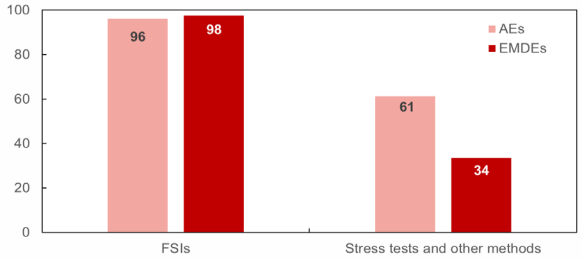


Source: IMF staff calculations.

20. More consistent integration of the content of the Risk Assessment Matrix (RAM) into the main text of staff reports can help better integrate views about systemic risk and macroprudential policy advice. The RAM often includes discussions on relative likelihood and potential economic impacts of risks, originated from or spilled over to the financial sector, that could alter staff's baseline projection. The assessment found that, in some cases, the high likelihood and material impact of risks to financial stability, pointed out in the RAM, were not articulated into staff's view about systemic risk in the main text. Bringing in views expressed in the RAM into the main text could help enhance the formulation and presentation of staff's view about systemic risk in staff reports.

Figure 9. Data and Tools Used in Systemic Risk Analysis

(Percent of staff reports in each income group, average over 2014-2019)



Source: IMF staff calculations.

21. The assessment found scope to make the systemic risk analysis more forward looking by going beyond Financial Soundness Indicators (FSIs). Nearly all staff reports included a discussion of FSIs, typically focusing on capital adequacy ratios, asset quality (i.e., non-performing loans ratios), and selected liquidity indicators (Figure 9). FSIs provide useful information about buffers but are often reported with lags and some may be slow or not good at predicting risks ahead. Therefore, focusing solely on FSIs may limit a proper forward-looking analysis of risks, particularly in circumstances of significant expected losses that have not yet materialized, such as in the current context with COVID-19.[8]

22. Many staff reports for AEs but less than half for EMDEs complement the analysis of FSIs with a wide range of approaches that facilitate a forward-looking and rigorous analysis of risks and vulnerabilities. Where feasible, a forward-looking analysis of risks and vulnerabilities should consider out-of-sample evaluations. The most widely used tools to support systemic risk analysis include scenario-based stress tests, GaR, and a variety of empirical analyses (e.g., asset price models). Specific examples include the 2019 staff report for Dominican Republic (IMF, 2019c) which used GaR to assess risks to future GDP growth from a tightening in financial conditions, and the 2014 staff report for Chile (IMF, 2014d) which conducted an in-depth assessment of corporate sector risks using a wide range of corporate vulnerability indicators and firm-level data. Integration of conclusions from FSAP stress tests also helps enrich analysis of risks: good examples include the 2017 staff report for Mexico (IMF, 2017d), the 2019 staff report for Singapore (IMF, 2019d) and Thailand (IMF, 2019e).

23. Drawing on external analysis, such as the authorities' Financial Stability Reports, has also helped form views on systemic risk. A significant fraction of staff reports referred to stress

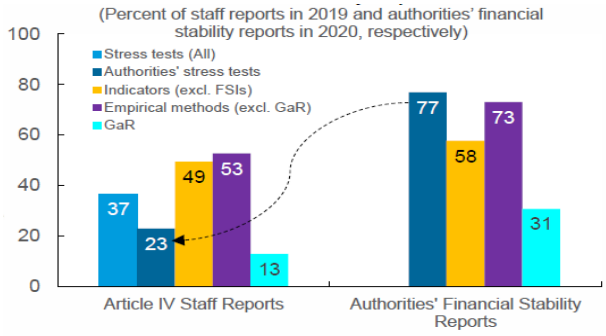
[8] Furthermore, FSIs typically focus on the banking system and do not fully capture vulnerabilities in the nonbank financial sector and nonfinancial corporations.

test results published in the authorities' Financial Stability Reports (FSRs) (Box 1). The increased availability of FSRs using similar tools, particularly stress tests, greatly increases the quality of the dialogue between Article IV teams and the authorities on systemic risk analysis. That said, staff should always form an independent view, even if based on reliable external analysis.

Box 1. Systemic Risk Analysis in Financial Stability Reports and Article IV Staff Reports

Financial stability reports (FSRs) are becoming an important tool for the authorities in communicating the state of financial sector health and vulnerabilities. They are typically published semi-annually, and contain in-depth analysis of systemic and sectoral vulnerabilities, as well as discussions on macrofinancial environment and linkages that have implications on the financial sector. A review of FSRs focused on analytical tools and methodologies covering 26 FSRs[1/] documents a wide range of indicators and analytical and qualitative toolkit to identify systemic financial risks and sectoral vulnerabilities (Comelli and Ogawa, forthcoming). Some of these approaches overlap with those deployed by Article IV staff reports, for example heatmaps and systemic risk indicators, credit gaps, financial conditions indices, and stress tests.

Toolkit Used in Staff Reports and Authorities' Financial Stability Reports



Source: IMF staff calculations.
Note: Empirical methods include econometric analyses, credit-to-GDP gap estimation, and DSGE model simulations. A sample of AIV SR includes 93 countries (25 AEs, 68 EMDEs) and a sample of Financial Stability Reports includes 26 countries (12 AEs, 14 EMDEs).

Some Article IV teams have leveraged FSR's analysis to inform their own views about systemic risk. A significant fraction of staff reports refers to stress test results published in the authorities' FSRs (see figure). Other empirical methods such as Growth-at-Risk feature in FSRs as well. The authorities' analyses based on granular and confidential supervisory data is valuable, as availability of such data is often not available to Article IV teams outside of the context of FSAPs.

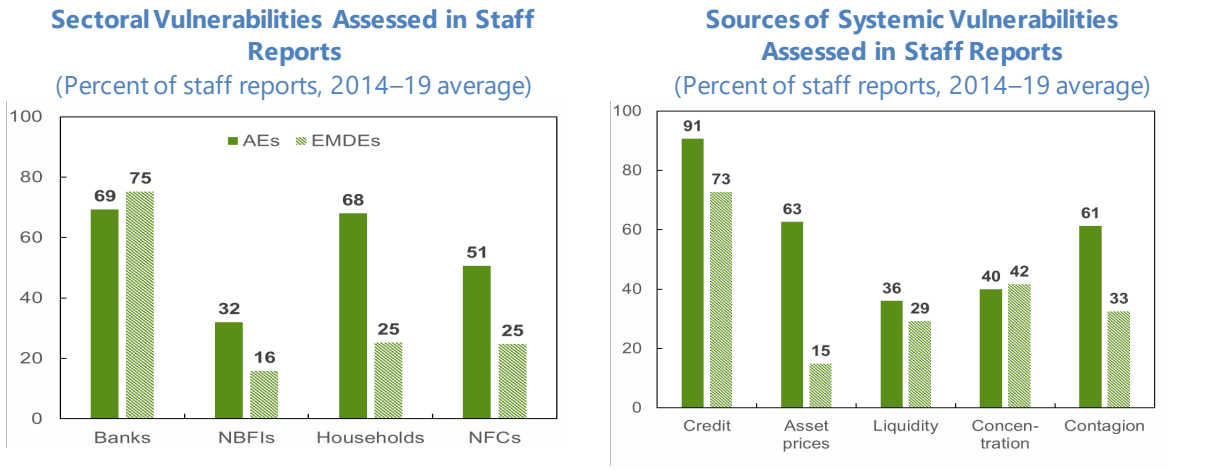
1/ The twelve advanced economies are Australia, Canada, Denmark, Germany, Hong Kong SAR, Ireland, Italy, Japan, Korea, Singapore, Sweden, and Switzerland. The fourteen emerging market and developing economies are Bangladesh, Brazil, Chile, Hungary, India, Indonesia, Mexico, Romania, Russia, Rwanda, Saudi Arabia, Seychelles, South Africa, and Turkey. The review focused on the latest available FSRs, but also looked at other recent issues when relevant for consistency of coverage.

24. Further enhancing the analytical toolkit should facilitate deepening the risk analysis and making it more forward looking, particularly among EMDEs. The use of analytical tools is the area where the gap is most pronounced between LICs and other EMDEs as well as relative to AEs, largely reflecting data constraints. The approach to macrofinancial analysis needs to remain flexible and pragmatic. Strengthening in-house expertise and applying simple approaches that can be utilized by a wider range of countries, could help enhance systemic risk analysis particularly in data-constrained environments, which is the case for many EMDEs. Particularly useful for EMDEs are recent additions to the toolkit, such as the systemic risk tracker, which facilitates comparisons of financial vulnerability indicators across a wide range of countries (Iossifov and Dutra, 2021). In

addition, simple user-friendly bank and corporate stress testing tools currently available and new ones under development based on aggregate data, can also help Article IV teams working on EMDEs. Several of these tools were originally developed for multilateral surveillance purposes (e.g. GFSR) and their extension for bilateral surveillance should also help strengthen consistency and integration between these two surveillance products.

25. The analysis of systemic vulnerabilities should also go beyond credit and banks, although this would require reducing data gaps. As highlighted in a recent paper (Cecchetti and others, 2018), risks can build up across a range of financial sector firms, beyond banks. Overall, and not unexpectedly, the analysis of vulnerabilities tends to be more comprehensive in staff reports for AEs, as financial sector issues tend to be more important, and data gaps less constraining. While bank- and credit-related vulnerabilities are covered more frequently across all staff reports, the coverage of other vulnerabilities is relatively more limited, especially in staff reports for EMDEs, reflecting in part different stages of financial development, and data gaps (Figure 10). There are good examples across AEs and EMDEs covering vulnerabilities reflecting prioritization and country-specific circumstances. For example, the 2017 staff report for Colombia (IMF, 2017e) and the 2016 staff report for the Kingdom of the Netherlands (IMF, 2017f) included an in-depth analysis of household indebtedness and rapid credit expansion to the real estate sector, respectively; and the 2017 and 2019 staff report for Luxembourg (IMF, 2017g and 2019f) assessed interconnectedness and contagion risks within and across borders. Leveraging analyses in multilateral surveillance products (e.g., those on non-bank financial institutions and nonfinancial corporates in the GFSR) can help expand the analysis of systemic vulnerabilities beyond banks and strengthen consistency across surveillance vehicles. However, additional efforts will also be needed to reduce data constraints that limit the scope of systemic risk analysis, particularly in areas related to real estate prices, nonbank financial institutions, nonfinancial corporates, and household indebtedness.

Figure 10. Analysis of Systemic Vulnerabilities by Type and Sector



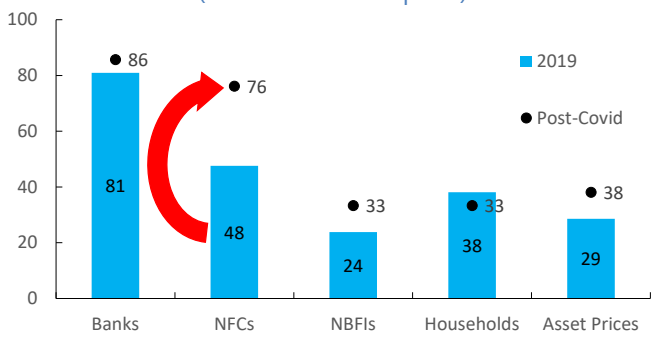
Source: IMF staff calculations.
Note: NBFIs = Non-Bank Financial Institutions; and NFCs= Non-Financial Corporations.

26. The Fund has undertaken initiatives in collaboration with international partners to help broaden data availability. They include the IMF/Financial Stability Board G-20 Data Gaps

Initiative (DGI) and a 2019 upgrade to the IMF's Financial Soundness Indicators (FSI) compilation guide. The revised guide of FSIs follows new international standards, operationalizes the measurement of concentration and tail risk in the financial system, and enhances the sectoral coverage of FSIs. The 2019 FSI Guide includes indicators for other financial intermediaries, money market funds, insurance corporations, pension funds, nonfinancial corporations, and households. It is expected to gradually help fill data gaps in these areas as countries compile and voluntarily report this information. The upcoming review of the Data Provision to the Fund for Surveillance Purposes will also be an opportunity to tackle data needs for macrofinancial surveillance.

Figure 11. Sectoral Vulnerabilities Discussed in Staff Report Since the COVID-19 Shock

(Percent of staff reports)



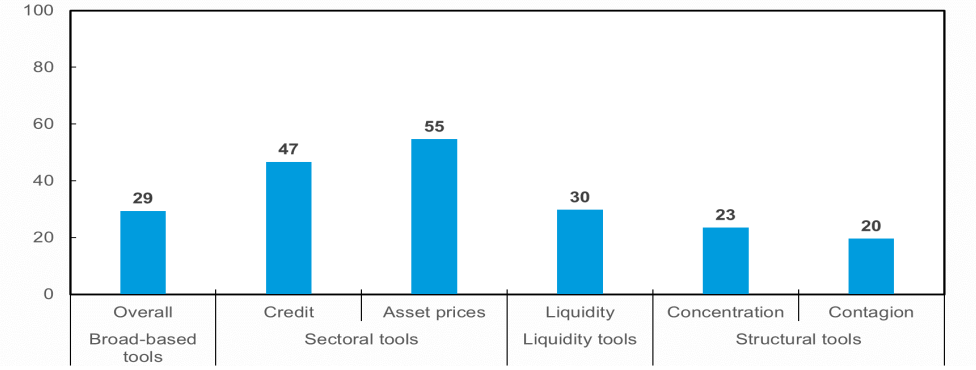
Source: IMF staff calculations.
Note: The chart includes information from Article IV reports since the restart of surveillance post COVID-19, from the second half of 2020 until March 21, 2021. To ensure comparability, the sample for 2019 is restricted to the same countries for which post-COVID-19 staff reports have been issued.

27. Reducing data gaps has become more important amid rising concerns about nonfinancial corporates since the start of the pandemic. A comparison of 21 recent staff reports issued between July 2020 and March 2021 with corresponding reports for the same countries in 2019, finds that most of the recent reports note increased financial stability risks, and a larger share of recent staff reports highlight vulnerabilities related to nonfinancial corporates since the onset of the pandemic (Figure 11). These concerns underscore the importance of continuing efforts to reduce data gaps, including related to nonfinancial corporates, but also the need to deepen the understanding of how systemic risk is impacted by financial and non-financial policies, as illustrated by the extensive policy support extended during the COVID-19 shock. Tools such as the Corporate Vulnerability Unit from the Research Department (covering 74 countries); upcoming corporate stress testing tools; and the corporate sector block of the systemic risk tracker can support enhanced monitoring of these risks.

28. Rising vulnerabilities since COVID-19 also underscores the importance for Article IV teams to advise building an adequate macroprudential toolkit. The assessment found that staff reports at times flagged relevant vulnerabilities but did not include specific macroprudential policy advice (Figure 12), partly reflecting different stages of operationalization of macroprudential policy across countries, including availability of relevant tools to address risks and vulnerabilities from nonfinancial corporates and nonbank financial institutions. When staff provided advice on specific tools, such advice was appropriately targeted, consistent with the operational guidance: for example, the 2017 staff report for Cambodia (IMF, 2017h) provided advice on reserve requirements on foreign exchange liabilities to manage liquidity risks. The 2017 staff report for Seychelles (IMF, 2017i) recommended borrower-based tools (e.g., limits on debt-to-income and debt-service-to-income ratios) to address risks including a rise in unsecured lending.

Figure 12. Detailed Macroprudential Policy Advice on Specific Type of Vulnerabilities

(Percent of staff reports flagging specific vulnerabilities, average over 2014-2019)



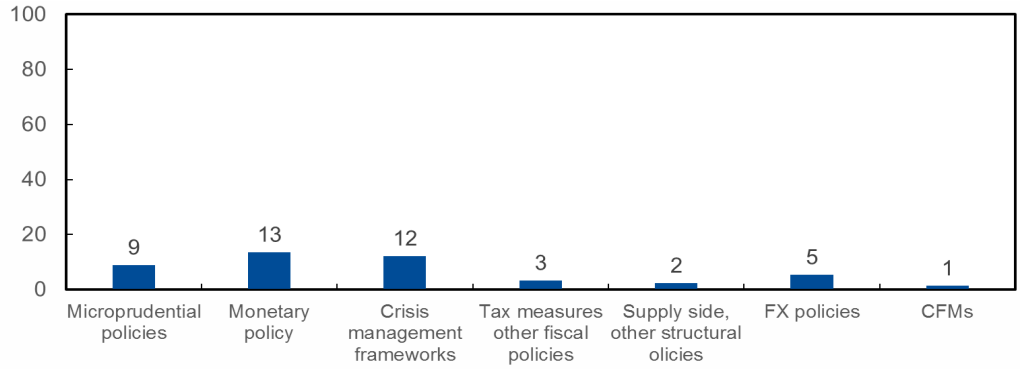
Source: IMF staff calculations.

29. It will also be important that staff advice continues to emphasize strengthening the institutional framework and monitoring capacity. Staff reports often include MPP advice related to the institutional framework and monitoring capacity. The institutional framework needs to assure the willingness to act, the ability to act, and cooperation among agencies. Often, Article IV teams have assessed whether the macroprudential mandate has been assigned to a body or a committee with a well-defined objective and legal powers and provided advice accordingly (for instance, see the 2017 staff report for Brazil, IMF, 2017p). Staff have also made recommendations to strengthen risk monitoring capacity, including through improving stress tests and data quality, as in the 2017 Article IV staff report for Algeria (IMF 2017q); however, there is in general little advice on communication.

30. Strengthening macroprudential policy advice also requires deepening staff's knowledge of its effects and interactions with other policies. Staff reports are increasingly including discussions of macroprudential policy effects, particularly in AEs with almost all 2019 staff reports containing evaluations of macroprudential policy effectiveness, including references to working papers and/or selected issues papers. Some staff reports also included discussions of

Figure 13. Discussion of Policy Mix with Macroprudential Policy

(Percent of staff reports providing macroprudential policy advice, average over 2014-2019)



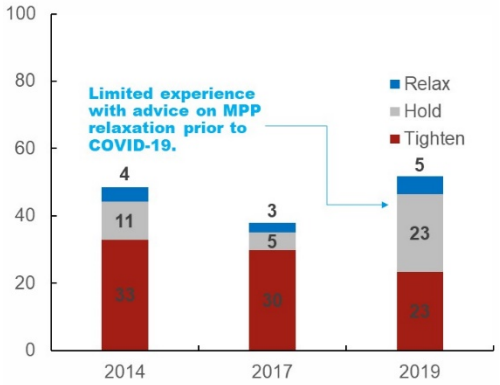
Source: IMF staff calculations.

potential leakages or costs in terms of output. For example, the 2017 staff report for Korea (IMF, 2018b) advised harmonization of regulations across different types of financial institutions to mitigate the risk of leakages. However, factoring in interactions with other policies remains limited (Figure 13). Some exceptions include the 2017 staff report for Thailand (IMF, 2017j) and the 2018 staff report for Australia (IMF, 2019g), which recommended using macroprudential policy to contain the build-up of systemic risk in the context of easy financial and/or monetary conditions. The 2017 staff report for Norway (IMF, 2017k) and Hungary (IMF, 2017l) recommended complementing macroprudential policy with tax and/or housing market reforms to address risks in housing markets and supply bottlenecks. The 2017 staff report for Iceland (IMF, 2017m) stressed the importance of the complementarity between microprudential and macroprudential policy.

31. Staff remain engaged in analytical work in this area. Since 2017, the Fund has conducted an annual survey of all member countries to create a cross-country database with a comprehensive set of indices, which was also part of the G20 Leaders' Hamburg Action Plan of July 9, 2017. Staff released the integrated Macroprudential Policy (iMaPP) database that provides comprehensive information of macroprudential tools (Alam and others, 2019).[9] More recently, staff released a comprehensive repository of quantitative effects of macroprudential policy for a wide range of tools, outcome variables, and country income groups based on a review of close to 60 papers in the literature (Araujo and others, 2020). In addition, new empirical studies assessing the effects of macroprudential policy and its interactions with other policies have also been produced by Fund staff (IMF, 2020d; Brandao and others, 2020; Mano and Sgherri, 2020). Ongoing work includes Adrian and others (forthcoming), which uses a GaR based metric as a measure of financial stability risks. It assesses macrofinancial vulnerabilities across business and financial cycles, and then calibrates a countercyclical capital buffer in the context of bank stress tests. Additional analytical work based on country experiences is needed to better understand the effectiveness of macroprudential policies and their appropriateness within the overall policy mix. This last objective is in line with those of the Integrated Policy Framework and the CSR's surveillance priority for unified policy advice.

Figure 14. Macroprudential Policy Advice on Direction of Policy Settings

(Percent of staff reports with advice on macroprudential policy tools)



Source: IMF staff calculations.

32. The COVID-19 shock has underscored the importance of better understanding the effects and tradeoffs from macroprudential policy easing. Prior to the COVID-19 shock, macroprudential policy advice in Article IV staff reports evolved from being predominantly on "tightening" to increasing instances on "hold"

[9] The iMaPP database will be updated annually with the information from the IMF's Annual Macroprudential Survey and posted at an IMF website and includes: (i) dummy-type indices of tightening and loosening actions of 134

(continued)

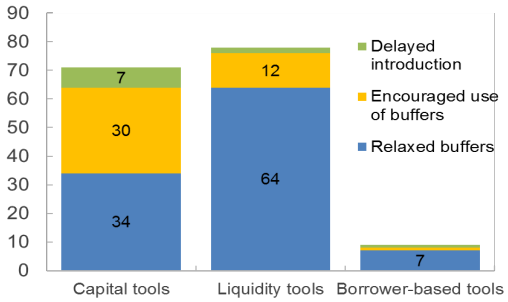
advice, as financial vulnerabilities were still rising or elevated in many jurisdictions, consistent with the overall analysis of risks presented in the GFSR (IMF, 2019h). Experience with advice on "easing" remained limited until 2019 (Figure 14). In response to the COVID-19 crisis, many countries have relaxed macroprudential policy (Box 2). These actions, along with other policies, have helped stabilize financial market conditions and maintain the flow of credit to the real economy, as highlighted in the October 2020 GFSR (IMF, 2020c). The experience from the recent macroprudential policy easing provides an opportunity to deepen the understanding of the effects and tradeoffs associated with macroprudential policy relaxation, as well as how to manage vulnerabilities in the context of extraordinary support measures.[10]

Box 2. Macroprudential Policy Relaxation amid the COVID-19 Crisis

In response to the COVID-19 shock, many countries have relaxed macroprudential policy to allow banks to absorb losses and support the flow of credit to the real economy (IMF, 2020a). Many economies have relaxed capital and liquidity tools or encouraged banks explicitly to use such buffers. For example, they lowered countercyclical capital buffer rates (e.g., the U.K., Hong Kong SAR), released domestic systemic risk buffers (e.g., Poland, Netherlands, South Africa), and loosened liquidity requirements (e.g., Brazil, India) to absorb losses and manage liquidity strains. Some countries have also relaxed sectoral tools (e.g., loan-to-value limits) to ease access to credit for borrowers who experienced financial distress (e.g., New Zealand, UAE).

Covid-19: Relaxation of Macroprudential Policy Tools

(Number of countries, data from March to end-August 2020)



Source: IMF (2020d).
Note: Liquidity tools include reserve requirements. For borrower-based tools: blue, yellow and green reflect a relaxation of LTV, D(S)TI, and other tools, respectively.

The experience during the COVID-19 crisis provides good opportunities to learn more about the effects of macroprudential relaxation. Under the operational guidance, two circumstances can warrant a macroprudential policy relaxation: if underlying systemic vulnerabilities dissipate, or if systemic risk materializes and financial conditions tighten, threatening to drag down real economic activities with it (IMF, 2014b). Where buffers have been built-up, their release can support the provision of credit when conditions warrant it. But its ultimate effects depend also on the overall policy mix and if and how banks use the released buffers. Additional analytical work and learning from country experiences can shed light on these questions and can also help inform the timing of reversing macroprudential policy easing.

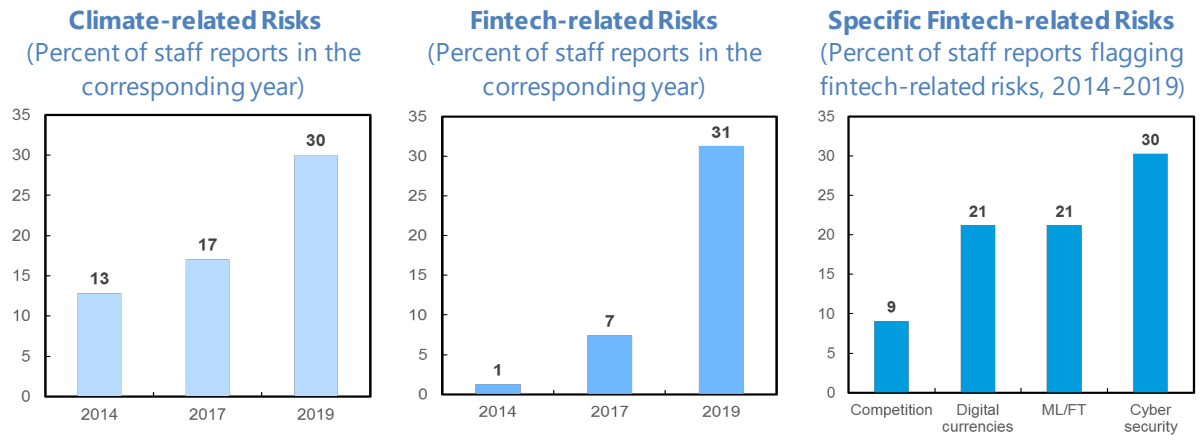
33. Emerging risks from climate change and fintech developments call for approaches to assess their financial stability implications. Staff reports have increased attention to climate- and

countries for 17 instruments at a monthly frequency from January 1990; (ii) detailed description of each policy action; and (iii) country-level average of limits on loan-to-value ratios.

[10] There is growing attention to understanding the effects of policy intervention during the COVID-19 pandemic, including those from regulatory easing. Demirgüç-Kunt and others (2020) find that easing of prudential regulations negatively affected bank stock valuations. Valencia and others (2021) find that looser prudential regulations helped eased overall financial conditions, but the effects differed across sectors and tools.

fintech-related risks when they have been deemed macro-critical. Staff reports flagging climate-related risks were mostly small states in 2014, with the increase by 2019 explained by other types of economies (Figure 15, left chart). However, only one staff report in the sample linked climate risks to financial stability (the 2017 staff report for Nicaragua, (IMF, 2017n). There is also a significant increase in flagging financial stability and integrity risks related to fintech in 2019 (Figure 15, middle chart), with areas of concern including (i) cybersecurity; (ii) AML/CFT issues; and (iii) competition (Figure 15, right chart). Several reports flagged risks stemming from the introduction of Central Bank Digital Currencies (e.g., the 2017 staff report for The Bahamas, IMF, 2017o; the 2019 staff reports for Norway, IMF, 2019i; and Sweden, IMF, 2019j) and the use of crypto assets (the 2019 staff report for Malta, IMF, 2019k; Samoa, IMF, 2019l; and Uganda, IMF, 2019m). Such emerging risks are largely flagged qualitatively, reflecting the still limited expertise and approaches to quantitatively assess their financial stability implications and better integrate these into the systemic risk analysis.

Figure 15. Risks from Emerging Areas



Source: IMF staff calculations.

CONCLUSIONS

34. The assessment found significant but uneven progress across staff reports in the depth and integration of systemic risk analysis and macroprudential policy advice. The improvements are notable among staff reports for AEs since the launch of the macrofinancial mainstreaming initiative in 2015. There has been increased attention to real-financial linkages across AEs and EMDEs. Bank- and credit-related vulnerabilities are typically well covered. However, there is scope to deepen and expand systemic risk analysis beyond banks and to better use it as an anchor for macroprudential policy advice, particularly among EMDEs. Strengthening this work has become more important in the context of rising financial vulnerabilities due to the COVID-19 shock and trade-offs associated with the wide-ranging policy responses across countries.

35. Based on staff's assessment, additional efforts are needed in the following areas:

- **A well-articulated view about systemic risk.** The Fund policy and operational guidance sets expectations for systemic risk analysis and macroprudential policy advice in Article IV

consultations. However, the assessment identified room for further advancing the depth and integration of the two areas more uniformly across Article IV staff reports. This could be addressed by setting clear expectations for Article IV staff reports to include a well-articulated view about systemic risk, grounded on a rigorous analysis of vulnerabilities, and to better anchor macroprudential policy advice, consistent with the guidance. However, it remains important to maintain a flexible and pragmatic approach to accommodate country-specific circumstances and uneven data availability. Simple approaches can particularly help EMDEs. Furthermore, good examples identified in this assessment across all country groups could help other Article IV teams strengthen their systemic risk analysis.

- **Follow-up on FSAP findings and recommendations.** The FSAP is an important resource that can inform systemic risk analysis and policy advice in Article IV consultations. The assessment found that integration of its findings on risk analysis into Article IV staff reports works well in the same year of publication of the FSSA. Nonetheless, the assessment also found room to better follow up in subsequent Article IV consultations.
- **More forward-looking systemic risk analysis.** Overall, staff reports articulating a view about systemic risk always supported such view with at least an analysis of FSIs. However, to ensure early detection of risks and timely activation of macroprudential policies, the analysis should be more forward looking, including by going beyond FSIs, data permitting. This could be achieved by better leveraging existing and new tools available to Article IV teams (e.g. systemic risk tracker, Vulnerability Exercise, GaR, Capital Flows-at-Risk, stress tests).
- **Wider coverage of vulnerabilities.** The analysis, however, should go beyond bank and credit-related vulnerabilities where relevant to assess potential sources of systemic risk outside the banking system. This includes risks stemming from nonfinancial corporates and nonbank financial institutions. This also requires reducing data gaps.
- **Deeper knowledge on the effects of macroprudential policy and its interaction with other policies.** Deepening the systemic risk analysis should go hand-in-hand with expanding knowledge on the effects of macroprudential policy. Further progress in this area should also support more effective advice on the use of macroprudential policy tools. This could be achieved through learning from country experiences and additional analytical work on the intended and side effects of macroprudential policy tools, including distributional implications and interactions with other policies.
- **Expansion of macrofinancial expertise.** All of the above will help better integrate and deepen systemic risk analysis and macroprudential policy advice in Article IV staff reports, but their successful implementation requires expertise. Through interviews with Article IV teams, the assessment found that limitations in macrofinancial expertise and competing priorities have constrained progress in integrating and deepening macrofinancial analysis, as concluded also by the IEO (2019). Therefore, major strides in this area requires increasing the Fund-wide pool of macrofinancial talent. The accompanying CSR paper on modalities (IMF 2021b) makes a concrete proposal in this regard.

- **Development of approaches to assess risks in emerging areas of importance.** Finally, the assessment found that staff reports are increasing attention to risks from climate change, fintech, and cybersecurity. As the Fund gains expertise and experience in these areas, perhaps first through capacity development and assessments under the FSAP, new approaches to assess financial risks from these areas can be developed and help better integrate these risks into systemic risk analysis.

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Annex I. Macrofinancial Analysis Toolkit

1. **Expanding the Fund's analytical toolkit to support macrofinancial analysis in Article IV consultations is a continued endeavor.** Since the global financial crisis, the Fund, led by relevant functional departments (MCM, RES, SPR, and STA) has continued to develop tools to support macrofinancial analysis in bilateral and multilateral surveillance. A selection is presented below:

- The toolkit includes approaches to estimate the **economy's position in the credit cycle** in isolation (BIS-Based Credit Gap tool), or jointly with the business cycle, allowing also a two-way linkage between the financial sector and the real economy (i.e., estimating credit and business cycle).

- The toolkit also includes user-friendly tools that allow the construction of **heatmaps of vulnerability indicators** or other forms of measuring relative performance aiming at extracting signals from a range of vulnerability indicators. These indicators can be banking sector specific—system-level FSIs (e.g., Financial Soundness Heatmaps) or bank-level information (e.g., Bank Health Assessment Tool; Bank Analysis Tool)—or go beyond banks and the domestic economy (e.g., "Ms. Muffet", Cervantes and others, 2014; and the Systemic Risk Tracker, Iossifov and Dutra, 2021). These approaches allow for model-free, simple comparisons of vulnerabilities over time or across countries.

- Advances in the toolkit have also emphasized understanding the **role of financial conditions and asset prices in financial stability**, both from a domestic perspective and with a forward-looking perspective. The Growth-at-Risk tool links the changes in financial conditions to the risks for future GDP growth, and its extensions (e.g., Capital Flows-at-Risk) allow to estimate the effects of macrofinancial vulnerabilities on the future distribution of capital flows and evaluate policy actions to mitigate associated risks. Relatedly, other tools allow Article IV teams to examine the extent to which asset valuations may have deviated from fundamentals (e.g., Equity Market–Valuation Multiples, Real Estate Markets Module) or to detect anomalies in bond prices (Bond Market Valuation Metrics).

- There are also a number of **bank solvency stress testing tools** available to Article IV teams, ranging from semi-structural modeling frameworks with considerations for two-way macrofinancial feedback loops (Two-way stress testing tool), to simpler, more accessible options, that allow to design country-specific stress tests, covering credit, market, liquidity, and contagion risk (e.g., Bank Solvency Stress Tester). A new excel-based Global Stress Test (IMF, 2020b) allows to conduct a solvency stress test, using publicly available individual bank data for major 33 banking systems. A simpler tool for the use in the wider membership is in the pipeline, based on aggregate data.

- Outside solvency risks, there are tools that support the analysis of **liquidity risks in the banking sector.** The Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) templates facilitate the calculation of the LCR and the NFSR ratios, as defined by the Basel Committee for

Banking Supervision. The Cash-flow Mismatches template allows users to estimate cash-flow mismatches under stressful liquidity scenarios.

- The toolkit also covers approaches to assess sources of systemic risk outside the banking system, such as **risks in the insurance sector** (Insurance Stress Tester) and **risks from sovereign exposures** (e.g., Sovereign Funding Shock Scenarios) which enables the user to assess the impact of a sovereign funding shock or other sovereign risk scenario analysis on the domestic banking system or sovereign bond holders more broadly; or **risks in nonfinancial corporates**, based on firm-level balance sheet data (e.g., Corporate Sector Stress Test, Corporate Vulnerability Utility). As mentioned in the FSAP Review (IMF 2021a), a new user-friendly corporate stress testing tools is also in the pipeline to help Article IV teams to evaluate vulnerabilities in corporate sectors, focusing on their links to financial stability.

- Article IV teams have also access to tools that facilitate the assessment **of interconnectedness and risks of contagion.** They include network analysis tools to assess cross-border and/or domestic contagion risks among banks (Bank Network Analysis) or between banks and other financial intermediaries (Analysis of Systemic Risk, Balance Sheet Analysis (IMF, 2015b)). Relatedly, the toolkit also includes analytical tools to assess the systemic importance of individual institutions (e.g., Conditional Value-at-Risk, Adrian and Brunnermeier, 2016; Distress Spillovers), or for when contagion risk is materializing (e.g., Returns Spillovers from Diebold and Yilmaz, 2014).

Annex II. Assessment Methodology

2. The sample includes Article IV staff reports for 93 jurisdictions. The selection covered all Article IV consultations concluded by the Executive Board during calendar year 2019. The strict applications criteria resulted in leaving out 2019 Article IV Consultations whose discussions took place in 2020 (Australia, Cyprus, and Hong Kong SAR). Staff dropped from the sample jurisdictions with combined Article IV Consultation and Use of Fund Resources Board discussions; reflecting that these are not purely surveillance cases, as well as Article IV consultations for currency unions, as discussions on systemic risk and macroprudential policy in these cases depends also on where the power over macroprudential policy resides. Annex Table 1 presents the list of jurisdictions in the sample classified by income level.

Annex Table 1. Sample of Jurisdictions by Income Groups

Group	Advanced Economies (AE)	Emerging Market and Developing Economies (EMDEs)
Jurisdictions	Australia, Austria, Belgium, Canada, Cyprus, Denmark, France, Germany, Greece, Hong Kong SAR, Ireland, Italy, Japan, Korea, Luxembourg, Macao SAR, Malta, Norway, Netherlands, Portugal, San Marino, Singapore, Sweden, Switzerland, United States.	Armenia, Azerbaijan, The Bahamas, Bangladesh, Barbados, Belize, Benin, Brazil, Brunei Darussalam, Bulgaria, Cambodia, Cape Verde, Chad, Chile, China, Colombia, Costa Rica, Democratic Republic of Congo, Djibouti, Dominican Republic, Ecuador, El Salvador, Gabon, Ghana, Grenada, Guyana, Honduras, Hungary, India, Indonesia, Iraq, Kyrgyz Republic, Kuwait, LAO, P.D.R., Lebanon, Liberia, Malaysia, Maldives, Mauritania, Mauritius, Mexico, Federated States of Micronesia, Mongolia, Montenegro, Morocco, Mozambique, Nigeria, Niger, Oman, Paraguay, Romania, Russia, Rwanda, Samoa, Saudi Arabia, Serbia, Seychelles, Somalia, South Africa, Thailand, Timor Leste, Togo, Turkey, Uganda, Uzbekistan, Vanuatu, Vietnam, Zambia.
Total	25	68

Source: IMF staff.

3. Staff used text mining tools to extract relevant information from staff reports. Staff identified a dictionary of key words or phrases (tokens) corresponding to four broad groups: financial, real economy, systemic risk, and macroprudential policy (Annex Table 2). The algorithm extracted sentences from the main text and annexes from staff reports, including references to analysis contained in Selected Issues Papers, containing at least one unit of text in the dictionary. Staff reviewed the extracted text and its context to conduct the assessment, and when needed went back to the corresponding staff report for additional information.

Annex Table 2. Dictionary Used to Extract Text

Group	List of Words
Financial	Abrupt reversal, adverse impact, asset price, asset, asset quality, balance sheet, bank, bank-sovereign, banking system, Brexit, bubble, capital, concentration risk, corporate exposure, corporate vulnerability, counterparty risk, credit allocation, credit concentration, credit cycle, credit expansion, credit gap, credit growth, credit quality, credit risk, credit-to-GDP, cyber, data gap, debt, debt-at-risk, debt-to-GDP, debt service, default, deleveraging, deposit, dollarization, distress, elevated, exchange rate, exposures, external funding, exuberance, exuberant, financial conditions, financial cycle, financial institution, financial market, financial risk, financial volatility, foreign currency, foreign exchange, funding cost, funding risk, FX-denominated, FX funding, FX risk, high risk, house price, house prices, housing market, housing price, housing prices, housing sector, indebtedness, interconnectedness, interconnections, interest rate, insurance, lending standard, leverage, leveraged, liabilities, liability, linkages, links, liquidity, liquidity risk, liquidity ST, loan quality, loan-to-GDP, maturity mismatch, mismatch, mortgage, network, non-bank, non-financial, non-performing loan, NPL, NPLS, open position, private credit, pocket, profitability, property market, rapid growth, real estate, real estate price, real estate sector, regulatory minima, regulatory minimum, related party lending, repayment capacity, resilient, risk-taking, sharp correction, solvency ST, sound, soundness, sovereign-bank, sovereign exposure, spillover, stability, stress-test, stress testing, substantial loss, sudden stop, systemic, turbulence, unhedged, volatility, vulnerable, vulnerability, vulnerabilities, uncertainty, under-provisioning, underwriting, wholesale funding.
Real economy	Accelerator, downside risk, economic activity, economic growth, economy, feedback, GDP growth, outlook, growth-at-risk, output, output growth, macro-financial, real sector, sharp decline, sharp downturn, side effect, systemic implications.
Systemic risk	Build-up of financial sector risks, build-up of risk, build-up of systemic risk, financial imbalances, financial risk, financial stability, financial sector stability, financial sector vulnerabilities, macro-financial imbalances, macro-financial risks, macro-financial stability, macro-financial vulnerabilities, risks in the financial sector, risks in the financial system, systemic risk.
Macroprudential Policy	Borrower eligibility criteria, borrower-based, borrower-related, broad-based, cap based on borrower leverage, cap on credit growth, capital conservation buffer, capital measure, capital requirement, capital standard, capital surcharge, CCOB, CCVB, CCYB, commercial real estate credit, concentration limit, core funding ratio, corporate sector tools, countercyclical buffer, counter-cyclical capital buffer, data sharing, debt-to-income, DTI, debt service ratio, D-SIB buffer, DSR, debt-service-to-income, DSTI, dynamic provisioning, exposure caps, exposure caps on household credit, exposure limit, financial sector policies, financial stability report, financial stability policies, financial stability review, foreign-currency-denominated loans, foreign exchange funding, foreign exchange positions, FSOC, FX regulation, hedging instruments, household sector tools, housing supply, income-based, institutional framework, institutional response, lending limits, LCR, limit on amortization periods, limit on bank, limits on maturity mismatches, liquidity buffer, liquidity-coverage-ratio, liquidity risks, liquidity standard, liquidity tools, loan loss provisioning, loan restrictions, loan-to-deposit ratio, loan-to-income, loan-to-value, LTD, LTI, LTV, minimum down-payment, MPM, MPP, net-stable-funding-ratio, NSFR, provisioning requirement, prudential measure, prudential policies, prudential policy, prudential regulation, reserve requirements, restrictions on unsecured loans, risk management framework, risk monitoring, risk weighting, risk weights, stability committee, stability forum, stress testing capacity, systemic risk assessment, systemic risk buffer, systemic risk oversight, systemically important bank, systemically important institution, targeted measure, tax measure, variable rate loans.

Source: IMF staff.

4. The assessment also involved interviews with 20 Article IV teams, four from each area departments (Annex Table 3). The interviews helped augment and verify the results from the assessment. Questions focused on challenges in: (i) identification and forward-looking assessment of

systemic vulnerabilities, such as gaps in data and expertise; (ii) formation of a view on systemic risk; (iii) a discussion of the real-financial feedback mechanism; and (iv) providing macroprudential policy advice anchored on the systemic risk analysis.

Annex Table 3. Article IV teams' Breakdown by IMF Area Department and Country Groups

IMF Area Departments		Income Groups		Other Groups	
AFR	4	AEs	4	G-20	6
APD	4	EMDEs	16	Non-G20	14
EUR	4				
MCD	4				
WHD	4				
Total	**20**	**Total**	**20**	**Total**	20

Source: IMF staff.