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UGANDA

SELECTED ISSUES

February 23, 2022

Approved By
The African Department

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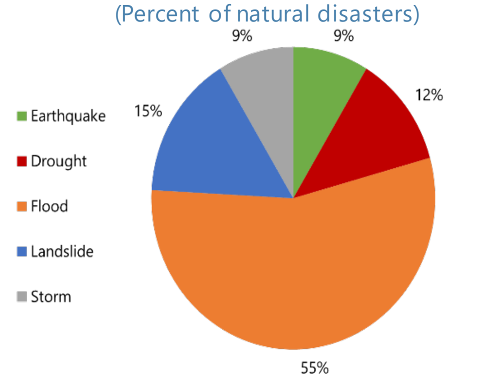
ENHANCING RESILIENCE TO CLIMATE CHANGE[1]

Uganda is prone to natural disasters that climate change is making more frequent and impactful. Besides the direct damages to lives and livelihoods, the effects of disasters, such as floods and droughts, extend to the wider economy. As recognized by the Third National Development Plan, climate adaptation and preparedness are essential to ensure the resilience of the population and the economy to extreme weather events. Debt-Investment-Growth-Natural-Disasters (DIGNAD) model simulations underscore that building adaptation infrastructure can reduce by two thirds the GDP losses at the trough triggered by a disruptive disaster and almost halve the resulting fiscal gap. Given the financial challenges posed by scaling up adaptation, international support—and scaling up capacity to access donor funds—is required to meet ambitious adaptation plans.

A. Context—Climate Change Events are Costly and Expected to become more Frequent and Impactful in the Future

1. **Uganda is prone to various types of natural disasters and lack of preparedness and adaptation infrastructure magnify the socio-economic impacts of extreme events.** While the Ugandan natural climate is moderate, the country is experiencing increased frequency and severity of extreme weather events. Uganda has contributed minimally to the build-up of human-derived greenhouse gases (GHGs) in the atmosphere[2] and yet, according to the Notre Dame Global Adaptation Initiative (2021), out of 182 countries, it ranks 10th in terms of vulnerability to climate change and 155th for ability to leverage investments and convert them into adaptation actions. In the past four decades (1985-2021), floods in Uganda (Figure 1) accounted for most natural disasters (55 percent), with both flash floods and slow-onset floods very common in urban areas, low-lying areas and areas along riverbanks and swamplands.

Figure 1. Prevalence of Natural Disasters (1985-2021)
(Percent of natural disasters)



Sources: EM-DAT and Fund staff calculations.

2. **Floods and droughts disproportionally affect the poor.** Erratic rainfalls cause floods, mudslides and landslides, which in turn lead to loss of lives and property. The rural poor and those living in slums are especially vulnerable as they have lower capacity to cope with and adapt to the impacts of climate change. On the other end of the spectrum, prolonged dry seasons cause loss of

[1] Prepared by Giovanni Melina (AFR).

[2] Uganda’s contribution to world's total green-house emission is estimated at 0.099% (Ministry of Water and environment, 2015a).

crops and livestock (Table 1). Rapid and unplanned urbanization, weak enforcement of building codes and zoning regulations, environmental degradation and lack of coordinated disaster response strategies enhance the country's vulnerability to these disruptive events (World Bank, 2021).

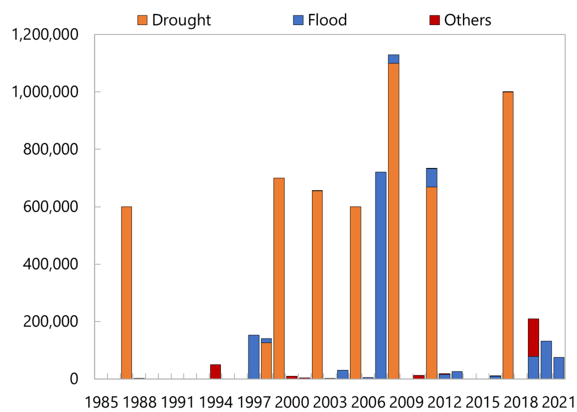
Table 1. Uganda: Top Floods and Droughts by Number of People Affected (2000-2021)

Floods	Droughts
2007 (Heavy rain)	2002 (Lack of rain)
2011 (Heavy rain)	2005 (Lack of rain)
2019 (Heavy rain)	2008 (Lack of rain)
2020 (Heavy rain)	2010 (Lack of rain)
2021 (Heavy rain)	2017 (Lack of rain)

Note: The COVID-19 pandemic is not included in the EM-DAT database because it is still an ongoing event.
Source: EM-DAT and Fund staff calculations.

3. **Droughts are the type of hazards that have affected the largest number of people, undermining food security.**[3] Although they represented 7 percent of total natural disasters in the past four decades, droughts have become more frequent in Uganda since the 2000s and have affected the largest number of people (Figure 2). This is largely explained by agriculture absorbing the largest share of the working population (about 70 percent) and often relying on rain-fed crops. Between 2002 and 2010, droughts impacted over 3 million Ugandans, and the severe drought that hit Uganda and the Horn of Africa in 2016/17, on its own, impacted more than 1 million people in the country, causing a humanitarian crisis and jeopardizing food security.

Figure 2. People Affected by Disasters (1985-2021)
(Number of people)

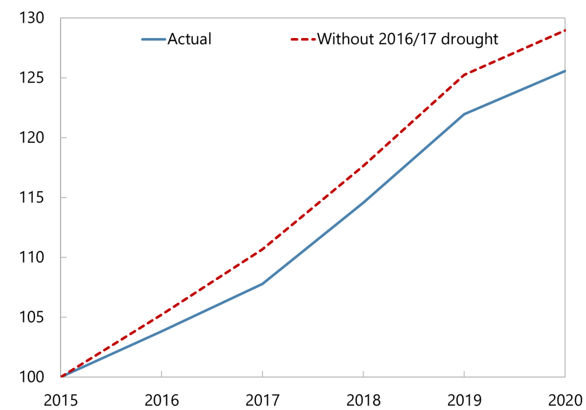


Sources: EM-DAT and Fund staff calculations.

[3] Affected people refer to those requiring immediate assistance during a period of emergency, i.e., requiring basic survival needs such as food, water, shelter, sanitation, and immediate medical assistance.

4. Disruptive natural disasters, such as droughts and floods, impact the economy to a large extent. In addition to direct damages to lives and livelihoods, the effects of disruptive natural disasters extend to the wider economy.[4] For example, the 2016/17 drought was one of the main reasons for a significant growth slowdown during those years, which impacted the level of real GDP going forward (Figure 3). In 2019, Uganda ended up with a level of real GDP that was 3½ percent lower than in a counterfactual scenario where growth was unaffected by the 2016/17 drought.

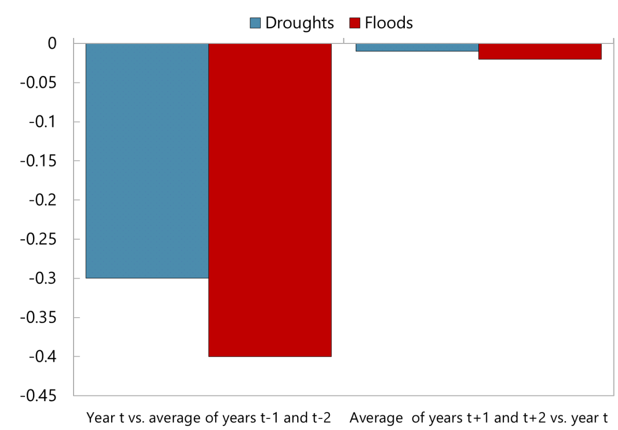
Figure 3. Real GDP Impact of 2016/17 Drought
(Index number, 2015=100)



Sources: Authorities' data and IMF staff calculations.

5. Cross-country estimates from sub-Saharan Africa confirm large and persistent macroeconomic effects of droughts and floods. The real GDP growth loss averages 0.3 percentage points for droughts and 0.4 percentage points for floods in the year of the disaster occurrence (IMF, 2020). The effect in the two years after the shock is smaller but still negative, implying a persistent level effect on real GDP (Figure 4). Disaster-prone countries like Uganda are often afflicted by disaster shocks repeatedly, and the effects may accumulate, weighing permanently on growth (Cantelmo, Melina and Papageorgiou, 2019). Growth challenges typically compound with widening of fiscal and current account deficits, lower tax revenues, and increased spending due to post-disaster relief and rebuilding of damaged infrastructure (IMF, 2016). In addition, household survey data indicate that climate-related disasters exacerbate already large inequalities in sub-Saharan Africa because almost half of the population depends on weather-sensitive activities for their livelihoods (IMF, 2020).

Figure 4. GDP Impact of Disruptive Droughts and Floods
(Percentage points)

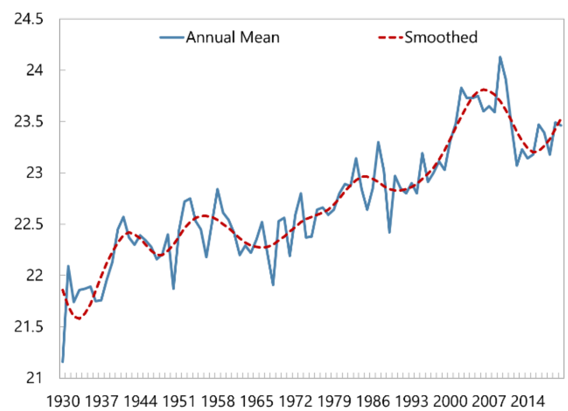


Sources: IMF (2020) and Fund staff calculations.

[4] Disruptive disasters are defined as those events with fatalities plus 0.3 times the affected persons exceeding 0.01 percent of the population.

6. Going forward, climate change will likely exacerbate the frequency and severity of natural disasters and cause very large economic damages in Uganda. Since the 1930s average temperature in Uganda has increased by 1.7°C (Figure 5). In addition, the country has experienced a statistically significant reduction in rainfall, especially during March-May, which has witnessed an average decrease of 6.0 mm per month, per decade since the 1960s.[5] As a consequence, droughts have been more frequent and longer-lasting, especially in the western, northern and north-eastern regions of the country. At the same time, more erratic rainfalls cause disruptive floods, common in urban areas, including the capital city Kampala. According to the Intergovernmental Panel on Climate Change (IPCC, 2014), Uganda's maximum temperatures will rise between 1°C and 2.2°C by 2050, while minimum temperatures will rise between 0.8°C and 2.5°C, depending on global emission scenarios. Therefore, most models adopted by the climate science community (CMIP5) predict an increase in the intensity and frequency of extreme weather events between the current and the mid-century period. In addition, the slow-moving impact or the temperature increase is expected to affect agriculture.[6] While it is projected that precipitation will increase in some parts of Uganda, warmer temperatures will accelerate the rate of evapotranspiration, reversing the benefits of increased rainfall[7] and reducing crop and livestock yields.[8] Climate change damage estimates in the agriculture, water, infrastructure and energy sectors could collectively amount to US$273-437 billion (2.8-4.5% of cumulative prospected GDP) between 2010 and 2050 (Ministry of Water and Environment, 2015).

Figure 5. Observed Average Annual Temperature
(Degrees Celsius)



Sources: World Bank CCKP and IMF staff calculations.

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[5] Observed, historical data, produced by Climatic Research Unit (CRU) of University of East Anglia, were retrieved from the Climate Change Knowledge Portal of the World Bank.

[6] The Warm Spell Duration Index (the number of days in a sequence of at least six days in which the daily maximum temperature is greater than the 90th percentile of daily maximum temperature) is expected to increase by 20-50 days.

[7] The number of days with precipitation greater than 20mm will increase in each of the two rainy seasons in Uganda Under a high-emission scenario, monthly annual precipitation is expected to increase in some areas of the country, and to decease in others, notably the northern and north-eastern areas.

[8] Besides the implications for food security deriving from the loss of food crops, major export crops like coffee and tea could also see a reduction in yields leading to combined economic losses of about US$1.4 billion by mid-century (World Bank, 2021). Climate-induced losses from the potential reduction of Arabica coffee yields are expected to range 10–50%, with the potential to reduce foreign exchange earnings by $15–$80 million per year (World Bank, 2021).

B. Estimating the Impact—Benefits of Adaptation

7. Scaling up adaptation and preparedness is essential to ensure resilience of the population and the economy to extreme weather events. Uganda is a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and the country intends to implement plans to foster a low-carbon development path, with an emphasis on adaptation (Ministry of Water and Environment, 2015c). The Third National Development Plan (NDPIII) recognizes that the livelihood of the people of Uganda is highly dependent on the exploitation of its natural resources and that climate change management is critical to the reduction of disaster losses. The country's goal is to reduce vulnerability in priority sectors and the NDPIII aims to increase water permit compliance and widen the land area covered by forests and wetlands. The accuracy of meteorological information, crucial for early warning systems, has improved to an extent, but other areas require more urgent actions. Uganda loses more than 800 km^2 of its wetlands every year, posing challenges to water access. The restoration of forests, which should increase forest coverage from 14% to 21% by 2030, has so far not kept pace with the annual loss, posing risks for soil erosion and landslides during flood events.

8. Adaptation and mitigation strategies are often complementary and go hand-in-hand with economic development. For example, reforestation programs contribute to emission reduction through carbon sequestration and enhance soil resilience to floods. The development of the electricity sector has significant mitigation potential, by offsetting wood and charcoal burning, while enhancing soil resilience by fostering forestation. Climate change is one of the reasons for the exploitation of forests and wetlands as the rural population tends to exploit these natural resources more intensely during drought events. Therefore, investments in more efficient irrigation structures would both enhance the resilience of agriculture and incomes of the rural population to droughts, while helping prevent environmental degradation. Moreover, broad-based inclusive growth policies, by reducing poverty, indirectly enhance climate adaptation, as they reduce the number of people vulnerable to disasters by increasing their capacity and resources to construct more durable structures and protect property and human lives.

9. Climate adaptation measures pose planning, implementation and financing challenges, and require international support. Adaptation policies involve a combination of physical investments; training and capacity building; and reforms in laws, regulations, and fiscal instruments that relate to different sectors. Low capacity makes it difficult to assess and prioritize projects, and to access climate funds due to complex bureaucratic processes. Accessing grants and concessional financing is pivotal for Uganda's adaptation strategy, given that the total climate adaptation budget, estimated at US$120 million per year for 2021-2030 (Ministry of Water and Environment, 2015b), equivalent to 0.3 percent of GDP or 2.1 percent of government revenues excluding grants, cannot be met only with domestic (private and public) resources. The COVID-19 pandemic added further challenges by diverting resources from climate adaptation to the health sector, both at the government and donor community level.

10. Model simulations are leveraged to illustrate trade-offs between alternative policies. The analysis is conducted by calibrating the Debt, Investment, Growth and Natural Disasters (DIGNAD) model of Marto, Papageorgiou, and Klyuev (2018) to Ugandan data. The DIGNAD model provides a framework to evaluate macroeconomic and financial implications of alternative investment programs and financing strategies. The production in the economy is carried out by firms in the tradable and non-tradable sectors, using private and public capital, besides labor. In the model, a natural disaster shock affects the economy by mainly destroying capital and reducing total factor productivity. Public capital can be of two different types, based on how resilient it is to weather-related events: standard and resilient/adaptation capital.[9] In addition, adaptation capital is characterized by a lower depreciation rate than standard infrastructure to capture higher durability, and may entail a higher fiscal cost.[10]

11. Illustrative experiments are set up along two main dimensions: investment options and financing. For the sake of simplicity, the assumption is that authorities use the same budget envelope of 0.5 percent of GDP for 5 consecutive years for building standard or adaptation infrastructure, and a natural disaster occurs as soon as this investment plan is completed. The experiments help address three main questions: (1) What are the gains associated with adaptation infrastructure in the face of a natural disaster? (2) How does the outcome change when the government finances the initial investment with international grants, rather than by raising taxes? (3) What are the financing needs for reconstruction in the aftermath of a disaster, depending on whether the government has invested on standard or adaptation capital? And what does this mean for international donors? Three scenarios are considered: (1) investment in standard infrastructure; (2) investment in adaptation infrastructure financed by higher taxation; (3) investment in adaptation infrastructure financed by international grants. These simulations, for simplicity, assume that the post-disaster reconstruction is financed by increased taxation, under the assumption that Uganda has limited fiscal space for deficit-financed spending. It is, however, possible that donors would intervene also with post-disaster grants.

12. Building adaptation infrastructure can reduce by two thirds the GDP losses at the trough triggered by a disruptive disaster and almost halve the resulting fiscal gap. As an illustration, in the absence of adaptation capital, the natural disaster shock is assumed to trigger a decline in GDP of one percent, in the ballpark of highly disruptive droughts and floods observed in sub-Saharan Africa, or the 2016 drought in Uganda. In this case, a fiscal gap of 2.7 percentage points of GDP would arise because of reconstruction needs and the decrease in tax revenues (Figure 6). The simulations assume that the fiscal gap is covered by an increase in taxes, and hence no new

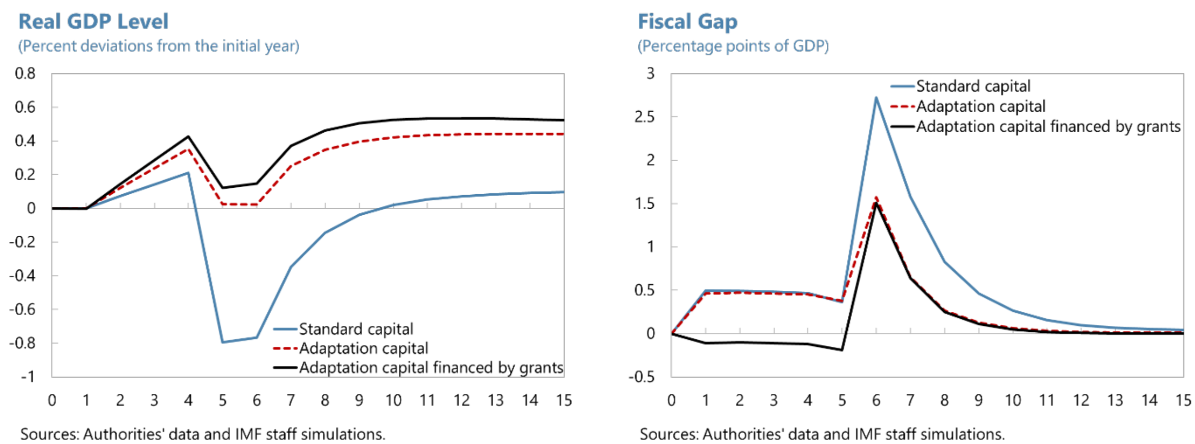
[9] Relative to standard infrastructure, adaptation infrastructure could be complementary—e.g., seawalls, breakwater, irrigation systems, retrofitting or climate proofing—or substitute—e.g., climate resilient infrastructure.

[10] While parameter values related to macroeconomic indicators are set to values in line with averages of Ugandan data observed in the past 5 years, parameters governing the resilience of adaptation capital are set at average values for developing disaster-prone countries as in Marto, Papageorgiou, and Klyuev (2017). These deliver an average effect across various possible investments.

debt is issued.[11] Building adaptation infrastructure, such as water supply systems that are less dependent on rain or infrastructure that withstand floods in the pre-disaster period can reduce the GDP losses at the trough by two thirds and almost halve the resulting fiscal gap. Financing public investment (in standard or adaptation infrastructure) with higher taxation would lead to a sacrifice in terms of GDP in the ramp up of the investment effort. Grant-financing can reduce this cost (or eliminate it if it covers the investment plan in full, as in the example provided in the figure).

13. **For donors it may be cost-effective to help finance investment in adaptation because it would reduce post-disaster disbursements.** The large fiscal gap arising in the aftermath of a disaster underscores a problem that authorities may face increasingly more often with worsening climate conditions. Very likely, donors might have to financially support the country in these circumstances, covering at least a fraction of the fiscal gap. It may therefore be more cost-effective for donors to help finance investment in adaptation, given the larger post-disaster disbursements that would be required to finance the larger fiscal gaps arising in the absence of adaptation. If donors financed a fixed fraction of the fiscal gap arising from natural disasters, post-disaster disbursements could be halved in the presence of adaptation.

Figure 6. Impact of a Stylized Disaster Shock on Real GDP and the Fiscal Deficit



C. Conclusions

14. **In sum, for Uganda, there are important economic dividends from investing in climate adaptation.** If the country were better prepared and equipped with a larger stock of adaptation capital, it would be more resilient to adverse weather events, reporting fewer damages, and lower GDP losses and post-disaster financing needs, beside fewer losses of lives. Adaptation investments, such as more efficient irrigation systems and resilient infrastructure pose significant financial

[11] An alternative assumption could be that the fiscal gap is financed by new government debt, which may deliver relatively more favorable GDP dynamics, thanks to a smaller crowding-out of private investment, if debt is issued externally.

challenges, especially in the presence of limited fiscal space, and require donor support. Simulations show that, also for donors, it may be cost-effective to help the country finance investment in adaptation because it would reduce post-disaster disbursements. While some inroads have been made, for instance, in providing more accurate weather forecasts, the country still faces challenges stemming from soil, forest and wetland degradation, which exacerbate the impact of disasters such as floods and droughts. Urgent policy actions, in line with authorities' NDPIII include:

- developing flood risk zoning, upgrading and enforcing development restrictions, as well as standards for construction and maintenance, which would improve the country's resilience to floods;
- revamping government support to reforestation programs, which would also enhance soil resilience to floods, while contributing to emission reduction through carbon sequestration;
- improving water mapping and monitoring, and water conservation measures (e.g., price differentiation and groundwater protection, among others), which would increase resilience to droughts;
- scaling up capacity to access donor funds that are critical to meet ambitious adaptation plans.

15. The forthcoming oil extraction represents an opportunity to leverage the associated revenues to finance Uganda's low-carbon development plans. This includes investing in renewable energy generation that will reduce the use of coal and wood, and thus benefit reforestation. Reducing poverty will also be part of climate adaptation, as a wealthier population has larger capacity and resources to protect property and human lives.

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THE NEUTRAL RATE OF INTEREST AND ITS IMPLICATIONS FOR MONETARY POLICY[1]

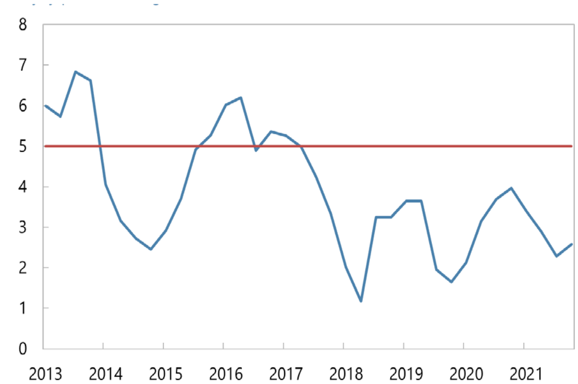
The estimation of Uganda's neutral rate suggests it has fallen in recent years, implying a more accommodative monetary stance is needed to return inflation back to target despite recent rate cuts and liquidity injections. The chapter also documents that more room for exchange rate flexibility is possible given relatively low exchange rate passthrough findings.

A. Introduction

1. **In July 2011, the Bank of Uganda (BoU) adopted a new monetary regime, namely Inflation Targeting Lite (ITL).** The primary policy objective is to hold annual core inflation to a medium-term target of 5 percent. Core inflation—measured through a new rebased CPI—averaged around 4.7 percent between 2013 and 2017. However, despite the policy rate having been lowered by 3.5 percentage points since 2019, core inflation has been fluctuating at around 2½ percent—well below the 5 percent target. From a monetary policy perspective, two factors could have contributed to this: an insufficiently accommodative monetary policy stance; and/or an impaired transmission mechanism. For monetary policy to support a durable return of core inflation to its target, both elements are needed, namely an appropriate monetary policy stance and a working transmission channel.

Figure 1. Core CPI Inflation

(Y-o-y percent change)



Sources: Haver and Fund staff calculations.

2. **This chapter estimates the real neutral rate for Uganda,** which provides a useful summary of the monetary policy stance as measured by real short-term interest rate. The neutral rate is defined as a measure of the real interest rate that, in the absence of temporary disturbances, is consistent with output at potential and price stability. Globally, the neutral rate has fallen. This trend, which started well before the global financial crisis (GFC), reflects, in part, lower potential growth, but also other factors—such as higher demand for safe assets (Caballero and others, 2017), larger income inequality (Mian and others, 2021), shifts in demographics (Eggertsson and others, 2019) and subdued investment (Summers, 2015). If the neutral rate had also fallen in Uganda, it would imply the monetary policy stance may not be as accommodative as the monetary policy committee intended.

[1] Prepared by Jiaqian Chen (SPR).

3. We use a semi-structural model to provide estimates of how the neutral rate has evolved over time and to construct interest rate gaps to assess the monetary policy stance. The seminal work of Laubach and Williams (2003, 2015) estimated the neutral rate for the US based on a variant of the Rudebush and Svensson (1999) model. They found significant variation in the estimated neutral rate over time but also noted that the estimates are imprecise. More recently, Pescatori and Turunen (2016) augmented the Laubach and Williams (2003, 2015) model with additional factors that have been identified in the literature as having played a fundamental role in reducing global interest rates. In this chapter, we adapt the empirical model from Pescatori and Turunen (2016) to estimate the neutral rate in Uganda using a Bayesian approach.

4. The chapter has three main results. First, the real neutral rate in Uganda has declined over time. We also found significant uncertainty around the estimated neutral rate in line with the literature. Second, the results show that the decline in the real neutral rate over time was predominately driven by falling trend growth, while more recently other factors such as economic uncertainty appear to have played an important role. Third, we document that the current monetary stance is broadly neutral despite the fact that the central bank has brought the nominal rate to record low levels.

5. The rest of the paper is organized as follows. Section B presents the empirical strategy for estimating the neutral rate, followed by empirical results in Section C. Section D discusses the main findings. Section E presents a forecast for inflation and Section F concludes.

B. The Empirical Framework for Estimating the Neutral Rate

6. The core system of equations follows Pescatori and Turunen (2016). It includes an IS-curve relating the output gap to an interest rate gap, a backward-looking Philips curve relating core inflation to an output gap, and an equation that links the neutral rate to its determinants. The main block of the dynamic system is:

$$x_t = a_1 x_{t-1} - a_r(r_{t-1} - r^n_{t-1} + r_{t-2} - r^n_{t-2}) + \varepsilon^s_t$$

$$\pi_t = \sum_{j=1} b_j \pi_{t-j} + b_y x_{t-1} + b_0 neer_{t-1} + \varepsilon^p_t$$

$$y^n_t = y^n_{t-1} + g_{t-1} + \varepsilon^n_t$$

$$g_t = g_{t-1} + \varepsilon^g_t$$

Where x_t is the output gap defined as the difference between actual and trend output in logs ($y_t - y^n_t$); r_t is the real policy rate, r^n_t is the real neutral rate, π_t is the CPI inflation; $neer_t$ is the deviation of the nominal effective exchange rate from its trend calculated based on a HP filter; while ε^s_t, ε^p_t are i.i.d. shocks. Trend output growth is driven by a random walk g (trend potential output growth) plus noise ε^n_t.

The evolution of the neutral rate is governed by trend growth g and an exogenous process z:

$$r^n_t = cg_{t-1} + z_t$$

Where c is a positive constant, and the variable z captures other determinants of the neutral rate. In particular, we consider real long-term US bond yields, the spread between the Uganda and US 10-year government bond yields and a measure of economic uncertainty. These measures are intended to capture global factors, as well as increased demand for safe assets owing to higher uncertainty:

$$z_t = d_1 z_{t-1} + d_2 z_{t-2} - d_c \Delta S_t - d_e \Delta E_t + \varepsilon_t^z$$

We estimated the empirical model using Bayesian methods which has the advantage over traditional maximum likelihood when the sample is relatively short.

C. Bayesian Inference and the Data

7. We use a quarterly sample from 1999Q1 to 2021Q2 on real GDP, inflation, exchange rate deviation from the trend, and the real short-term interest rate (approximated with 91-day T bill rate). The test for structural break at the time of the regime change in 2011 was statistically insignificant, implying that using the longer time series remains appropriate.

8. Prior and posterior estimates. The prior means are set following Pescatori and Turunen (2016). The posterior distribution of the model parameters has been sampled using an MCMC algorithm. Table 1 reports the model, median, and percentile posterior parameter estimates. The parameter estimates for the baseline model show that trend growth rates is strongly associated with the neutral rate.

Table 1. Uganda: Estimated Parameter Values

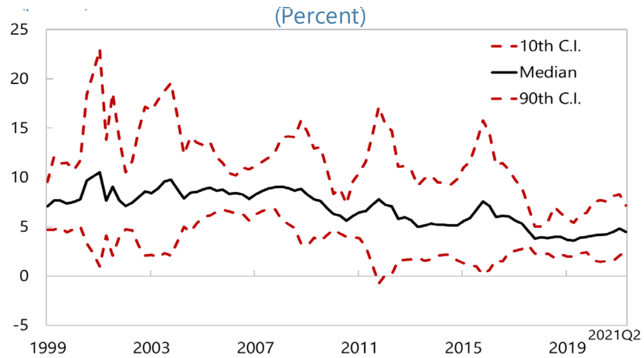
Parameter name	prior mean	post. mean	HPD 90%	interval	prior	pstdev
c	1	0.9926	0.9146	1.0786	gamma	0.05
a1	1.28	1.0426	0.9401	1.1403	gamma	0.1
a_r	0.08	0.0273	0	0.0566	gamma	0.07
by	0.4	0.3986	0.3812	0.4153	beta	0.01
b1	0.4	0.5479	0.4498	0.6448	beta	0.1
b2	0.25	0.1212	0.0434	0.1973	beta	0.1
b0	0.03	0.0278	0.014	0.0417	beta	0.01
dc	0.5	0.2911	-0.5259	1.0997	norm	0.5
de	0.5	0.5616	-0.1525	1.2667	norm	0.5
dp	0.5	0.4691	-0.3407	1.2875	norm	0.5

D. The Estimated Neutral Rate for Uganda

9. The results show a trend decline in the neutral rate in Uganda, starting from 2008. For robustness, we compute four alternative measures of the neutral rate using different variables and sample sizes.[2] While the range of estimates is large, confirming that estimates of the neutral rates are intrinsically imprecise, all the estimates point to a declining neutral rate. The neutral rate was at around 9 percent in real terms between 1999 and 2008. It has fallen to as low as 4 percent in early 2020 and has recovered somewhat in the most recent quarters to about 4½ percent.

Figure 2. Estimated Neutral Rate

(Percent)

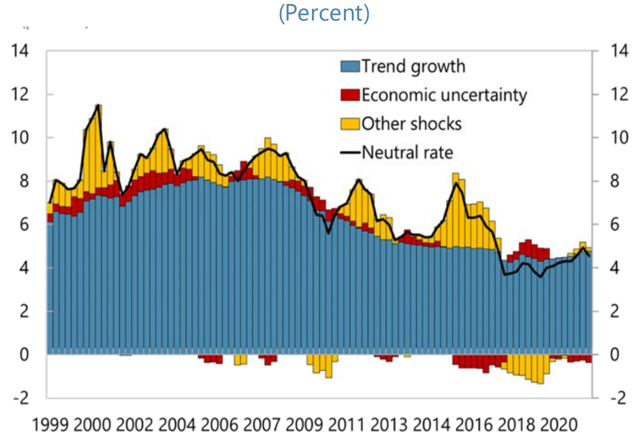


Sources: Fund staff calculations.

10. The neutral rate equation above shows that it depends on trend growth and other factors. In the long run, the neutral rate is determined by the supply of and demand for savings. For example, higher productivity growth is generally associated with new investment opportunities that increases the demand for capital, driving up interest rates. On the other hand, when economic uncertainty is high, demand for safe assets increases which would push down the equilibrium real rate. Our results confirm that trend growth is, indeed, an important, but not the only, driver of neutral rates over time. Trend growth was high before 2008, rising in the 2000s and declining after that. The decline since 2008 was an important driver of the decline in neutral rates. Nonetheless, other determinants also played a role. In particular, since the beginning of 2020, heightened economic uncertainty, hence an increased risk aversion, has contributed to the fall in the neutral rate.

Figure 3. Neutral Rate Components

(Percent)

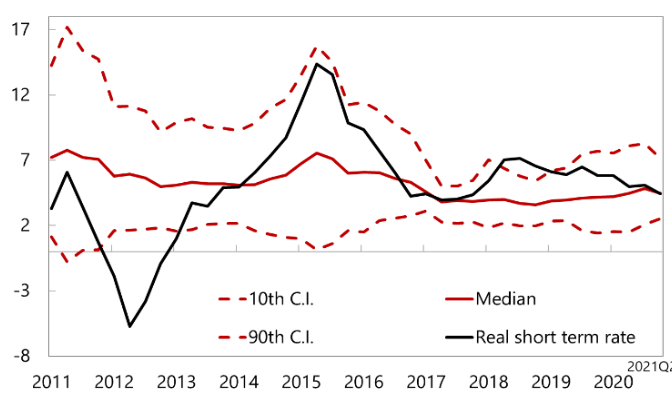


Sources: Fund staff calculations.

[2] These results are available upon request.

11. The real interest rate gap—the difference between the observed real rate and the estimated neutral rate—is estimated at zero in 2021Q2, suggesting the monetary policy stance was broadly neutral. (Figure 4). This neutral policy stance is driven by a combination of decelerating inflation—which implies a higher real rate all else equal—and a falling neutral rate.

Figure 4. Neutral Rate and Real Short-term Rate
(Percent)



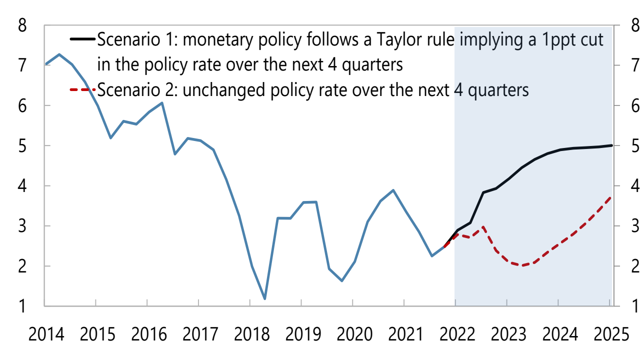
Sources: Fund staff calculations.

E. Inflation Outlook

12. This section looks at inflation projections to provide a forward-looking assessment of the appropriateness of the current monetary policy stance. Inflation projections are based on the Forecasting and Policy Analysis System (FPAS, Berg and others., 2006) which is also used by the BoU. The FPAS model is a new Keynesian semi-structural model that contains four key equations: (i) an IS curve; (ii) a Phillips curve; (iii) an UIP condition; and (iv) a monetary policy reaction function. The model is estimated using data between 2000Q1 and 2021Q4 and incorporates the estimated neutral rate from section D as well as assumptions on global commodity prices and US inflation that are broadly consistent with the January WEO database.[3] We conduct two sets of forecasts:

- The first scenario is based on an assumed fiscal path that is broadly consistent with the authorities' plan and monetary policy follows a Taylor rule. In this scenario, the policy rate is cut by 1 percentage point and the shilling depreciates by about 10 percent over the next year, which offset the negative impact from planned fiscal consolidation on inflation. As a result, core inflation continues to steadily accelerate, reaching the inflation target at end-2023.

Figure 5. Model Based Core Inflation Projection 1/
(Y-o-y. percent change)



Sources: Fund staff calculations.
1/ Illustrative simulations were conducted with a Quarterly Projection Model (QPM) developed with support from IMF Institute for Capacity Development. A similar framework is used as a core model in the BoU's Forecasting and Policy Analysis (FPAS): Bank of Uganda (2019) Working Paper No.15/2019.

- The second exercise builds on the first by assuming the central bank keeps the policy rate unchanged. In this case, monetary policy does not react to the deflationary pressures, thus core

[3] The model doesn't account for the change in monetary policy framework in July 2011. This enables a larger sample for estimating the model.

inflation falls before gradually accelerating again towards the target. Since monetary policy is unchanged, the shilling depreciates less in this scenario.

- These simulations indicate that additional monetary easing would ensure a return of inflation to the central bank's medium-term target. However, monetary policy should remain data dependent, and if external conditions change, the BoU should adjust its stance accordingly. Moreover, passthrough of exchange rate depreciation to inflation driven by a risk premium shock is estimated to be relatively moderate. While the passthrough is estimated to be much higher with demand shocks, there is no trade-off for the BoU to respond in this scenario (Box 1).

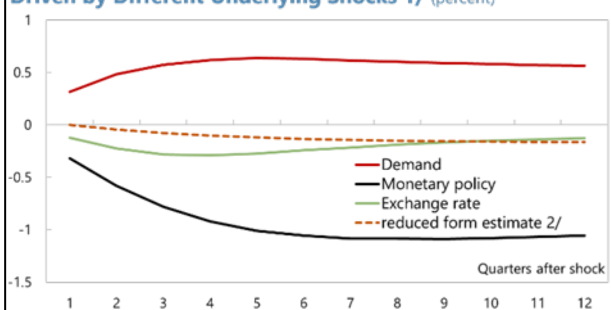
Box 1. Estimating Exchange Rate Pass-through

The pass-through of the exchange rate to inflation can be a concern for many small and open economies (SOEs). The literature found that the passthrough can be significantly higher in SOEs than in developed countries (Ball, 1998, Mishkin and Savastano, 2001 and Aron and others, 2014). Thus, in economies with large global trade, monetary policy cannot focus on inflation targeting without having some control over the exchange rate.

In the case of Uganda, the literature on the size of exchange rate passthrough is inconclusive. The estimated passthrough coefficient ranges from 0.05 to 0.47 (Anguyo, 2008 and Bwire and others, 2013).

Using a structural VAR based on Forbes et al. (2018), results highlight the importance of the underlying shock in determining the exchange rate pass-through. In particular, the estimated pass through could be as large as 0.6 following a demand shock, which drives the exchange rate as well as inflation in the same direction, or as low as 0.05 following an exchange rate risk premium shock.

Pass-through to CPI Price Index of a 1percent Appreciation Driven by Different Underlying Shocks 1/ (percent)



Sources: Fund staff calculations.
1/ Based on an estimated structural Bayesian VAR; pass-through is defined as the median ratio of cumulative impulse responses of CPI relative to exchange rate.
2/ Based on an estimated Phillips curve with core CPI as the dependent variable.

F. Conclusions

13. **This chapter uses a semi-structural model to estimate the time-varying neutral rate in Uganda.** The empirical framework is based on Pescatori and Turunen (2016). Our results show a decline in the neutral rate over time, driven mostly by a decline in trend growth. As expected, the confidence interval and the range of estimated neutral rates are large suggesting the point estimates should be taken with caution. Going forward, the level of the neutral rate may rise as economic uncertainty falls; however, low potential growth is likely to continue weighing on the neutral rate. Our results highlight the importance of identifying the monetary policy stance by looking at the interest rate gap rather than just the headline nominal policy rate. Finally, the analysis suggests a more accommodative stance would be needed to ensure a return of inflation back to the central bank medium-term target. Nonetheless, monetary policy should remain data dependent given the fast-changing external environment.

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