

2017

# Monetary Policy In Tanzania: Accomplishments And The Road Ahead

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## Recommended Citation

P. J. Kessy, J. Nyella, and Stephen A. O'Connell. (2017). "Monetary Policy In Tanzania: Accomplishments And The Road Ahead". *Tanzania: The Path To Prosperity*. Volume 3, 241-270.  
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## Monetary Policy in Tanzania

### Accomplishments and the Road Ahead

*Pantaleo J. Kessy, Johnson Nyella, and Stephen A. O'Connell*

The reserve-money programming framework that has successfully guided monetary policy in Tanzania over the past two decades is on the cusp of what is arguably its first major change—a transition from monetary aggregates to interest rates as the operational target of policy, in the context of taking on many of the core elements of inflation targeting. We focus in this chapter on the road ahead and the issues the Bank of Tanzania (BoT) will confront as it makes this transition. Our focus throughout will be on the conduct of national monetary policy, noting that the BoT's direction of travel is fully consistent with the convergence process towards East African Monetary Union.

Our central argument is that the BoT is continuing to evolve towards a modern system of what Bernanke and Mishkin (1997) called constrained discretion, in which monetary policy provides a strong anchor for inflation expectations while also performing a role in stabilizing the real economy. We will argue that a clearer focus on interest rates can improve the transparency of policy and strengthen the BoT's leverage over inflation—and also that it can enhance the development of the financial sector, a key secondary objective of monetary policy in Tanzania. We begin, however, with the origins of the current system and the sources of its success to date.

#### 11.1 The Monetary/Fiscal Accord of the Mid-1990s

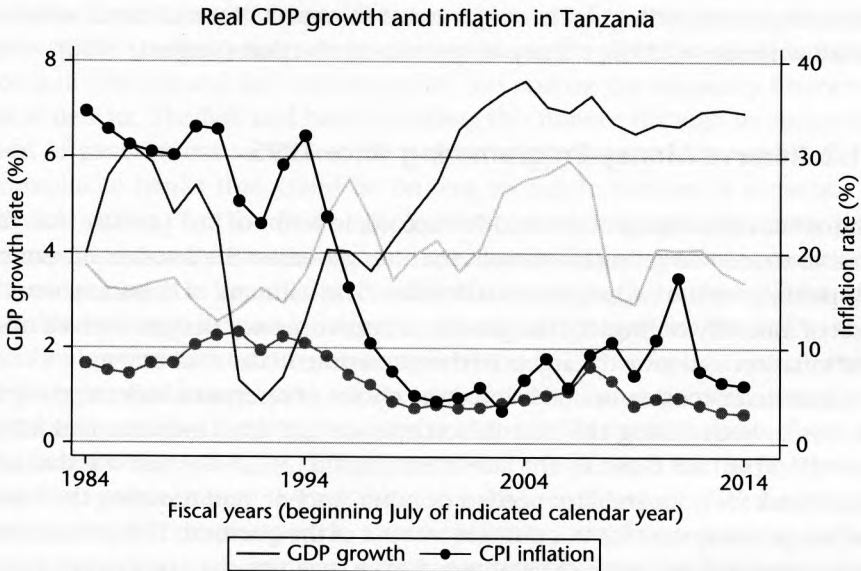
The current framework for monetary policy dates from the fiscal and legislative reforms of the mid-1990s. By the early 1990s, a decade of market-based reforms had restored the role of market prices throughout the economy, including the

exchange rate and interest rates (Chapter 2, this volume). Exchange controls had been eliminated for current account transactions, privatization of the banking sector was underway, and the government bond market was being developed. A situation of *fiscal dominance* nonetheless persisted, in which the banking system and the central bank were obliged to finance any public-sector spending not covered by tax revenues or foreign grants. Domestic financing therefore ballooned when the government's commitment to revenue mobilization and expenditure control slackened in the early 1990s and conflict with external donors emerged (Mpango, 2002).

The Bank of Tanzania was operating at that time under the 1978 Amendments to the Bank of Tanzania Act, which obliged the Bank to support the development priorities of the government (Appendix Table 11A.1 shows the relevant provisions). Market-based reforms and privatization of the banking system had allowed the BoT to retreat from the wide range of quasi-fiscal roles it had assumed in the long wake of the Arusha Declaration,<sup>1</sup> but the BoT arguably had neither the mandate nor the political independence in the early 1990s to contain inflation in the face of large fiscal deficits. To do so would have required holding back overall money growth, which would have required a sharp and costly contraction in bank lending to the private sector. What was needed to bring down inflation at a tolerable cost to the economy—and to open the space for a monetary policy capable of delivering price stability on an ongoing basis—was an accord that would lock in fiscal discipline in the near term while placing the BoT at arm's length from future demands for excessive monetary finance.

The key elements of the accord that emerged in Tanzania in the mid-1990s were an explicit acknowledgment, at the highest levels of government, that inflation was being driven by the monetary finance of fiscal deficits; an International Monetary Fund (IMF)-supported agreement that directly prevented monetary finance by imposing a monthly cash budget on the spending ministries; and a new Bank of Tanzania Act (1995) that bolstered the institutional independence of the BoT.<sup>2</sup>

Section 5.3 of the BoT Act of 1995 elevated price stability to unambiguous status as the chief objective of monetary policy in Tanzania. The increased clarity that this conferred may have made little difference at first to the disinflation that got underway in 1995/96; and on paper, the BoT's capability to pursue its mandate appeared to be undermined by a passage in the 1995 Act—never activated, and eliminated in the Bank of Tanzania Act of 2006—that authorized the Minister of Finance to conduct monetary policy unilaterally for a period of up to a year in the event of 'irreconcilable disagreement' with the Board of the Central Bank (see Appendix Table 11A.1). But the cost of that disinflation to the aggregate real economy—looking at Figure 11.1—appears to have been extremely mild. By comparison with the growth that was taking



Grey lines show average growth and median inflation for 114 emerging/developing countries.

**Figure 11.1.** Inflation and growth in Tanzania, 1984/85–2014/15

Source: BoT and IMF October 2015 World Economic Outlook database online.

place in other developing countries, Tanzania’s cost was centred in 1996/97, when growth was unchanged in Tanzania while it rose in other countries, and completely absent by 1997/98, when Tanzania’s GDP growth rate did fall by a small amount, but by less than that in the rest of the developing world.

The buoyancy of Tanzania’s real economy in the face of a concerted money-based disinflation is at odds with the typical experience in emerging-market economies, where stabilizations accomplished through tight monetary policy have been associated with a demand-driven recession as high interest rates take a toll on aggregate demand (Calvo and Vegh, 1999). Tanzania’s milder experience may reflect the prevalence of flexible prices in Tanzania’s large agricultural and urban informal sectors, along with the impact of direct government controls over some influential prices (e.g., for public utilities) and wages (e.g., in the public sector)—these factors may have facilitated rapid disinflation without requiring a major contraction in aggregate demand. Structural reforms helped to reduce inflationary pressures from the supply side (Chapter 2, this volume), and donor inflows softened the underlying fiscal adjustment. But the low aggregate cost of Tanzania’s disinflation is also consistent with a favourable credibility effect. In this interpretation, participants in the economy interpreted the multifaceted accord as a durable change in the fiscal and monetary policy regime, and adjusted their inflationary

expectations accordingly. This adjustment in expectations allowed inflation to fall without requiring a sharp economic contraction (Sargent, 1982).

## 11.2 Reserve-Money Programming since 1995

The operational legacy of the mid-90s accord, in terms of BoT practice, was the reserve-money-targeting framework that has governed the conduct of monetary policy over the two subsequent decades. The hallmark of this framework is a set of monthly ceilings for the growth in reserve money that are derived from the inflation and growth targets in the government's annual budget.

Three main considerations favored the choice of reserve-money targeting in Tanzania, both during the disinflation episode and after inflation had fallen into the 5 per cent range by the late 1990s (Figure 11.1).<sup>3</sup> The first was that any framework for price stability needs a nominal anchor, and restoring the fixed-exchange rate system for this purpose was out of the question. The government was committed to a market-determined exchange rate, having laboured over much of the previous decade to dismantle the highly distorting exchange-control regime that had emerged from the balance-of-payments crises of the 1970s. So the system would need a different nominal anchor.

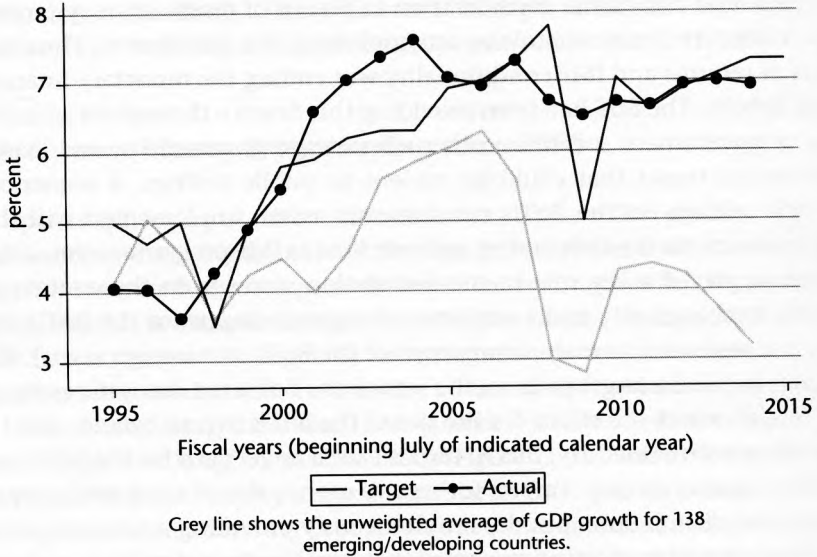
Inflation itself had emerged as a possible nominal anchor in the formal inflation-targeting (IT) system introduced by the Reserve Bank of New Zealand in 1989. The Reserve Bank's framework combined an explicit numerical range for inflation with new standards of communication, transparency, and independence in central bank practice. But as of the mid-1990s, IT was regarded as an option limited to countries with well-developed financial markets and high-quality data, and with established traditions of fiscal discipline. The main alternative to the exchange rate among developing countries—and the natural choice for the BoT—was the path of a broad monetary aggregate like M2.<sup>4</sup>

Given a monetary aggregate as nominal anchor, a second decisive feature favoring reserve-money targeting was the rudimentary condition of Tanzanian financial markets. In a well-developed financial market, a central bank can pursue a broad monetary aggregate using either a short-term interest rate or some variant of reserve money as its operating target.<sup>5</sup> But interbank and short-term government bond markets were in their infancy in Tanzania in the 1990s, and large parts of the rural economy continued to operate mainly on currency. The interest-rate option was therefore unrealistic. It is only recently that the option of setting a target for a short-term interest rate, and relying on financial markets to translate the BoT's target into economy-wide lending conditions and the exchange rate and other key asset prices, has become potentially viable.

A final and non-trivial consideration in favour of reserve-money targeting grew out of its distinctive role in accomplishing the disinflation. The central focus of reforms and IMF conditionality was ending the monetary finance of fiscal deficits. The BoT had been providing this finance through its accumulation of government securities, other advances to government, and loans to commercial banks that could be on-lent to public entities. A sequence of explicit ceilings on the BoT's net domestic assets, implemented with high transparency via the cash budget and specified as IMF programme conditions, therefore played a key role in the disinflation strategy. In the context of a flexible exchange rate and a sequence of separate targets for the BoT's international reserves (the main component of the BoT's net foreign assets), these ceilings implied a target path for the *sum* of the BoT's net domestic assets and net foreign assets—in effect, for the size of the BoT's overall balance sheet. By the balance-sheet identity, this in turn meant a target path for the BoT's main liability, reserve money. Targets for reserve money therefore played a key role during the disinflation episode, simultaneously providing a nominal anchor for inflation and supporting an accord that very clearly and publicly distanced the BoT from fiscal pressures.

By the late 1990s, the success of the disinflation was clear and the question of an appropriate monetary framework could in principle have been posed anew. But the conditions emphasized in this section remained relevant, including the commitment to exchange-rate flexibility, the thinness of domestic financial markets, and the familiarity of the framework within the context of an ongoing policy dialogue with the IMF. Added to these was the basic suitability of the IMF's financial programming model to the data-poor environment of the BoT.<sup>6</sup> Reserve-money programming was therefore a natural choice for Tanzania even outside of a stabilization context, as it was starting in the 1990s for many low-income countries transitioning away from fixed exchange rates and developing the capacity to conduct an independent monetary policy (Berg et al., 2015).

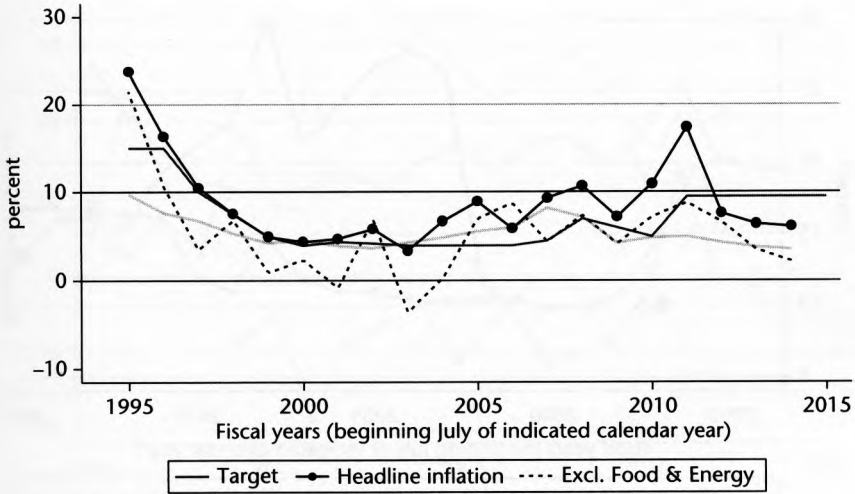
Tanzania's system has been remarkably successful, as illustrated in Figures 11.2a and 11.2b. The BoT's primary legislative mandate, dating from the BoT Act of 1995, is to maintain 'price stability conducive to a balanced and sustainable growth of the national economy of Tanzania'.<sup>7</sup> This objective reflects the twofold principle that the ultimate aim of monetary policy is to provide an environment conducive to favourable performance of the real economy, and that the single most important contribution the central bank can make to this goal is to achieve price stability, defined in practice as a reasonably low and stable rate of inflation.<sup>8</sup> The BoT's mandate includes the crucial secondary objective, also grounded in the ultimate aim of balanced and sustainable growth, of supporting the development and stability of the financial sector (see Appendix Table 11A.1).



**Figure 11.2a.** Targeted and actual real GDP growth in Tanzania, 1995/96–2014/15  
*Source:* BoT and IMF, April 2015 World Economic Outlook database online.

Figures 11.2a and 11.2b compare the performance of gross domestic product (GDP) growth and consumer price index (CPI) inflation to the government’s annual fiscal-year targets for these variables. With the exception of 2008/09—the inaugural year of the global financial crisis—the real economy has met or out-performed the government’s growth targets despite their rapid increase from 4 per cent at the outset of the disinflation to roughly 7 per cent per year by the late 1990s. By comparison with 138 other developing countries, Tanzanian GDP growth has proven remarkably robust to the global shocks of the post-2006 period, including the global food price shocks of 2006 and 2007, the global financial crisis, and the collapse of global commodity prices (particularly energy) starting in 2011. Energy prices have a special status—their recent collapse has helped the Tanzanian economy while simultaneously dampening the future prospects of the natural gas sector and serving as an early warning of the volatility to which Tanzania will be exposed if it becomes a major energy exporter.

The real-side accomplishments in Figure 11.2a provide indirect testimony to the success of monetary policy since the mid-1990s—at the very least it has apparently done little harm, unless substantially more ambitious growth targets were appropriate for the period. A similarly favourable—but somewhat more complex—story emerges in Figure 11.2b, which shows CPI inflation. Following its rapid decline during the second half of the 1990s, headline



Target pertains to headline; see discussion in text.  
 Grey line shows median CPI inflation rate for 138 emerging/developing countries.

**Figure 11.2b.** Targeted and actual real CPI inflation in Tanzania, 1995/96–2014/15

Note: From FY2011/2012 to FY2015/16 the Government’s inflation target has been stated as ‘CPI inflation in single digits.’ In the Figure we use 9.5% to denote this target. The BoT continues to maintain an internal medium-term target of 5%.

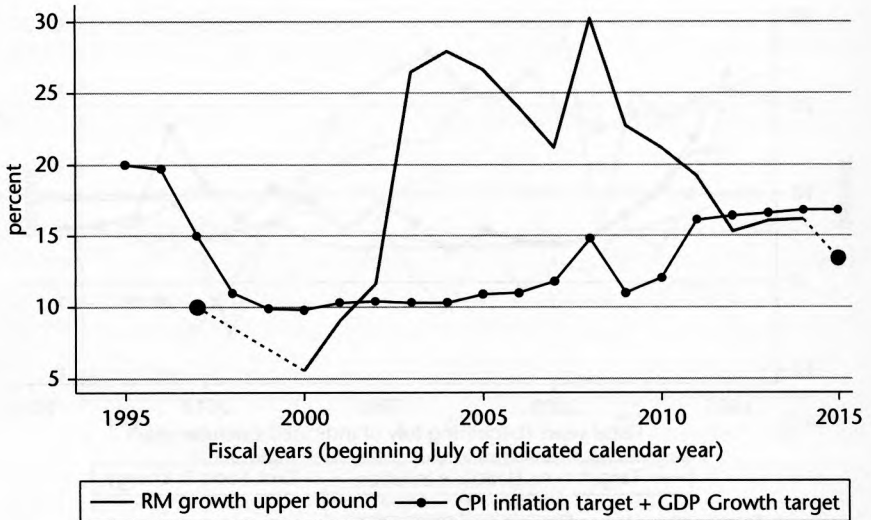
Source: BoT and IMF, April 2015 World Economic Outlook dataset online.

inflation has remained below 10 per cent in most years and within 5 points of the median for 138 developing and emerging-market countries with the exception of 2010 and 2011. Core inflation, which excludes food and energy prices, has been even lower, remaining below 10 per cent since FY1996/97.<sup>9</sup> Headline inflation has nonetheless remained above the BoT’s ‘medium-term target’ of 5 per cent since FY2004/05, and some dissonance has emerged between this aspirational goal and the government’s annual fiscal-year target, which has been stated since 2011 as the less demanding ‘inflation in single digits’. As of 2014/15, however, inflation was once again under firm control, approaching 5 per cent on a headline basis and well below that for core.

### 11.2.1 Implementing the Framework

Figure 11.3 provides a sense of reserve-money targeting in action. Annual targets for the growth in reserve money are derived within the framework directly from the government’s growth and inflation targets shown in Figures 11.2a and 11.2b. To show how, we need a bit of notation: we will use  $P$  to denote the CPI,  $\gamma$  to denote real GDP,  $M$  to denote the monetary aggregate





Dotted lines: RM growth targets for 1997/98 and 2015/16 are from Monetary Policy Statements. All other RM growth rates are calculated using end-yr targets and end-previous-yr actual levels.

**Figure 11.3.** Fiscal-year reserve-money growth targets in Tanzania

Source: Bank of Tanzania.

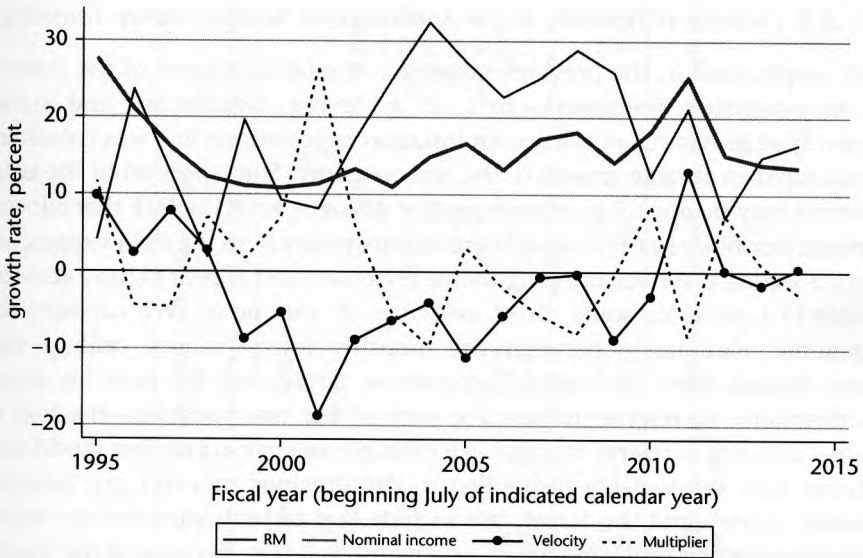
that serves as the BoT’s intermediate target (M2 or M3), and  $H$  to denote reserve money, defined as the sum of currency in circulation and the deposits of commercial banks at the BoT. The links between the targets are then defined by two key empirical relationships within the monetary block of the IMF’s financial programming model. These are  $M \cdot v = P \cdot \gamma$ , where  $v$  is the velocity of the BoT’s intermediate target; and  $M = \mu \cdot H$ , where  $\mu$  is the money multiplier. Taken together, these relationships imply  $P \cdot \gamma = v \cdot \mu \cdot H$  or, using the notation  $g(\cdot)$  to denote a growth rate from one year to the next,

$$\pi + g \cong g(H) + [g(v) + g(\mu)], \tag{11.1}$$

where we have used  $\pi \equiv g(P)$  to denote the CPI inflation rate and  $g \equiv g(\gamma)$  to denote the growth rate of real GDP.

Equation (11.1) provides a consistency framework that relates the growth rate of reserve money to the growth rates of nominal income, velocity, and the money multiplier. The fiscal-year budget adopted by Parliament includes the inflation and real GDP growth targets for the year, which tie down  $\pi + g$ . The BoT then forecasts the growth rates of velocity and the money multiplier using a combination of econometric modeling and expert judgement. This leaves  $g(H)$  as the growth rate of reserve money that is consistent with the government’s targets.

Holding the growth rates of velocity and the money multiplier constant at their forecasted values—more on this in Sections 11.2.2 and 11.3.1—the



**Figure 11.4.** Relation of reserve money growth to nominal income growth  
 Source: Bank of Tanzania.

reserve-money-targeting (RMT) framework incorporates a simple account of what monetary economists call the *transmission mechanism* of monetary policy, defined as the link between the operational targets directly under the central bank’s control and the ultimate economic outcomes the central bank is seeking to influence. For given values of  $g(v)$  and  $g(\mu)$ , faster growth in reserve money drives the growth of nominal income above the government’s implied target, with the split between higher  $\pi$  and higher  $g$  determined by the slope of the economy’s short-run aggregate supply curve. To anchor inflation at the targeted level, therefore, the growth of reserve money should not exceed the value in equation (11.1).

Figure 11.3 plots the BoT’s fiscal-year target for reserve-money growth against the government’s target for nominal income growth. Given the relative stability of targeted nominal income growth, the wide amplitude of fluctuations in programmed reserve-money growth was driven by large and variable trends in velocity and the money multiplier (Adam and Kessy, 2011; Adam et al., 2012). While the BoT was reasonably successful at extrapolating ongoing trends over this period—Figure 11.4 shows the actual evolution of the components of equation (11.1)—some portion of the large cumulative decrease in velocity starting in the late 1990s was unanticipated, and led to a combination of programme overshoots (see Figure 11.5) and interest-rate volatility.

### 11.2.2 *Evidence of Flexibility in the Application of Reserve-Money Targeting*

We emphasized in the previous subsection the broad success of the reserve-money-targeting framework—first, at achieving disinflation, and subsequently at providing an anchor for inflation expectations that was consistent with rapid and stable growth of the real economy. Some portion of the latter success may be due to an ongoing policy dialogue with the IMF that allowed greater flexibility in the conduct of monetary policy than the rigid sequence of target-setting exercises and programme reviews would appear to have allowed. Table 11.1 provides some direct evidence on this point. We consider the dynamic relationship between the monthly reserve-money ceilings that were derived from semi-annual programme targets and the monthly actual performance of reserve money. For each of the two variables—the logs of target and actual reserve money—we estimate an error-correction model that shows how the variable responded to the previous month's gap between reserve money and the target. We include lags of both variables to control for other features of the dynamics, and we estimate two versions of the model, one in which the gap is simply defined by the difference between the logs of reserve money and the target, and one in which we define an adjusted gap that has a mean of zero over the full sample but has separate nonzero means before and after July 2007.<sup>10</sup>

Two suggestive findings stand out from this exercise.<sup>11</sup> First, it is clear that the framework operated to constrain monetary policy, as it was intended to do. Gaps between reserve money and the ceiling generated policy adjustments that altered reserve-money growth in a direction that would reduce the gap. This is apparent in the negative and statistically significant coefficient on the gap in columns 1 and 5. These adjustments are consistent with an interpretation of the gap as a slippage in policy that required—and produced—a corrective adjustment in policy.

Second, however, the targets themselves also appear to have responded to the lagged gap. This is not apparent in columns 2 and 6 where the gap enters symmetrically, but Granger causality runs in both directions between these variables, and when we allow for asymmetric responses—allowing targets to adjust differently depending on whether reserve money is above or below the ceiling—we find that adjustments in the target did play a systematic role in responding to observed gaps (columns 4 and 8).<sup>12</sup> Strikingly, these adjustments took place when the gap was positive. Their impact was therefore to partially accommodate the 'excessive' reserve money growth that had taken place.<sup>13</sup>

This evidence of accommodation has at least two possible interpretations, with different implications for the ability of the system to anchor inflation expectations. The first is that deviations from target were interpreted with some regularity as appropriate responses by the BoT to new information about

**Table 11.1.** Responses to deviations from the reserve-money ceiling

Variable	Regressions with unadjusted gap				Regressions with adjusted gap			
	log(RM)	log(Ceiling)	Log(RM)	Log(Ceiling)	log(RM)	log(Ceiling)	Log(RM)	Log(Ceiling)
Gap (t-1)	<b>-0.301***</b> -3.53 p=0.001	<b>0.053</b> 0.84 p=0.401			<b>-0.489***</b> -4.67 p=0.00	<b>0.081</b> 1.03 p=0.31		
Gap > 0 (t-1)			<b>-0.134</b> -1.01 p=0.316	<b>0.234**</b> 2.40 p=0.018			<b>-0.353**</b> -2.16 p=0.03	<b>0.298**</b> 2.44 p=0.02
Gap < 0 (t-1)			<b>-0.514***</b> -3.28 p=0.001	<b>-0.179</b> -1.56 p=0.120			<b>-0.607***</b> -4.00 p=0.00	<b>-0.108</b> -0.95 p=0.34
Month=Jul 07					<b>-0.025</b> -0.68 p=0.497	<b>-0.018</b> -0.65 p=0.519	<b>-0.027</b> -0.73 p=0.468	<b>-0.021</b> -0.76 p=0.451
Lags	2	2	2	2	2	2	2	2
N	184	184	184	184	184	184	184	184
r2_a	0.251	0.193	0.258	0.215	0.285	0.192	0.285	0.212

Notes: \* p<0.05; \*\* p<0.01; \*\*\* p<0.001. *t* values are below the coefficient estimates.

The unadjusted gap is the difference between the log of reserve money and the log of the reserve-money ceiling. The adjusted gap is the residual from a regression of the unadjusted gap on a constant and a dummy variable that equals 1 starting in July 2007 and zero otherwise. Monthly data are from the Bank of Tanzania.

the state of the economy—in other words, as appropriate monetary policy decisions that should not be reversed in the absence of even newer information. For example, reserve money growth might have exceeded targets because the BoT observed that money demand was rising faster, and therefore velocity falling faster, than was predicted when the targets for reserve-money growth were set. Allowing reserve money to exceed the targets was perfectly appropriate in such a situation, and would have been non-inflationary; in fact, a policy of forcing reserve-money growth back to pre-existing programme targets would have created an unnecessary contraction in credit conditions and the real economy.

The other interpretation is that the system was unwilling to absorb the political costs of correcting episodes of over-expansionary policy, and was therefore subject to a degree of inflation bias despite the presence of the IMF as an external monitor. Headline inflation does appear to be less well anchored after 2005 than before (Figure 11.5 shows the gap between headline inflation and the BoT's own medium-term target of 5 per cent). But some portion of this is driven by adverse supply shocks originating in Tanzania's large food-production sector and world energy markets. Figure 11.2b shows core inflation, which excludes food and energy prices and is often viewed as a more accurate proxy for expected inflation than headline inflation. Core inflation remains below headline over most of the period since 2005. This is

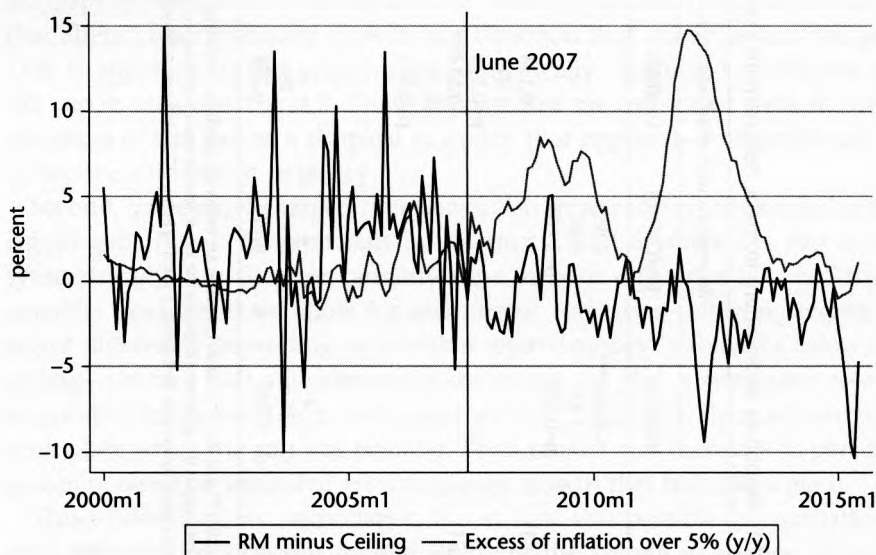


Figure 11.5. Reserve-money targeting in Tanzania

Source: Bank of Tanzania.

consistent with a policy that allowed headline inflation to reflect the first-round effects of supply shocks, while seeking to limit the transmission of these shocks into expectations and core inflation.<sup>14</sup> Figure 11.5 also shows the BoT's tendency to run reserve-money growth below targets after 2007, suggesting a real-time response to inflation developments that suggested faster-than-anticipated growth in velocity (equation (11.1)). Our own interpretation of Table 11.1 therefore leans more heavily on the first explanation—the argument that reserve-money targeting, as actually practiced in Tanzania, reflected a collaborative dialogue with the IMF that allowed an otherwise relatively rigid framework to achieve some desirable degree of flexibility in practice. Elements of both explanations may of course be present.

### 11.3 Practical Challenges: Portfolio Shocks, Policy Transmission, and Financial Development

Bernanke and Mishkin (1997) use the term *constrained discretion* to describe a monetary policy that provides a strong anchor for inflation while also acting to stabilize the real economy. To anchor inflation successfully, the monetary authority must be genuinely constrained by its price stability mandate, in the sense of being willing to take corrective policy action to bring inflation into line even when doing so is costly. Its commitment to doing so must be communicated to the public and demonstrated in action, because actual inflation depends on expectations of inflation. But if inflation expectations are anchored in this sense, then the monetary authority also has scope to improve the performance of the real economy by counteracting costly fluctuations in aggregate demand over the business cycle.

We have argued that the success of RMT in Tanzania reflects elements of both constraint and discretion. Despite its success, however, RMT has three emerging limitations at this stage in Tanzania's development. The first is its vulnerability to shocks to velocity and the money multiplier. This vulnerability is a familiar property of systems that target monetary aggregates, and when other considerations favour a flexible exchange rate as in Tanzania, it is generally thought to favour a *policy rate* system, where inflation serves as the intermediate target and a short-term interest rate serves as the operational target. Much of modern monetary economics is built around the analysis of such systems. The second limitation of RMT is its relative lack of transparency, a potentially serious weakness when monetary policy is largely about the management of private-sector expectations.

The third limitation of RMT is more speculative, and relates to the two-way relationship between the BoT's policy framework and financial development in Tanzania. We will argue that even in the absence of fiscal dominance,

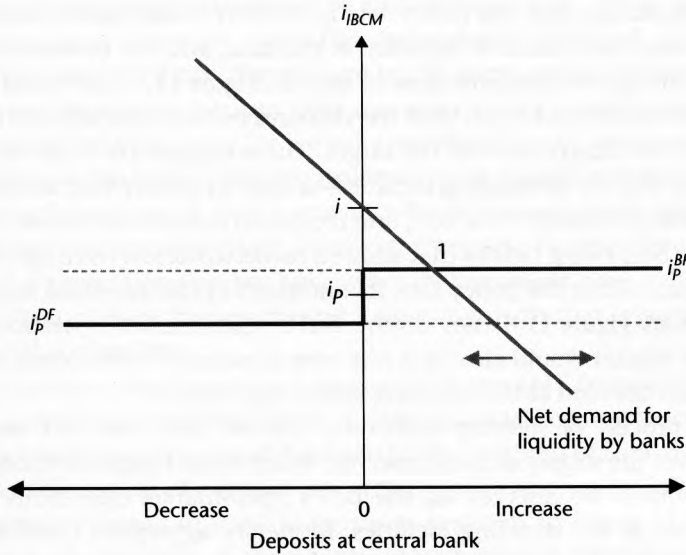
monetary policy in low-income countries may be subject to a subtle but challenging trap, where in the short run poorly-developed financial markets favor a policy framework that relies for its effectiveness on quantity targets and direct interventions—but where these interventions then create a barrier to the long-run development of a financial sector that is competitive and inclusive enough to support strong transmission of the central bank's policy rate throughout the economy.

A policy rate system has advantages in dealing with each of these challenges. Other combinations of operational and intermediate targets are possible—for example, targeting inflation but using reserve money as the operating target (as the Bank of Mexico has done for extended periods) or targeting broad money but using a short-term interest rate as the operating target (as the US Fed did during episodes in the 1970s). And Tanzania's RMT framework is itself under constant internal review to improve its operating characteristics.<sup>15</sup> In our view, however, the appropriate direction of travel is clear: towards a policy rate system in which the role of monetary aggregates is de-emphasized and a short-term interest rate is used to target inflation and communicate the stance of policy.

### 11.3.1 *Accommodating Portfolio Shocks*

The most obvious shortcoming of RMT is its tendency to produce interest-rate volatility in the presence of unforeseen shocks to velocity or the money multiplier. Figure 11.6 illustrates this point analytically, focusing on the interbank market for liquidity in the form of deposits at the BoT.<sup>16</sup> The Figure illustrates the market for overnight interbank loans, where banks that are short of liquidity can borrow at the interbank call money rate  $i_{BCM}$  from banks with liquidity to spare.

The downward-sloping line in Figure 11.6 shows the net demand for liquidity by all banks taken together. The position of this curve reflects all of the determinants of bank demand, including the public's preference for currency versus demand deposits, the stringency of legal reserve requirements, and the eagerness of banks to lend. But it also depends on the overall supply of commercial bank deposits at the BoT. The BoT directly controls this supply by purchasing securities or foreign exchange from the banks when it wants to expand reserve money and selling securities or foreign exchange when it wants to contract reserve money. Net purchases inject liquidity, shifting the curve to the left; net sales withdraw liquidity, shifting it to the right. Because the interbank market clears at a net inter-bank trade of zero, the resulting interbank interest rate is given by the intersection of the demand curve with the vertical axis. Net injections reduce the interbank rate, other things equal, while net withdrawals (often referred to as 'mopping up') increase it.



**Figure 11.6.** An interbank market with and without standing facilities

*Note:* Given the position of the demand curve for liquidity, the equilibrium is at  $i$  in a system without standing facilities and at point 1 when standing facilities are in operation.

What this implies is that a system that prioritizes a sequence of reserve-money targets must accept the resulting path of short-term interest rates. This may in fact be one of the main virtues of reserve-money targeting in a situation where the monetary authority wants to adopt a very tight stance—for example, in a disinflation where the key objective is to achieve a shift in inflation expectations. The quantity target provides the central bank with political cover for a policy that will create very high interest rates, with attendant costs to borrowers and potentially severe impacts on aggregate demand. But when expectations are reasonably anchored, a system that forces overall bank liquidity onto a predetermined path can create damaging volatility in short-term interest rates. This volatility emerges when shifts in portfolio preferences or bank behaviour create unanticipated movements in the net demand for liquidity by banks (in equation (11.1), these shifts produce forecast errors in the growth rates of velocity and/or the money multiplier). The key feature of RMT is that does not accommodate such shifts until after the fact, and possibly after an extended period of debate and inaction during which the stance of monetary policy is unintendedly loose or tight.<sup>17</sup>

A *policy-rate system*, by contrast—one in which the BoT determines (and communicates) the stance of monetary policy as a target level of some key short-term interest rate—automatically accommodates shocks to velocity and the money multiplier. Figure 11.6 illustrates the role of open-market operations and the potential role of standing facilities in such a system. To keep



the interbank rate near the policy rate  $i_p$ , the BoT would have to forecast the total demand for interbank liquidity at this rate, and use open-market operations to nudge that demand close to zero. In Figure 11.6 this would require a net injection of liquidity, to shift the demand curve to the left and bring the interbank rate down towards the target. These operations could be complemented by the use of standing facilities—a deposit facility that allowed banks to deposit any amount at the BoT, and receive an interest rate below the policy rate, and a borrowing facility that allowed banks to borrow overnight from the BoT, at a rate above the policy rate. If conditions in the interbank market were as shown in Figure 11.6 (net of the BoT's open-market operations),<sup>18</sup> the interbank market would clear at a rate very close to  $i_p^{BF}$ , with banks satisfying their excess demand at the standing borrowing facility.

In the process of steering short-term interest rates, the BoT would lose control over the supply of bank reserves, which would respond endogenously to the demand for reserves via the BoT's open-market operations and any transactions at the standing facilities. Monetary aggregates could of course serve as information variables, with unusual behaviour of reserve money or broader aggregates leading to possible revisions in the policy rate.

### 11.3.2 *Improving Transparency*

Because wage- and price-setting is a forward-looking process, the management of inflation expectations is a central task of monetary policy (Woodford, 2003). The disadvantages of monetary aggregates from this perspective have become clearer as central banks have increased their focus on price stability and placed greater emphasis on communication with the public. By contrast with a broad monetary aggregate, inflation is a widely understood concept that is readily observable as an intermediate target and (by definition) directly related to the objective of price stability. A similar point applies to the choice of operational target. Few people understand and follow reserve money, and despite the simplicity of equation (11.1) the empirical links between reserve money and inflation are complex. Short-term interest rates, by contrast, are easily observed and interpreted, and their relevance to the private spending decisions of firms and households are widely understood.

### 11.3.3 *Strengthening Policy Transmission and Fostering Financial Development*

In well-developed financial markets, the impact of interest-rate volatility operates through aggregate demand, as in the classic analysis by Poole (1970). But when financial markets are less developed, a set of new considerations become important. First, the transmission of short-term interest rates into longer-term

rates and aggregate demand tends to be weak (Mishra et al., 2014), suggesting that conventional concerns about the demand-side effects of interest-rate volatility may be overstated. Second and by the same token, the absence of a reliable transmission mechanism from monetary policy to aggregate demand may appear to limit the scope for virtually *any* discretionary demand management by the central bank—while in reality its main impact may be to encourage the continued use of direct, quantity-based interventions that impose high costs on the banking system. Finally, the impact of interest rate volatility and direct interventions on banking-sector development gives rise to a link between the monetary framework and long-run growth that is largely absent in advanced economies.

Taken together, these arguments suggest that the RMT framework may be less well adapted to an environment of rapid financial-sector innovation and economic transformation than it has been to the conquest of fiscal dominance and the establishment of a credible monetary-policy anchor for inflation.

The common thread in these concerns is apparent in Figure 11.7—which shows the high volatility of short-term interest rates in Tanzania and their limited pass-through into bank deposit and lending rates<sup>19</sup>—and Figure 11.8, which uses a rough measure of pass-through to compare Tanzania with other countries in sub-Saharan Africa (SSA). Figure 11.8 shows the year-by-year ratios of the standard deviation of monthly bank loan rates to the standard deviation of monthly short-term T-bill rates. Higher values of this index are

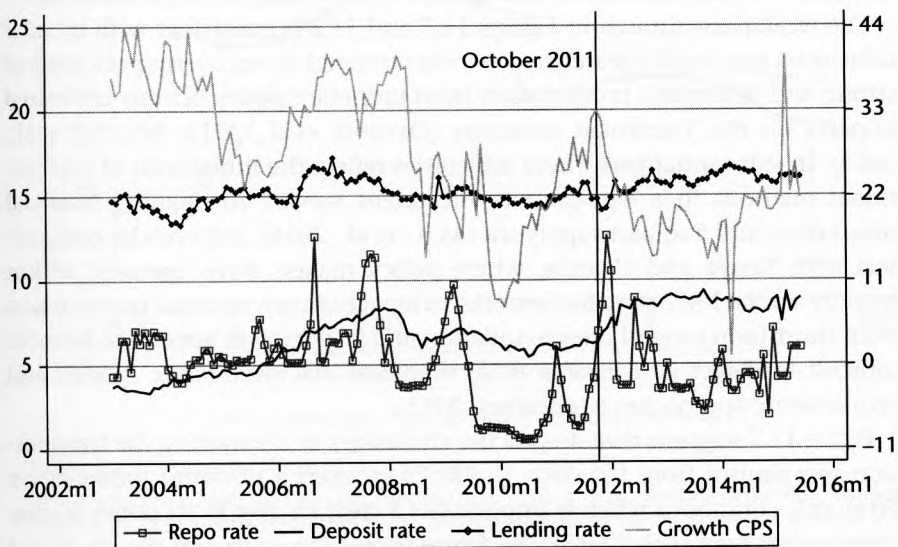
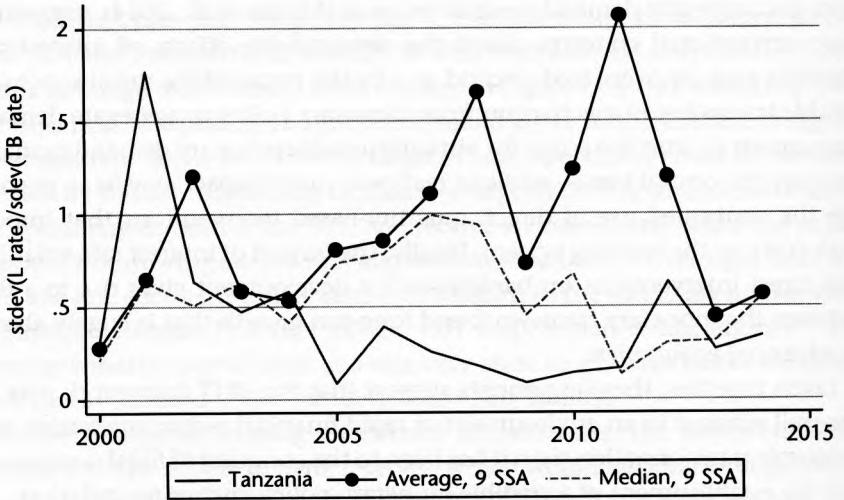


Figure 11.7. Interest rates and monetary transmission in Tanzania

Source: Bank of Tanzania.



**Figure 11.8.** Volatility of monthly interest rates: Tanzania vs. nine other SSA

*Note:* this figure includes all countries with in SSA with available data (Cape Verde, Kenya, Malawi, Nigeria, Seychelles, Sierra Leone, South Africa, Tanzania, Uganda, Zambia), except the CFA countries and non-South African members of the Rand Monetary Area.

*Source:* IMF, International Financial Statistics online.

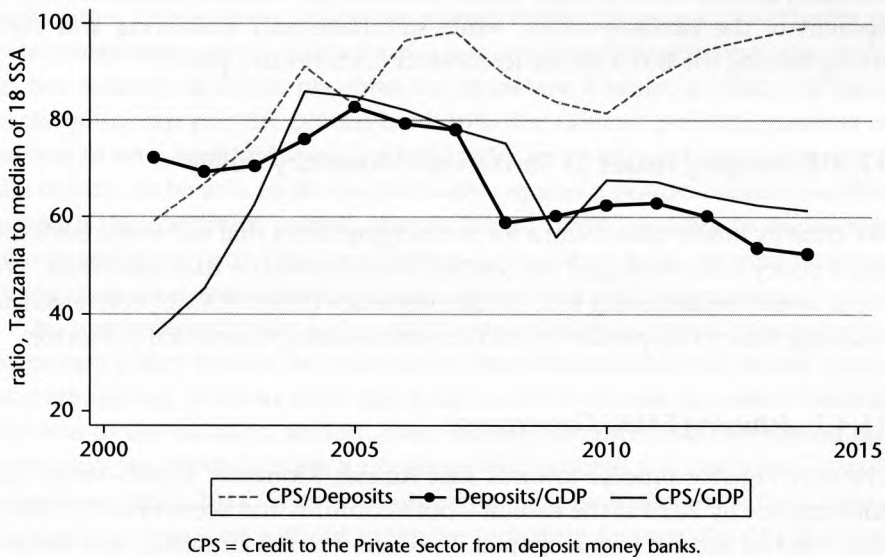
associated with stronger pass-through of short-term to long-term interest rates. Tanzania’s ratio is consistently below the median for twelve comparator countries with available data, and far below the average for these countries.<sup>20</sup>

The weak pass-through in Figures 11.7 and 11.8 is consistent with broader difficulties empirical researchers have encountered in uncovering evidence of strong and systematic transmission from monetary policy actions to desired impacts on the Tanzanian economy (Davoodi et al., 2013; Montiel et al., 2012). In substantial part, these difficulties reflect the limitations of conventional methods in a data-poor environment subject to ongoing financial innovation and frequent supply shocks (Li et al., 2016). But even by comparison with Kenya and Uganda, where policy makers have operated within broadly similar RMT-style frameworks, evidence of conventional transmission from short-term interest rates to inflation and GDP growth appears to be more difficult to detect in Tanzania using standard macroeconomic models and econometric approaches (Goncalves, 2015).

Figure 11.7 suggests that despite the challenges of discovering the transmission mechanism from the data, the BoT can exert a powerful influence on economic conditions when it implements a clear change in its policy stance. Drawing on Berg et al. (2013), the figure shows the impact of the concerted monetary tightening by the central banks of Kenya, Tanzania, and Uganda in October of 2011. Short-run rates rise sharply in Tanzania, and there is a modest

but perceptible pass-through to deposit rates. Lending rates hardly budge, consistent with the apparent absence of conventional transmission through the term structure of interest rates. But consistent with bank-level evidence in Tanzania (Mbowe, 2012), lending *volumes* respond strongly to the tightening. Berg et al. (2013) also document a turn-around in exchange-rate depreciation—the main focus of the intervention—and inflation, the reversal of which is evident in Figure 11.5 in this chapter.

Monetary policy can therefore exert strong leverage over inflation in Tanzania, and the BoT’s willingness to do so when necessary has helped to establish an effective monetary-policy anchor for private-sector expectations—an outcome made possible by the relative absence of fiscal dominance since the mid-1990s, but by no means guaranteed. Financial-sector development—a key secondary objective of the BoT—has proceeded rapidly in key respects, including declines in interest-rate spreads and increases in the ratio of claims on the private sector to overall deposits (Figure 11.9).<sup>21</sup> But the policy environment remains one of high interest-rate volatility, limited transparency, and occasional recourse—particular at moments of clear policy action—to direct interventions. The behaviour of banks will of course reflect the environment



**Figure 11.9.** Financial deepening: Tanzania vs. Other SSA

*Note:* this figure excludes the CFA countries and non-South African members of the Rand Monetary Area, but includes all other countries in SSA with available data (Angola, Botswana, Burundi, Cabo Verde, Comoros, Democratic Republic of Congo, The Gambia, Ghana, Kenya, Mauritius, Mozambique, Nigeria, São Tomé and Príncipe, Seychelles, Sierra Leone, South Africa, Tanzania, Uganda, and Zambia).

*Source:* IMF, International Financial Statistics online.

within which they operate, including any systematic features of the BoT's policy framework. If volatile overnight rates are a consequence of RMT, bank behaviour will adjust to this volatility. Large excess reserves, for example, have been a feature of Tanzania's banking sector throughout the RMT era, and have been associated in cross-country work with a weakening of the transmission mechanism of monetary policy (Saxegaard, 2006). These reserves may in part reflect self-protection against episodes of very high interbank rates. Volatility of short-term rates can also weaken the transmission of short-term interest rates into the longer-term rates that matter more directly for lending and aggregate demand (Woodford, 2003).

We emphasized in Section 11.2 that one of the continuing rationales for RMT has been the rudimentary nature of the financial sector. Figure 11.9 suggests that after an initial decade of very rapid expansion in the wake of banking-sector privatization and the mid-1990s accord, the pace of financial deepening has slowed considerably over the past decade in Tanzania, relative to that among comparator countries in SSA. In our view, this constitutes a final—and admittedly speculative—argument in favour of transition towards a policy-rate system. Particularly in an environment of ongoing financial-sector innovation and rapidly increasing financial inclusion, a system that stabilizes interest rates is likely to provide stronger encouragement for development of the banking sector, while simultaneously preserving and even strengthening the BoT's ability to conduct discretionary policy.

## 11.4 Emerging Issues in Tanzanian Monetary Policy

We close by briefly addressing a set of emerging issues that will shape both the BoT's policy framework and the conduct of policy within that framework. We focus in turn on achieving East African Monetary Union (EAMU) convergence, retaining policy independence, and accommodating the natural gas sector.

### 11.4.1 *Achieving EAMU Convergence*

The convergence process towards East African Monetary Union—with full convergence by 2023 at the earliest—both confirms and accelerates the direction of travel laid out in this chapter. In contrast to the Eurozone, East Africa's convergence process is unlikely to involve exchange-rate commitments except perhaps over a final period of a few months before union, when members may elect to adopt a fixed grid of internal rates. A union-wide central bank, in turn, is virtually certain to reflect the practices of its largest members by adopting a version of inflation targeting and operationalizing it using a policy rate system. The developments discussed so far therefore place

Tanzania's framework on a course of convergence towards the eventual union-wide framework.

In the meantime, an EAMU-driven process of financial-sector harmonization is already altering the BoT's operating environment by shaping the set of relevant policy instruments and altering the BoT's exposure to portfolio shocks. The harmonization of reserve requirements, for example, narrows the set of policy instruments by limiting the BoT's recourse to (already very intermittent) changes in reserve requirements—appropriately, as we argued earlier. The opening of Tanzania's capital account is likely to increase the mobility of short-term capital, a development that will heighten the disadvantages of RMT by transmitting interest-rate volatility more strongly into exchange rates. These considerations add further impetus to Tanzania's shift towards a policy rate system.

#### 11.4.2 *Retaining Policy Independence*

We have emphasized the crucial importance of the mid-1990s accord in overcoming fiscal dominance and thereby allowing the establishment of a monetary-policy anchor for inflation. Two concerns will have to be navigated if the BoT is to retain the appropriate degree of independence from the fiscal authorities. One is that a policy-rate system forces the monetary authority to take transparent responsibility for the level of short-term interest rates. Even in the absence of direct pressures for monetary finance, a period of fiscal indiscipline can put the central bank into the difficult political position of having to set a very high policy rate in order to avoid inflationary finance of the deficit. To be able to do so effectively requires a political consensus that supports the continued pursuit of an inflation target—and places the burden of adjustment on the fiscal authorities—even when high interest rates are doing clear short-term damage to both private and public borrowers.

The fundamental point is that debt sustainability is a fiscal responsibility. Monetary policy cannot be expected to keep interest rates low in real terms, and attempting to do so when the fiscal accounts are out of control leads to the loss of the inflation anchor. Even formal commitments to inflation targeting are no rescue in such a situation, as illustrated forcefully by Ghana's experience since 2011. Such commitments must be backed by a fiscal policy that can be sustained without excessive monetary finance. Retaining policy independence therefore requires continued recognition that the fiscal/monetary accord achieved in the mid-1990s was crucial to the two subsequent decades of macroeconomic stability.

The second concern is more subtle and relates to the BoT's capacity to handle the budgetary costs of managing monetary policy. Central banks have a monopoly on the currency issue, and more broadly on the issuance

of reserve money. The BoT must absorb the costs of producing currency, but neither currency nor (at present) bank reserves pay interest. The BoT is therefore typically in the position of earning net profits, because the interest on its assets—foreign-exchange reserves, and government securities—is more than enough to cover salaries and other operating costs. These profits are transferred to the government's budget after due provision for maintaining the BoT's capital and other financial buffers.

Central banks cannot go bankrupt, but profits can become negative when balance-sheet trends sharply reduce net interest earnings. In such a situation, the BoT's financial health may become the subject of public concerns, and the BoT itself may be subject to scrutiny regarding its financial management. Despite the explicit provision for recapitalization in the BoT Act of 2006, the danger is that concerns about profitability will exert an undue influence on the BoT's monetary policy stance. A looming example relates to the BoT's agreements under EAMU and the Southern Africa Development Community (SADC), which require convergence to much higher levels of gross official reserves—4.5 months of imports in the case of EAMU and 6 months of imports for SADC. Reconciling a substantial build-up of foreign-exchange reserves with low inflation is likely to require a shift in the composition of the BoT's balance sheet, with the additional reserves financed through costly domestic liabilities rather than reserve money. The resulting budgetary pressures call for a well-defined framework of liquidity-management cost sharing with the government.

### 11.4.3 *Accommodating the Natural Gas Sector*

Tanzania may soon be receiving large foreign direct investment inflows to support the development of offshore deep-water natural gas. The projects under consideration involve both upstream (extraction) and downstream (pipeline and processing and liquefaction) components, and will generate well over twenty-five years of natural gas production for domestic consumption and exports. Government revenues will increase substantially once exports are underway, in the form of income taxes, royalties, production-sharing, and government equity participation (see Chapter 3, this volume). Changes in world energy prices will generate volatility in export revenues, with implications for foreign exchange markets both directly and via potential linkages to foreign creditworthiness and capital flows.

The main macroeconomic issues associated with the gas economy are fiscal rather than monetary: the Government must convert a large and persistent increase in its spending power into a sustainable increase in the well-being of the private sector. The most important responsibility of monetary policy is in fact to be clear that it is fiscal policy that matters most of all. This includes

underscoring the need for sustainable debt accumulation and emphasizing the dangers of a pro-cyclical spending response to fluctuations in natural gas prices. As a centre of high-quality economic research, the central bank is in a unique position to contribute to debates on best practices and to monitor the implications of ongoing fiscal management.

Two monetary policy issues, however, will occupy the BoT as the gas economy expands. The first is responding (or not) to the wealth effect of the resource discovery. Even in the face of a prudent public spending response, a substantial increase in the economy's net external wealth means higher sustainable consumption spending. This is likely to produce a modest and long-lasting real appreciation relative to what would have occurred without the resource discovery. Attempts to peg the real exchange rate at its pre-discovery level are unlikely to be successful; a policy of resisting nominal appreciation, for example, would tend to generate either domestic inflation or—holding fast to inflation targets—a contractionary bias in monetary policy (Calvo, Reinhart, and Vegh, 1995).

To the degree that spending is front-loaded and has a high domestic component, the short-run appreciation that would occur under a passive exchange rate policy during the development and early production phases is likely to be considerably larger than the real appreciation that is ultimately required to absorb the economy's increased spending power. Managing this potential overshooting requires an empirical assessment of the appropriate long-run appreciation—as a benchmark—and a judgement regarding the costs of a large and ultimately temporary real appreciation relative to this benchmark.

The major challenges for monetary policy, however, will emerge once exports are underway, and have to do with managing the volatility in global energy prices. The macroeconomic management of commodity-price volatility has been the subject of a voluminous literature—see Frankel (2012) and IMF (2012). For a given *ex ante* exposure to shocks, a distinction can be made between policies that improve risk-sharing with external partners (e.g., denomination of debt contracts in gas), fiscal rules designed to smooth spending and ensure debt sustainability in the face of shocks, and monetary policy rules that target an appropriate balance of volatility in inflation and real GDP. We focus here on the response of monetary policy to volatility in export revenues.

The literature on managing external shocks has focused largely on the merits of alternative degrees of exchange rate flexibility. A time-honoured result states that when domestic prices are sticky, floating exchange rates allow for efficient macroeconomic adjustment to shocks that call for a change in the real exchange rate. An example is a shock to commodity export prices: a favourable shock increases the spending power of a commodity-exporting economy, and calls for a real appreciation to induce the appropriate



production shift towards non-traded goods. A floating nominal exchange rate accomplishes this more quickly and at lower macroeconomic cost than a peg.

Inflation-targeting frameworks tend to incorporate a substantial degree of exchange-rate flexibility, because the nominal anchor in the system is inflation rather than the exchange rate. The appropriate measure of inflation may differ, however, for a country subject to large swings in export prices. The reason is that an inflation-targeting central bank will tend to react indirectly—and possibly inappropriately—to commodity prices, via their impact on the nominal exchange rate. Thus a boom in export prices generates nominal appreciation, which tends (other things equal) to reduce inflation. A strict inflation targeter pushes back, by lowering interest rates in order to expand aggregate demand. But the boom has already expanded aggregate demand, to a degree that combines the fiscal response with any increase in the commodity sector's demand for domestically produced inputs. If spending on domestic output is already procyclical with the export price, a procyclical monetary easing may create excessive volatility in the real economy (Lama and Medina, 2012; Ferrero and Seneca, 2015). A good fiscal rule can soften this conflict very considerably, by generating a more neutral spending response. But an inflation-targeting rule that uses domestic price inflation rather than the CPI inflation may also have a favourable impact, by down-weighting the nominal exchange rate and avoiding excessive real-side volatility in the face of commodity price fluctuations.

## Appendix

Table 11A.1. Aspects of the legislative mandate of the Bank of Tanzania

Bank of Tanzania Act	Objectives of Monetary Policy	Provisions on Non-Financial Relationship to Fiscal Authorities
1965	<p>5.-(1) The principal functions of the Bank shall be to exercise the functions of a central bank, and, without prejudice to the generality of the foregoing, to issue currency, to regulate banking and credit, to manage the gold and foreign exchange reserves of Tanzania, and to perform any function conferred upon it (or to act as the agent of the Government in respect of any function conferred on the Government) by or under any international agreement to which Tanzania is a party.</p> <p>5.-(2) Within the context of the economic policy of the Government, the activities of the Bank shall be directed to the promotion of credit and exchange conditions conducive to the rapid growth of the national economy of Tanzania, due regard being had to the desirability of fostering monetary stability.</p>	<p>61.-(1) The Bank may advise the Government on any matter relating to its functions, powers and duties under this or any other law and shall advise the Government when, in the Bank's opinion, any such matter is likely to affect the achievement of the principal objectives of the Bank as set forth in section 5.</p> <p>61.-(2) The Government may require the Bank to give its advice on any matter relating to the functions, powers and duties of the Bank and credit conditions in Tanzania or any proposals, measures or transactions relating thereto, and the Bank shall give its advice accordingly.</p>
1978 Amendment	<p>5.-(2) [...] due regard being had to the desirability of fostering domestic and external monetary stability.</p> <p>5.-(3) Subject to sections (1) and (2) of this document, the Bank shall engage in the promotion of rural development, industrial and agricultural production and the development of such other sectors of the economy of Tanzania as the Bank may deem appropriate. The Bank shall carry out its functions under this subsection through, amongst other ways—</p> <p>(a) the provision of financial facilities, under such terms and conditions as the Bank may determine, to banks and designated financial institutions engaged in the financing of the economic sectors referred to in this subsection;</p> <p>(b) the guaranteeing, through funds created under Section 46B, of loans, investments or advances made available by banks and other designated financial institutions engaged in the financing of the economic sectors referred to in this subsection;</p> <p>(c) the provision of training facilities or opportunities designed to promote the development of a system of sound financial management in Tanzania;</p>	

(continued)

Table 11A.1. Continued

Bank of Tanzania Act	Objectives of Monetary Policy	Provisions on Non-Financial Relationship to Fiscal Authorities
1995	<p>(d) the supervision and inspection of the activities of banks and specified financial institutions.</p> <p>5.-(1) The principal functions of the Bank shall be to exercise the functions of a central bank and, without prejudice to the generality of the foregoing, to formulate, implement and be responsible for monetary policy, to issue currency, to regulate and supervise banks and financial institutions and to manage gold and foreign exchange reserves of Tanzania.</p> <p>5.-(2) The Bank shall promote sound monetary, credit and banking conditions conducive to the development of the economy of Tanzania.</p> <p>5.-(3) The primary objective of the Bank shall be to formulate and implement monetary policy directed to the economic objective of maintaining price stability conducive to a balanced and sustainable growth of the national economy of Tanzania.</p> <p>5.-(4) Without prejudice to its primary objective as stated above, the Bank shall support the general economic policy of the Governments.</p>	<p>7.-(1) There shall be regularly held consultations between the Governments and the Governor on monetary policy.</p> <p>7.-(2) In the event of fundamental and irreconcilable differences between the Minister and the Governor over monetary policy, the Minister shall by Order published in the Gazette direct the Governor to formulate and implement monetary policy along the position of the Minister for a period not exceeding twelve months or any other period as shall be specified in the Order.</p> <p>7.-(3) Except as provided herein above nothing in this section shall be construed as to limit or affect the obligation of the Bank to carry out its primary objective.</p>
2006	<p>7.-(1) The primary objective of the Bank shall be to formulate, define and implement monetary policy directed to the economic objective of maintaining domestic price stability conducive to a balanced and sustainable growth of the national economy.</p> <p>7.-(2) Without prejudice to subsection (1), the Bank shall ensure the integrity of the financial system and support the general economic policy of the Government and promote sound monetary, credit and banking conditions conducive to the development of the national economy.</p>	<p>7.-(3) The Minister and the Governor shall, where circumstances require, consult each other with a view to exchanging information and seeking coordination on economic and financial matters. There is no counterpart in the BoT Act of 2006 to Section 7.-(2) of the BoT Act of 1995.</p>

Sources: Government of Tanzania, BoT Acts of 1965, 1995, and 2006, and 1978 Amendment to the BoT Act of 1965.

Notes

1. See Kaufmann and O'Connell (1997) on the quasi-fiscal implications of the exchange-control system in Tanzania, and Collier and Gunning (1991) on the quasi-fiscal implications of financial repression in Tanzania's socialist banking system.
2. See Mpango (2002) on Tanzania's experience with the cash budget. Cash budgets also played an important role in Uganda (Kasekende and Hussain, 2000) and Zambia (Adam and Bevan, 2000) during the 1990s.
3. The US Fed famously adopted a variant of reserve-money targeting (focused on what the Fed defined as non-borrowed reserves) at the outset of the Volcker disinflation in 1979.
4. The BoT has recently begun to take on many elements of IT, and we will focus on this ongoing transition in Section 11.3.
5. The former approach implies allowing elements of its balance sheet to adjust as may be required to keep the interest rate close to its target; the latter allows short-term interest rates to adjust. The US Fed used a short-term interest rate target to pursue broad monetary aggregates during episodes in the 1970s and 1980s.
6. The financial programming model was designed to guide monetary and fiscal policy when balance-sheet data were available from the banking sector but a dearth of real-time information about the state of the economy limited the scope for fine-tuning the government's efforts to achieve economic stabilization (Polak, 1957).
7. This language is from the BoT Act of 2006 but is virtually identical with section 5.3 of the BoT Act of 1995, which represented a major departure from the 1978 Amendment to the BoT Act of 1965.
8. In contemporary monetary policy analysis, price stability is usually interpreted as a low and stable rate of *expected* inflation—a situation in which expectations are anchored in the sense that wage- and price-setters view shocks to inflation as temporary. Inflation itself may be variable, but around a constant and low medium-term average.
9. The differences between headline and core inflation are striking in Figure 11.2b: there are only two years out of twenty in which core exceeds headline, suggesting that food and energy prices (taken together) have been rising in real terms over the entire twenty-year period.
10. The adjusted gap allows for a distinction between the programme ceiling and the implicit target of BoT behaviour and policy dialogue between the BoT and the IMF. In July 2007 reserve-money programme targets were redefined as applying to average reserve money in the final month of each quarter, rather than to reserve money on the final day; and rather than a single ceiling, a narrow target range was specified. The targets used in the regressions are the actual programme targets before July 2007, and the upper bound of the target range starting in July 2007. In Figure 11.5, these changes coincide with an apparent change both in the volatility of the gap—which the move to a monthly average was intended to reduce—and the average level of the gap.
11. The logs of these two variables are non-stationary, but they share a common random walk component or stochastic trend. We cannot reject the hypothesis

that the gap between the two variables is stationary, and we can only marginally reject the hypothesis that the cointegrating vector relating the two variables is [1 -1]. Given the theoretical appeal of this restriction and the short data sample, we impose this restriction on the data and therefore estimate the error-correction equations using the gap as the lagged equilibrium error.

12. The statement that Granger causality runs in both directions means that each of these variables helps to predict the other, conditional on the other variable's lagged values.
13. There is weaker evidence of asymmetry on the reserve-money side, but columns 3 and 7 suggest that adjustment was faster when reserves were below the ceiling than when they were above.
14. Portillo et al. (2016) note that food prices are considerably more flexible than non-food prices. They show that in a low-income economy with a large food-production sector that is subject to droughts and other supply shocks, the optimal inflation objective may be to stabilize non-food rather than headline inflation. The reason for this is that stabilizing headline inflation creates excessive volatility in inflation and output in the non-food sector.
15. Examples include the July 2007 adjustment in how reserve-money targets were calculated, the accommodation of quarterly real GDP data since 2010, and current discussions of improving policy responsiveness by elevating the informational role of free reserves (bank deposits at the BoT in excess of the statutory minimum) in the BoT's internal deliberations.
16. The classic analysis is Poole (1970), who focused on the markets for broad monetary aggregates and government securities. In a well-functioning financial market, the short-term rates determined in the interbank market feed through to the longer-term rates emphasized by Poole—an issue we address further in Section 11.3.3.
17. The BoT is of course alert to this concern, and pays attention to movements in exchange rates and market interest rates when deciding on monthly reserve-money targets. It also stands ready to alter liquidity conditions through direct interventions that include changes in reserve requirements or foreign exchange cover requirements.
18. The demand for liquidity by banks will depend on the BoT's operating procedures and on the presence or absence of standing facilities. There is therefore no presumption that the position of the demand curve in Figure 11.6 is independent of the policy framework.
19. Interbank interest rates are not shown in Figure 11.7 but are even more volatile than the repo rate (on short-maturity repurchase agreements by the BoT).
20. The financial-sector comparisons in this section are based on publicly available IMF data and use all countries in sub-Saharan Africa with available data, with the exception of countries in the CFA franc zone and non-South African members of the Rand Monetary Area. We exclude these countries because they are on fixed exchange rate systems.
21. The average monthly interest-rate spread in Tanzania (overall lending rate minus overall deposit rate) fell from 12.8 percentage points in 2000–04 to 6.9 in 2010–14,

and is now below the median for eighteen comparator countries in sub-Saharan Africa (this group excludes the CFA zone and non-South African members of the Rand Monetary Area). The median spread among the comparator countries fell from 11.1 to 8.8 percentage points for the same periods.

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