Foreign Exchange Reserve Adequacy in East African Community Countries

Paulo Drummond, Aristide Mrema, Stéphane Roudet, and Mika Saito

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Executive Summary

The concomitant external shocks experienced in 2008-09 by the East African Community (EAC) countries and stepped-up support by the IMF—including the SDR allocation—and other donors, are likely to arouse renewed interest in the question of the adequate level of international reserves. This note discusses the evolution of reserve holdings in EAC countries and uses several tools for assessing reserve adequacy in the region. The analysis suggests that reserve levels in most cases seem to include safety buffers, and thus, do not require immediate action. However, the situation could become tighter if export recovery is delayed or export prices do not pick up. Over the medium term, the desirable reserve path should also be adapted to regional and international integration.[1]

1 Introduction

The global financial crisis has affected the level of reserves in many emerging market and developing countries (EMDCs). The crisis has caused a surge in risk aversion, a decline in capital and trade flows, and a deterioration in international commodity prices. Faced with these external shocks and lower growth prospects, countries have implemented policies that have often led to a decline in international reserves. When possible, they have increased foreign borrowing. However, where the room for accessing external finance and using reserves was limited, countries have had to adjust their policy stances and/or let their exchange rates depreciate.

In response to the crisis, multilaterals, and the IMF in particular, have stepped up their support. A number of multilateral creditors have increased their commitments or have front-loaded disbursements under existing loan agreements. The IMF has strengthened its support in different ways. First, it has responded quickly to its members' requests—the commitments for use of IMF resources have jumped to about US$150 billion and the number of financial arrangements on concessional terms increased substantially. Second, a major overhaul of the IMF's lending toolkit allowed a doubling of access limits for all types of arrangements, a modernization of lending instruments, and a streamlining of conditionality. In addition, an allocation of SDRs equivalent to about US$280 billion was agreed upon by the IMF shareholders and became effective in September 2009.

The East African Community (EAC) countries have not been immune to these developments. They have been hit by lower external demand for their goods and services, deteriorating terms of trade, and a decline in capital flows. After having reached an all-time high in all the countries in the region, official foreign exchange reserves have started to decline. At the same time, some countries in the region have benefited from substantial IMF financial support. EAC countries have also benefited from the SDR allocation.

These circumstances are likely to breathe new life into the question of the desired or adequate level of international reserves going forward. Given the

sharp, unexpected turnaround in the external environment, the EAC countries have been reminded of the usefulness of international reserves as a buffer against external shocks. However, accumulating reserves is costly, and accessing Fund concessional funding in the face of a shock could be an alternative to piling up costly reserves. The SDR allocation has helped bolster international reserves; but should this allocation be spent or saved? Given the differences in economic circumstances and policy frameworks across the region, there can probably not be a single response to the question of the desired level of reserves. At the same time, however, EAC countries have similarities and share the common goal of adopting a common currency. What does this entail regarding the optimal reserve level, both at the time of the adoption of the common currency and in the transition process?

This paper aims at addressing these questions by examining the issue of reserve adequacy in EAC countries. It is organized as follows: Chapter 2 discusses the rational for holding reserves and provides a brief overview of the literature on reserve adequacy. Chapter 3 takes stock of the evolution and current levels of foreign exchange reserves in EAC countries, based on standard reserve adequacy measures and by comparing reserve holdings with the size of shocks the economies are subject to. Chapter 4 calibrates a self-insurance model with a view to determine the adequate level of reserves for the countries in the region. Chapter 5 concludes. It provides a summary of the results and discusses other factors likely to affect the desired level of international reserves.

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Overview of Literature on Reserves Adequacy

There are several motives for central banks to hold foreign exchange reserves:

- *Meeting transaction needs.* Reserves may be held to finance foreign exchange operations of the public and the private sector. While the transaction motive is probably only marginal in advanced economies with access to international markets—see Roger (1993)—and developed/liberalized domestic markets, it is likely to be more important in countries with substantial exchange controls and a large proportion of foreign exchange transactions channeled through the central bank.

- *Self-insuring against shocks.* In the event of disruptions in a country's balance of payment (BoP) flows, drawing down reserves can help avoid potentially disruptive adjustments in the exchange rate or domestic consumption and investment. Accumulating international reserves for this purpose is generally referred to as precautionary demand for reserves.

- *Fostering confidence in the government policy framework and its capacity to meet external obligations.* A number of papers have shown that a high reserve buffer can help reduce external borrowing costs,[2] the likelihood of sudden stops of capital flows,[3] or the occurrence of currency crisis.[4]

- *Reserves as a by-product of active exchange rate intervention.* A modern version of the mercantilist approach—see Dooley, Folkerts-Landau, and Garber (2003 and 2007)—asserts that exchange rate intervention to maintain undervalued exchange rates can be a rational and

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[2]See for instance Duffie, Pedersen, and Singleton (2003), Hauner (2005), and Levy-Yeyati (2007).

[3]See Caballero and Panageas (2008), Calvo, Izquierdo, and Mejia (2004), Durdu et. al. (2009), Frankel and Cavallo (2008), Ghosh et al. (2008), Jeanne and Rancière (2008), Jeanne (2007), and Kim (2008).

[4]See Chang and Velasco (2000), Bussiere and Mulder (1999), and Morris and Shin (1998).

sustainable development strategy. Reserve accumulation in this case is seen as a by-product of this export promotion policy.[5]

The economic literature has mainly focused on the self-insurance motive, with reserve adequacy standards having changed with the nature of BoP disruptions. Under the Bretton Woods system and until the early 1980s, as capital mobility was somewhat limited, disruptions came mainly from trade flows. Reserve adequacy was therefore primarily assessed on this basis, with a key benchmark being a reserve coverage ratio of three months of imports of goods and services. As capital flows grew and countries become susceptible to sudden stops in the flows, the focus changed to capital account-based measures of reserve adequacy. The now traditional Greenspan-Guidotti rule—reserves covering short-term external debt (or amortization coming due in the next 12 months)—is a standard benchmark. Other metrics related to stock concepts of the capital account are also used. These include reserves to broad money—in an attempt to capture the potential for capital flight by residents—and reserves to domestic equity portfolio holdings by foreigners. However, all these standard metrics lack strong foundations.

Simple rules of thumb are now often complemented with increasingly micro-founded normative approaches. Optimal reserve models, for instance, are based on cost-benefit frameworks, where reserves are accumulated up to the level where the marginal benefit of holding the insurance (declining with the level of reserves) equals the marginal cost (increasing). Early models were derived from the Baumol-Tobin inventory model with exogenous fixed costs of holding and replenishing reserves.[6] More recent contributions provided micro-foundations to the costs and benefits of holding reserves, for instance by weighing the consumption smoothing benefits of holding reserves against their cost—Aizenman and Lee (2007), Garcia and Soto (2004), and Jeanne and Ranciere (2006). While holding reserves can induce several types of costs, optimal reserve models generally focus on the opportunity cost, which depends on alternative uses of foreign exchange reserves. Prepaying external debt or undertaking public investment projects, for instance, may yield greater returns than placing reserves on short-term risk-free paper.[7] This note applies an optimal reserve model which focuses on insurance against aid and terms-of-trade shocks.

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[5]See for instance Aizenman and Lee (2007) for an investigation of the importance of the mercantilist motive for holding reserves include.

[6]See Frenkel and Jovanovic (1981) and Flood and Marion (2002) for a recent review.

[7]Holding reserves can also induce (1) sterilization costs, when domestic debt is issued to offset the associated increase in money supply—especially if the interest rate for domestic borrowing exceeds the interest rate on reserves; and (2) costs related to balance sheet risks: if the local currency appreciates, the local value of foreign reserves decreases.

3 Evolution of Reserve Holdings in EAC Countries

The EAC countries have accumulated international reserves over the past ten years. A generally favorable international environment and prudent macroeconomic policies have contributed to the accumulation of international reserves in all EAC countries. As for many other EMDCs, and even before the recent Special Drawing Rights (SDR) allocations, the absolute levels of official foreign exchange reserves had reached historical highs in all of these countries (Figures 1–5).

However, relative measures of international reserves provide a more contrasted picture of this reserve accumulation. While the absolute levels of official international reserves have increased, the other traditional metrics used to assess reserve adequacy have sometimes shown a stable or declining trend.

- *Import coverage ratio.* This metric is more relevant for assessing reserve adequacy in countries that have limited access to capital markets and are, therefore, less vulnerable to sudden stops in capital flows. Import coverage ratios are higher now than they were ten years ago in all EAC countries. However, in Kenya, it is only right around the traditional target of three months of imports, and thus, below the EAC objective of an import coverage ratio of four. While it has increased to above six months of imports in Rwanda, Tanzania, and Uganda in the early 2000s, it has decreased since then—though still remaining at comfortable levels. It increased to above six months of imports in Burundi.

- *Reserves relative to broad money.* Money-based indicators of reserve provide a measure of the potential for resident-based capital flight. For example, a sizable money stock in relation to reserves suggests a large potential for out-of-money capital flight, especially if money demand is unstable and there is evidence of a weak banking system. Of course, this metric might be less relevant for EAC countries than for countries that have fully liberalized their capital account. However, as EAC economies further advance their integration into the global economy, monitoring this indicator will become more important. In any case, the broad money coverage ratio for EAC

countries compares favorably with the 2004-07 average for all EMDCs (about 27 percent—see IMF, 2009), suggesting comfortable levels of reserves on the basis of this indicator.

- *Debt-based measures of reserve adequacy.* Reflecting another potential source of pressure on the capital account, reserves are often measured relative to short-term external debt. We chose not to present this indicator for EAC countries, because of the poor quality of short-term external debt data. We note, however, that compared to emerging markets, EAC economies have had limited access to international capital markets, and that a large proportion of their external financing has been obtained on concessional terms, with long maturities. Again, this indicator is likely to become more relevant for EAC countries in the medium-term, as they rely more on international capital markets.

- *Reserves relative to GDP.* Although not one of the traditional metrics for assessing reserve adequacy, we chose to present this variable, as the analysis presented in the following chapter is based on consumption smoothing with results presented in terms of GDP. This indicator has increased in all countries over the past decade but is now under pressure as a result of the global financial crisis.

The global financial crisis has put some downward pressure on reserves in recent months. All EAC countries have been hit by lower external demand for their exports of goods and services and a decline in capital flows. Some have also experienced deteriorating terms of trade. Lower external demand and financing have forced EAC economies to adjust. As a result, a reduction in domestic absorption and growth is at play, and most countries in the region have suffered currency depreciation. In the absence of the SDR allocations, most countries in the region would have experienced declines in international reserves in 2008-09.

This has prompted some countries in the region to request IMF financial support. To help cushion the impact of the global financial crisis on its economy, the IMF Executive Board in May 2009 approved a one-year arrangement for Tanzania under the Exogenous Shock Facility (ESF), with access of 110 percent of quota (SDR 219 million or about US$328 million).[8] It also approved in May 2009 a disbursement of SDR 135 million (or about US$200 million) for Kenya, under the rapid access component of the ESF. Both countries benefited from the doubling of IMF borrowing limits for low-income countries.[9]

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[8]IMF financial support explains most of the discrepancy between gross international reserves and net foreign assets in 2009–10 on Figure 3.

[9]Burundi is implementing a PRGF-supported program, while Rwanda's PRGF expired in August 2009. Uganda is implementing a program under the Policy Support Instrument, a non-financial instrument.

Figure 1. Kenya: Official International Reserves
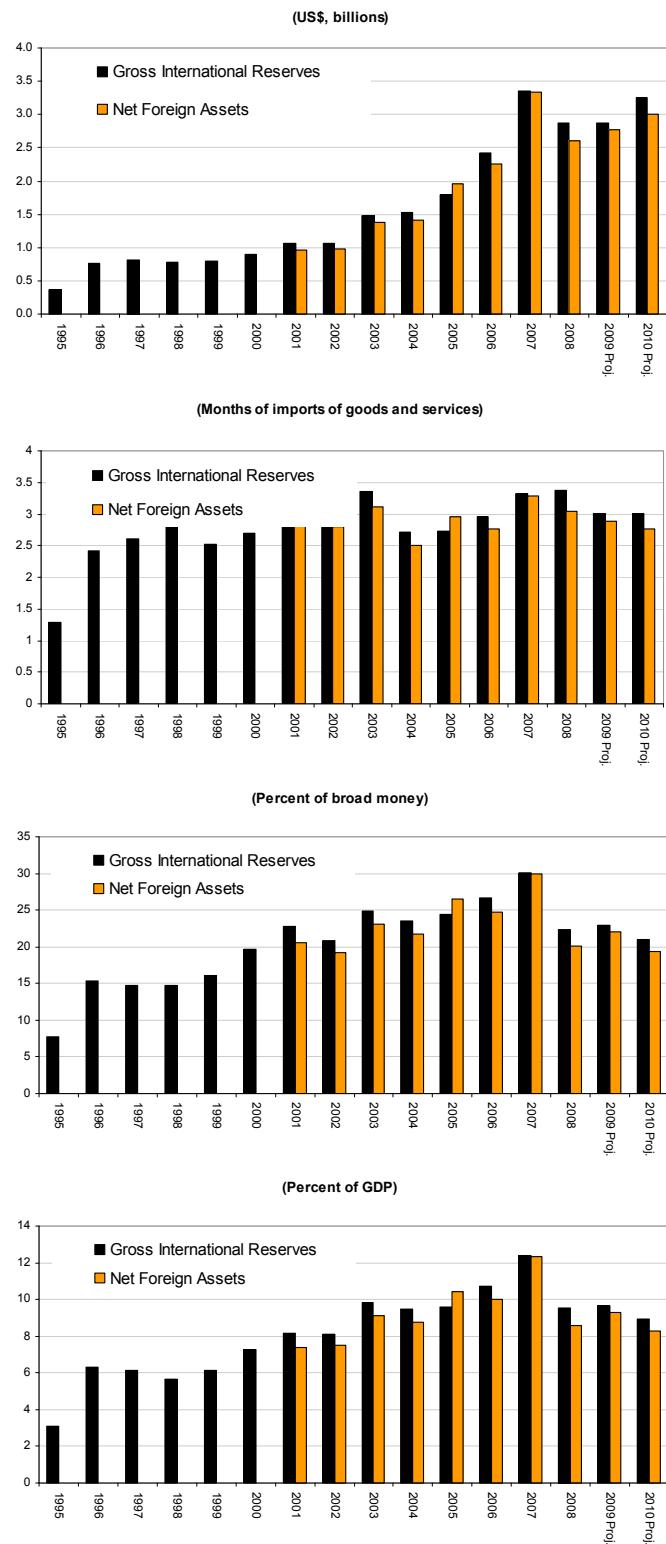
Source: IMF, IFS, *World Economic Outlook*, and IMF staff projections before the SDR allocations.

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Figure 2. Rwanda: Official International Reserves
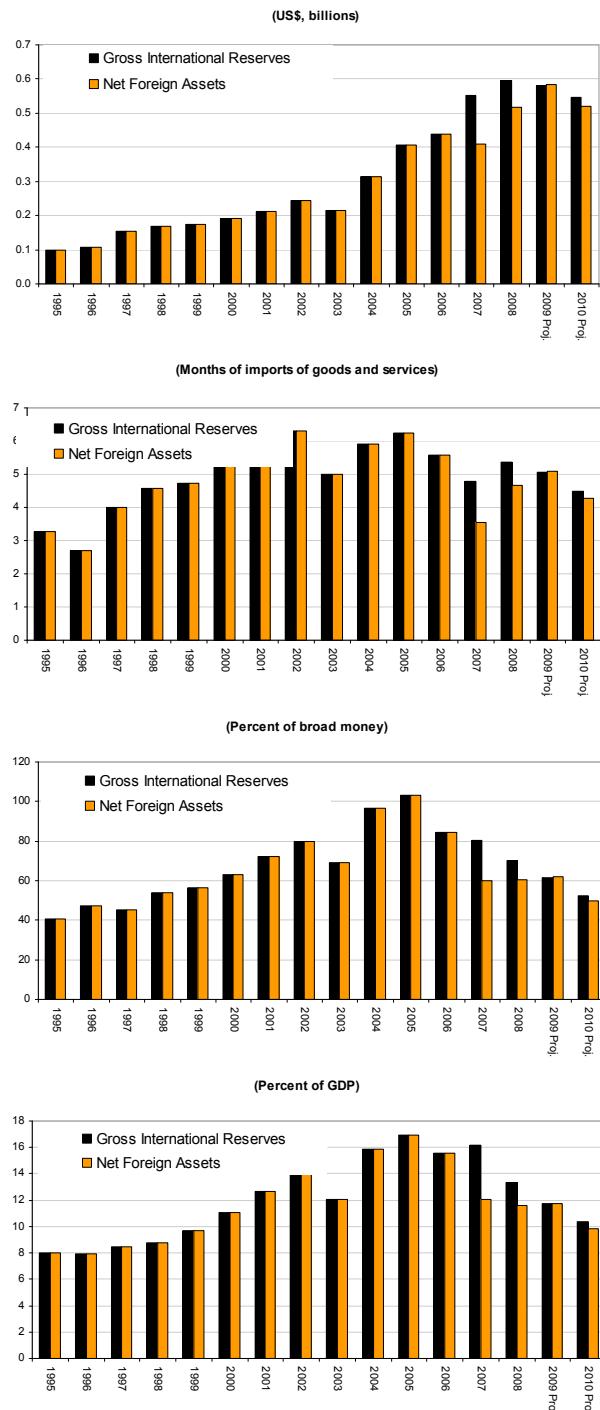
Source: IMF, IFS, *World Economic Outlook*, and IMF staff projections before the SDR allocations.

Figure 3. Tanzania: Official International Reserves
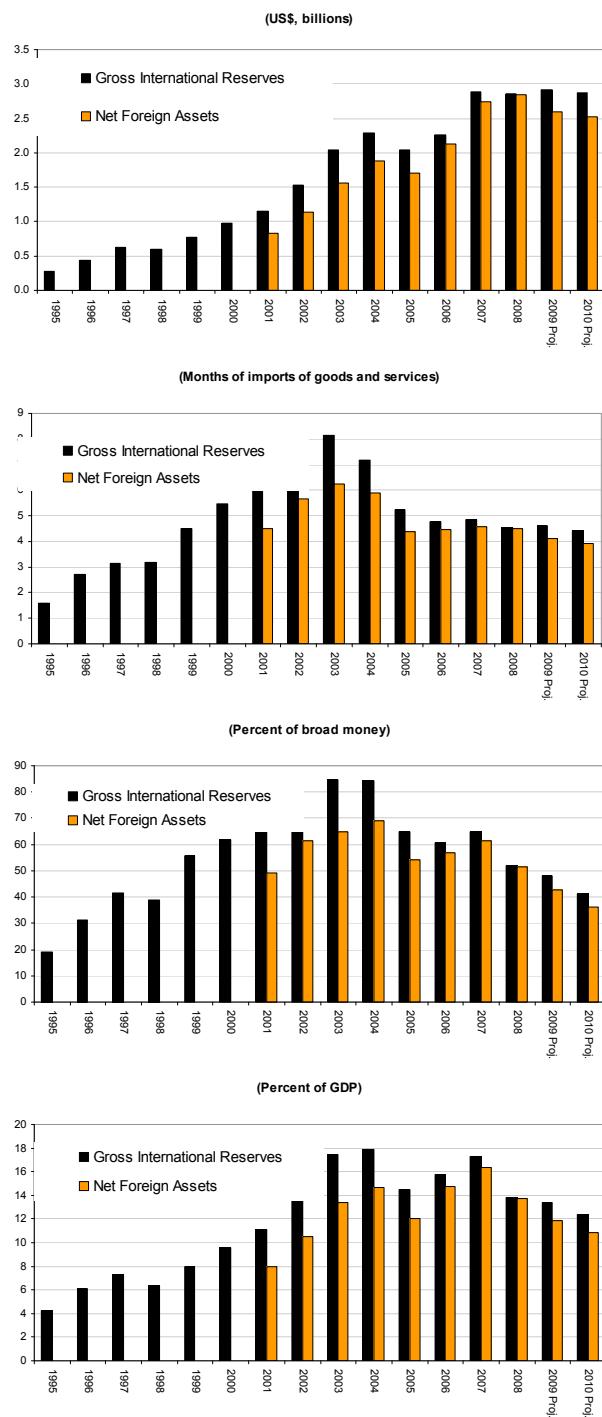
(US$, billions)

(Months of imports of goods and services)

(Percent of broad money)

(Percent of GDP)

Source: IMF, IFS, *World Economic Outlook*, and IMF staff projections before the SDR allocations.

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Figure 4. Uganda: Official International Reserves
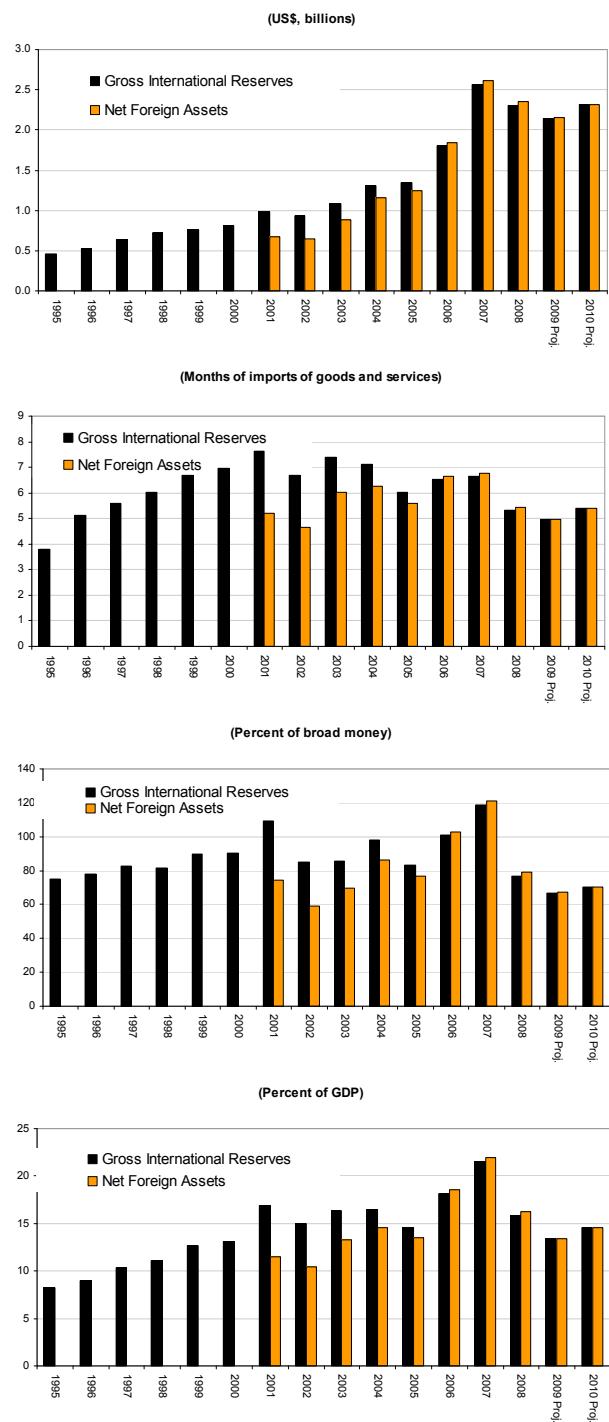
(US$, billions)

(Months of imports of goods and services)

(Percent of broad money)

(Percent of GDP)

Source: IMF, IFS, *World Economic Outlook*, and IMF staff projections before the SDR allocations.

Figure 5. Burundi: Official International Reserves
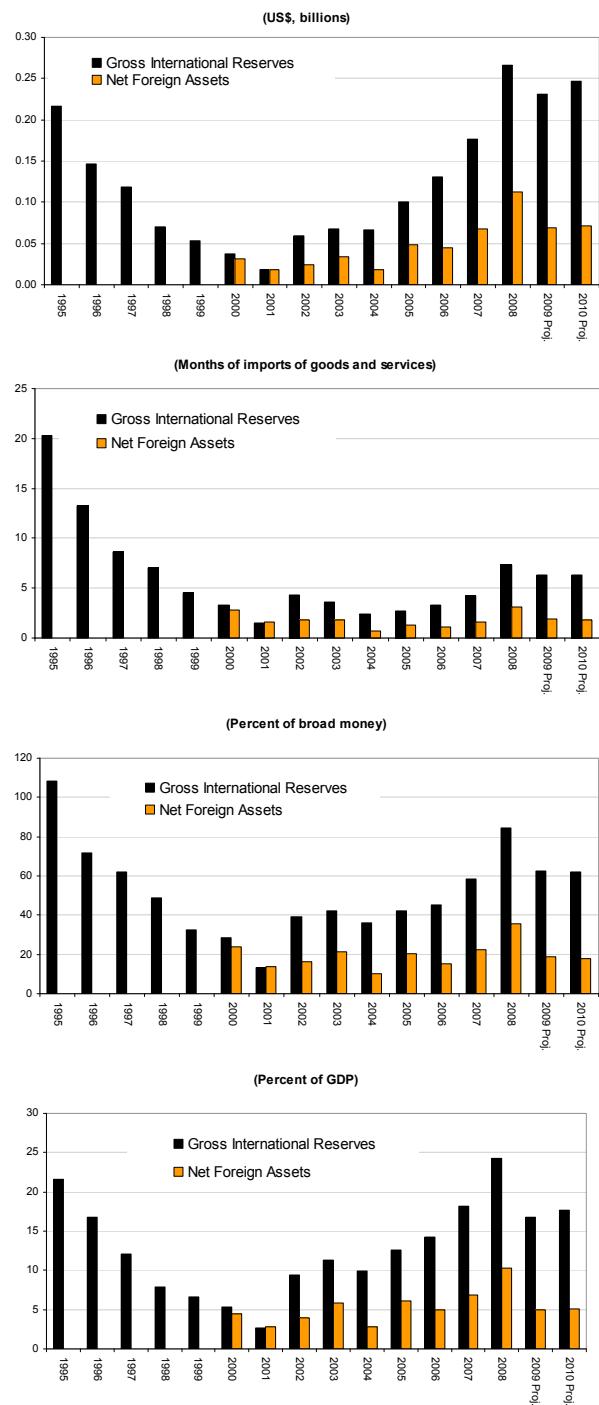

Source: IMF, IFS, *World Economic Outlook*, and IMF staff projections before the SDR allocations.

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Table 1. EAC: Reserve Holdings in 2009 (end-of-period)[1]

	Billions of U.S. Dollars	Months of Imports	Percent of Broad Money	Percent of GDP
Burundi	0.2	6.3	62.5	16.8
Kenya	2.9	3.0	23.0	9.7
Rwanda	0.6	5.1	61.6	11.7
Tanzania	2.9	4.6	48.0	13.4
Uganda	2.1	5.0	66.8	13.4

Source: IMF, IFS, *World Economic Outlook*, and IMF staff projections.

[1]Before the SDR allocations.

The SDR allocations have been a welcome development in the face of the crisis. A general allocation of SDRs equivalent to about US$250 billion became effective on August 28, 2009. The general SDR allocation was made to IMF members that are participants in the Special Drawing Rights Department in proportion to their existing quotas in the Fund. Separately, the Fourth Amendment to the IMF Articles of Agreement provided for a special one-time allocation of SDR 21.5 billion. The special allocation was made to IMF members on September 9, 2009. The impact of this allocation on reserve levels has been relatively modest for most EAC countries: Tanzania, Rwanda, Uganda, and Kenya have seen their reserve holdings increase by a modest average half month of imports. Burundi, however, benefited from a dramatic increase of its reserves (Table 2).[10]

Another way to assess the adequacy of the current levels of reserve in the region is to compare them with the size of potential shocks. With substantial risks to macroeconomic stability emanating from external trade and aid shocks, a measure of reserves compared to the size of these shocks is a useful indicator of reserve adequacy. Two key results stand out for the EAC countries:

- Even before the SDR allocations, projected reserve holdings at end-2009 are generally consistent with the reserve coverage that would be needed to accommodate large annual shocks (Figures 6–7; EAC countries are indicated with an arrow). Rwanda is the sole exception if we consider the largest aid shock since 1990.

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[10]Following several years of conflict, Burundi's quota has become out of line with its economic fundamentals (i.e. overstated compared to the underlying calculated quota).

Table 2. EAC Countries: Impact of SDR Allocation on International Reserves
(In millions of SDRs, otherwise indicated)

	Quota	General SDR Allocation[1]	Special SDR Allocation[2]	Total	Total[3]		
					In millions of USDs	Months of Imports	Percent of GDP
Burundi	77.0	57.1	3.1	60.2	94.2	2.6	6.8
Kenya	271.4	201.2	21.5	222.7	348.5	0.4	1.2
Rwanda	80.1	59.4	3.7	63.1	98.8	0.9	2.0
Tanzania	198.9	147.4	11.7	159.1	249.0	0.4	1.1
Uganda	180.5	133.8	9.9	143.7	224.9	0.5	1.4

Source: IMF Finance Department.

[1]The general allocation of 74 percent of quotas took place on August 28, 2009.

[2]Provided under the Fourth Amendment of the Articles of Agreement; took place on September 9, 2009.

[3]Based on USD/SDR exchange rate of 1.565 on August 21, 2009.

Figure 6: Reserve Coverage and Annual Terms-of-Trade Shocks[1]

Largest TOT shock since 1990
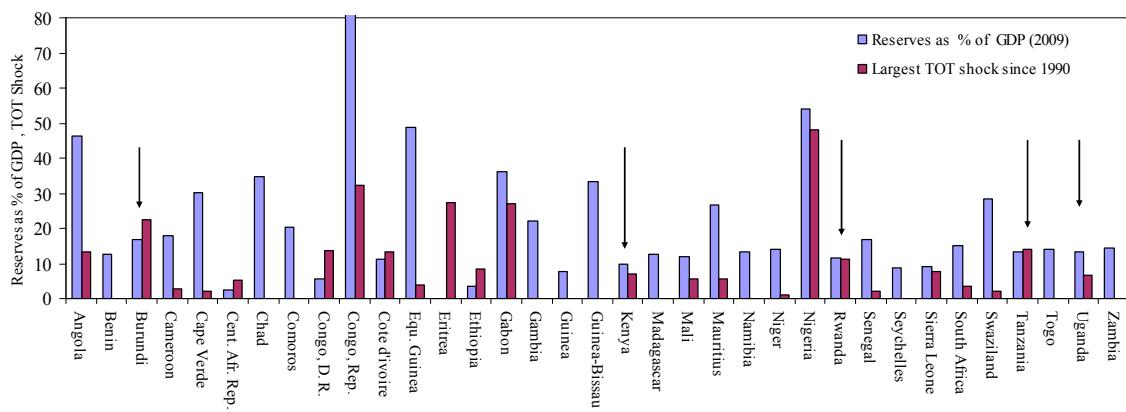
Terms of Trade Coverage—75 Percent of Shocks
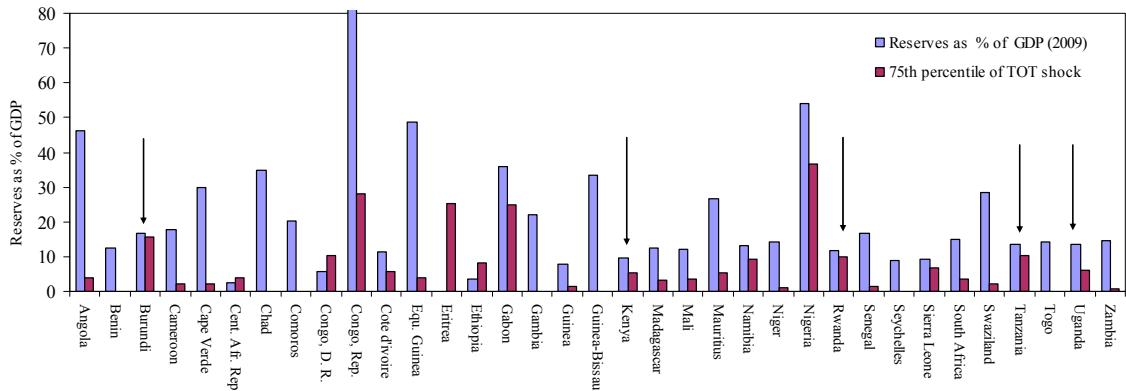
[1]The impact of the shocks is measured as the decline in net exports (in percent of GDP) resulting from lower terms-of-trade.

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Figure 7. Reserve Coverage and Annual Aid Shocks[1]

Largest aid shock since 1990

Aid Coverage—75 percent of shocks
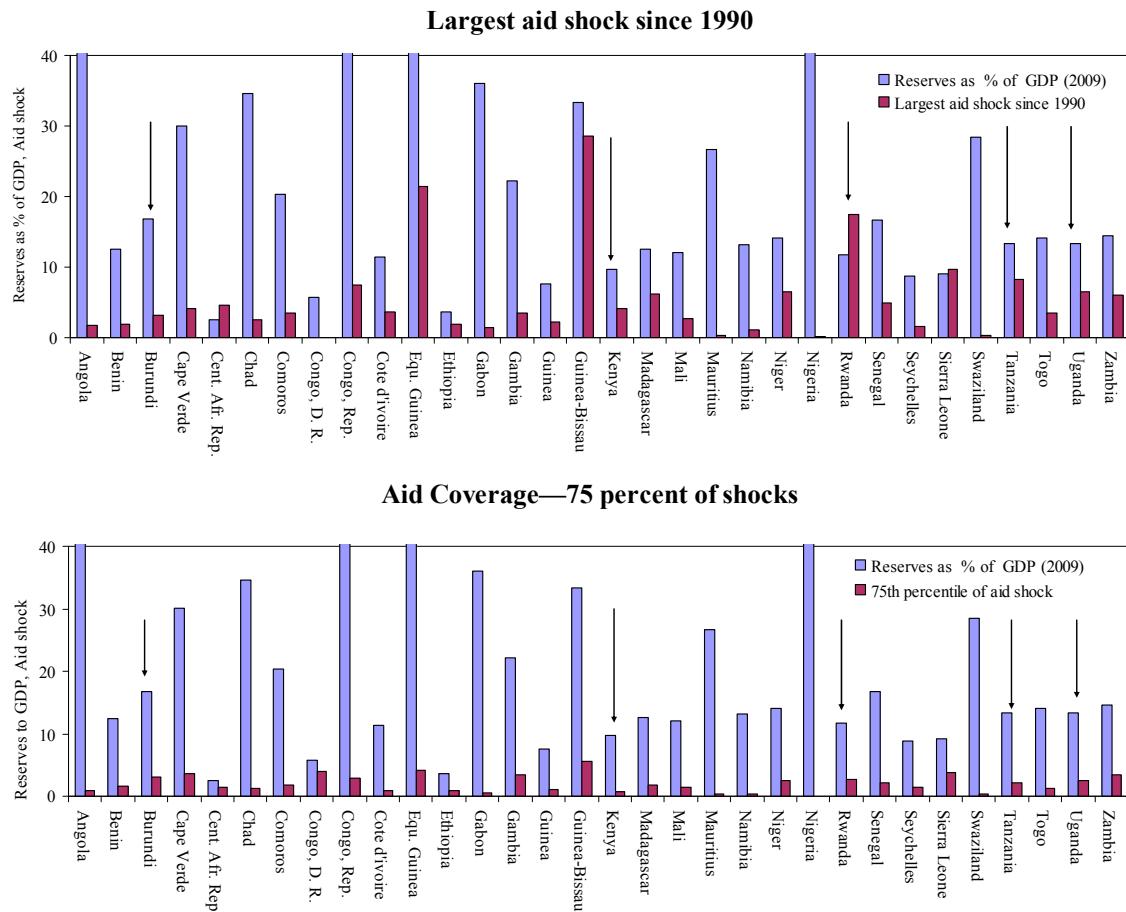
[1]The impact of the shocks is measured as the decline in net aid flows (in percent of GDP).

- However, the reserve coverage at end-2009 would generally not be sufficient to accommodate more persistent shocks for countries in the EAC. The only exceptions are Uganda, Burundi, and Kenya in the case of aid shocks. Figures 8 and 9 contrast actual reserve holdings and the reserve coverage that would be needed to accommodate three-year shocks.[11] Even in countries where the amount of reserves would seem sufficient to cover the largest annual trade shocks, the persistence of shocks considerably raises the needed reserve threshold.[12]

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[11]Three-year shocks are defined as the difference between three year non-overlapping sums of terms of trade and aid flows.

[12]This note does not suggest that reserves should be held to absorb permanent shocks, which would require adjustment in relative prices, but rather highlights the risks of more persistent temporary shocks, which may also require some policy adjustments.

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Figure 8. Reserve Coverage with Persistent Terms-of-Trade Shocks[1]

Largest 3 year TOT shock since 1990

Three Year TOT Coverage—75 percent of shocks
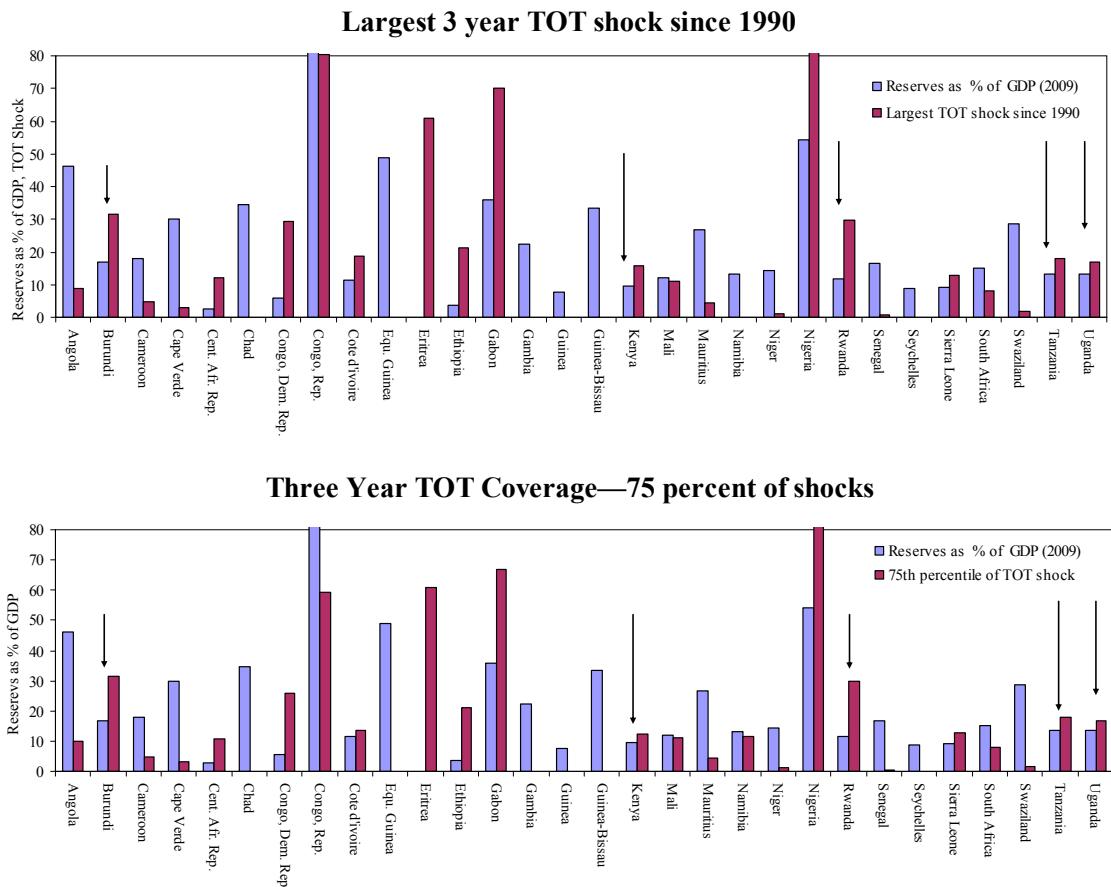
[1]The impact of a three-year shock is measured as the decline in net exports—resulting from a decline in terms-of-trade—in the past three years (i.e., *t*–1, *t*–2, and *t*–3) compared to the preceding three years (i.e., *t*–4, *t*–5, and *t*–6).

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Figure 9: Reserve Coverage with Persistent Aid Shocks[1]

Largest 3-year aid shock since 1990

Three-year aid coverage—75 percent of shocks
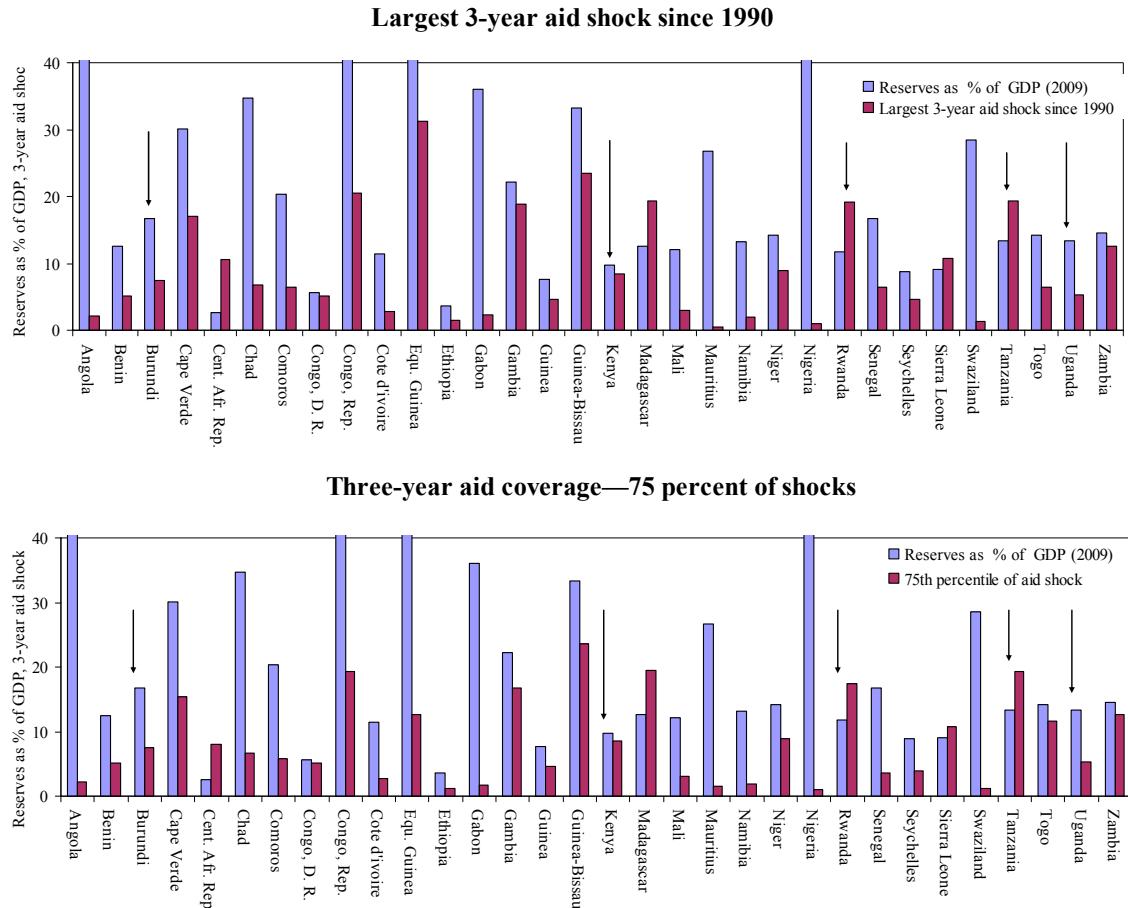
[1]The impact of a three-year shock is measured as the decline in net aid flows in the past three years (i.e., t–1, t–2, and t–3) compared to the preceding three years (i.e., t–4, t–5, and t–6).

4

Optimal Reserve Model

To complement the analysis, this chapter applies an optimal reserve model to assess the adequacy of reserves in EAC countries. While most optimal reserve models focus on the risk of sudden stops in capital flows, some of them address insurance against other types of shocks. Barnichon (2008) for instance develops a model of insurance against external shocks such as natural disasters or terms-of-trade shocks. In this note, we apply the Drummond and Dhasmana (2008) model. The latter extends the Jeanne and Rancière (2006) model to account for risks related to aid and terms-of-trade shocks, which are likely to be the main sources of balance of payment disruptions in sub-Saharan African countries. As for any modeling approach, optimal reserve models have a number of weaknesses (see Chapter 5). However, its main advantage—compared to that of focusing on the indicators used in the preceding chapter—is to be based on a micro-founded optimization framework. We use the Drummond and Dhasmana (2008) two-good model of self-insurance against terms-of-trade and aids shocks. In this model, the optimal level of reserves is the one that maximizes the consumption-smoothing benefits of holding reserves taking into account the related cost.

In this model, the optimal reserve level depends on several parameters. On one hand, an increase in the degree of risk aversion, the size and incidence of terms-of-trade and aid shocks, and the output cost of these shocks tend to push the desired or optimal reserve level up, as they increase the benefits of smoothing consumption in the face of these shocks. On the other hand, a higher risk premium makes it more costly to hold reserves and thus reduces the optimal level. A higher short-term debt also increases the optimal reserve level, as terms-of-trade and aid shocks are always accompanied by sudden stops of capitals in this model. The model does not allow for a closed-form analytical solution. Numerical techniques are used to solve for the optimal reserve level as a function of output. The results of simulations also depend on a number of parameters related to the structure of the economy, such as the shares of imports in consumption, potential growth, or the level of the risk-free rate.

We simulate reserve holdings in light of likely terms-of-trade and aid shocks, using a combination of country-specific and common parameters. The model is calibrated based on a sample of 44 sub-Saharan African countries, using data from 1980-2007. We use this data set to estimate the probability and sizes of terms-of-trade and aid shocks. The probability of a shock is simply the number of shock events during 1980-2007 divided by the total number of years for each country. Output cost of terms-of-trade and aid shocks were calibrated based on the impulse responses.[13] The probability of terms-of-trade and aid shocks, the ratio of short-term debt to GDP, and the shares of imports in consumption are allowed to vary across countries. The risk-free short-term rate of return was set at 5 percent for all countries—the average U.S. federal funds rate during 1987-2005. The term premium, which we use as an estimate of the cost of holding reserves, was set at 1½ percent for all countries—similar to the value used by Jeanne and Rancière (2006). The degree of risk aversion and output cost are also assumed to be common parameters.

Contrasting optimal reserve holdings with actual holdings of EAC countries at end-2009 suggests that EAC countries carry some buffer compared to the model-based optimal level. In Figure 10, the broken line is the 45-degree line, which identifies countries holding an actual reserve level equal to the optimal for them. EAC countries compare favorably with several other sub-Saharan African countries, which hold fewer reserves than suggested by the model of optimal holdings (countries to the left of the 45-degree line).

However, these results should be interpreted with caution. While the use of a small open economy two-goods model allows us to simulate the optimal level of reserves across a broad spectrum of shocks and output costs, the "optimal level" of reserves is sensitive to the choice of key parameters such as the risk aversion, the term premium, and the probability of shocks. Figure 10 provides the simulation results under a particular set of parameters.

The simulation results are highly sensitive to the assumptions made about the size and the probability associated with the external shocks. As per the figure, we plot the actual reserve to GDP ratio for sub-Saharan African countries at the end of year 2009 along with the optimal level determined by our model for alternative values of key parameters. Figure 11 shows the sensitivity of optimal reserves to the probability of terms-of-trade shocks. The average probability of terms-of-trade shocks was set at 2 percent to simulate optimal reserve levels for sub-Saharan African countries (the average of which is

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[13]The average size of terms-of-trade shocks across countries was about 21 percent, while that of an aid shock was 1.8 percent (4-5 percent of GDP).

Figure 10: Optimal Reserves Panel[1]

Reserve Adequecy for African Countries Using Two-Good Model
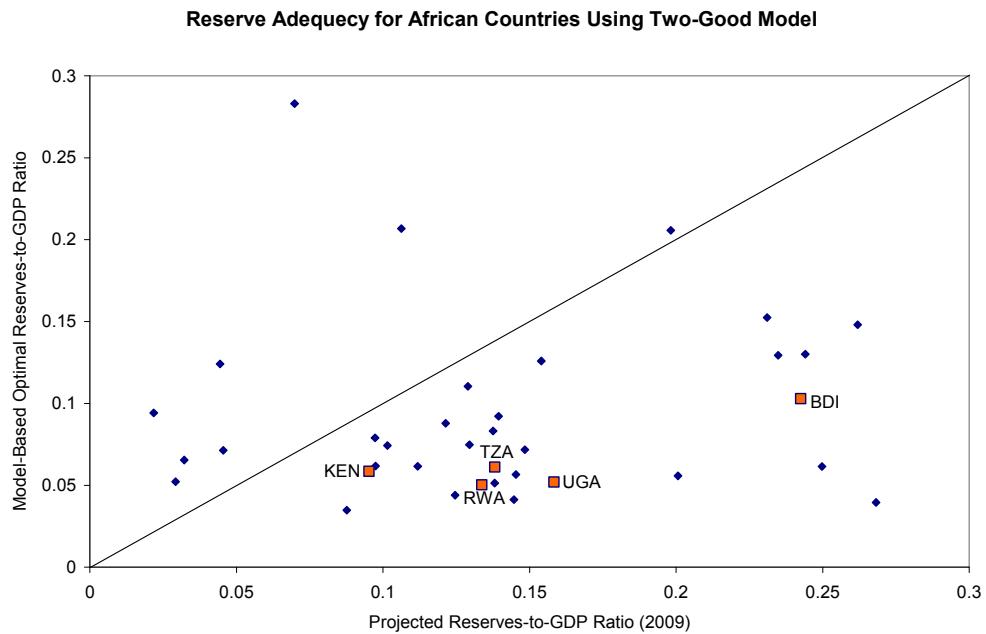
[1]Being right of the 45-degree line implies that the projected reserve level at end-2009 (excluding the SDR allocations) is higher than the level predicted by the model.

Figure 11. Sensitivity of Optimal Reserves to Probability of Terms-of-Trade Shocks

Optimal Reserves Probability of Terms of Trade Shocks
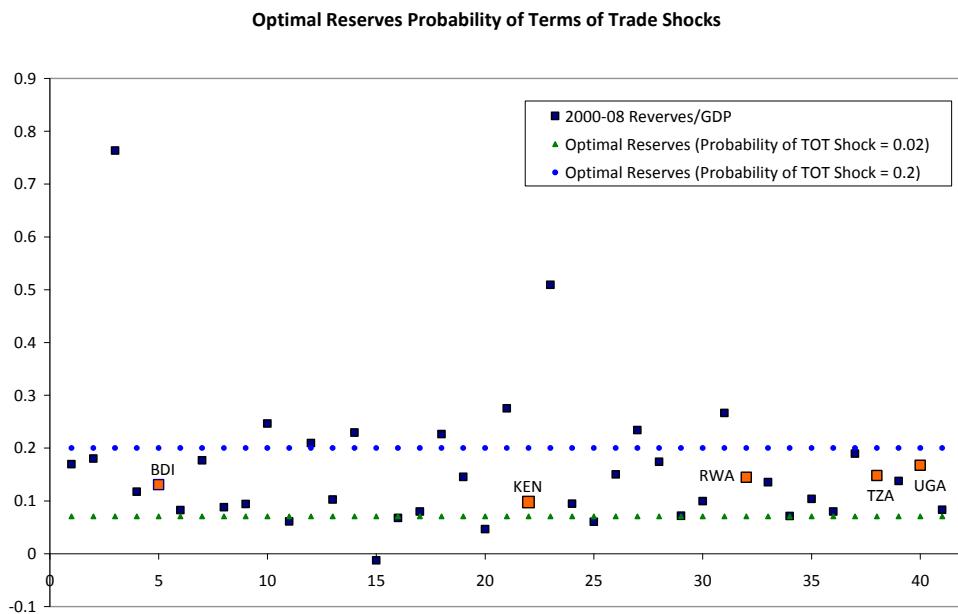
Source: IMF staff, *Regional Economic Outlook.*

Figure 12. Sensitivity of Optimal Reserves to Size of Terms-of-Trade Shocks

Optimal Reserves Size of Terms of Trade Shocks
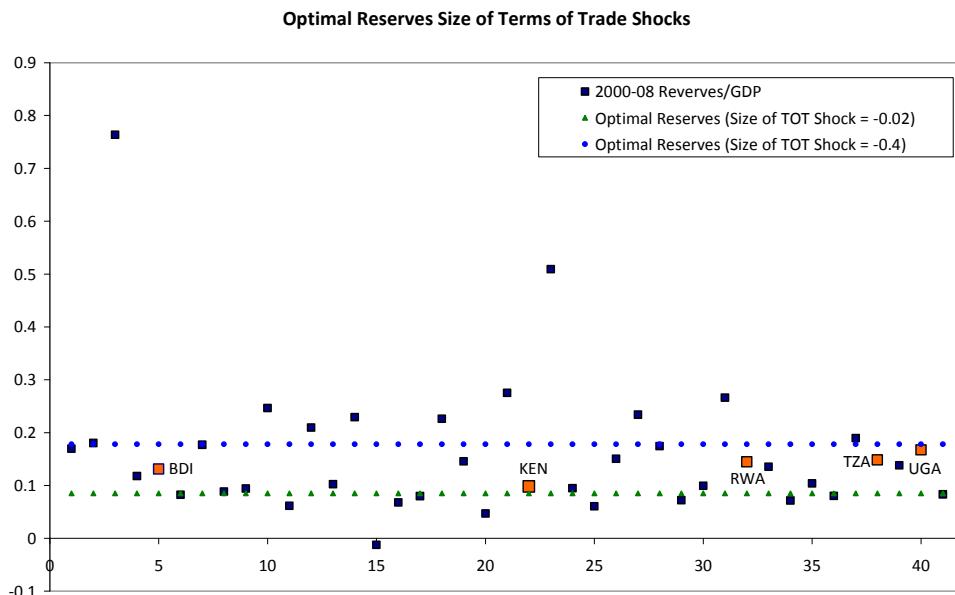
Source: IMF staff, *Regional Economic Outllok.*

indicated by the green line). If it were set at 20 percent, however, actual reserve levels in most cases would have fallen short of optimal levels (the average of which is indicated by the blue line). Figure 12 shows the sensitivity of optimal reserves to the size of terms-of-trade shocks.

The simulation results are also highly sensitive to other key assumptions. Figure 13 shows sensitivity of optimal reserves to assumptions regarding the term premium. The term premium, which reflects the cost of holding reserves, was set at 1.5 percent to simulate optimal reserve levels for sub-Saharan African countries (the average of which is indicated by the green line). If it were set at 5 percent, however, actual reserve levels in most cases would have fallen short of optimal levels (the average of which is indicated by the blue line). Finally, Figure 14 shows sensitivity of optimal reserves to assumptions on the size of output loss due to exogenous shocks.

Clearly, the choice of the probability parameter makes a significant difference in terms of determining whether a country has adequate reserves or not. The same holds true for the size and output cost associated with a terms-of-trade shock and the size of the term premium. Similar results arise for aid: for countries with a much greater dependence on aid (either for consumption or for investment), the choice of optimal reserve level is likely to be sensitive to the size, probability, and output cost of aid shock. For the EAC countries,

Figure 13. Sensitivity of Optimal Reserves to Term Premium

Optimal Reserves—Term Premium
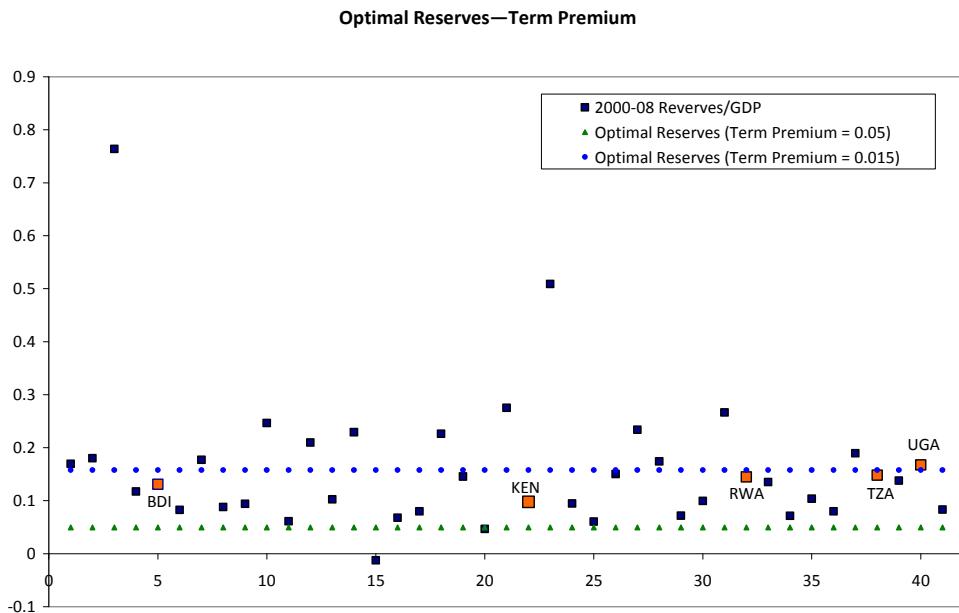
Source: IMF staff, *Regional Economic Outllok.*

Figure 14. Sensitivity of Optimal Reserves to Size of Output Loss

Optimal Reserves Size of Output Loss
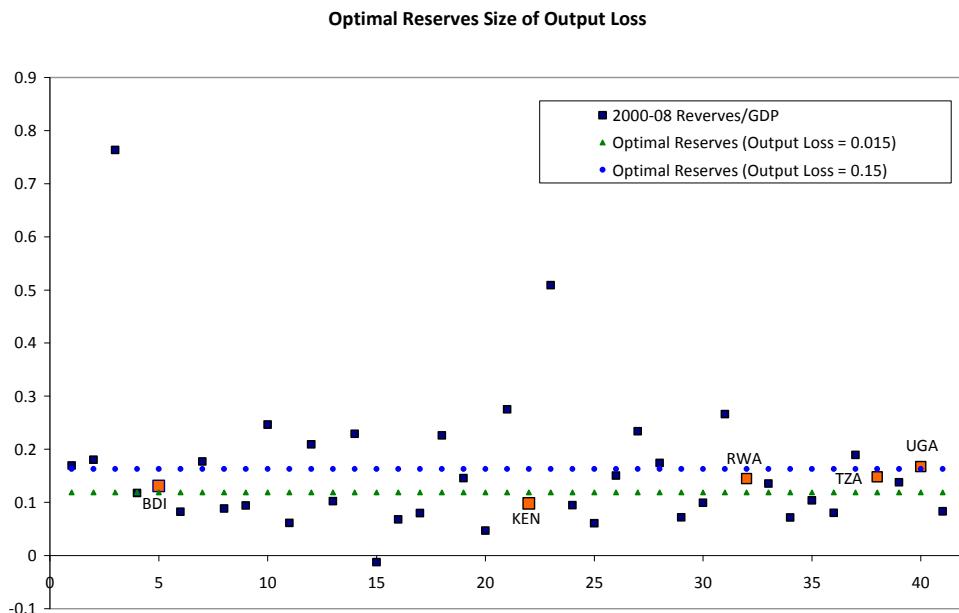
Source: IMF staff, *Regional Economic Outllok.*

while current holdings of foreign reserves would seem sufficient to cover the size and probability of shocks that have been observed in historical samples, they could easily prove not to be enough if the probability, size, and/or cost of shocks were to be higher experienced historically. This is consistent with findings in Chapter 2 that current reserves levels would in most cases not be sufficient in case of persistent socks. Arguably, in this case, the choice of how much reserves to hold should aim to strike a balance between costs of holding reserves and how much protection against adverse shocks policymakers wish to obtain.

5

Conclusions and Medium-Term Outlook

The analysis here suggests that reserve levels in EAC countries include safety buffers, and thus, do not require immediate action. Most indicators used for the analysis indicate that projected reserves at end-2009 would be relatively comfortable, even excluding the recent SDR allocations. This suggests that there could be room in these countries to use part of the SDR allocations, by drawing down reserves up to their pre-allocation levels.[14]

However, consideration should also be given to the fact that the situation could become tighter if export recovery is delayed or export prices do not pick up. The analysis shows that higher reserve holdings would be necessary in case of persistent shocks.

However, it should also be noted that all the metrics used for this analysis present a number of caveats. They leave many key considerations out. Inevitably, then, their application requires judgment.

- As noted in Chapter 2, the standard metrics used here are not based on solid microeconomic foundations. They are applied uniformly across countries, irrespective of their economic structures and susceptibility to shocks.

- The analysis in terms of coverage of terms-of-trade and aid shocks takes into account the susceptibility of the economies to shocks but does not formally take into account the likelihood of shocks. Nor does it relate the structure of the economy to the characteristics of shocks and the optimal level of reserve.

- The proposed optimal reserve model addresses some of these issues but is very sensitive to the parameters used, raising the question of its usefulness for policymaking. Countries' preferences regarding the

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[14]For instance, the SDR allocation may allow for larger fiscal deficits and/or greater use of reserves for budgetary financing, especially where fiscal financing constraints are binding. The SDR allocation could also support countercyclical monetary policies and help limit excessive exchange rate adjustment.

extent of adjustment or the desirability of holding costly reserves are difficult to quantify. A high level of reserve holdings might also reflect a higher degree of risk aversion, reflecting past crisis episodes.

- It does not take into account all the shocks to which EAC economies could be susceptible. For instance, most countries in the region are also sensitive to shocks to remittance and tourism receipts. If these shocks are not correlated to the main shocks—those already accounted for—then the level of reserves necessary to be insured against the main shocks is likely to be sufficient. If, however, they are correlated, not taking them into account could lead to an underestimation of the optimal reserve level. Recent evidence suggests that terms-of-trade shocks and sudden capital flow reversals are likely to take place at the same time as drops in remittances and tourism flows. Aid shocks do not seem to be correlated.

- These approaches do not take into account the cost or desirability of adjustment in a comprehensive manner. For instance, a specific level of reserves may be adequate when alternative sources of financing exist or adjustment can be quickly attained. The same level of reserves may not be adequate if there are no alternative sources of financing, a reluctance to use the exchange rate instrument, and/or a reluctance or inability to correct a current account deficit. Among EAC countries, for instance, exchange rate regimes vary substantially across countries, with at one end Kenya and Uganda with very flexible regimes and at the other end Rwanda with a more rigid regime. In addition, balance sheet weaknesses may constrain the authorities' ability to let the exchange rate adjust.

- They do not account for all aspects of the structure of these economies. While the vulnerability related to the level of short-term debt is accounted for in the Drummond and Dhasmana (2008) model, a number of economic characteristics can amplify the impact of adverse shocks and render a country crisis-prone in the event of a shock. These include stock imbalances due to maturity, currency, and interest-rate mismatches and high leverages in public and private sector balance sheets.

- These approaches do not take into account the fact that reserves are also held to foster confidence in the government's policy framework and to reduce the likelihood of crisis and sudden stops. They also ignore asymmetric behaviors, such as over-insurance on the part of countries that can afford it.

- Finally, all these approaches are fundamentally backward-looking. The parameters related to the shocks are estimated based on crisis history in a panel of or a particular country. At the same time, the structure of the economy is assessed at one particular point in time.

Looking at reserve adequacy in a forward-looking manner is very important, as the EAC economies are likely to undergo substantial structural transformation in the not-so-distant future. The impact of these structural changes on the desirability of holding international reserves would be an interesting topic for future research work. They include for instance:

- *Further integration into the world economy.* As the EAC countries continue to implement reforms aimed at reaping the benefits of more integration into the world economy, either through enhanced trade or by liberalizing capital account transactions—Tanzania, for instance, is likely to further liberalize capital account operations in the coming years—the economy is also likely to become more susceptible to the global economic environment. Higher reserve levels may then be useful to guard against more pronounced external shocks.

- *The adoption of a common currency.* The EAC aims at achieving a monetary union in 2012. Two questions can be asked:

  ➢ What would be the appropriate level of pooled reserves for the region under a common currency? This would probably depend on (1) the policy framework, including the regional exchange rate regime—the more flexible the exchange rate, the less reserves would be needed—and (2) susceptibility of the monetary zone to shocks—degree of openness to world trade and capital flows. As regional integration—and intraregional trade in particular—increases, the region might become less vulnerable to external shocks.

  ➢ What would be the appropriate level of reserves in the transition period? Again, this would depend on the policy framework chosen, in particular the exchange rate mechanism. Countries might want to over-insure themselves in the period and hold more reserves to boost credibility and defend the viability of the union an exchange rate mechanism.

Finally, the reforms implemented at the IMF this year could also have a significant impact on the desirability of holding large stocks of reserves. By significantly increasing access limits for low-income countries, the IMF is adding to the level of reserves readily available to low-income countries in case of shocks, therefore reducing the need for self-insurance against these shocks. At the same time, the reduction in interest rates on Poverty Reduction Guarantee Fund (PRGF) resources increases explicitly the opportunity cost of holding reserves. In addition, by reducing the stigma attached to an IMF program, the streamlining of IMF conditionality is likely to reduce the implicit cost of accessing IMF resources and further reduce the need for self-insurance.

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