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GUIDANCE NOTE ON THE ASSESSMENT OF RESERVE ADEQUACY AND RELATED CONSIDERATIONS

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GUIDANCE NOTE ON THE ASSESSMENT OF RESERVE ADEQUACY AND RELATED CONSIDERATIONS

EXECUTIVE SUMMARY

This note provides operational guidance to staff on reserve adequacy discussions in the IMF's bilateral and multilateral surveillance. It is based on the views presented in the policy paper [Assessing Reserve Adequacy—Specific Proposals](#) and the related Board discussion. The note addresses key issues related to Staff's advice on the assessment of the adequacy of reserves and related items, including answering the following questions:

- What is the expected coverage of reserve issues at different stages of the bilateral surveillance process (Policy Note, mission, and Staff Report) [Section II, Box 3]?
- Which reserve adequacy tools best fit different economies based on their financial maturity, economic flexibility, and market access [¶s 8, 9, Annex II]?
- What do possible reserve needs in mature markets relate to, and how can their adequacy be assessed [Section III A.]?
- How can reserve adequacy discussions for emerging and deepening financial markets [Section III. B.] be tailored and applied to better evaluate reserve levels in: (i) commodity-intensive economies [¶s 23–25]; (ii) countries with capital flow management measures (CFMs) [¶s 21, 22]; and (iii) partially and fully dollarized economies [¶s 26–30]?
- What reserve adequacy considerations hold for countries with limited access to capital markets? How can metrics for these economies be tailored to evaluate their reserve needs [Section III C., Annex IV and VI]?
- How should potential drains on reserves be covered [Box 1, ¶7]?
- What are the various measures of the cost of reserves for countries with and without market access [Section IV]?

In general, individual Article IV consultation reports should discuss the authorities' stated objectives for holding reserves, including for precautionary and non-precautionary purposes. Where warranted, the domestic and external cost of reserves would be discussed. The depth and emphasis of the discussion, as well as the applicable methodologies, should depend on country circumstances and reflect the aspects relevant for the country's external stability as well as global stability, with the discussion on reserve issues integrated into the general policy discussion.

This guidance note points to available reserve adequacy data and tools, including a template for countries with limited access to capital markets, and provides examples of application in Fund surveillance. (Section V).

Approved By
Siddharth Tiwari

Prepared by the Strategy, Policy and Review Department in consultation with other departments.

CONTENTS

I. INTRODUCTION	3
II. RESERVE ADEQUACY IN FUND SURVEILLANCE	5
III. ADEQUACY CONSIDERATIONS BY TYPE OF ECONOMY	9
A. Mature Markets (MMA)	11
B. Deepening Financial Markets (DFM)	13
C. Credit-Constrained Economies	18
IV. MEASURING THE COST OF RESERVES	19
A. Countries with Market Access	20
B. Countries that are Credit Constrained	21
V. TOOLS AND RESOURCES	21
BOXES	
1. Important Concepts used in this Guidance Note	4
2. Integrated Surveillance Decision: Aspects Related to International Reserves	5
3. Guidance on the Coverage of Reserve Adequacy Issues in Bilateral and Multilateral Surveillance	8
4. Dynamic Reserve Assessment	14
REFERENCES	39
ANNEXES	
I. The IMF Composite EM Reserve Adequacy Metric and Other Metrics Relevant for Deepening Financial Markets	23
II. Country Classification	25
III. Commodity Intensive Economies and Calculation of the Commodity Buffer	27
IV. Application of the ARA-CC Approach to Credit-Constrained Economies	30
V. Assessing Reserve Adequacy Tool for EMs	33
VI. Assessing Reserve Adequacy Tool for Credit-Constrained Economies and LICs	36

I. INTRODUCTION

1. This guidance note (GN) provides operational guidance for reserve adequacy assessments as a part of regular IMF surveillance. It is based on the analysis and policy positions contained in a series of Fund papers on reserve adequacy. These papers are [Assessing Reserve Adequacy](#), 2011 (referred to in this paper as ARA 2011), [Assessing Reserve Adequacy—Further Considerations](#), 2013 (referred to as ARA 2013), and [Assessing Reserve Adequacy—Specific Proposals](#), 2015 (referred to as ARA 2015). The guidance contained in this note also reflects the views expressed by the IMF’s Executive Board during their discussions. A key aim of this work and note is to provide a deeper and more consistent discussion of reserve issues in IMF bilateral and multilateral surveillance, particularly in Article IV consultations and the External Sector Report. In addition, since reserves targets form an anchor in many Fund programs, the considerations and tools discussed in this note are also likely to be relevant for cases where Fund resources are being used.

2. The IMF’s Executive Board agreed reserves, in conjunction with sound policies and fundamentals, can bring significant benefits by reducing the likelihood of balance of payments crises and preserving economic and financial stability. Reflecting the importance of reserve issues for external and global stability, most Directors supported a systematic discussion of reserve adequacy issues in Fund bilateral and multilateral surveillance reports, which could help enrich staff’s analysis and policy advice. They also noted that as reserve holdings can reflect different motives and institutional settings, the depth and emphasis of the discussion should depend on country circumstances and reflect the aspects that are relevant for each country’s external stability as well as global stability.¹

3. A regular, forward-looking discussion on reserve adequacy is important for understanding emerging external vulnerabilities. As part of the consultations with IMF members during the preparation of the policy papers mentioned above, country authorities noted that they assess their reserve needs on a relatively frequent basis, even if actual needs change less frequently. Some authorities noted that while predicted needs may not change significantly from year to year, they find this type of exercise useful to test their assumptions. Making the discussion forward looking also ensures that anticipated changes in baseline external vulnerabilities (e.g., rising FX imbalances in the financial sector or external liabilities) are taken into account. Box 1 clarifies important concepts used in the guidance note.

4. This GN is structured as follows. Section II outlines the scope of reserve adequacy discussions in Fund surveillance. Section III discusses applications of reserve adequacy assessments in different types of economies, followed by the cost of reserves (Section IV). Section V concludes with a brief discussion of the available tools and resources for country teams and others interested.

¹ In terms of the analysis of reserve needs, the IEO’s evaluation, [International Reserves—IMF Concerns and Country Perspectives](#), recommended in the *bilateral context* that assessments of reserve adequacy reflect country-specific characteristics, and that clearer advice be given on reserve adequacy considerations for advanced economies.

Box 1. Important Concepts used in this Guidance Note

This box clarifies some important concepts used in this guidance note.

Gross Reserves. Reserves are fundamentally an external liquidity buffer. The definition of gross reserves should follow the definition in IMF (2009, p. 111) “*Reserve assets are those external assets that are readily available to and controlled by monetary authorities for meeting balance of payments financing needs, for intervention in exchange markets to affect the currency exchange rate, and for other related purposes (such as maintaining confidence in the currency and the economy, and serving as a basis for foreign borrowing).*” Hence gross reserves only directly include the market value of financial derivatives including swaps and forward positions. While forward and swap positions tend to be persistent, they can influence the level of gross reserves. Changes in the authorities’ net swap position will lead to changes in the level of gross reserves until the swaps come to an end (and are not rolled over). Forward transactions by a central bank will affect the level of reserves on the execution date.

Net reserves. Measures of net reserves subtract predetermined short-term drains (due to both non-residents as well as residents) from the official reserve position. The drains can arise from on-and-off balance sheet activities, where the latter could take the form of activated swaps, forward positions that unwind, and the former could be short-term FX liabilities (e.g., FX deposits, including cash outflows derived from repos) that are used to fund the reserve asset position.²

Metrics. A reserve adequacy metric is a measure of a country’s potential FX liquidity needs in adverse circumstances against which reserves could be held as a precautionary buffer. Its size relative to reserves could be a measure of a country’s vulnerabilities and hence provide an indication of adequacy. These can also be seen as a “short-hand” form of scenario analysis, focusing on a selected set of risks and pre-specified impacts in a partial equilibrium set-up.

Country classification and reserve adequacy tools. As discussed extensively in ARA 2013 and ARA 2015, the tools and considerations appropriate for assessing the reserve needs for a particular economy depend on the extent of its market access, resilience of market liquidity, and economic flexibility. While these characteristics are broadly correlated with the standard split between low-income, emerging and advanced/developed market economies, they need not be. Consequently, the discussion of adequacy considerations in this note (Section III) is organized around *mature market*, *deepening financial markets* and *credit-constrained* economies. While Directors generally welcomed the staff’s work on country groupings, these categories are closely aligned with the standard categorization by advanced and emerging market countries, and low-income countries, respectively. Staff should justify their choice of tools in individual cases.

² See [IMF International Reserves and Foreign Currency Liquidity: Guidelines for a Data Template \(Guidelines\)](#) and the associated [Data Template](#).

II. RESERVE ADEQUACY IN FUND SURVEILLANCE

5. **A discussion of a country's reserves holdings is a key element of the external stability assessment, consistent with the Integrated Surveillance Decision** (Box 2).³ Article IV staff reports would generally report a country's reserves position and include an assessment of adequacy in view of its specific characteristics and vulnerabilities. Multilateral surveillance reports, such as the External sector report (ESR), present a multilaterally consistent assessment of the largest economies' international reserve positions and policies.

Box 2. Integrated Surveillance Decision: Aspects Related to International Reserves

Stability is the organizing principle for surveillance. In this regard, the Integrated Surveillance Decision (ISD) provides guidance for the Fund and members for the conduct of surveillance, both bilateral (assessment of each member's economic and financial policies that can significantly influence present or perspective balance of payments conditions or domestic stability) and multilateral (assessment of issues that may affect the effective operation of the international monetary system (IMS), including significant spillovers from policies of individual members). To this end, the ISD defines Principles for the Guidance of Members' Policies regarding exchange rate policies and the conduct of domestic economic and financial policies.

Several of these Principles inform the Fund's view on reserve accumulation strategies. Principle A reiterates each member's obligation under Article IV to avoid manipulating exchange rates or the international monetary system to prevent effective BOP adjustment or to gain an unfair competitive advantage. Principles B–E include recommendations that members should: intervene in the exchange market if necessary to counter disorderly conditions; take into account in their intervention policies the interests of other members; and avoid exchange rate policies that result in balance of payments instability.¹

As part of its analysis, staff needs to review and discuss with the authorities certain developments related to international reserves. These include:²

- Protracted large-scale intervention in one direction in the exchange rate market.
- Official or quasi-official borrowing that either is unsustainable or brings unduly high liquidity risks, or excessive and prolonged official or quasi-official accumulation of foreign assets, for balance of payment purposes.

In Article IV consultations, the ISD requires staff to consider both inward and outward spillovers as needed, including those arising from policies on reserve accumulation. For inward spillovers, staff should examine whether the reserve policies of the other countries affect the member's stability. For outward spillovers, staff should assess whether spillovers from the member's reserve policies may significantly influence the effective operation of the IMS. Such an assessment should be done even if the member's reserve policies do not undermine its own stability.

¹ Principle E is not discussed here as it is not relevant for these purposes.

² See paragraph 22 in IMF (2012) and Annex I in the [Guidance Note for Surveillance Under Article IV Consultations](#).

6. **The discussion should reflect country circumstances and risks, as well as the authorities' objectives and, where relevant, the cost of holding reserves.** The nature and emphasis of this discussion should reflect the country's circumstances and the aspects that are relevant for a country's external stability as well as global stability. For instance, greater emphasis on reserve adequacy for

³ See [IMF, Modernizing the Legal Framework for Surveillance – An Integrated Surveillance Decision](#).

precautionary reasons would likely be appropriate where reserves are relatively low, while more emphasis on the non-precautionary motives and cost of reserves would likely be appropriate for countries that have comfortable reserve holdings. This discussion of adequacy (including on reserves held for non-precautionary motives) will capture the benefits of reserves. The views of the authorities on relevant country-specific aspects are an important consideration in the determining the nature and emphasis of the discussion. Specific requirements during an Article IV consultation and multilateral surveillance process (e.g., the ESR) are outlined in Box 3, although the overarching considerations for the aspects of the reserve adequacy discussion are:⁴

- **Precautionary.** The discussion of precautionary reserve needs should reflect the relevant external liquidity vulnerabilities faced by a country.
 - The assessment would be based on tools relevant for the characteristics of the economy that may affect the ability to manage external shocks (e.g., external liability positions, capital controls, the flexibility of the economy, the depth and resilience of financial markets), and other buffers. Article IV consultation staff reports should explain why the particular set of tools was chosen.
 - Where a preliminary assessment at the Policy Note (PN) stage suggests a likely substantial deviation from the appropriate level of reserves—for example, where there has been persistent large-scale intervention in one direction in the exchange rate market⁵—there should be a thorough assessment and discussion of the adequacy of reserve holdings for precautionary purposes with the country authorities during the mission.
 - The discussion of precautionary reserve needs should also take into account alternative complementary sources of external liquidity (e.g., swap lines) and be undertaken in a forward-looking way to ensure that a country’s reserve policy takes account of the expected evolution of vulnerabilities (Box 4 provides an example of this).
- **Non-precautionary.** Where the authorities have important non-precautionary reasons for holding external buffers in the form of reserves—e.g., when international reserves are well above the adequate level implied by precautionary motives—a discussion of these motivations would likely help understand the authorities’ reserve holdings. Examples of non-precautionary motives could include the nature of the exchange rate regime (foreign exchange intervention is automatic under a *de facto* fixed exchange regime) or may result from actions to achieve an inflation target if other transmission channels (such as credit or interest rate) are ineffective.⁶ In addition, foreign assets (held in the form of reserves) can form an important part of a country’s savings to ensure intergenerational equity, notably in

⁴ In addition to the topics presented below, a country team could discuss the analysis of the country’s Reserves Data Template (RDT). If a country’s authorities do not compile and disseminate these data, staff should encourage them to do so.

⁵ The precise list of observations triggering a thorough assessment under the ISD is highlighted in ¶ 22 in IMF (2012), and this is summarized in Annex I of the [2015 Surveillance Guidance Note](#).

⁶ Assessment of the level of exchange rates, including multilateral consistency and global imbalances, is beyond the scope of this note.

economies endowed with non-renewable resources.⁷ Finally, reserve accumulation can be a by-product of export-led growth strategies that rely on sterilized intervention to enhance external competitiveness.

- **Cost.** For some countries, the domestic financial and opportunity cost of reserves would likely be an important topic for discussion in the Article IV consultation. For countries where reserve policies may significantly influence the effective operation of the IMS (important outward spillovers), the Article IV consultation, and possibly multilateral surveillance products, should (in line with the ISD) discuss those external costs (see Box 2).⁸
- **FX Intervention.** For countries with reserves lower than the adequate level, the policy advice should be to encourage the authorities to build reserves. However, rebuilding reserves need not be through intervention. For example, some countries use borrowed foreign currency to hold as external reserve assets. In such cases, the foreign currency borrowings need to have a relatively long maturity.

7. Significant short-term FX liabilities or other potential short-term drains on a central bank's reserves warrant discussion. While reserve adequacy is a gross concept, the impact of potential drains (if the impact could be material) on the availability of reserves buffers, needs to be discussed with the authorities, given that such drains limit the usability and availability of reserves. For example, provisions that allow commercial banks to meet their reserve requirements in foreign exchange boost gross international reserves. However, international reserves linked to these provisions may not be available for other balance-of-payments purposes, as they would fall if deposits were to decline. Similarly, a central bank may have drains on its reserves reflecting its swap/forward position and its short-term FX liabilities to residents, and these positions would also need to be discussed. In such cases, these potential drains should be discussed relative to the level of gross reserves. Net reserves (Box 1) could also be compared with relevant reserve adequacy metrics. Moreover, the composition of international reserves could have a substantial impact on a central bank's reserves during stress periods, mainly through the liquidity of reserve assets and valuation effects from fluctuations in exchange rates.

⁷ Sovereign assets not directly required for liquidity purposes are generally more appropriately managed through longer-term Sovereign Wealth Funds (SWFs). Some countries include their SWFs in reserves reporting to the Fund while others do not. The latter is, however, usually the case when SWFs assets do not meet the definition of official reserves. To be counted as *official reserve assets*, SWF assets would need to be both readily available to, and controlled by, the monetary authorities to meet the balance of payments needs (IMF 2009).

⁸ See section on operational priorities for surveillance in [Surveillance Guidance Note](#).

Box 3. Guidance on the Coverage of Reserve Adequacy Issues in Bilateral and Multilateral Surveillance

The depth, nature and emphasis of the reserve adequacy issues should depend on the country circumstances. Specific procedures are outlined below:

Bilateral surveillance (Article IV consultations)

Staff should highlight the following before the mission (Policy Note (PN)):

- *A preliminary discussion of precautionary reserve adequacy.* The assessment should use tools appropriate to the country given its characteristics and institutions. A set of possible tools are outlined in Section III. The choice of tools will depend on the nature of external vulnerabilities, depth of financial markets, reliance on capital controls, commodity intensity, and other structural characteristics. Given the breadth of its coverage, the assessment of reserve needs in emerging and deepening financial market economies should include the Fund's ARA EM metric amongst other appropriate tools. Where reserve policies may significantly influence the effective operation of the IMS, the PN should also discuss these policies. Finally, where a country faces potentially sizable drains in reserves, staff should also discuss the implications for the NIR position.
- If the authorities have important *non-precautionary motives* for holding reserves, the PN should discuss reserve holdings associated with meeting these needs.
- When reserves are more than adequate for precautionary purposes, based on relevant standard metrics and scenario analysis, the PN should provide a detailed assessment of the *opportunity costs of reserve holdings*. In addition, when using the tool designed for low-income credit constrained economies, the PN should also discuss the cost of reserves which is an important input for the framework.
- However, where there has been a detailed consideration of these issues in a recent Article IV consultation (e.g., in the last two years), and considerations are broadly unchanged, a brief update in the PN is sufficient.

Staff should discuss the following with the authorities during the mission:

- *Staff's assessment of the reserve needs for precautionary purposes.* This assessment would include relevant metrics and other analysis, including adjustments for country specific factors like commodity intensity and CFMs.
- Their *reserve policies and their views on desirable reserve holdings*. This discussion should understand the nature of vulnerabilities and risks the authorities see, desirable external liquidity buffers and how these are met between reserves and alternative external buffers or policies, and non-precautionary motives to hold reserves.
- Where reserves are assessed to be at a comfortable level, the *opportunity cost of reserve holdings*. If reserves policy may significantly influence the effective operation of the IMS, there should be a discussion of potential outward spillovers.

The Staff Report:

As in the Surveillance Guidance Note (¶ 67), Article IV staff reports should normally, as part of the external sector assessment, include a discussion and provide a bottom line on staff's assessment of reserve adequacy for precautionary purposes, as well as a presentation of the authorities' views. When there is no disagreement between staff and the authorities, presentation of the authorities' view may not be necessary, but if there are differences of view, the authorities' views should be presented in the main text of the SR. The discussion would, where appropriate, include non-precautionary needs and the cost of reserves, with the emphasis reflecting the country's circumstances. The assessment should include a discussion of externalities associated with reserve policies if these policies have global systemic implications. Where relevant, discussion of potential drains, NIR, non-reserve buffers and appropriateness of the use of FX intervention should also be included.

Multilateral surveillance products (for example, the ESR):

The adequacy of international reserves is one of the major pillars in the staff assessment of the overall external position in the ESR. The methodology and results of the assessment on the adequacy of international reserves in the ESR needs to be consistent with the Article IV consultation staff report of each country. The external sector assessment presented in the ESR individual country assessments should reflect only staff views and should not include the authorities' views (although teams should discuss the assessment with the authorities during relevant policy discussions).

III. ADEQUACY CONSIDERATIONS BY TYPE OF ECONOMY

8. Assessing the adequacy of reserves for precautionary purposes provides a useful starting point to ground the discussion on reserve issues. While there is no universally accepted framework for discussing reserve adequacy for precautionary purposes, several metrics have been widely used for reserve adequacy assessments. The advantage of these metrics is that they are simple guides on the strength (or vulnerability) of a country's reserves position relative to particular risk factors and can be applied uniformly across economies. However, some metrics may be more appropriate than others depending on a country's circumstances. In this regard, metrics can provide a practical starting point beyond which analysis of country specific risk factors could complement the discussion. Staff need to apply judgment in interpreting the assessment derived from relevant metrics.

9. This section outlines tools that could be useful when considering reserve adequacy across a broad spectrum of economies. Annex II provides a discussion of the considerations underpinning the role of market maturity and economic flexibility that may be relevant for the choice of analytical tools used in each case. However, since these characteristics often overlap with per capita income, staff may also base their choice of analytical tools on the traditional classification of countries across advanced, emerging, and low-income economies. Some economies straddle different country groupings and hence considering their maturity and economic flexibility could complement the standard classification of a country in the choice of tools. Staff are to use judgment in selecting the analytical tools appropriate to the assessment of any country.

10. The section is organized as follows. Part A summarizes the reserve adequacy considerations for mature—or advanced—market economies (MMA). Given the nature of the risks facing these relatively flexible economies with deep markets, a principal tool is scenario analysis given limited data availability for computing standardized metrics for these economies. Part B outlines considerations and metrics that can be used to analyze reserve needs for deepening financial—or emerging—market economies (DFM). Part C outlines the application of a tool developed by the IMF for the analysis of reserve needs in credit-constrained, mostly low-income, economies which are principally vulnerable to current account shocks. Some economies, like frontier markets,⁹ have characteristics of more than one category (e.g., significant exposure for current account shocks while limited and growing exposure to external financial shocks). In such cases, staff could, as appropriate, use judgment in selecting the most relevant tools the groups below.

⁹ [Frontier market countries](#) are a group of fast-growing low-income countries with new market access.

Currency Unions

11. Before proceeding to consider the tools for specific types of economies, it is useful to discuss the consideration for currency unions,¹⁰ which span economies of all maturity levels.

Individual economies in a currency union can be subject to balance of payments shocks. However, when a common central bank holding an adequate level of reserves can allocate adequate liquidity within the union, there would generally be less need for individual members to cover their reserve needs through their own reserve holdings. The nature of the currency union is critical for the level of consolidated external buffers needed. For currency unions able to issue a reserve currency (like the Euro area), the reserve adequacy considerations at the *consolidated union level* would align with those for a reserve currency issuer (see Section IV.A in ARA 2015). For unions comprising emerging market and low-income countries,¹¹ reserve adequacy considerations at the union level should be described in line with those types of economies.

12. The financial architecture of the currency union and the synchronization of shocks may limit the scope for reserve pooling, and hence influence the reserve needs in individual members or across the union.

- *Financial architecture.* The financial architecture of the union, such as the absence of a banking union, and the possibility that liquidity may not be allocated efficiently within the union (to stem financial pressures) would be a limitation for reserve pooling.
- *Synchronization.* If members of a currency union lack sufficient economic diversification, the synchronicity of their business cycles may expose them to correlated shocks, limiting the value of pooling. Such shocks could include surges in food and fuel prices, plunges in FDI and terms of trade, and drops in the external demand of common trading partners. In these cases, the level of pooled reserves will need to be higher, and may even reach the aggregate level of the reserve needs for each individual member.

¹⁰ Methodological guidance for reserve assets in the circumstance where an economy is a member of a currency union (CU) is presented in Appendix IV in *International Reserves and Foreign Currency Liquidity: Guidelines for a Data Template*.

¹¹ For example, the Eastern Caribbean dollar is pegged to the US dollar, and supported by a quasi-currency board. In the ECCU's case, the monetary base is backed by international reserves (Dehesa and Druck, 2008). On the other hand, the West African and the Central African CFA francs are pegged to the euro and backed by the French Treasury. The overall reserves should reflect the nature of these pegs (Delèchat and Martijn, 2007).

A. Mature Markets (MMA)

13. Mature market economies without a reserve currency or automatic access to reserve currencies through standing swap lines¹² may have a need for reserve buffers for precautionary motives,¹³ as these economies are not immune to foreign exchange and external funding pressures.¹⁴ Where reserve adequacy issues are relevant in the external sector assessment of a mature market country, Article IV staff reports would be expected to discuss the authorities' reserve adequacy framework, including risks, possible reserve needs, and the costs associated with holding reserves in these countries.

14. Mature market economies' reserve needs are often related to acute financial market stress and dysfunction, as highlighted in Parts II-I in ARA 2013 and IV-A in ARA 2015. The required buffer should, conceptually, reflect potential FX funding needs of the financial system, the extent and availability of buffers in the financial system, and the potential duration of market dysfunction. The need to assist with potential funding needs in the banking systems depends on the size of mismatches in assets and liabilities in foreign currency and their maturities.¹⁵ The duration of the market dislocation is a key consideration for setting the bounds for the amount of buffers needed while keeping the cost of holding reserves down. Past experiences suggest that dysfunctional funding and foreign exchange markets typically last between two and three weeks, but sometimes extend longer (ARA 2013).

¹² Central banks that have access to standing liquidity swap arrangements are the U.S. Federal Reserve, the Bank of Canada, Bank of England, Bank of Japan, the ECB, and the Swiss National Bank. The IMF has clarified the concept of reserve currencies, and how this relates to the concept of "freely usable." See [Clarifying the Concept of Reserve Assets and Reserve Currency](#) (2015).

¹³ The need for reserve buffers likely differs between reserve currency issuers (and those with predictable access to reserve currencies) and other mature market countries. As the ARA 2013 argued, reserve currency issuers as well as countries with standing central bank swap lines involving reserve currencies are unlikely to need sizable reserves for precautionary purposes, as they can create assets which can be swapped into any other currency at any time. For non-reserve issuers without predictable access to reserve currencies, external buffers—including in the form of reserves—can provide insurance against the risk of market dysfunction. Chapter 4 in Supplementary information for the ARA 2013 provides information on the liquidity swap lines between several central banks and reserve issuers (especially USD swap lines) to meet short-term dollar funding needs of banks and stem market dysfunction during the global financial crisis. Updated information on the bilateral swap lines since the ARA 2013 is presented in the [Adequacy of the Global Financial Safety Net](#) (IMF, 2016). This paper notes that bilateral swap lines are dominated by large and indefinite swap agreement between six systemic advanced economies, with predictable access to resources (as central banks can create on-demand their own currency reserves). Most of the remaining arrangements are renminbi swap lines between China and other countries, which reflect China's domestic objectives and the need to facilitate trade rather than for countries' BOP needs.

¹⁴ In the [Board discussion](#) of ARA 2015 "Directors agreed that a discussion on reserve adequacy can be appropriate for mature economies, as these economies are not immune to foreign exchange and external funding pressures."

¹⁵ The Committee on Global Financial Stability (CGFS Paper No. 37) has documented how the build-up of such mismatches within and across currencies was a major vulnerability that was exposed by the dislocations in funding markets that have occurred since 2007. The CGFS notes that having adequate foreign exchange reserves during the crisis helped to alleviate pressures, though this self-insurance comes at a cost.

15. Providing reserves against such financial sector risks may, however, create some moral hazard. Supervisory and prudential policies provide the principal defense against such risks, and thus should be important in limiting moral hazard. Beyond this, a fee could be charged by the central bank based on each institution's contribution to the risks covered by reserves in order to limit moral hazard.

16. Due to modelling challenges and data gaps, developing standardized approaches or metrics for assessing reserve adequacy form MMA countries is difficult.¹⁶ While the need for reserves can be relatively well articulated, there is no consensus in the literature on how to assess the appropriate reserve level for precautionary purposes in mature market economies. In addition, detailed bank-by-bank balance sheet and liquidity data needed to develop a metric along these lines is not usually available in the public domain.

17. Where a deeper reserve adequacy assessment is warranted, Article IV consultations should seek to discuss reserve needs based on scenario analysis. Scenario analysis can be used to assess potential FX funding needs relative to existing bank and nonbank buffers as well as to test their sensitivity.¹⁷

- *Authorities' scenario analysis.* While staff should not aim to simply replicate the authorities' scenario analysis, they should engage in a discussion on the authorities' reserve adequacy framework, including the authorities' view of dominant risks, the possible reserve needs to stabilize markets, and the costs related to holding reserves.
- *Staff scenario analysis.* Staff can also complement the authorities' analysis with their own. Although there is no one-size-fits-all approach, scenarios usually centers on the risks of market dysfunction and risks to (bank and nonbank) balance sheets from FX funding shortfalls.¹⁸ The FX funding needs can be calibrated using available historical information (on trading liquidity and turnover, market participant behavior, and short-term funding needs), including based on events, and assumptions of adverse shocks used, in other countries.
- *Financial market stress.* Given that these countries' reserve needs are often related to acute financial market stress, Article IV staff reports should also discuss appropriate prudential and regulatory frameworks, since they are crucially important to mitigate potential financial pressures. Buffers held in financial institutions may be relevant as well.¹⁹

¹⁶ For details, see IV-A in the ARA 2015.

¹⁷ According to a survey of countries for ARA 2013 and discussions with several mature market authorities, country authorities use scenario analysis as the main tool for assessing reserve adequacy.

¹⁸ Some mature economies also reported the need to hold reserves against the possible need to meet obligations to international financial institutions.

¹⁹ ARA 2013 (¶135) also noted the potential to use a Liquidity Coverage Ratio (LCR); "[i]n cases where foreign currency mismatches are ... important ... the [Basel Committee on Banking Supervision] recommends monitoring the ... LCR for significant currencies. Indeed, some countries ... are considering ... adopting a foreign exchange LCR ... [suggesting] the central bank could hold a buffer of highly liquid foreign currency assets sufficient to meet any LCR shortfalls."

B. Deepening Financial Markets (DFM)

Analysis on Reserve Adequacy using Metrics

18. Staff should use all relevant reserve metrics in considering reserve needs for countries with deepening financial (or emerging) markets. Appropriate metrics (Annex I provides a list of metrics) should be used with judgment in gauging reserve adequacy. There should not be any mechanical application of any metric. Traditional metrics include import coverage, and reserves to broad money or short-term debt. Optimality models, such as Jeanne and Rancière (2006), are more complex and explicitly equate the marginal benefits and costs of reserves. While no approach can provide definitive guidance for all countries, metrics provide a starting point for a discussion of reserve adequacy for precautionary purposes as they neatly summarize the vulnerabilities to particular types of liquidity shocks, and can be seen as a simple—standardized—type of scenario analysis. Such discussion could include an analysis of possible additional risks or drains on reserves (e.g., swap or forward transactions, or “encumbered” reserves); the availability of additional external buffers (e.g., contingent financing lines and borrowing arrangements); and the use of metrics in a dynamic setting that could highlight the expected evolution of both reserves and vulnerabilities (see Box 4).

19. The ARA EM metric was proposed by the Fund as an additional metric against the backdrop of the traditional metrics (Annex I). In the Board discussion, most Directors agreed with the methodology to calculate the ARA EM metric.²⁰ A key motivating factor for the work towards an additional metric was the experience of past balance of payments crises, which were characterized by multiple channels of market pressure, suggesting the need for a metric encompassing a broad set of risks (see ARA 2011 for motivation). This view was supported by a survey of country authorities (ARA 2013) and analytical work from reserve demand regressions in ARA (2011, 2013), suggesting that reserves are held against multiple vulnerabilities. The ARA EM metric developed by the IMF aims to balance simplicity and completeness, while permitting comparability across countries. Given the broad coverage of the ARA EM metric—which covers the potential loss of export income, the risk of resident outflows (broad money), rollover risks (short-term debt), and the risk of nonresident equity and MLT debt outflows (other liabilities)—this metric should be reported along with other relevant analysis in the Article IV consultation staff reports for these economies. The weights for this metric are reported in the following text table.

(in percent)		Short-term Debt	Other Liabilities	Broad money	Exports
Revised	Fixed	30	20	10	10
Weights	Floating	30	15	5	5

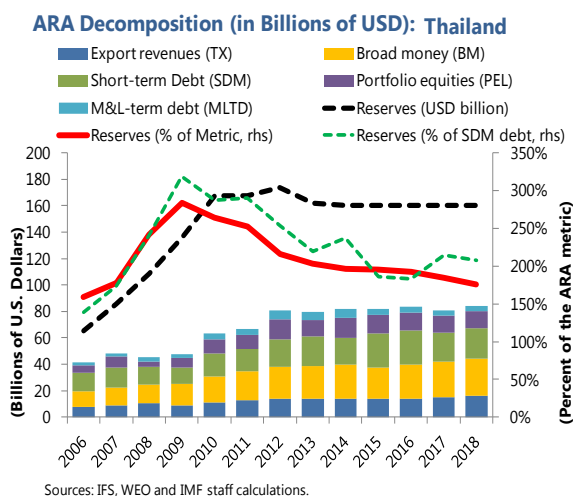
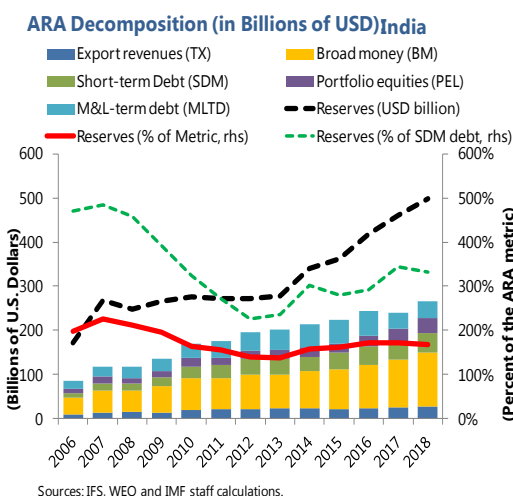
²⁰ See the [IMF Board's assessment](#): “Directors supported the use of all relevant reserve metrics, including those developed by the Fund.”

Box 4. Dynamic Reserve Assessment

To better capture evolving risks and the build-up of external vulnerabilities, we propose a forward-looking approach to assess reserve adequacy. The approach consists of taking into consideration not only a country's current reserve position and metric, but also to evaluate relevant metrics in light of the expected path of the reserves and the key risks. This is illustrated here using the ARA EM metric and short-term debt.

The dynamic use of a metric relies on desks' projections of its components. For instance, the projections on changes in the foreign exchange reserves, short-term debt, broad money, and exports could be taken directly from the latest WEO, while the projections on portfolio equity and medium- and long-term debt could be constructed based on the latest available international investment position data and the WEO projections for the associated balance-of-payment flows (assuming no valuation effects). Where valuation effects may be important in the evolution of IIP stocks, they could also be incorporated. Using these estimates, a projected ARA metric can be constructed.

Applications to India and Thailand are shown below. For most emerging markets their relative position vis-à-vis the ARA EM metric does not change much in the projection period, although there are changes for some because of projected changes in international reserves (e.g. India), or projected movements in the country-specific components of the ARA EM metric and short-term debt in addition to reserves (e.g. Thailand). These two countries saw changes in their coverage relative to Short-term debt after 2009 as they faced more capital inflows. This type of forward-looking diagnostic could serve as an important surveillance tool for policy discussions with country authorities.



Some Country-Specific Considerations

20. There are a number of country-specific considerations that should be addressed when the ARA EM and other metrics are used in the assessment of reserve adequacy. To provide a sense of how the discussion could be adjusted in such circumstances, this GN provides some suggestions for: (i) countries with long-standing capital flow management measures (CFMs); (ii) commodity-intensive economies; and (iii) dollarized economies. Staff should also outline how other relevant factors for the country in question are built into the assessment.

Countries with Capital Flow Management Measures (CFMs)²¹

21. Reserve adequacy should take into consideration the presence of long-standing CFMs, as empirical studies suggest that such controls tend to reduce resident outflows. For instance, Binici, Hutchinson, and Schindler (2010) find that capital controls can substantially reduce the volume of equity outflows. Saborowski and others (2014) reported that effectively tightening controls reduced capital outflows in EMs when the tightening is supported by strong macroeconomic fundamentals or good institutions, or if existing restrictions are already fairly comprehensive. Staff studies also found that CFMs can reduce the probability of exchange market pressure (EMP) events (Figure 4 and Annex II in the ARA 2015); the ability of residents to transfer assets (proxied by broad money) abroad; and the amount of resident outflows during EMP events (Table 1, Box 2 and Annex III in ARA 2015). However, these findings do not suggest that CFMs are either an appropriate response to external pressures or that they are a substitute for reserves, simply that outflow pressures are likely lower when CFMs are in place.²²

22. For the ARA EM metric, the above discussion suggests that where countries have CFMs on residents, the weight on broad money (a proxy for the risk posed by resident outflows) should be adjusted.²³ In such cases both the

	(in percent)	Broad money
Without CFMs	Fixed	10
	Floating	5
With CFMs	Fixed	5
	Floating	2.5

standard (unadjusted) ARA EM metric and the metric with an adjusted weight on

broad money—together with other relevant metrics—should be presented in Article IV staff report. Staff should use this information to form a judgment on overall adequacy, with the nature of controls, their relative effectiveness, and progress towards liberalization also being relevant factors. As reserve adequacy should be a forward-looking discussion, if liberalization is expected in the near-term, the speed of liberalization and the need for supportive macroeconomic policies during the transition period are important topics for discussions during the Article IV consultation.²⁴ In these cases, the staff report should elaborate and assess liberalization plans and discuss reserve needs during the transition, possibly using the dynamic reserve assessment methodology. There is scope

²¹ CFMs have been discussed extensively in IMF (2013c).

²² See [Guidance Note for the Liberalization and Management of Capital Flows](#). Where used, CFMs should typically seek to be transparent, temporary, and non-discriminatory.

²³ Where countries maintain clear controls on the exit of non-resident assets—such as minimum holding periods for securities, approval requirements for repatriation of investments, or a tax discouraging early redemptions—the weight on “other liabilities” could be halved as discussed in the ARA 2013 and the ARA 2015.

²⁴ In the case of Iceland with capital controls since 2008 and ahead of finalization of the authorities’ updated capital account liberalization strategy, the team assessed reserve adequacy relative to the unadjusted metric. Reserves were projected at what the team considered as minimum adequate levels, more specifically at the 150 percent of the unadjusted ARA metric. This determined the BOP space available for release of the BOP overhang. Please see the staff report for the 6th PPM and AIV consultation, IMF Country Report No. 15/160.

for judgment in deciding whether an adjustment for a country's controls is warranted. However, this judgment should be made based on recognized indicators of controls. The empirical work in ARA 2015 was based on countries with at least two of the three standard capital control indicators (Chinn-Ito, Quinn and IMF share) with a value less than or equal to 0.25 (where the indices are normalized between 0 and 1) being considered as having important CFMs for this purpose.²⁵ Consequently, country teams should consider these indicators when assessing whether an adjustment may be warranted. Teams could also bring in additional indicators of controls, including deviations from covered interest parity, in forming their view.

Commodity-Intensive Economies

23. External risks and the potential need for additional buffers in commodity-intensive economies should be discussed in Article IV consultations. Commodity-intensive economies face more volatile terms of trade, and have greater difficulty in adjusting to these shocks since commodity imports or exports are relatively price inelastic (see Box 3 and Annex IV in the ARA 2015). This suggests that they may have higher precautionary liquidity needs than other economies to smooth the adjustment against commodity price changes, and the need for such an additional buffer can be added to the discussion on reserve adequacy.

24. The above considerations should be handled by maintaining an additional buffer against terms-of-trade shocks. The additional liquidity needs arising from commodity price changes need not be addressed through reserve holdings, and could be met in a variety of other ways, including through hedging (Mexico) or longer-term contracts, or savings under a sovereign wealth fund not included in reserves (Chile). As such, there is no case to adjust a reserve adequacy metric for these economies. Instead, in addition to the relevant metric(s), the staff paper should also report the nominal size of the buffer, and can supplement these with the ratio(s) of reserves to the metric(s) augmented by the buffer where the authorities intend to meet the buffer need through reserves.

25. The buffer should be calculated on the basis of forward-looking adverse price movements at a given confidence level. In general, a one standard deviation price "shock" (e.g., 68 percent confidence interval) should be sufficient to cover commodity price risks as the buffer is available to smooth adjustment during a temporary shock or possibly to slow adjustment to a permanent terms-of-trade shock. If staff judge it appropriate to calculate the buffer with different assumptions, the reasoning should be clearly elaborated and justified in the staff report. In a situation where the country intends to meet the buffer need through reserves, the staff report could clearly indicate reserves relative to the appropriate metric and, if appropriate, the clearly identified additional buffer for commodity intensive economies (see Box AIII-1 in Annex III for an example). In such cases, the report would explain why reserves are the tool to cover this buffer need and, if the team wishes to depict (or report) the ratio of reserves to a metric (ARA EM metric or other)

²⁵ For details, see Box 2 and Annex II in the ARA 2015. Box 2 notes that the standard indices of de jure controls are imperfect measures of the effectiveness of such controls, making the use of staff judgment important in the assessment.

augmented with the buffer, and then (as discussed above) the report should also show the ratio of reserves to the metric (without the buffer) and the nominal size of the buffer. Annex III provides the methodology and an illustrative example to calculate the buffer.

Dollarized Economies

26. The discussion on reserve adequacy should take into account the specific circumstances of fully and partially dollarized economies. For partially dollarized economies in which they have their own currency and a central bank that can meet the local currency needs of the financial system, reserve adequacy considerations do not differ conceptually from non-dollarized ones. For fully dollarized economies, the need for the authorities to hold an FX liquidity buffer differs from other countries since they do not face the risk of exchange rate fluctuations and currency mismatches.

Fully Dollarized Economies

27. Fully dollarized economies may need liquidity buffers in the adopted foreign currency to support domestic financial institutions, but also as a buffer for government financing.

Liquidity pressures in banks could result from outflows from the financial system, which can originate from various sources including a decline in exports, a sudden stop in external financing, non-resident flight, or a resident run. In addition, governments may wish to maintain *additional fiscal savings* as buffer against unexpected fluctuations in revenue or spending since funding in the adopted currency may be difficult in times of stress.²⁶

28. Several fully dollarized economies complement high liquidity ratios in banks with centralized reserve buffers. It has been argued that decentralized liquidity buffers allow dollarized economies to avoid the moral hazard problem of centralized liquidity buffers (Levy Yeyati 2006). However, decentralized buffers do not eliminate the need for centralized reserves and several fully dollarized economies have already established, or are in the process of establishing, liquidity funds as LOLR-type facilities (see footnote 38 in ARA 2015).

29. Staff reports for fully dollarized economies where reserve issues require a deeper discussion should assess the available (public and private) buffers are sufficient to meet liquidity needs. While precisely calibrating the possible needs due to external pressures is difficult, most risks identified above are captured by the components of the ARA EM metric. Also, fully dollarized economies do not appear to have faced events of BOP pressures that are more severe than non-dollarized countries (ARA 2013), although inferences may be hampered by the small sample size. As such, the ARA EM metric may provide a conservative starting point as an adequate liquidity buffer to support domestic financial institutions in a fully dollarized economy. For the fiscal reserve buffer, Wiegand (2013) proposes one month of government spending as a standard

²⁶ Dollarized economies cannot accumulate reserves by issuing base money in exchange for FX assets. Instead, reserves accumulation is achieved through central deposits by another entity, such as the government (Kosovo, Panama) or a bank-financed liquidity fund (Ecuador), controlled by the Central Bank. See Wiegand (2013) for more details on the case of Kosovo.

yardstick. Also, staff could discuss the needs of additional tools (for example, fiscal rules to warrant the fiscal savings) to secure the level of international reserves.

Partially Dollarized Economies

30. There is no strong empirical basis to argue that partially dollarized economies need larger reserve buffers. As such, the ARA EM metric may provide a useful starting point to consider the size of foreign exchange liquidity buffers. The existing literature on the impact of dollarization on the likelihood and severity of crises is mixed. On the one hand, there is no clear positive association between the degree of dollarization and crisis likelihood or cost, and partially dollarized EMs have not seen larger outflows during market pressure events than others (see the discussion in Box 4 in ARA 2015), although this could reflect higher buffers held by banks in these economies. On the other hand, non-resident deposits seem more likely to leave during market pressure periods in highly dollarized economies (Figure 9 in ARA 2015 and Gonçalves 2007). Depreciation pressures created by liquidity shortages could be exacerbated by balance sheet effects due to currency mismatches of banks. The discussion in Article IV reports for partially dollarized economies should explain if the extent of privately held buffers or dollarization means a higher or lower level of reserves is needed compared with standard metrics, including the ARA EM metric, and which metric estimate is the most appropriate for the overall assessment. To the extent that non-resident foreign exchange holdings are seen to present higher risks than those captured in the ARA EM metric, these should be discussed and accommodated within the adequacy assessment. In addition, larger FX reserve requirements often seen in these economies should be taken into account in the adequacy assessment, as these may also have implications for overall reserve needs, as discussed in ¶ 7.

C. Credit-Constrained Economies

31. This section provides guidance on assessing reserve adequacy in credit-constrained economies, henceforth LICs, with a particular focus on the implications from the new Fund approach.²⁷ As with other economies, reserves provide a buffer against external stability risks. This is particularly important for LICs given their high vulnerability to exogenous shocks and limited access to capital markets. This section, together with Annexes IV and VII, addresses some of the practical issues in implementing reserve adequacy assessments for LICs in Article IV consultations using the new Fund (“ARA-CC”) approach, which seeks to balance marginal benefits and costs.

32. A wide range of approaches could be used to assess reserve adequacy in LICs. As with EMs, traditional approaches—including the 3-month import rule, 20 percent broad money coverage, and 100 percent short-term debt coverage—remain useful tools. Nonetheless, while these methods are simple and easy to apply, their basis may not necessarily reflect country specificities and/or properly capture multiple motives for holding reserves. The ARA-CC approach progressively developed over the three ARA papers is designed to address some of these gaps.

²⁷ See ARA 2011, 2013, 2015.

33. The ARA-CC approach is a useful complement to existing approaches as it takes into account the nature of external drains and LICs' degree of capital market access. It assesses the adequacy of reserves for countries with limited or no access to international capital markets. Reflecting this, it focuses primarily on shocks emanating from the current account side (e.g., adverse terms of trade, remittance and aid shocks).

34. In the ARA-CC approach, the adequate level of reserves is derived through an algorithm that balances the absorption smoothing benefits of reserves in the event of adverse shocks against the opportunity cost of holding reserves taking into account country specificities. The *absorption smoothing benefits* of holding reserves are estimated by two empirical regressions capturing: (i) the role that reserves play in reducing the likelihood of a crisis, and (ii) the impact of reserves in reducing the severity of a crisis. To quantify the *cost of holding reserves*, one of the external funding costs, sterilization cost or the marginal product of capital (all net of returns from holding reserves) could be used as proxies. The adequate level of reserves should be given by the level where the additional (marginal) benefit to be achieved by holding one more unit of reserves is equal to the additional (marginal) cost to obtain and maintain that level of reserves.

35. Close attention should be paid to country specificities (e.g., size and composition of debt, nature of shocks) to ensure that the approach used best captures the risks and vulnerabilities that a country could face. For countries that face potential rollover risks (e.g., arising from high external debt) or capital flight risks, the team could also apply the ARA EM metric discussed above, the short-term debt and/or broad money rule. The small islands metric, which draws on the new Fund metric for economies with market access (ARA-EM), is a useful metric that combines different reserve needs taking into account small island specificities (e.g., vulnerability to natural disasters).²⁸ Dollarized LICs may need to hold more reserves, though their sources of external drains and ways of smoothing shocks depend on the nature and degree of dollarization (see Box 6 in ARA 2013).

IV. MEASURING THE COST OF RESERVES

36. Reserves can be a costly form of self-insurance, making the opportunity cost of reserve accumulation a potentially important input into bilateral policy discussions. Discussions on costs of reserves are relevant when weighing such costs against their numerous proven benefits, which have been discussed elsewhere in this note and past ARA papers. Such discussions could, for instance, be relevant in country cases if the opportunity cost of reserve

²⁸ See Mwase, 2012, "How much should I hold? Reserve Adequacy in Emerging Markets and Small Islands", IMF Working Paper, WP 12/205.

accumulation has been rising, and where reserves are in or above adequate ranges. This section provides guidance on cost measures across various types of country cases.²⁹

A. Countries with Market Access

37. For countries with market access (MMA and DFM), sterilization and yield-based opportunity costs provide useful measures of the marginal cost of reserves. Estimates of the cost of reserves generally comprise two main components: the foregone return on an alternative use/asset of the local authorities or the cost of issuing paper for sterilization *less* the return on reserves (Hauner, 2005). For the first component, indicators identified in the literature include external debt servicing cost (pointing to the opportunity cost of retiring debt), the social opportunity cost of public capital, and sterilization cost. The chosen measure should reflect country circumstances, including the adequacy of reserves, the alternative use of reserves, and the level of the exchange rate compared to its fundamentals.

38. Where reserves are assessed as inadequate or barely adequate, the marginal cost of financing their accumulation would seem most relevant. These costs could be either the cost of borrowing reserves, or the cost of sterilizing the intervention to acquire them (based on the maturity of paper used for sterilization). When reserve levels are relatively low, alternatives to accumulation are less relevant, but the quasi-fiscal cost of sterilizing the accumulation can be high (Calvo 1991). These costs would include the anticipated exchange rate valuation losses.

39. Where reserves are ample, the “net financing” or opportunity cost would be a suitable measure of the cost of reserves. Specifically, the net financing cost can be defined as the difference between the local yield and the return on reserve assets, adjusting the country’s yield for the fact that higher reserves may reduce these yields as they reduce risk. This measure is designed to reflect the opportunity cost of holding reserves, and can be tailored to country circumstances.

- For market access economies with high externally issued foreign currency debt, the use of the external FX denominated yield is a relevant opportunity cost measure, reflecting the opportunity cost of partially retiring this debt. This measure can be proxied by the EMBI spread less the endogenous impact of higher marginal reserves in lowering spreads. ARA (2011, 2015) found that while the impact of reserves on lowering the marginal cost of reserves had been significant in the past, for the median EM, the rise in reserve holdings in recent years had essentially eliminated this effect. That is, there had been a general convergence of the net financial cost measure with the EMBI spread, at least for the median emerging economy. However, the adjustment may remain relevant for particular countries.³⁰

²⁹ The global costs of reserve accumulation however, while an important component of the international monetary system, are beyond the scope of ARA and this guidance note, and are best addressed in the Spillover Report and External Stability Report.

³⁰ The yield would be adjusted to count any anticipated FX depreciation, and could be in line with the expected exchange rate path in the Article IV consultations.

- For market access economies with adequate reserves and local currency debt that could be retired, a local currency bond yield is a commonly used proxy. This reflects the opportunity cost of the government retiring local currency debt or using the savings for a project they would have otherwise borrowed for.

B. Countries that are Credit Constrained

40. For credit-constrained economies, the opportunity cost of holding reserves could be approximated by the market yield on a sovereign bond, or by the estimated marginal product of capital. The considerations are as follows:

- If a credit-constrained country/LIC has issued a sovereign bond in the last five years, then the yield can be used as a proxy. If there is no recent data or there are concerns about market biases, the average market yield for a subset of LICs or the cross-country currency interest swap (also known as cross currency swap)³¹ can be used.
- If there are no major distortions in government securities market, the return on government securities can be used as a proxy, adjusted for the exchange risk premium. For LICs that do not have forward exchange markets, the premium could be computed using an average of historical real effective exchange rate depreciation. Staff should use the return on longer-term securities (as they are less likely to be influenced by monetary policy decisions) but ensure that these are not illiquid.
- For other credit-constrained countries/LICs, the evolution of the output-to-capital ratio provides a good proxy for capturing the opportunity cost of foregone fixed investment (MPK). It depends on investment as a percent of GDP, output, the depreciation rate, and the share of the capital stock (See Box 5 in IMF 2013 for details).³² For cases where the state has command of significant resources held in foreign currency at the central bank (e.g., for resource-rich economies), the MPK of public capital can be a useful indicator for resource rich countries. Due to measurement and data issues, the MPK estimates could use averages (e.g., regional or LIC average).

V. TOOLS AND RESOURCES

41. A number of the tools outlined in this note are made available on the following website:³³ <http://www.imf.org/external/np/spr/ara/index.htm>. Detailed cross-country data on reserve holdings as well as the underlying data to calculate various metrics and tailor these along

³¹ This provides an estimate of the interest rate that banks are willing to take to enter into a cross-currency swap with another bank or client to exchange the local currency for a foreign currency during the tenor of contract. The data can be obtained from financial markets (e.g., using Bloomberg database).

³² For additional details on computation, see the accompanying sheet in the LIC template.

³³ In addition, for internal users, information can be found on the SPR and External Sector Assessment intranet pages.

some dimensions are also presented. In addition, some examples of good coverage in Fund surveillance are listed.

42. The EM ARA tools are tailored for different types of EMs (buffers for commodity-intensive economies and adjusted metrics for countries with CFMs), based on the specific proposals in ARA 2015 and the detailed guidance in this note. While the main template can be applied to all EMs, including those with both rigid and flexible exchange rate regimes, it also provides indicators of CFMs across countries, which could be used to tailor the assessment in the case of a specific country. Several more features are available in the template, including (i) plotting reserves against several adequacy metrics, (ii) tracking recent monthly reserves relative to ARA metric, and (iii) providing the one-year ahead forecast of metric components. A separate stand-alone tool allows country teams of commodity-intensive economies to calculate the additional buffer in the way discussed in Section III. B. Annex V provides detailed information on how to use the ARA tools for EMs.

43. The ARA-CC tool helps assess reserve needs for countries with limited access to financial markets. Specifically it: (i) determines whether the country is “credit constrained”; (ii) identifies the country’s economic classification and exchange rate regime; (iii) compiles the data for the empirical regressions; (iv) chooses the most appropriate proxy for the cost; (v) quantifies the net cost of holding reserves; and (vi) calibrates reserve adequacy. Annex IV and Annex VI provide detailed information on how to use the ARA-CC tool.

44. To provide country teams with examples of good practice in reserve adequacy discussions, the coverage in a few country staff reports is described. For EMs, India (commodity importer) and Colombia and Russia (commodity exporters), staff reports highlighted the need to hold reserves against volatile terms of trade, the risk of capital flight, and intergenerational equity considerations. The Croatia and South Africa staff reports nicely outlined the complementary role of regulatory FX liquidity buffers in commercial banks, and the fiscal cost of reserve holdings, respectively. The South African report also presented a dynamic reserve adequacy assessment. The discussion of Sweden’s experience with FX liquidity shortages in the banking system after the Lehman collapse and the corresponding reserve needs is presented as a good MMA example. For credit constrained economies, the discussion of reserve needs against their high cost in Mozambique provided a good example. For a full list of corresponding country reports and a short summary of the analyses, please visit <http://www.imf.org/external/np/spr/ara/index.htm>.

Annex I. The IMF Composite EM Reserve Adequacy Metric and Other Metrics Relevant for Deepening Financial Markets

Traditional metrics and other approaches:

- For countries with less open capital accounts, **import coverage** is often seen as a relevant measure, highlighting how long imports can be sustained in the event of a shock. Traditionally, the measure has been based on months of prospective imports, with three months' coverage typically used as a benchmark. However, the applicability of this metric has become less useful for countries that have opened up financially, and the financial links have become large.
- **The ratio of reserves to short-term debt** (ST debt) has been extensively used as an indicator of crisis risk for market-access countries, and plays a key role in any assessment of reserve adequacy. This measure is particularly relevant for a country with large short-term cross-border financial transactions. The "Greenspan-Guidotti" rule of 100 percent cover of ST debt is the most widely-used standard of adequacy for EMs.
- For countries with a large banking sector and very open capital accounts, **the ratio of reserves to broad money** (typically M2) has been used to capture capital flight risks, given that many recent capital account crises have been accompanied by outflows of residents' deposits. The upper end of a prudent range for reserve holdings is typically set at 20 percent, but a threshold of around 5 percent is more typical.
- **Combination metrics** have been used to capture a range of risks. The most common such metric is the expanded Greenspan-Guidotti rule, consisting of ST debt plus the current account deficit (if it is in deficit), which is intended to reflect the full potential 12-month financing need.¹ Another combination metric is Wijnholds and Kapteyn (2001), which uses ST debt and M2 to model debt repayments and capital outflows as motivations for holding reserves, taking into account exchange rate regimes and country risk.
- **Optimal reserve models** were developed to integrate cost and benefit considerations. A widely used model is that of Jeanne and Rancière (2006), where the optimal level of reserves is determined by balancing the economic cost (the potential loss in output and consumption, given the size and probability of the sudden stop) with the opportunity cost of holding reserves, and reflecting the degree of risk aversion.² The work of Jeanne and Rancière (2006) suggests that many EMs would optimally hold reserves at around 80–100 percent of ST debt plus current account deficit and between 75 to 150 percent of the ARA EM metric. However, for alternative assumptions, such as on output loss, the probability of a sudden stop and risk aversion, the level of optimal reserves can change considerably (ARA, 2013).

¹ The asymmetric treatment of the current account implies a larger shock for surplus countries than for deficit countries, whereas if anything the reverse might be more justifiable. From this perspective, a formulation of "ST debt minus the current account balance" (positive or negative) might be worth considering instead.

² For details, see ¶ 31 in the ARA 2013.

The ARA EM metric

- The ARA EM metric comprises four components reflecting potential drains on the balance of payments: (i) *export income* to reflect the potential loss from a drop in external demand or a terms of trade shock; (ii) *broad money* to capture potential residents' capital flight through the liquidation of their highly liquid domestic assets; (iii) *short-term debt* to reflect debt rollover risks; and, (iv) *other liabilities* to reflect other portfolio outflows.³ The relative risk weights for each component are based on the 10th percentile of observed outflows from EMs during exchange market pressure episodes.
- This metric does not include the current account deficit (or imports). This is because to the extent that current account deficit is financed by external liabilities, debt and other portfolio inflows, it should raise either the ST debt or other liabilities elements included in the metric, or both.⁴ That said, the EM metric would imply higher reserve needs for current account deficit countries even without including current account deficit as its financial components will be larger due to the external financing need of the current account deficit.
- Reserves in the range of 100-150 percent of the composite metric are considered broadly adequate for precautionary purposes (III. B. in ARA (2011)). The selection of a range—rather than of a point estimate for the adequacy level—reflects the intention to be cautious in view of the uncertainty inherent in the estimation of various balance of payments risks.
- The weights applicable to the individual components are reported in the main text (¶ 19).⁵

³ In ARA 2013 consideration was given to separating “other liabilities” into debt and equity liabilities. However, on balance, the composite term was maintained. This reflected the fact that equity remains an intrinsically less risky element of the balance of payments since price falls associated with liquidation limit the value of assets seeking to exit and hence the pressure on the balance of payments, but empirical estimates do not seem to adequately capture this lower vulnerability through lower prices. Consequently, the aggregated term captures the appropriate balance of risks. Moreover, only a limited set of emerging market countries (around 65 percent) have separate data on external debt and equity liabilities.

⁴ On the other hand, if the deficit is financed by FDI, it is not covered in the EM metric. In the event of a shock, FDI flows tend to result in more limited pressure on the exchange rate because FDI, as FDI has proved relatively stable compared to portfolio and other investment inflows in past events.

⁵ Given the post-2008 experience, the weights on “other liabilities” (or MLT debt and equity liabilities to non-residents) were raised by 5 percentage points in the ARA (2015).

Annex II. Country Classification

Different structural characteristics influence the choice of tools to assess reserve adequacy.

Key characteristics affecting an economy's tolerance to external risks—and hence influencing the choice of tools to assess reserve needs—are the flexibility of its economy, maturity of its markets, and extent of market access. ARA (2013) found that countries' tolerance depends on market maturity and depth and the robustness of market liquidity, as well as their economic flexibility (see Part I. I. A. in ARA (2013)). The depth and resilience of market liquidity could limit the impact of external pressures, while economic flexibility makes adjustment to external shocks easier.

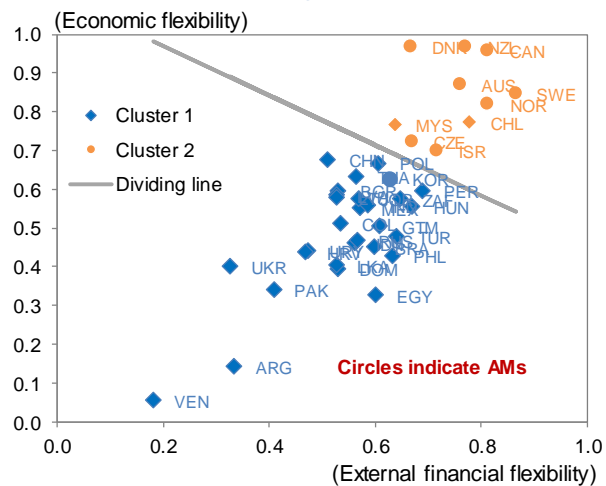
To illustrate this point, consider the following exercise—taken from ARA 2015 (¶ 18 in Section III)—sorting advanced and emerging market economies by these characteristics. The text chart summarizes

the outcome of the exercise. Countries in cluster 1, which largely overlaps with the standard EM classification, are generally less flexible economies with less developed and flexible external financial markets. Countries in cluster 2, which generally overlap with advanced economies are more flexible along both dimensions. However, these characteristics do not always align with the standard (income based) classification of countries between advanced, emerging, and low income, with some economies close to the “dividing line” switching standard classifications. Many Directors supported, and some were open to, the classification based on market access and economic and financial flexibility, although several other preferred the standard country classification.

For countries without well-established market access, a measure of reserve needs based around current account risks is most appropriate. This margin can be judged using indicators based on the durability and depth of market access. These include the magnitude and frequency of public issuance over the past three-to-five years, sovereign debt rating, borrowing in international markets, and the use of government or external guarantees. Some of these indicators are also used for PRGT eligibility (IMF 2013a).

The following table provides a classification of countries based on the algorithm discussed above, although staff teams can use judgment (with explanation) in how they classify countries and hence the tools they choose to use.

Classification of Economies, 2010–12
(Based on simple average)



Sources: Bloomberg, EWND, WEF, PWT and IMF staff calculations.

Maturity Based Country Classification

(Data as of January 2016)

(Average of 2010-12)

	Cluster-based Classification 1/	WEO	World Bank 2/
Australia	Mature markets	AM	High income
Canada	Mature markets	AM	High income
Chile	Mature markets	EMDE	Middle income
Denmark	Mature markets	AM	High income
New Zealand	Mature markets	AM	High income
Norway	Mature markets	AM	High income
Sweden	Mature markets	AM	High income
China, Mainland	Gray zone	EMDE	Middle income
Czech Republic	Gray zone	AM	High income
Hungary	Gray zone	EMDE	High income
Israel	Gray zone	AM	High income
Korea, Republic of	Gray zone	AM	High income
Malaysia	Gray zone	EMDE	Middle income
Peru	Gray zone	EMDE	Middle income
Poland	Gray zone	EMDE	High income
South Africa	Gray zone	EMDE	Middle income
Thailand	Gray zone	EMDE	Middle income
Argentina	Deepening financial markets	EMDE	Middle income
Brazil	Deepening financial markets	EMDE	Middle income
Bulgaria	Deepening financial markets	EMDE	Middle income
Colombia	Deepening financial markets	EMDE	Middle income
Croatia	Deepening financial markets	EMDE	High income
Dominican Republic	Deepening financial markets	EMDE	Middle income
Egypt	Deepening financial markets	EMDE	Middle income
Guatemala	Deepening financial markets	EMDE	Middle income
India	Deepening financial markets	EMDE	Middle income
Indonesia	Deepening financial markets	EMDE	Middle income
Jordan	Deepening financial markets	EMDE	Middle income
Latvia	Deepening financial markets	EMDE	Middle income
Lithuania	Deepening financial markets	EMDE	Middle income
Mexico	Deepening financial markets	EMDE	Middle income
Pakistan	Deepening financial markets	EMDE	Middle income
Philippines	Deepening financial markets	EMDE	Middle income
Russian Federation	Deepening financial markets	EMDE	Middle income
Sri Lanka	Deepening financial markets	EMDE	Middle income
Turkey	Deepening financial markets	EMDE	Middle income
Ukraine	Deepening financial markets	EMDE	Middle income
Uruguay	Deepening financial markets	EMDE	Middle income
Venezuela	Deepening financial markets	EMDE	Middle income

1/ See Section III in ARA (2015). Gray zone countries are the 10 smallest distance from the "dividing line".

2/ GNI per capita thresholds in US\$ (Atlas methodology) larger than US\$ 12,275, US\$ 12,475, and US\$ 12,615 in 2010, 2011 and 2012, respectively.

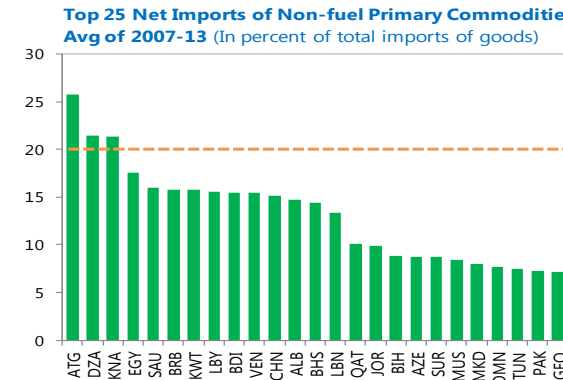
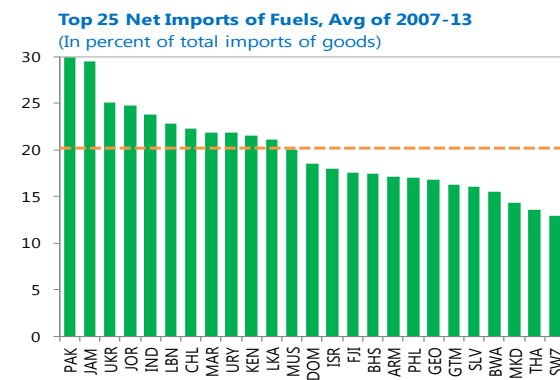
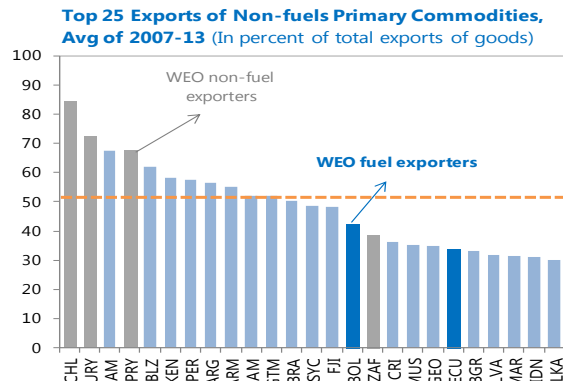
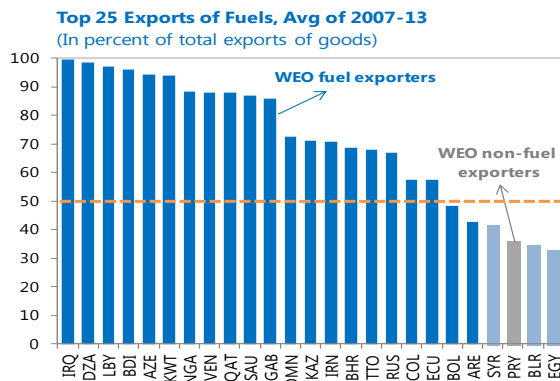
Source: IMF staff estimates, WEO and

<https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries>

Annex III. Commodity Intensive Economies and Calculation of the Commodity Buffer

This annex discusses the commodity-intensity of various economies, and outlines the method proposed in ARA 2013 and 2015 for calculating an additional buffer for commodity-intensive economies.

Commodity intensive economies. Staff can use judgment in deciding whether an additional commodity buffer is a relevant consideration for a particular country given the commodity intensity of their imports and exports. ARA (2015) reported the commodity intensity of several emerging and frontier markets using COMTRADE data from 2007–13 (see the charts below). The list of exporters with commodity intensity above 50 percent of total goods exports are broadly consistent with the WEO classification of commodity exporters (with only Colombia added as a fuel exporter and Argentina, Brazil and Peru as non-fuel exporters). For importers, 20 percent was proposed in ARA (2015).¹



Source: WITS (UN Comtrade) and IMF staff calculations.

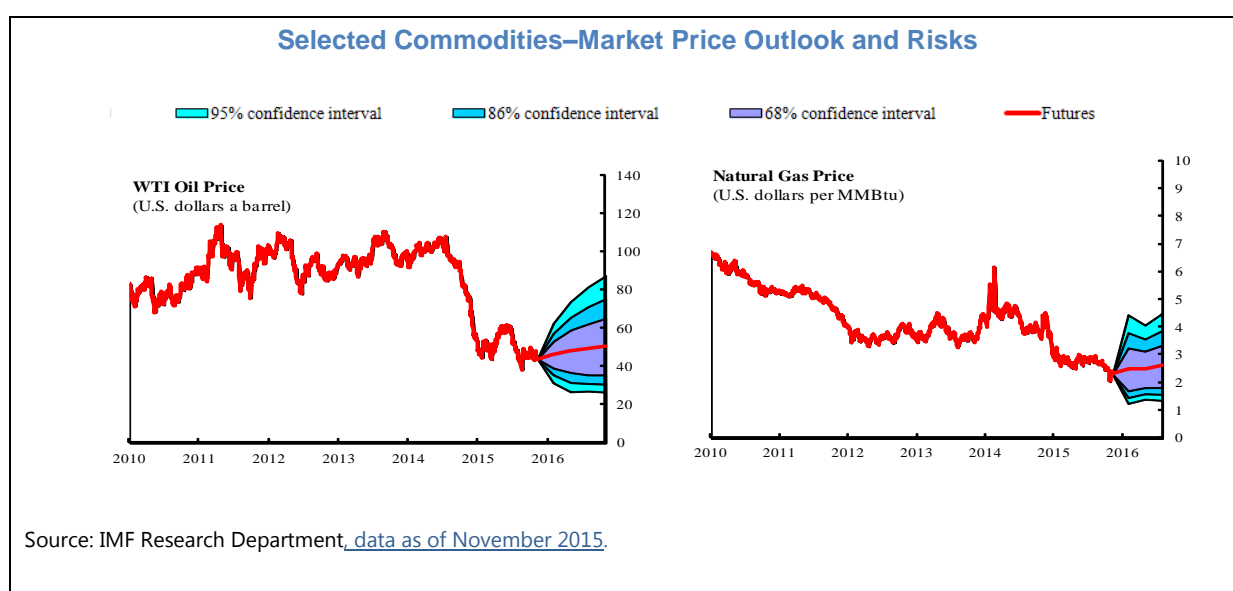
1/ Fuels include coals, petroleum, natural gas, and electric current.

2/ Primary commodities include food and live animals, beverages and tobacco, crude materials (except fuels), animal and vegetable oils, and non-ferrous metals.

3/ Advanced economies and PRGT-eligible countries are excluded.

¹ This reflects some heavy commodity importers re-export a large share of these imports, mitigating the price risk.

Methodology to calculate the buffer. The buffer is calculated by multiplying the price gap with trade value, where the price gap is derived as the difference between current prices and a specific moment of the forecast price distributions (Annex V discusses the tool to compute the buffer). Specifically, for the price gap (defined as percent change from the baseline price projections), ARA (2013) took a future price at the 68 percent confidence interval (equivalent to one standard deviation if the future distribution is Gaussian). The distribution of future prices could be based on a model (e.g., VAR) or option prices (as in the two text charts below).^{2,3} For countries (e.g., Chile) with institutions specifically tasked to project long-term commodity prices, distributions in their models could be used, provided that assumptions on the distributions are discussed with the authorities during Article IV consultations. An illustrative example based on the methodology is presented in the box below.



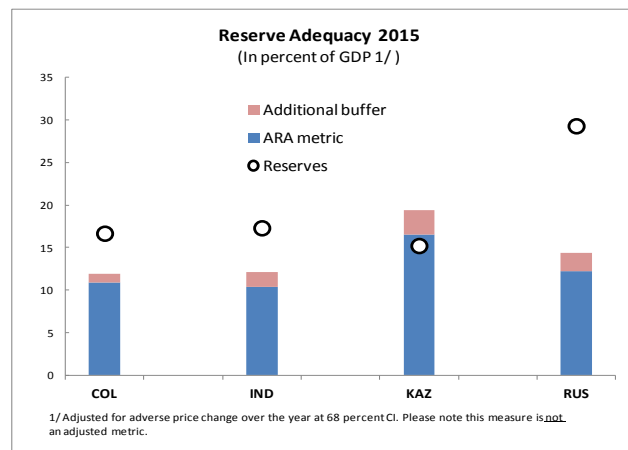
² Prior to the global financial crisis futures prices (as in the text chart)—particularly for energy—provided an unbiased projection of commodity prices (Chinn and Coibion, 2013). However, their performance has since been outperformed by model based forecasts (IMF, 2014), suggesting the latter may be preferable in more recent times.

³ The charts are based on the data in RES's monthly [Commodity Price Outlook & Risks](#).

Box AIII-1. Illustrative Example of Buffers for the ARA EM metric in Commodity Intensive Economies

As an illustrative example, this box estimates the additional buffer for a few key fuel exporters (Colombia, Kazakhstan and Russia) and a net fuel importer (India). The buffer is given by multiplying the relevant price gap by the 2015 value of oil exports/imports. Reserves remain well above 100 percent of the metric, and the metric augmented by the commodity buffer. Augmenting the ARA EM (or any other) metric with the calculated commodity buffer in this way could be appropriate if the authorities intend to meet this need through reserves rather than by hedging or some other method. However, the buffer need should be shown separately. If staff wishes to depict the ratio of reserves to a metric (ARA EM metric or other) augmented with the buffer, then the report should also show the ratio of reserves to the metric (i.e., without the buffer). An example is shown below.

- Fuel exporters.** The additional buffer captures the risk of *lower* future oil prices. The price gap of 19 percent is the difference between the one year ahead price forecast at the 68 percent confidence interval (US\$35 per barrel as of Nov 2016) and the current WTI price (US\$44 per barrel as of Nov 2015). The price gap is then multiplied with the value of oil exports in 2015.
- Fuel importers.** For fuel importers, the additional buffer captures the risk of *higher* future oil prices. The gap is about 49 percent for the one year ahead price forecast and the 68 percent confidence interval (US\$65 per barrel as of November 2016 and US\$ 44 per barrel as of November 2015).



Annex IV. Application of the ARA-CC Approach to Credit-Constrained Economies

Practicalities in applying the ARA-CC approach

There are six steps to assess reserve adequacy in this framework: (i) determine whether the country is “credit constrained”; (ii) identify the country’s economic classification and exchange rate regime; (iii) compile the data to get the marginal benefit of holding reserves; (iv) choose the most appropriate proxy for the cost; (v) quantify the net cost of holding reserves; and (vi) calibrate reserve adequacy. Annex VII shows more detailed information.

The first step involves determining whether a country is “credit constrained” and thus meets the criteria for this approach. All developing countries (including middle-income countries, MICs) with very limited or no access to international capital markets can use this approach as a complement to existing approaches. Operationally, this refers to countries that do not regularly borrow—defined as countries that have at least one issuance of bonds per year in the last five years—from the markets¹ and/or are on average rated as “less than investment grade”.

The second step entails specifying the economic classification (specifically, resource-rich², fragile states, small states, or frontier LICs) and the exchange rate regime (also covered in Annex VII, Step 2). This affects the estimated marginal benefit of holding reserves in reducing the likelihood and/or moderating the severity of a crisis. Operationally, staff may need to apply judgment to determine the most appropriate designation for LICs that straddle multiple classifications (e.g., both resource-rich and frontier markets)³. Staff should identify the de facto exchange rate regime that best reflects country circumstances and use a dummy variable to identify the regime.

The third step involves providing the corresponding data for the two empirical regressions. Table AIV-1 below provides a brief summary of the suggested data and reference period. Staff should apply judgment and use the indicator that best reflects the macro-variable of interest taking into account the country’s circumstances. For example, if tourism is important, the terms of trade measure should include services. The choice of the government balance variable (e.g., central or general government) should take into account country circumstances and data availability. For countries that have received debt forgiveness, aid flows excluding the stock adjustment for debt relief could be used to capture aid. External demand could be captured using (trading partner

¹ Therefore, countries that have been able to issue bonds but very infrequently (e.g., about 1–2 sovereign bonds as the case has been for some frontier LICs) in recent years would not typically be considered to have market access.

² A country is considered resource-rich if it depends on natural resources for at least 20 percent of export or fiscal revenue using average data for 2006–10. Country teams could use the updated coefficients for the resource-rich economies or the original coefficients reported in ARA (2011).

³ The empirical regression controlling for multiple economic classifications (e.g., small state sample with a dummy variable for resource-rich) did not yield significant results on the economic characteristic dummy while greater granularity with dual categories (e.g., small and fragile state sample) was constrained by sample size.

weighted) global growth (or external demand). Where data does not exist, staff could use the closest proxy to the missing data. This is particularly important for the Country Policy and Institutional Assessment (CPIA) as this typically is not provided for MICs. In this case, country teams could use other institutional indicators to identify a similar country that could be used as a benchmark and then apply the CPIA from this country.

Table AIV-1. Economic Indicators: Description of Unit and Reference Period.

Economic indicator	Unit	Reference period	Comments
Net FDI to GDP	Change in "net FDI in percent of GDP"	10th percentile of last 5 years	Could use 5-year projection instead
Government balance	Percent of GDP	Most recent year	Could use 5-year average (past or projection). Use definition of government that best reflects economy.
Gross Domestic Product, Nominal	US\$, millions	Most recent year	Use same period as imports (next row)
Imports of Goods and Services, Nominal	US\$, millions	Most recent year	Use same period as above
Reserves, Nominal	US\$, millions	Most recent year	Use same period as above
GDP, constant prices, weighted by partner country exports	% change	10th percentile of last 5 years	Could use 5-year projection instead
Change in net ODA and official aid received	Change in "net ODA in percent of GDP"	10th percentile of last 5 years	Could use 5-year projection instead; could use definition most application including grants from the BOP
Terms of Trade goods	% change	10th percentile of last 5 years	Could use 5-year projection instead
Exports of goods and services	Percent of GDP	Most recent year	Could use 5-year average (past or projection). Use definition of government that best reflects economy.
Imports of goods and services	Percent of GDP	Most recent year	Same as above
CPIA structural policies cluster average	(1=low to 6=high)	Most recent year	Country Policy and Institutional Assessment (CPIA)

The **fourth step** entails choosing a proxy for the cost of holding reserves. The considerations for this are presented in Annex IV.

The **fifth step** involves estimating the cost of reserves net of their returns. The real return on a country's reserves can be estimated by: (i) identifying the portfolio distribution of the country's reserves, by asset class decomposed further by currency, and maturity; (ii) estimating the likely return for each asset class (again taking into account the currency and maturity); (iii) deflating the nominal returns using the constituent currency's inflation (e.g., US consumer price index for U.S. dollar assets); and (iv) computing the weighted average real return, using the asset size.⁴

In the **final step**, teams calibrate the adequate level of reserves. For efficiency, the Fund has developed a template that uses the above information and a cost-benefit algorithm to calculate the adequate level of reserves. This is explained in detail in Annex IV.

⁴ IV-B in IMF 2013 provides a simple approach to identify the key asset classes (e.g., SDR, gold, deposits, and government securities) that central banks hold and estimate the real return.

Applying Judgment in Interpreting Findings

Staff should apply judgment in interpreting the results derived from the template, as with any reserve adequacy framework. First, staff should ensure that the assumptions appropriately reflect the country circumstances.

- Staff could refine the data (time period and/or indicator) in the benefits section particularly in situations where the outturn/forecast is expected to deviate from the recent trajectory. It is important to decide whether to reflect one-off shocks (e.g., if a country has experienced a sharp deterioration in a country's institutions or macro-economic position) or to smooth these factors and instead to use recent averages (e.g., five-year average of fiscal balance instead of the most recent year).
- For the cost section, the external financing cost (i.e., the sovereign bond rate) could be a better indicator of cost for countries that are expected to access international capital markets in the near horizon; in this case, cost averages from similar economies could be a useful proxy.
- More generally, if large structural changes are expected in the economy (e.g., rapid investment growth, new natural resource exports), forward projections could be used as guidance (e.g., for cost proxy and terms of trade). The potential impact of major structural changes on the cost of holding reserves could also be considered (e.g., measures to deepen financial markets could reduce the cost of finance, including sterilization, while a huge surge in investment rates (e.g., due to large scale infrastructure projects) could affect the assumption of steady state used to derive the estimates of MPK in Box 5 in ARA (2013). Staff could therefore opt to use a different cost proxy or a sample average of similar countries in these cases.

An important next step is, where relevant, applying scenario analysis to capture the impact of different benefits and/or costs of holding reserves. In this regard, the country data for the benefits section could draw on data from a more adverse alternative macroeconomic framework to highlight the risks from less fiscal adjustment or less benign external environment (e.g., weaker terms of trade) on external stability risks. Staff could also examine the sensitivity of the results to a less benign external environment (e.g., illustrative higher borrowing costs or the most recent sovereign spreads that similar economies have faced).

Annex V. Assessing Reserve Adequacy Tool for EMs

This annex outlines the reserve adequacy data and resources made available on the IMF's internal and external websites for emerging and deepening financial market economies.¹

Graphing tool. The reserve adequacy graphing tool for EMs depicts data on reserve holdings (based on IFS definitions), various metrics (broad money, imports and short-term debt), and the underlying data to compute the ARA EM metric (as well as its level) for fixed and flexible exchange rate regimes. The graphing tool also shows the ARA metric adjusted for CFMs as discussed in the main text of the guidance note.

Figure AV-1. Snapshot of the ARA EM tool

Assessing Reserve Adequacy

The Reserve Adequacy Measure compares reserve holdings and alternative metrics of reserve adequacy. It also permits such comparison for multiple countries.

To create a cross country comparison chart:

- Choose the primary country of interest and its exchange rate regime (float or other).
- Choose any other countries from the "Comparison Countries" list you wish to assess as comparison.
- Remove or add indicators from the "Compare Indicator" list.
- Display the cross-country chart, or select to display the time series of the primary country.
- Options:
 1. You can download the entire data file
 2. Click the "Rank" button to see Reserves ranking by country

As a rule of thumb, reserves within 100-150 percent of the new ARA metric are considered adequate (see [Assessing Reserve Adequacy](#) and [Assessing Reserve Adequacy - Further Considerations](#))

An additional reserve buffer is necessary for commodity intensive economies, consider this [template](#) as an illustrative example that calculates the buffer for a fuel importer and a fuel exporter.

RESERVE ADEQUACY MEASURE ⓘ View: Cross Country Comparison | Time Series (One Country) Full Data

Options

Exchange Rate Regime: Float ☰ Compare Indicator ☰ End of Year Reserves ☰ Primary Country ☰ Comparison Countries +

Variables (in percent of GDP)

Stock of Reserves ARA EM Metric Adjusted for CFM X ARA EM Metric X 100% of Short-term Debt (RM) X 20% of Broad Money X

3 Months of Imports X

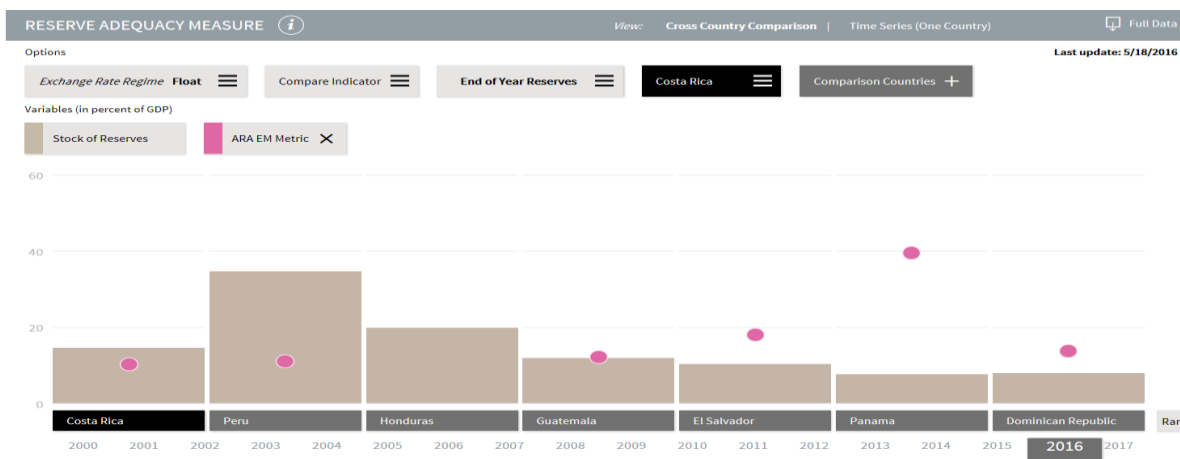
Last update: 5/18/2016

The graphing tool also allows users to produce customized charts of reserve stocks and reserve adequacy metrics, either by (i) presenting a time series from 2000 to the first projection year (using the WEO projection or data for the most recent month) for reserves and reserves metrics for one country; or (ii) plotting for a particular year reserve and metric data across a set countries chosen by the user. The exchange rate regime of the main country of interest can be specified, as well as the frequency of reserve data (end of year vs. current month). The default option reports reserve stocks against all reserve adequacy metrics (100 percent STD, 3 months of imports, 20 percent of broad money, ARA metric and adjusted/augmented ARA metrics). It is also possible to narrow the comparator metrics (i.e., remove particular metrics) by clicking on the X button next to each metric (Figure AV-1). An Excel file containing the underlying data on reserves and metrics can also be downloaded through a link on the upper-right corner. Figure AV-2 compares Costa Rica's reserve

¹ The resources discussed in this annex are available at <http://www.imf.org/external/np/spr/ara/index.htm>. For internal users, information can be found on the SPR and External Sector Assessment intranet pages.

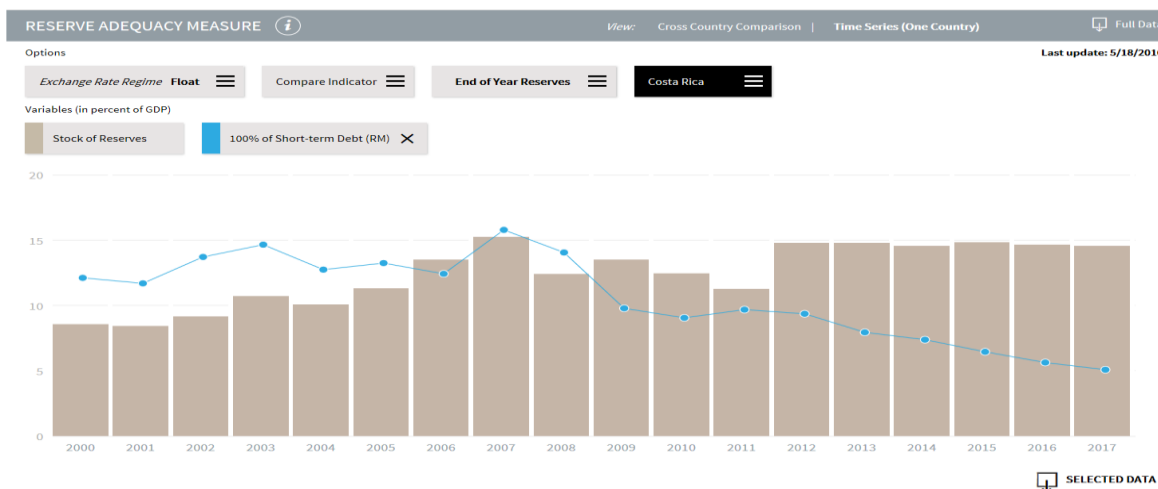
levels to the ARA EM metric in 2016 aside a set of chosen comparator countries. The option “Rank” ranks countries by reserve stocks to GDP.

Figure AV-2. Example # 1



The graphing tool also provides a dynamic feature allowing users to view time series data of various metrics against reserves. Where data is available, users can also track recent monthly reserves (IFS definition) relative to the metric. The overall time frame is from 1990 to a one-year ahead forecast. Figure AV-3 provides an example of the “Time series (One Country)” option for Costa Rica, showing reserves against the 100 percent of STD metric.

Figure AV-3. Example # 2



Database. A spreadsheet containing reserves data and based on the latest published WEO with all the underlying data is provided on the external website. This spreadsheet includes data on de jure measures of capital control as well as a template to compute dynamic reserve adequacy assessments (as in Box 4). A description of the data is shown in figure AV-4. The database on the external website will be update twice a year.

Figure AV-4. Description of sheets and data of ARA EM tool Excel template

WEO vintage:	\\RES\WEO\Archives\2016\WEOApr2016Pub
<i>Sheet name:</i>	<i>Description:</i>
Dynamic Country Chart	View each country's time-series metric data and decomposition
Capital Control Ctry List	View how the capital control dummy is calculated
Calculated metrics	
ARA_EM Metric	Reserve Adequacy for Emerging Markets (ARA EM) metric in Bil of USD, based on default/fixed/float exchange rate regimes
ARA_EM Metric (cap control adj)	ARA EM metric adjusted for capital control, based on default exchange rate regimes
Reserves_%ARA_metric	Reserves over ARA EM metric in Bil of USD, based on default exchange rate regimes
Information that we use as inputs	
Reserves	Stock of International Reserves (include gold), billions of U.S. dollars. WEO (BPM6)
Exchange_rate_regime	Exchange rate regime from AREAER database - only once a year
Exchange_rate_type	Exchange rate type (float/other) - only once a year
Broad Money	Broad money, billions of U.S. dollars. Calculated as M2 over ENDE
Other_Liabilities	Other liabilities, billions of U.S. dollars
Short-term Debt	Short-term debt outstanding, remaining maturity basis, billions of U.S. dollars. WEO
Exports	Value of Exports of Goods & Services, billions of U.S. dollars. WEO (BPM6)
Imports	Value of Imports of Goods & Services, billions of U.S. dollars. WEO (BPM6)
Portfolio investment liabilities	Portfolio investment liabilities (stock), billions of U.S. dollars. IFS
Other investment liabilities	Other investment liabilities (stock), billions of U.S. dollars. IFS

Commodity buffer template. This template², provides a framework to compute the commodity buffer for commodity intensive economies following the methodology in Annex III. The template includes two illustrative examples: (i) Colombia, a fuel exporter; and (ii) India, a fuel importer.

Automatically updated input sheets include gross reserves and the ARA EM metric. Input sheets to be updated by the user include the current year dollar value of commodity imports/exports, and the relevant latest commodity price projections provided by the commodities team of the IMF's Research Department. The template example is based on the November 2015 commodity price outlook and risks. The latest commodity price projections can be obtained by sending an email to commodities@imf.org.

This data is used in the "calculations" sheet to compute the price gap, defined as the percent difference between the current commodity price and the one-year ahead forecast based on the 68 percent confidence interval. The buffer is then calculated by multiplying the price gap by the current value of commodity exports/imports. Users should enter the 3-letter country code in the relevant cell in "calculations" sheet.

Country examples. The external website listed above also provides some examples of reserve adequacy assessments undertaken by Fund staff.

² Can be found on the link "template" on the ARA EM internal website. External users can request this template by writing to SPREMRA@imf.org.

Annex VI. Assessing Reserve Adequacy Tool for Credit-Constrained Economies and LICs

The ARA tool for Credit-constrained Economies (LICs), available ([here](#)), allows calculation of reserve adequacy metrics for credit constrained economies. Figure AVI-1 below (see “Approach” sheet in the template) summarizes the flow of data to generate the reserve adequacy assessment. The template is designed to automatically obtain data from various sources including a country desk macro-framework and the World Economic Outlook (WEO) databases. Figure AVI-2 illustrates the template structure. The steps outlined in this section mirror those in the template.

Figure AVI-1. Operational Methodology to Determine the Adequate Level of Reserves

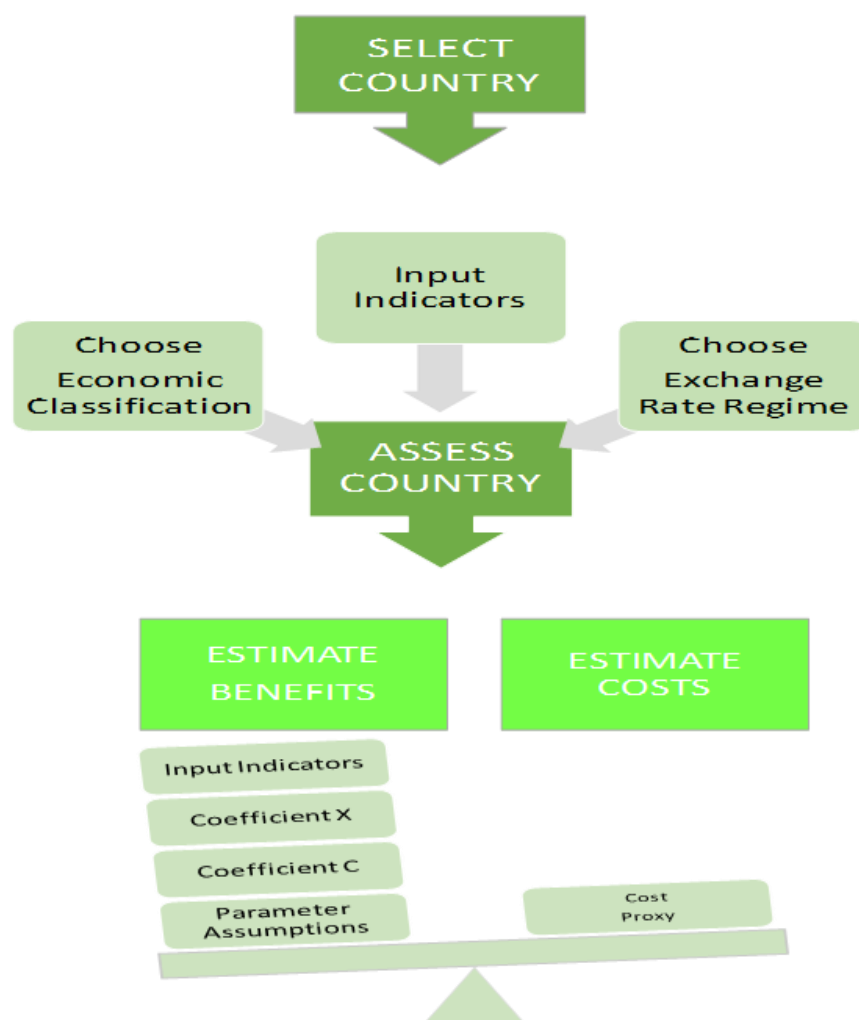
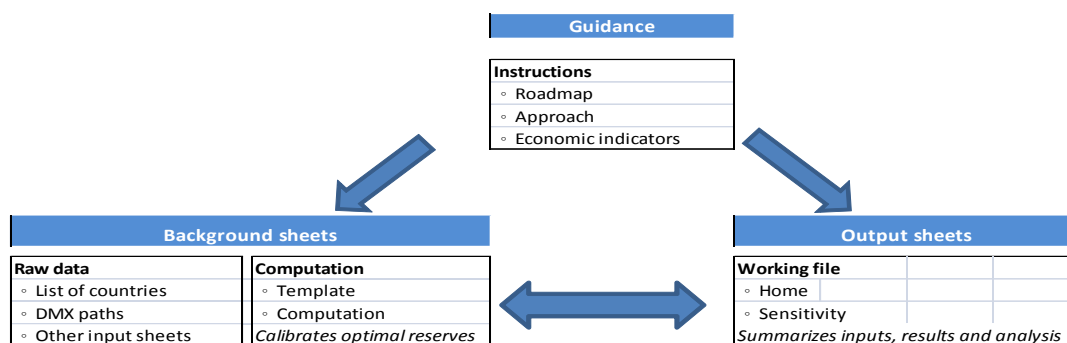


Figure AVI-2. Template Structure



The steps below summarize the procedures needed to compute reserve adequacy using the template (see “Home Sheet” in the template file).

Step 1: Choose the country

The template includes all developing countries. This provides the option to apply the metric to developing countries that are perceived to be credit constrained.

Step 2: Choose economic classification, exchange rate regime and country paths

- The template automatically populates the economic classification into either “resource rich” or “non-resource rich” economy; the default settings for “resource-rich” countries are drawn from the 2012 “Macroeconomic policy frameworks for resource-rich developing countries” IMF board paper. The template default classifies the de facto exchange rate regime drawing on the AREAER database.
- Country teams could manually adjust both the economic classification and exchange rate regime to capture coefficients from regressions that reflect additional sub-samples, specifically, frontier, fragile, or small state and also adjust for exchange rate to better reflect country circumstances (e.g., the exchange rate regime may have changed). This affects the coefficients in the marginal benefit regressions. The “reset” button resets the data to the default settings. In addition, desks could adjust the path of the database (i.e., data source), and/or the variable codes (which are coming from the database or the desk codification of the variables) that will be used in the analysis.
- **Step 3–6: Choose data that can be used to estimate the marginal benefits of holding reserves.** The template includes all the coefficients of the regressions—these are described in detail in IMF, 2011 and 2013—and the relevant country data based on a comprehensive dataset that is linked to various databases (including country desks) enabling teams to easily compile the data needed (see Table AVI-1 and Figure AVI-1).¹ Country teams can override as needed

¹ The template (see later) includes detailed information on the relevant data codes and is designed to automatically upload and populate the sheet once the country code is inserted. Country teams may wish to adjust the data code if they are using different one to reflect the particular variable or if an alternative variable may be more suitable given the country circumstances.

both data and also the coefficients to best reflect country situation; all the data inputs for the benefits section are updated when the file is refreshed to reflect the latest data contained in the relevant database while economic classification and cost data are based on the IMF (2013, 2015) Board paper classifications and will be updated annually.

Table AVI-1. Estimated Coefficients for Marginal Benefits Computations

Likelihood of a crisis	Resource	Non Resource	Updated			
	Rich	Rich	Resource Rich	Small State	Fragile	Frontier
Reserve, months of imports	-0.093	-0.090	-0.093	-0.093	-0.090	-0.090
Government balance, % of GDP	-0.031	-0.032	-0.031	-0.035	-0.032	-0.032
CPIA	-0.314	-0.309	-0.314	-0.246	-0.309	-0.309
Flexible exchange rate regime, 1 if flexible	-0.381	-0.380	-0.381	-0.440	-0.380	-0.380
IMF program	-0.291	-0.302	-0.291	-0.394	-0.302	-0.302
Constant	0.922	0.865	0.922	0.782	0.865	0.865

Magnitude of absorption drop	Resource	Non Resource	Updated			
	Rich	Rich	Resource Rich	Small State	Fragile	Frontier
Reserves, months of imports, in logs	-2.257	-2.240	-2.239	-1.945	-1.945	-1.945
Flexible exchange rate regime, 1 if flexible	-8.623	-8.698	-8.611	-9.418	-9.418	-9.418
External demand growth, percent	-1.002	-0.932	-0.833	-0.901	-0.901	-0.901
Terms of trade growth, percent	-0.086	-0.084	0.000	0.000	0.000	0.000
Change in FDI to GDP, percentage point of GDP	-0.023	-0.016	0.000	0.000	0.000	0.000
Change in aid to GDP, percentage point of GDP	0.000	0.053	0.000	0.000	0.000	0.000
Fixed effects	7.569	3.784				
Terms of trade growth, percent*resource rich	0.000	0.000	-0.181	0.000	0.000	0.000
Resource Rich	0.000	0.000	5.297	0.000	0.000	0.000

Step 7: Estimate the cost of holding reserves (net of real returns). The template provides estimates drawing from ARA (2013) and ARA (2015); these are automatically populated in the template and staff have the option to pick which proxy to use and the sample (e.g., the average cost for that approach from ARA (2015), the average for countries in similar region, size economic size, or degree of fragility). There is also an option for staff to manually insert their own cost estimates.

Results and analysis: The adequate level of reserves is calibrated in sheet "Computation" and the results are presented in the "home" sheet. In addition, a simple comparison with the findings from the traditional three month rule is illustrated (visually using graphs, a table and text, in the template). Judgment is needed in interpreting the results (see previous section on judgment).

For the scenario analysis, teams could adjust one more variables to see how a change in the marginal benefits (either macroeconomic or institutional country factors or external environment) or the cost of holding reserves affects the adequate level of reserves (see the "Sensitivity Analysis" sheet in the Template file). For example, country teams could keep all the data unchanged but adjust the government balance to enhance policy discussions on the impact of a more adverse fiscal outturn on reserve adequacy. They could also examine the impact of an alternative macroeconomic framework (e.g., an adverse scenario with worse fiscal balance, less benign external environment etc.). A separate sheet is provided that mirrors the "home" sheet to enable the team to view the results of the scenario analysis. Country teams may also wish to alter one variable and example the sensitivity/robustness of the findings to the change (e.g., one standard deviation in fiscal balance).

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