TECHNICAL ASSISTANCE REPORT

KENYA

Revamping the Central Bank of Kenya's Core Quarterly Projection Model

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Glossary

AR	Autoregressive
BOP	Balance of Payments
CBK	Central Bank of Kenya
CPI	Consumer Price Index
FPAS	Forecasting and Policy Analysis System
FT	Forecasting Team
GDP	Gross Domestic Product
IMF	International Monetary Fund
IT	Inflation Targeting
KMD	Kenya Meteorological Department
KNBS	Kenya National Bureau of Statistics
MCI	Monetary Conditions Index
MCM	Monetary and Capital Markets
MPC	Monetary Policy Committee
MPR	Monetary Policy Report
PC	Phillips Curve
QNA	Quarterly National Accounts
QPM	Quarterly Projection Model
RSAD	Real Sector Analysis Division
TA	Technical Assistance
UIP	Uncovered Interest Parity

Preface

At the request of the Central Bank of Kenya (CBK), a technical assistance (TA) mission from the Monetary and Capital Markets (MCM) Department of the International Monetary Fund (IMF) visited Nairobi, Kenya from April 10 to 17, 2025 to assist the authorities in further improving the CBK's Forecasting and Policy Analysis System (FPAS), with a focus on its core quarterly projection model (QPM) for monetary policy analysis and forecasting. The mission team comprised Jianping Zhou (Mission Chief, MCM), Archil Mestvirishvili (Resident Advisor, AFRITAC East), Adrienne Gagnon (Principal Economist, Bank of Canda), and Jaime Trujillo (Principal Economist, Bank of Canada).

This MCM TA mission on FPAS completed a full update of the core QPM. The new model more closely reflects Kenya's key economic features and the transmission mechanisms of its inflation-targeting (IT) monetary policy framework, along with a new fiscal policy block, a more disaggregated inflation block, and an improved external block that incorporates a simple balance of payments channel. In addition to having further strengthened the CBK's monetary policy modeling capacity, the TA also introduced a new approach to integrating climate risks directly into the CBK's QPM and properly modeling them as supply-side shocks with more challenging policy tradeoffs. This approach can be applied to similar classes of New Keynesian QPMs in many FPAS TA recipient countries.

The mission held highly interactive daily technical sessions and a useful high-level concluding meeting. Participants included the CBK forecasting team (FT) in the Real Sector Analysis Division (RASD), experts from the External and Fiscal Analysis Division, as well as staff from the Monetary Policy Division and the Monetary Policy Committee (MPC) Secretariat. The mission team also held a concluding session with Governor Dr. Kamau Thugge, discussing the revamped QPM model and the key recommendations.

The mission would like to thank the CBK staff and management for their cooperation, productive discussions, and their hospitality.

Executive Summary

In response to a request from the CBK, an MCM TA mission visited Nairobi, Kenya from April 10 to 17, 2025. The primary objective of the mission was to further enhance the CBK's core QPM and follow up on the recommendations of the April 2024 TA mission. Building on the progress made by the CBK's modeling team since the last mission, this TA further strengthened the CBK's FPAS and modeling capacity.

The IMF team worked closely with the CBK staff and undertook a comprehensive update of the core QPM. The updated model more effectively captures Kenya's key macroeconomic features and the transmission mechanisms under its flexible inflation targeting (IT) policy framework. The model was recalibrated and forecasting accuracy was improved significantly. The introduction of a new fiscal block, with explicit modeling of government spending and revenue, enhances the model's ability to assess the macroeconomic and policy implications of fiscal developments, including their effects on aggregate demand and risk premiums. This, in turn, supports a richer analysis of fiscal-monetary policy interactions. The disaggregation of the inflation block into core, food, and energy components, utilizing new data from the Kenya National Bureau of Statistics (KNBS) co-developed with the CBK, allows for a more detailed interpretation of inflation dynamics and strengthens the policy narrative underlying model-based forecasts. The mission also developed a suite of tools to support the analysis of the model results and the evaluation of model performance, in addition to the EViews scripts on estimating parameters of the decomposed Philips Curves (PC) and the neutral interest rate.

The mission also made progress with integrating climate risks into the core QPM to strengthen monetary policy analysis. A model extension was introduced to incorporate weather shocks. Specifically, using World Bank climate risk data for Kenya, a new climate index was constructed and embedded in the food inflation Phillips Curve (PC) to better capture the impact of weather-related shocks on supply-side inflation pressures. A climate risk scenario was used to illustrate the potential macroeconomic and monetary policy implications. As the CBK staff begin the process of operationalizing this climate-risk-augmented QPM model, the immediate priority is to refine the climate index to ensure it captures relevant weather variables with macroeconomic significance for Kenya

The mission recommended using the new core QPM model in monetary policy analysis and decision-making, while regularly evaluating model performance. Strengthening modeling capacity and further enhancing the QPM will be an ongoing process, requiring sustained commitment from both CBK management and the modeling team. The CBK management is encouraged to support staff training and experimentation to foster continued model refinement, learning, and capacity building. The modeling team should also ensure that any model updates are clearly documented in the equation overview and the how-to manuals prepared during the mission.

Follow-up TA will focus on assessing progress in implementing the revamped QPM and on further improvement of the overall FPAS process. Building on the preliminary review of the FPAS process conducted during the mission, the next TA will aim to support the development of a unified FPAS database, streamline the forecasting process, and improve CBK's internal and external communication. In particular, the TA will seek to make CBK's Monetary Policy Reports (MPRs) more forward looking by integrating QPM-based risk assessments and policy scenarios into these reports.

Recommendations

Table 1. Key Recommendations

Recommendations	Priority	Timeframe [1/]
Implementing the New Core QPM		
Apply the new QPM model to monetary policy analysis and decision-making. Specifically:	High	Near term
- Use QPM-based simulations (impulse responses, scenarios, judgement and uncertainty-based analysis) to enhance capacity for policy analysis.		
- Use the mock-up presentations prepared during the mission for model changes, staff projections, and risk scenarios.		
- Use alternative Taylor-rule specifications for counterfactual policy analysis.		
Regularly engage with fiscal experts over the projection period and ensuring that fiscal projections are consistent with the government budget plans.	High	Near term
Systematically evaluate the performance of the individual PC inflation equations and re-estimate them as needed using the newly developed EViews estimation scripts.	High	Near term
Encourage staff training and experimentation to ensure continued model development, learning, and capacity building.	High	Near term
Regularly update the two manuals developed during the mission: the CBK QPM Equation Overview Manual and the CBK QPM Operation Manual.	High	Medium term
Further Improving the Core QPM		
Further improve the new model extensions that incorporates weather shocks, including by developing appropriate climates risk variables to more accurately capture the dynamics of weather shocks in the QPM.	High	Near term
Recalibrate the external black and reassess the model performance when the revised exports and imports data become available.	High	Near term
Refine the new QPM extensions as more data becomes available, especially quarterly nominal and real GDP data by expenditure (domestic demand, exports and imports, and government expenditures).	Medium	Medium term
Further Improving the FPAS Process		
Develop and maintain a unified FPAS database.	High	Near term
Consider synchronizing the forecasting rounds with the release of the quarterly national account data.	High	Near term
Further improve internal and external communication.	High	Medium term

[1/] Near term: < 12 months; Medium term: 12 to 24 months.

I. Introduction

1. **Monetary policy in Kenya currently aims to achieve and maintain price stability by targeting medium-term headline inflation of 5 percent, with a tolerance band of ±2.5 percent.** The QPM for Kenya was initially developed in 2014 with IMF FPAS TA support and has served as the foundation for medium-term forecasting and policy analysis, supplemented as needed by ad hoc statistical models. With the CBK's recent transition to an IT regime, it has become essential to update the QPM so that the model generates clear and meaningful policy transmission channels, thereby strengthening both decision-making and policy communication.

2. **The CBK has been using its QPM model for medium-term forecasting and monetary policy analysis, supplemented with ad-hoc statistical models and expert judgement.** Some extensions to the original model (such as the fiscal block) have been added by CBK staff. However, CBK staff believed that the QPM model remained inadequate for capturing important policy channels and external shocks. Therefore, a full revision was deemed necessary, including recalibrating key model parameters and steady-state levels, and updating model equations to reflect the current structure of the Kenyan economy.

3. **Developing a New Keynesian-based semi-structural QPM for monetary policy analysis and forecasts in an emerging economy like Kenya presents several challenges**. Data limitations remain a key constraint, as many key macroeconomic indicators—such as quarterly GDP by expenditure components and long time-series for expectations—are largely unavailable. Moreover, policy transmission mechanisms are still evolving, with structural changes in financial markets, fiscal policy, and external conditions affecting the stability of estimated and calibrated relationships. Finally, institutional capacity constraints, including a relatively small forecasting team with competing priorities, make model maintenance and updates more challenging.

4. **A 2024 TA mission identified the practical scope for a comprehensive revision of the CBK's core QPM, given these challenges.** The ultimate objective was to develop a QPM model with stronger analytical consistency, better data fit, and improved forecasting accuracy. The 2024 mission implemented significant modifications and made detailed recommendations for further enhancements. The modifications included adjustments to the model's steady states to better reflect the real economy, improvements to the aggregate demand block to better account for policy, domestic demand, and external shocks, and enhancements to the uncovered interest parity (UIP) and policy rule blocks to effectively represent the current policy framework. Additionally, the foreign block was improved by integrating a simple three-equation model for the U.S. economy, and the model was recalibrated to capture the economy's sensitivities to various shocks. The mission recommended further improvement of the fiscal and UIP blocks, refine core inflation, and update the Consumer Price Index (CPI) block to include separate equations for food and energy inflation.

5. **The CBK's effective implementation of the FPAS TA over the past two to three years has been commendable**. The use of the updated Nowcasting and Near-term Forecasting (NTF) systems (introduced during the 2023 TA mission) and the partially revamped QPM (developed during the 2024 TA mission) has continued to support Gross Domestic Product (GDP) and inflation forecasts and strengthen monetary policy decision-making. According to the authorities, forecast accuracy has significantly

improved. Moreover, the Research Department's size has been increased by five staff members, including one dedicated to the modeling team.

6. Building on the progress of the 2024 mission, the 2025 TA mission aimed at developing a fully revamped QPM. The objective was to incorporate key features of the Kenyan economy and more clearly defined monetary policy transmission channels. Specifically, the mission tasks include rebuilding the fiscal block to better capture interactions between monetary and fiscal policy, introducing separate PC equations for food and energy inflation, and re-estimating a new core inflation PC equation using the new core inflation data. The mission's another main task was to improve the UIP equation to better capture risk premium shocks and exchange rate dynamics by adding and calibrating a simplified Balance of Payments (BOP) channel as well as a fiscal risk channel. The mission also planned to evaluate the performance of the revamped QPM and conduct simulations (impulse responses, scenarios, and judgement- and uncertainty-based analyses) for model-based policy analysis.

7. The 2025 TA mission extended beyond the scope identified in the 2024 mission. Prior to the mission, the CBK staff highlighted the growing importance of supply-side shocks, such as extreme weather events, and expressed strong interest in the new QPM's capacity to better capture these shocks and enable more sensible policy trade-off analysis. The IMF team had noticed that weather shocks were previously proxied by agricultural output shocks but placed in the demand block, with potentially misleading monetary policy implications. It therefore agreed to share the modeling experience of the Bank of Canada in capturing climate risk shocks. In the event, the mission team managed to add an extension to the revamped QPM by including a weather variable explicitly in the model's supply block and using the World Bank climate data for Kenya.

8. To address challenges related to institutional capacity constraints, the mission's work plan focused on strengthening CBK's ability to maintain and update the new QPM. The forecasting team is small and has faced the risk of staff turnover. This risk has been mitigated by rotating the team members among different tasks, though at the expense of specialization. To help the CBK maintain and update the QPM—and to train new staff—the mission planned to record all key steps and model codes and to leave a comprehensive set of supporting materials. These include operational manuals, mock-up presentations for model changes, staff projections, and risk scenarios, as well as several tools to facilitate model analysis and support the evaluation of ongoing model development.

9. The CBK has improved the FPAS process over the year, though further enhancements could be made in a few areas. The need to formalize the internal forecasting process was discussed in the 2024 TA mission and remains as an essential element of an effective FPAS to support monetary policymaking. The mission planned to briefly review CBK's FPAS data management, forecasting rounds, and internal and external communication against the best practice, with the objective to identify areas for the follow-up FPAS TA focuses.

II. Revamping of the Core QPM

10. This section addresses the issues identified with the current QPM and outlines the solutions implemented during the mission. The mission undertook a comprehensive enhancement of the QPM by incorporating key economic features particularly relevant to Kenya's economic landscape. The updated fiscal block now includes government spending and revenues, allowing for a more nuanced analysis of how (exogenous) fiscal policies impact aggregate demand. Additionally, the inflation block was disaggregated into core, food, and energy components, leveraging newly available disaggregated inflation data from the KNBS. Adjustments were made to the model's calibration to further fine-tune its sensitivity to exchange rate and interest rate gaps, ensuring that the model's generated outputs better align with historical data, thereby enhancing forecasting accuracy and reliability.

A. Aggregate Demand Block

Previous Specification

11. The aggregate demand block in the previous specification consisted of three equations. Output gap for the non-agricultural output ($l\_y\_non\_agr\_gap$) was modeled as a function of the US output gap ($l\_y\_us\_gap$), fiscal impulse ($fisc\_imp$), monetary conditions index (mci) as well as a lag and a lead (Equation 1). MCI was a weighted average of the real interest rate gap (rr_gap) and the real effective exchange rate (l_z_gap) (Equation 2). Output gap for the agricultural output ($l\_y\_agr\_gap$) was modeled as an autoregressive (AR) process (Equation 3).

1) $l\_y\_non\_agr\_gap_t = \beta_1 * l\_y\_non\_agr\_gap_{t-1} + \beta_2 * l\_y\_non\_agr\_gap_{t+1} +$
$\beta_3 * l\_y\_us\_gap_t + \beta_4 * fisc\_imp_t - \beta_5 * mci + shock\_l\_y\_non\_agr_t$

2) $mci_t = \alpha_1 * rr\_gap_t + \alpha_2 * -l\_z\_us\_gap_t$

3) $l\_y\_agr\_gap_t = \gamma_1 * l\_y\_agr_{gap_{t-1}} + shock\_l\_y\_agr$

12. There were two main issues with the previous specification. First, the non-agricultural output was too sensitive to both the exchange rate and the interest rate. As such, following an increase in the interest rate, the currency would appreciate considerably and amplify the decline in output. Second, in Kenya's interest rate-based monetary policy framework, the MCI is no longer a reliable indicator of the monetary policy stance in the aggregate demand equation, and it hinders a clear narrative around the forecasts specifically, partly because the two components of MCI could have opposite effects. Svensson (2001) considers such use of MCI a substantial deviation from best practice inflation targeting, finding that the use of MCI in New Zealand before 1999 had contributed to unnecessary interest rate variability and potentially unnecessary output variability.[1]

[1] See Lars Svensson, Independent Review of the Operation of Monetary Policy in New Zealand: Report to the Minister of Finance, February 2001.

Improvements

13. To address the first issue, we lowered the sensitivity of non-agricultural output to the real interest rate gap by a factor of four and that of the exchange rate by a factor of 10. These changes reduced the average historical shocks by a factor of two, suggesting this new calibration is better aligned with historical data. Following discussions with the CBK team, we also increased the weight on the lag of the aggregate output gap to enhance the persistence of shocks, which had previously dissipated too quickly.

14. Regarding the second issue, we included real interest rate gap and real effective exchange rate gap separately in the aggregate demand equation. This would help provide clearer policy transmission channels and improve policy narrative. MCI is no longer in the demand equation, but the CBK team can still calculate MCI independently and use it to help assess or quantify the impact of overall monetary conditions.

15. We also replaced the old "fiscal impulse" variable by a new "government spending gap" variable. This new variable is measured by the deviation of the government spending to GDP ratio (g_rat) from its trend (g_rat_tnd). Section C discusses in more detail the rationale of this approach and the calculation of the new variable. The modified new demand equation is as follows:

4) $$l\_y\_non\,agr\_gap_t = (1-\beta_4) * [\beta_1 * l\_y\_non\_agr\_gap_{t-1} + \beta_2 * l\_y\_non\_agr\_gap_{t+1} + \beta_3 * l\_y\_us\_gap_t - \beta_5 * rr\_gap_{\,t} + \beta_6 * l\_z\_us\_gap_t] + \beta_4 * (g\_rat_t - g\_rat\_tnd_t) + shock\_l\_y\_non\_agr_t$$

16. In addition, the mission recalibrated the steady-state growth rates for agricultural and non-agricultural output. The new calibration reflects discussions with the CBK team and is based on an assessment of economic data for 2009–19 and 2023–24. The period 2020–22 was excluded to avoid biases from the COVID-19 pandemic and the extreme weather events experienced during those years.

Recommendations

17. The mission recommended continuously refining the aggregate demand block as more data becomes available. At present, quarterly nominal and real GDP components by expenditure are not published. Once they are available, the new QPM should be further improved by incorporating domestic demand, exports and imports, and government expenditure data into the aggregate demand block.

B. Monetary Policy Reaction Function

Previous Specification

18. The monetary policy reaction function was a typical Taylor rule with interest rate smoothing. The nominal policy rate (rn) is determined by the equilibrium real short-term interest rate, non-agricultural output gap, and inflation gap (the deviation of the expected inflation from the medium-term inflation target of 5 percent). Monetary policy shock is captured by *shock_rn*.

5) $rn = \beta_1 * rn_{t-1} + (1 - \beta_1) * (rn\_neutral_t + \beta_2 * cpi\_dev_t + \beta_3 * l\_y\_non\_agr\_gap_t) + shock\_rn$

6) $cpi\_dev_t = (\log(CPI_{t+3}) - \log(CPI_{t-1})) - cpi\_target$

Improvement

19. The mission recalibrated the policy rule with a higher weight on the inflation gap, ensuring closer consistency with the CBK's IT framework. The mission held discussions on how to estimate the real neutral interest rate and calibrate a Taylor Rule (e.g., by calibrating the parameters on inflation and output gap to center and reduce the monetary policy shocks). In the final specification, monetary policy shocks are more symmetrically distributed, representing an improvement over the previous calibration, which exhibited a downward bias.

Recommendations

20. The mission recommended using alternative Taylor-rule specifications for counterfactual policy analysis. Illustrative cases include a faster adjustment path—achieved by lowering the coefficient on the lagged policy rate—and an inflation-only rule, where the output gap is excluded from the reaction function (i.e., putting zero weight on the output gap).

C. New Fiscal Block

Previous Specification

21. Previously, the demand impact of an exogenous fiscal policy was captured through a fiscal impulse variable ($fisc\_imp$) (see Equation 1). The fiscal impulse basically measures a shock to structural fiscal deficit, derived from a fiscal block that included discretionary, structural, and cyclical fiscal components, and a government budget deficit (def_rat) (Equations 7–11).

22. Using the budget deficit as a proxy for fiscal policy's impact on demand has important limitations. The deficit may reflect changes in expenditure, revenues, or debt-service costs, each with different implications for aggregate demand. For instance, a higher deficit driven by lower revenues or increased debt payments does not stimulate demand, whereas a deficit increase stemming from higher government consumption or investment does.

7) $\mathrm{def}\ \_rat_t = struct\_rat_t + cyc\_rat_t + disc_t$

8) $struct\_rat_t = \beta_1 * struct_{rat_{t-1}} + (1 - \beta_1) * ss\_struct\_rat + shock\_struct_t$

9) $cyc\_rat_t = -\beta_1 * l\_y\_gap$

10) $disc\_rat = shock\_disc\_rat$

11) $fisc\_imp_t = \mathrm{def}\ \_rat_t + \beta_1 * shock\_struct_t$

Improvement

23. To better capture the impact of fiscal policy on aggregate demand, the new fiscal block introduces both government spending[2] (g_rat) and government revenues (t_rat) (Equations 12–14, respectively).[3] By incorporating government spending directly, the model more accurately reflects the implications of fiscal policy on non-agricultural demand, replacing the earlier fiscal impulse measure (Equation 4)[4]. This added detail enables CBK staff to design richer fiscal scenarios that account for both expenditure and revenue dynamics over the projection horizon, while also supporting a more comprehensive and persuasive narrative on the impact of fiscal policy on the forecast profile.

12) $def\_rat_t = \beta_1 def\_rat_{t-1} + (1-\beta_1) ss\_def\_rat_t + \beta_2 l\_y\_gap_t + \text{shock\_disc}\_rat_t$

13) $g\_rat_t = \beta_1 g\_rat_{t-1} + (1-\beta_1)\text{g}\_rat\_tnd_t + \beta_2\, l\_y\_gap_{t-1} + shock\_g_t$

14) $t\_rat_t = g\_rat_t + \text{def\_rat}_t$

Recommendations

24. Going forward, CBK staff responsible for QPM projections should regularly engage with fiscal experts in the department to calibrate fiscal trajectories in the new fiscal block— particularly the government spending and budget deficit profiles—over the projection period. This will help ensure that fiscal projections remain consistent with official budgets published by the fiscal authorities.[5] In addition, CBK staff could refine the fiscal block further by disaggregating government spending into sub-components, enabling richer narratives around the fiscal profile and the calibration of differentiated demand elasticities.

D. New Disaggregated Inflation Block

Previous Specification

25. The previous version of the model included two separate PC equations: one for non-food and non-fuel inflation ($\mathbf{dl\_cpi\_nfnf}$) and another for food and fuel inflation ($\mathbf{dl\_cpi\_ff}$). Both equations included lagged inflation, expected inflation (one period ahead), and the sector specific marginal cost (rmc). In addition, non-food and non-fuel inflation—the measure most closely aligned with core inflation—also depended on imported prices for other goods (equation 15), while food and fuel inflation—the more volatile components of the inflation basket—depended on imported food and oil prices as well (equation 16).

[2] The new government spending measure featured in the fiscal block abstracts from foreign debt payments to better capture the impact of government consumption on aggregate demand.

[3] The new fiscal block variables (government spending, revenue and deficit) are expressed as a ratio of GDP.

[4] The non-agricultural demand equation features the government spending measure in deviation from a time-varying government spending-to-GDP trend that staff can calibrate to better align with the government's long-run fiscal objectives.

[5] Staff can deviate from such published profiles for scenario analysis and when published announcement might seem implausible or outdated.

15) $dl\_cpi\_nfnf_t = \beta_1 * dl\_cpi\_nfnf_{t+1} + (1 - \beta_1 - \beta_6) * dl\_cpi\_nfnf_{t-1} + \beta_2 * rmc\_nfnf_t + \beta_6 * dl\_cpi\_imp\_nfnf_{t-1} + shock\_dl\_cpi\_nfnf_t$

16) $dl\_cpi\_ff_t = \beta_1 * dl\_cpi\_ff_{t+1} + (1 - \beta_4 - \beta_5) * dl\_cpi\_ff_{t-1} + \beta_6 * rmc\_ff_t + \beta_4 * dl\_cpi\_food\_ff_{t-1} + \beta_5 * dl\_cpi\_oil\_ff_{t-1} + shock\_dl\_cpi\_ff_t$

Improvement

26. The KNBS, in collaboration with the CBK, has recently produced new measures of inflation, including a core inflation data series. The new core CPI provides a more accurate gauge of underlying domestic inflationary pressures in Kenya and represents a much larger share of the CPI basket—81 percent compared with 53 percent for the previous non-food, non-fuel CPI measure.[6]
To leverage these improvements, a new inflation block was estimated with three distinctive PC equations: Core inflation (81 percent), Food inflation (12 percent), and Energy inflation (7 percent).[7] Each equation follows a standard PC framework, incorporating lagged and expected inflation (one period ahead), as well as sector-specific elasticities with respect to aggregate (non-agricultural) demand and exchange rate pass-throughs (equations 17–19).

27. The new inflation block offers a few advantages than the previous block. It provides richer narratives through three alternative profiles for discussion, greater disaggregation for scenario analysis, and improved in-sample and out-of-sample forecast performance (see Section IV for details).

17) $dl\_cpi\_Core_t = \beta_1 dl\_cpi\_Core_{t+1} + (1 - \beta_1 - \beta_2 - \beta_3 - \beta_4) dl\_cpi\_Core_{t-1} + \beta_5 l\_y\_non\_agr\_gap_t + \beta_2 dl\_cpi\_foodimp\_Core_{t-1} + \beta_3 dl\_cpi\_oilimp\_Core_{t-1} + \beta_4 dl\_cpi\_imp\_Core_t + \beta_6 (l\_z\_gap - l\_rp\_core\_gap_t) + shock\_dl\_cpi\_Core_t$

18) $dl\_cpi\_food_t = \beta_1 dl\_cpi\_food_{t-1} + (1 - \beta_1) dl\_cpi\_food_{t+1} + \beta_2 l\_y\_non\_agr\_gap_t + \beta_3 * (l\_z\_gap_t - l\_rp\_food\_gap_t + l\_rfood\_gap\_t) - \beta_4 l\_y\_agr\_gap_t + shock\_dl\_cpi\_food_t$

19) $dl\_cpi\_energy_t = \beta_1 dl\_cpi\_energy_{t-1} + (1 - \beta_1) dl\_cpi\_energy_{t+1} + \beta_2 l\_y\_non\_agr\_gap_t + \beta_3 (l\_z\_gap_t - l\_rp\_energy\_gap_t + l\_roil\_gap\_gap\_t) + shock\_dl\_cpi\_energy_t$

Recommendations

28. Going forward, CBK staff should systematically evaluate the performance of the individual PC equations and re-estimate them as needed, using the newly developed EViews estimation scripts provided during the mission.

[6] For details see [Core and Non-Core Inflation Measures for Kenya–January 2025]

[7] Energy inflation is modelled together with transport CPI (1 percent), to ensure the weights of the CPI sub-components (core, energy and food) aggregate to total CPI.

E. An Updated Uncovered Interest Parity Formulation with Balance of Payments

Previous Specification

29. The UIP condition was previously specified as follows and used the inter-bank rate (rn_ib) instead of the policy rate (equation 20):

$$20)\ \frac{KES_{t+1}}{USD_{t+1}} - \frac{KES_t}{USD_t} = \frac{rn_t - rn\_us_t + prem_t}{4} - shock\_s$$

Improvements

30. The mission introduced several changes in the new UIP equation. First, the interbank rate was replaced by the CBK policy rate (*rn*).[8] The UIP equation usually uses the returns on domestic and foreign bonds, which are typically represented by the policy rates or the short-term rates implied by the model's monetary policy rules. Second, a current account balance variable (*c_bal*) was included to partly capture the impact of external balances: a larger current account deficit would put downward pressure on the exchange rate, while a larger surplus would lead to appreciation. We assumed no changes in foreign exchange intervention (FXI) or external financing, as both of which are currently not directly included in the model. Lastly, the UIP risk premium (*prem*) is now directly linked to the government deficit (*def_rat*): a larger fiscal deficit, either due to higher spending (including high interest payments) or lower revenues, would increase the sovereign risk premium.

31. The new UIP equation is calibrated using both historical data and estimates from existing empirical studies, such as Adler et al. (2015).[9] The steady state of the country risk premium was recalibrated, based on the average sovereign debt spread for Kenya (4.5 percent), measured by the difference between the yields on 10-year U.S. Treasury bonds and 10-year USD-denominated Kenyan sovereign bonds. The spread should be updated when significant revisions occur.[10]

$$21)\ \frac{KES_{t+1}}{USD_{t+1}} - \frac{KES_t}{USD_t} = \frac{rn_t - rn\_us_t + prem_t}{4} + \beta_1 * (c\_bal_{t-1} - ss\_c\_bal) - shock\_s_t$$

$$22)\ prem = \beta_1 * prem_{t-1} + (1 - \beta_1) * ss\_prem + \beta_2 * (\text{def}\_rat_t - ss\_\text{def}\_rat_t) + shock\_prem_t$$

Recommendations

32. The BOP channel should be recalibrated once the revised balance of payments data becomes available. In the revamped QPM, the inclusion of this new channel did not improve the model's forecast accuracy meaningfully. The authorities were in the process of revising the monthly BOP data and the revision was expected to be completed soon. Once data becomes available, the CBK team should reassess the model and review its calibration.

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[8] The CBK used to use the interbank rate because the time series of the policy rate was too short.

[9] Adler, Gustavo, Olivier J Blanchard, Irineu E de Carvalho Filho. 2015. "Can Foreign Exchange Intervention Stem Exchange Rate Pressures from Global Capital Flow Shocks?" IMF Working Paper 15/159, International Monetary Fund, Washington, DC.

[10] Data source: MCM Sovereign Spread Monitor.

33. Relatedly, the modeling of the current account needs to be reviewed. The current account balance is now modeled as a simple AR process, estimated using historical data. Ideally, it could be modeled as a function of exports and imports, contingent on the availability of quarterly GDP by expenditure data. Alternatively, CBK could leverage the already available monthly import and export data compiled in the BOP statistics.

III. New QPM–Performance Assessments

34. **This section evaluates the performance of the revamped QPM by examining its forecasting accuracy and model properties.** We first compare the forecasting accuracy of the revamped QPM ("new QPM") with the QPM the CBK used before the 2024 TA mission ("old QPM"), highlighting improvements in projecting key economic variables over a two-year horizon. We then review the model's historical fit, assessing how well past economic shocks are captured and discussing the trade-offs involved in improving model performance. The evaluation shows that the performance of the new model is far superior to that of the old model.

A. Forecasting Accuracy

35. **The forecast accuracy of the main variables has improved significantly over the two-year horizon.** Specifically, we compared the forecast errors for the key equations from the new QPM with those from the old QPM (see Table 2). Forecasting errors were computed for Q1:2012–Q4:2023 under the assumption that foreign/US variables are known. The comparison was conducted for two versions of the new QPM: one including and the other excluding the BOP channel in the UIP equation.[11] As shown in Table 2, using the new QPM without the BOP channel, the forecasting accuracy improved significantly, except for period-1 nominal policy rate, which remained more or less unchanged. Using the new QPM including the BOP channel, the forecast accuracy for the nominal policy rate deteriorated in the first three periods. The mission discussed several possible reasons, including missing variables (such as FXI and capital flows) and poor data quality (for example, the BOP data used in the QPM). The model performance should be reassessed when the UIP equation is updated with the revised BOP data (see Section II.E).

Table 2. Root Mean Squared Error (RMSE) Ratios*

Horizon	1	2	3	4	5	6	7	8
Total output gap	0.83 (1.00)	0.46 (0.59)	0.32 (0.43)	0.26 (0.35)	0.24 (0.31)	0.26 (0.32)	0.30 (0.37)	0.35 (0.45)
Nominal policy rate	1.03 (2.81)	0.64 (1.66)	0.50 (1.27)	0.40 (0.93)	0.31 (0.66)	0.25 (0.51)	0.22 (0.41)	0.20 (0.35)
Nominal exchange rate	0.25 (1.08)	0.29 (0.85)	0.30 (0.68)	0.26 (0.56)	0.22 (0.45)	0.18 (0.35)	0.14 (0.28)	0.12 (0.22)
CPI inflation	0.30 (0.47)	0.28 (0.54)	0.26 (0.44)	0.23 (0.30)	0.21 (0.25)	0.21 (0.22)	0.22 (0.23)	0.23 (0.24)

Source: IMF Staff Estimates.

* RMSE Ratio between the new QPM (excluding the BOP channel) and the old QPM. Values in parentheses use the new QPM with BOP channels. Ratios below one indicates improved forecasting accuracy.

[11] . When we included the BOP channel, we only found large improvements in forecasting accuracy for most variables from the second to the eighth period-ahead forecast.

B. Historical Shocks

36. The new QPM also shows noticeable improvement in historical fit. To evaluate the fitness, we looked at the historical shocks. We compared historical shocks from the old QPM with those based on the new QPM, with or without the BOP channel, and found overall improvement especially of the new QPM without the BOP channel (Table 3). In a few cases, however, the historical shocks were somewhat larger, and this might reflect the trade-off between historical fit (i.e., how well the model captures history and the forecast accuracy. For example, the recalibration of the steady states for the demand equations reflects the recent trend in these series rather than the average trend over the estimated period and this could introduce some bias in the earlier sample.

Table 3. Historical Shocks (2012–23 Average)

	Old QPM	New QPM	New QPM (excl. BOP channel)
Nominal policy rate	-0.4	-0.6	-0.2
Nominal exchange rate	-0.5	0.0	0.0
Non-agriculture output gap	0.0	-0.6	0.0
Agriculture output gap	0.1	0.2	-0.1
CPI inflation	0.2	-1.9	0.2

Source: IMF Staff Estimates.

IV. Illustrative Scenarios[12]

37. Scenario analysis is a key tool for effective monetary policy, allowing central banks to anticipate and prepare for a range of possible outcomes. Given the uncertainty surrounding domestic and global developments, shifting geopolitical dynamics, and the growing importance of non-traditional factors, scenarios provide a structured framework for assessing risks relative to the baseline projection. Scenario analysis is usually informed by reviewing residuals from forecasting models, using survey data, or comparing current conditions with previous episodes.

38. The mission developed three illustrative scenarios to serve as useful references when evaluating risks. The focus was on how to design these scenarios and how to present the results in stylized charts that can be included in monetary policy reports or analytical presentations. The mission followed similar modeling approaches used in the Bank of Canada. The three scenarios are: (i) a trade-policy shock scenario, in which tariff impositions significantly affect inflation dynamics; (ii) a domestic confidence scenario, where weak sentiment and persistent uncertainty suppress domestic demand; and (iii) an unchanged policy scenario, in which policy rates remain constant for an extended period of time.

A. Trade Policy Scenario[13]

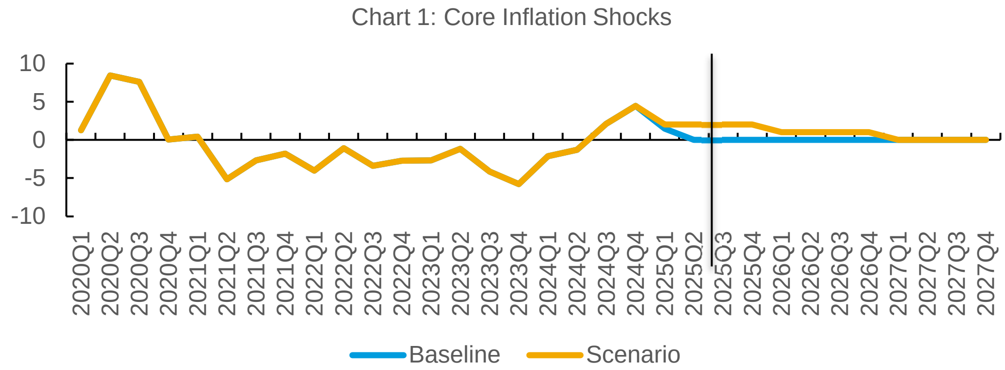
39. In this simplified scenario, inflation is expected to be more persistent than in the baseline, because of the impact of anticipated tariffs. The scenario was designed to assess the monetary policy response to higher tariffs on Kenya inflation but didn't make explicit assumptions about changes in Kenya exports due to the lack of data. For the illustrative purpose of this exercise, the mission made some analytical assumptions about the impact—in line with the existing literature and similar scenarios conducted at the Bank of Canada—while acknowledging large uncertainties surrounding the estimates. More specifically, the impact was captured as a marginal-cost shock in the Phillips Curve (PC), with tariffs directly raising the cost of imported inputs used in production and also increasing agents' expectations of future inflation.

40. Figure 1 shows that inflation would increase and only converge back to the baseline after about two years. These increased inflation surprises stemmed from both the direct impact of tariffs on the cost of imported goods and the indirect effect on domestic price expectation dynamics. While the direct price impact of tariffs is short-lived (a one-time price level adjustment), the inflation impact from expectations would be more persisting (Figure 2, Chart 2).

[12] The mission emphasized that these scenarios were designed strictly for training and illustrative purposes and should not be interpreted or used as policy advice.

[13] The context of this scenario was that, during the time of this TA mission, the US had imposed across-the-board tariffs with a baseline minimum of 10 percent, which we formulated as a global "shock".

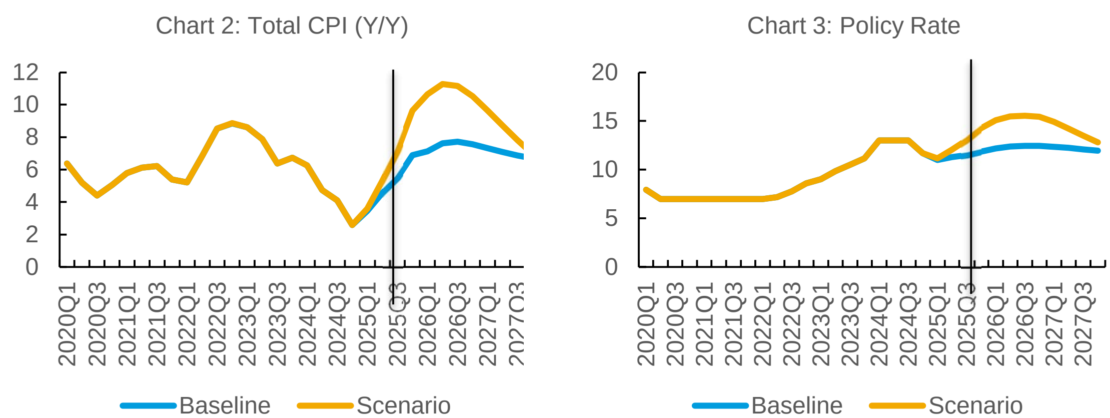
Figure 1. Impact of Tariffs on Inflation–An Illustration



Source: IMF Staff Estimates.

41. In response to the persistent inflationary pressures, monetary policy would be more restrictive than in the baseline. In this illustrative scenario, the impact on inflation is significant (Figure 2, Chart 2) and the policy rate would increase to the peak of 15 percent by 2026:Q3 (Figure 2, Chart 3). The mission stressed the *illustrative* nature of this scenario and the importance of anchored inflation expectations—the stronger the central bank's policy credibility, the more anchored expectations are, the more transitory the impact of tariffs becomes, and the greater the justification for monetary policy to "look through" such supply-side shocks and not to react. This approach is inherently backward-looking, which can be usefully supplemented by assessing more forward-looking indicators, such as the survey data on inflation expectations.[14]

Figure 2. Policy Response to Inflation Impact of Tariffs



Source: IMF Staff Estimates.

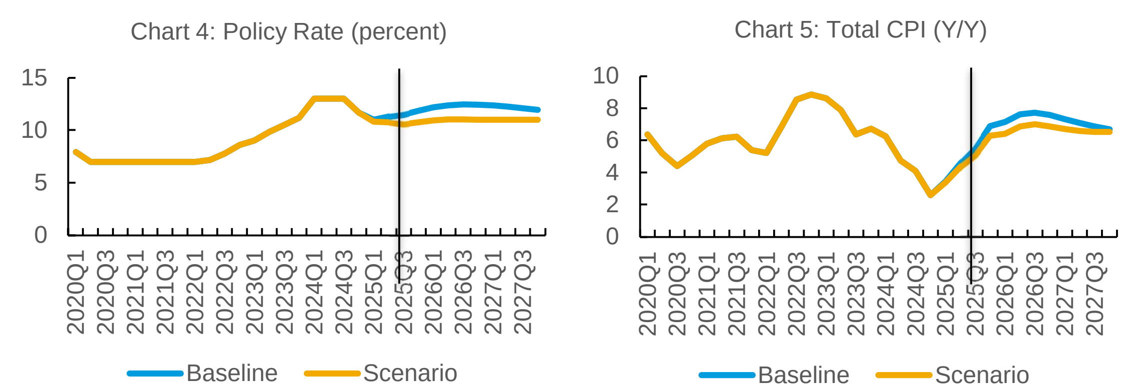
[14] During the mission, staff also discussed how to increase the impact of past inflation in the PC equation (by increasing the coefficient on the lag parameter) to calibrate the agents' inflation expectation so the results are more consistent with recent inflation surprises.

B. Weak Domestic Confidence Scenario

42. In this illustrative scenario, aggregate demand is expected to recover more slowly than anticipated in the baseline, possibly reflecting weaker consumer confidence. The design of the scenario was based on reviewing the “forecasting residuals” (i.e., the history of forecasting errors) of previous episodes of slow recovery. Negative residuals were used to calibrate the magnitude and persistence of the slow recovery and the demand shocks that would generate a path similar to those residuals.

43. Figure 3 shows the simulation results of a weaker recovery. Lower domestic demand leads to lower inflation (Figure 3, Chart 5). Accordingly, monetary policy would be more accommodative than in the baseline scenario. For example, policy interest rates are expected to remain close to 11 percent (the level observed during the time of the mission) throughout 2025 and 2026, instead of rising to 12.5 percent as in the baseline. (Figure 3, Chart 4). This extended period of lower rates aims to support economic activity as the recovery faces persistent headwinds.

Figure 3. Policy Response to a Domestic Confidence Shock



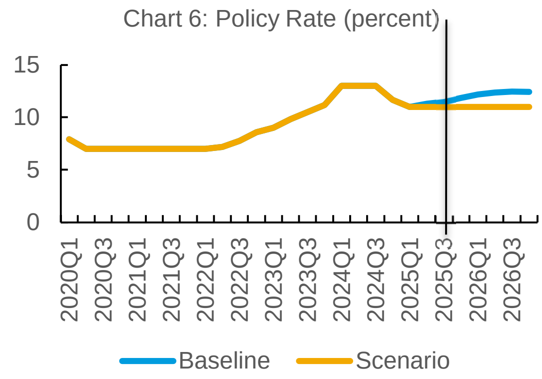
Source: IMF Staff Estimates.

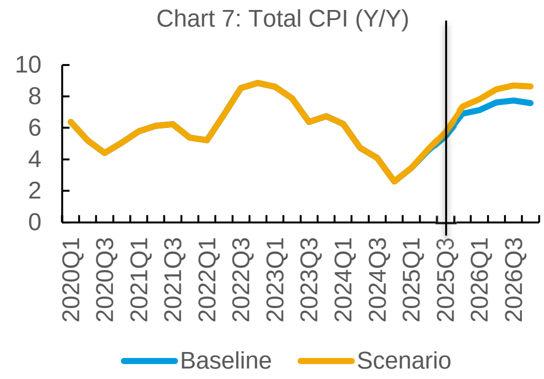
C. Unchanged Policy Rate Scenario

44. As a final illustrative scenario, the mission considered a case in which the policy rate remains unchanged throughout the projection horizon. This type of scenario is useful for assessing the potential consequences of policy inaction, helping to identify whether maintaining the current stance could lead to undesirable inflation and output outcomes in the absence of policy adjustments. In this specific scenario, unchanged policy was a more stimulative path, resulted in a higher inflation (+0.6 p.p. y-o-y) and a slightly larger non-agricultural output gap (+0.1 p.p.) over the projection horizon (Figure 4).

45. During the mission, it was emphasized that this type of scenario should be viewed as a sensitivity analysis rather than a policy recommendation and should be interpreted within the broader context of the model’s structure. Since a key feature of the model is the endogenous determination of monetary policy, any fixed-rate assumption should be seen only as part of a sensitivity scenario analysis designed to isolate the implications of holding rates constant. Ultimately, policy recommendations should remain anchored in the joint dynamics of inflation, output, and expectations as reflected in the model’s baseline projections.

Figure 4. Domestic Response to Monetary Policy Inaction





Source: IMF Staff Estimates.

V. An Extended QPM with Climate Risks

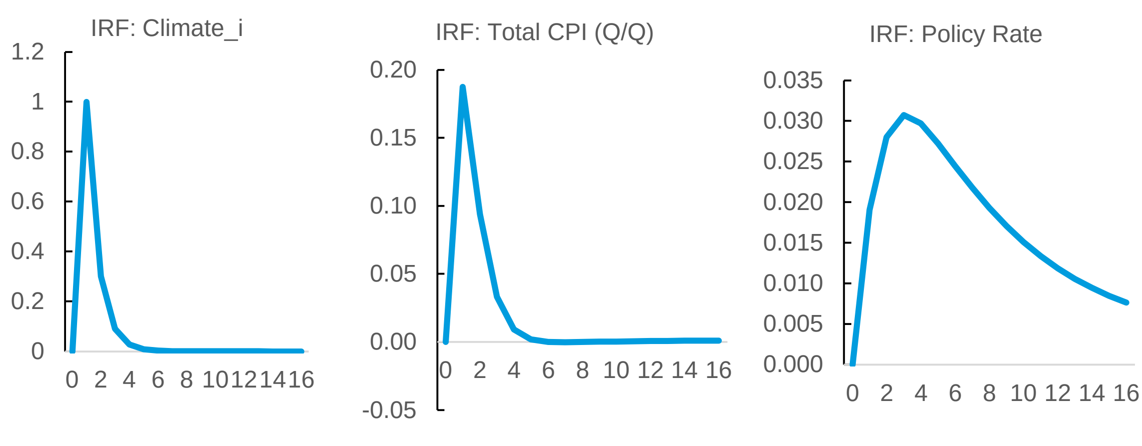
46. Reflecting the CBK's strong interest, the mission added a preliminary extension to incorporate extreme weather shocks. Specifically, in the new QPM ("the base case model"), a new climate index for Kenya ($climate\_i$)—a standardized precipitation measure from the World Bank Climate Portal—was introduced in the Food CPI PC equation to explicitly account for weather-related supply side shocks (equation 23).

$$23)\ dl\_cpi\_food_t = \beta_1 8 * dl\_cpi\_food_{t-1} + (1-\beta_1) * dl\_cpi\_food_{t+1} + \beta_2 * l\_y\_non\_agr\_gap_t + \beta_3 * (l\_z\_gap_t - l\_rp\_food\_gap_t + l\_rfood\_gap\_t\ ) - \beta_4 l\_y\_agr\_gap_t + \beta_5 * climate\_i + shock\_dl\_cpi\_food_t$$

47. This is a new approach to integrating climate risks in QPM. In other TAs, climate risks have often been approximated by shocks to agriculture output and climate variables didn't enter QPM explicitly. Properly modeling the weathers shocks as supply side shocks will highlight the more challenging policy tradeoffs. This approach can be applied to similar classes of New Keynesian QPMs in many FPAS TA recipient countries.

48. A simplified climate risk simulation was conducted during the mission to illustrate the macroeconomic implications of climate shocks. The simulation assumed that the World Bank climate index follows precipitations patterns in Kenya. Based on discussions with CBK staff, the periods of high precipitation (i.e., more rain) are generally associated with lower foods prices. Given this relationship, the illustrative climate risk simulation assumed that a negative shock to the climate index (i.e., lower precipitation) would lead to an inflationary food price effect, as shown in Figure 5. In response, monetary policy would tighten marginally.

Figure 5. A Climate Shock in the Extended QPM



Source: IMF Staff Estimates.

Recommendations

49. The CBK staff should focus on improving the extended QPM. The immediate priority is refining the climate index to ensure it captures relevant weather and environmental variables with macroeconomic significance for the Kenyan economy. Other than the precipitation index from the World Bank Climate Portal, several other alternatives could be considered to capture specific aspects of climate variability, including temperature extremes and drought severity. In particular, the CBK should aim to utilize time-series data on precipitation and temperature from the Kenya Meteorological Department (KMD) as soon as it becomes available as this would more accurately reflect the true climatic events in Kenya. Once a refined climate index is established, it should be used to re-calibrate the model's response, particularly in fine tuning the sensitivity of key variables, such as Food CPI, to varying levels of climate stress. Comparing the sensitivity of food prices to changes in the index during previous episodes should help inform the calibration.

50. As part of this work, CBK staff could further enhance the framework by introducing non-linear dynamics to better capture the disproportionate impact of extreme weather events. For example, staff could refine the PC framework by introducing a max/min function. This function would amplify or reduce the impact of the climate index once a specific threshold is reached (equation 24).[15]

$$24)\ dl\_cpi\_food_t = \beta_1 * dl\_cpi\_food_{t-1} + (1-\beta_1) * dl\_cpi\_food_{t+1} + \beta_2 * l\_y\_non\_agr\_gap_t + \beta_3 * (l\_z\_gap_t - l\_rp\_food\_gap_t + l\_rfood\_gap\_t) + \beta_3 * climate\_i + \beta_4 * \max(climate_i, threshold\ \#) + shock\_dl\_cpi\_food_t$$

[15] During the mission, staff were also exposed to alternative non-linear approaches that could be used to model non-linear effects from the climate shock. An approach that was discussed included a smoothing function (fz = exp($climate_i$) / (1 + exp ($climate\_i$)) that amplifies the effect of a climate shock during severe climate events but dampens the impact during more 'normal' times.

VI. FPAS Process–A Brief Review and Recommendations

51. This section briefly reviews the CBK's FPAS process and supporting infrastructure, focusing on strengthening the CBK capacity for formulating and communicating its forward-looking monetary policy. The purpose was to identify areas for the follow-up FPAS TA in Kenya. The mission discussed the structure and scheduling of forecasting rounds, as well as the interactions between technical staff and decision-makers throughout the forecasting cycle. It also conducted a preliminary assessment of the alignment of forecasting activities with key macroeconomic data releases, the internal and external communication practices, and the challenges posed by current data management approaches.

A. Forecast Round Schedule and Frequency

52. The CBK currently conducts six MPC meetings per calendar year, with a full model forecast during each round. The specific dates for these meetings are not announced in advance; however, they typically occur during the first week of every second month. One week prior to each MPC meeting, the CBK holds an analytical meeting where the Research Department makes detailed presentations on developments and outlook in inflation and GDP, global economy and monetary aggregates. During this analytical meeting, staff receive feedback and comments from management and MPC members to refine the presentations further. The main meeting also includes presentations on financial markets, fiscal policy, the banking sector, and media coverage.

53. The analytical meeting is attended by all MPC members and chaired by the Governor, who also serves as Chairperson of the MPC. Most substantive discussions take place during the analytical meeting. Staff usually make preliminary MPC presentations to the external members about a week before the analytical MPC meeting for feedback and comments, which are incorporated ahead of the formal MPC meeting. The presentations at the formal MPC meeting are relatively brief—each lasting about 10 minutes, including one from the RSAD unit, which provides model results from the QPM, for example, the model-generated monetary policy path. Upon receiving the feedback and comments at the analytical meeting, staff must submit revised presentations three days before the main decision-making meeting.

54. The FPAS forecasting rounds are currently not synchronized with the release of the QNA data. The CBK holds MPC meetings six times per year, whereas the QNA data is published four times annually, with one-quarter lag. Inflation-targeting central banks that implement FPAS typically initiate their forecasting rounds shortly after the release of QNA data, concluding right before the MPC meeting. Given the misalignment between data publication and MPC meetings, some CBK forecast rounds have been compressed and relatively short, while others may begin several weeks after new QNA data becomes available. In addition, if new CPI data is published between the analytical and main MPC meetings, staff may need to rerun the model within a very short time frame, with limited time for thorough analysis of the new data and forecast revisions.

55. The compressed timeline places significant pressure on the forecasting team, especially if major adjustments are needed. The tight schedule often leaves little time for the FT to update data, refine forecasts, and revise baseline and alternative scenarios. As a result, it has been challenging for the team to produce a detailed, consistent, and persuasive narrative, even for the baseline scenario, while avoiding technical errors.

56. Producing a reliable, detailed, and consistent forecast along with related analyses, including alternative scenarios, requires time. Leading central banks typically find that an optimal length for a forecast round is about five to seven weeks, from the Issues Meeting to the MPC. Initiating the forecast too early may result in it not being based on recent data, while starting too late does not allow sufficient time for adequate forecasts and related analysis. The forecasting schedule should allow adequate time between feedback from policymakers and the final MPC meeting so that the FT can derive alternative scenarios based on policy members' feedback. Having a detailed schedule before each forecast round will optimize workloads and enhance the quality of forecast outputs, including alternative scenarios.

Recommendations

57. The mission recommended that CBK consider initially reducing the number of MPC meetings to four per year and later increasing to eight. The four MPC meetings can align with QNA data release and include full-fledged forecasts. Subsequently, CBK could add four interim meetings between the main meetings based on updated data, including nowcasts and near-term projections. The interim meetings would not need to include full model updates and discussed in the MPR. After each MPC meeting, a press release should communicate the committee's decisions and the rationale behind it. Main MPC meetings should be followed by a press conference led by the Governor and the release of the MPR shortly thereafter. The forecasting round for main MPC meetings could begin one week after QNA data are published and conclude with the MPC meeting, or one or two weeks after the release of CPI data.

B. Internal Coordination/Communication

58. There is effective horizontal coordination in CBK between modeling and sector expert teams during the forecast round. The forecasting round is led by the RSAD, with consultations with fiscal and external sector experts. While the FPAS coordinator has not been clearly defined, effective coordination exists between modeling and sector expert teams during the forecasting rounds. The FT consists of modelers from the RSAD and sector experts, with the number of staff in the RSAD increased to seven following recent inclusion of additional new member of staff. The staff have varying levels of proficiency in using MATLAB software.

59. Each week, the Research Department meets with external MPC members. The meetings are organized by the Monetary and MPC secretariat Division on Wednesdays to discuss available economic indicators of current developments. Other Divisions in the Research Department, Financial Department, and other departments also make presentations when necessary. The RSAD usually uses these meetings to update the external MPC members whenever new inflation and GDP data is released by the KNBS.

60. Each month, the RSAD team prepares a brief for CBK management analyzing inflation on the day the CPI data release. The KNBS published CPI data on the last day of every month, sometimes late in the evening. RSAD staff would review and assess the main drivers of inflation and its components and provide this analysis to management on the same day. If the inflation rate breaches the target range for three consecutive months, the CBK is required to send a letter to the Cabinet Secretary of the National Treasury detailing the drivers of inflation and any remedial actions to bring inflation back to the target range.

Recommendations

61. The mission recommended that discussions at the main MPC meetings focus more on issues directly relevant to monetary policy decisions. The analytical MPC may include a relatively large number of presentations related to the monetary policy decision; however, during the decision-making MPC meeting, the focus should be on analyzing monetary policy decision, harnessing the policy narrative, and streamlining the press statement.

62. The mission also recommended that the staff's presentation at the formal MPC meeting includes a core, model-based forecast covering inflation, GDP, exchange rate, policy rate, and changes from the last projection. This forecast should present an analytically coherent view of the short- to medium-term outlook, incorporating both baseline and alternative scenarios. The most critical component of the forecast is the endogenous path for the short-term interest rate, which should be clearly communicated to the MPC. In addition to the core model forecast, the presentation should include historical trends and analyses of all relevant data, including forecasts derived from now-casting and non-core satellite models. The RSAD should present the narrative underpinning the projections and their evolution, including the decomposition of the output gap, inflation, and other key variables. Finally, this MPC presentation may also include policy recommendations from staff, based on the model-derived endogenous policy rate path and expert judgement. The MPC will then apply its own judgement, assess alternative scenarios, and determine the final policy decision.

C. External Communication

63. The CBK has established a monetary policy communication framework. While it does not publish the minutes of MPC meetings, the CBK issues a press release on the day of each MPC meeting and holds briefings for the press, banking sector and private sector after every MPC meeting. The MPR is prepared every six months, submitted to the Cabinet Secretary of the National Treasury for presentation to the National Assembly, and published on the CBK website. Both the MPC press statement and the MPR are backward-looking, outlining the MPC's activities over the preceding six months without including inflation forecasts.

Recommendations

64. The mission recommended that monetary policy communication be made more forward-looking, with a focus on anchoring medium-term inflation expectations. A forward-looking monetary policy framework, such as IT, requires clear communication of inflation forecasts and an explanation of how inflation is expected to converge to the target. Streamlining the FPAS process and improving QPM forecasts will help enhance monetary policy communication. This should include publishing MPC statements that emphasize current policy decisions and provide the clear rationale behind them. The MPR should elaborate on macroeconomic forecasts, assess policy options, and explain how monetary policy instruments will be adjusted to achieve policy objectives.

65. The MPR should include inflation forecasts and an assessment of risks of these forecasts, accompanied by one or two alternative scenarios. These alternative scenarios should reflect the MPC's understanding of key risks to the Kenyan economy and represent full model forecasts, including the alternative policy rate paths required to return inflation to target if the identified risks materialize. Given the importance of clear communication in building the CBK's credibility and achieving price stability more efficiently—and the inherent complexity of monetary policy communication, especially amid increasing global uncertainties—the CBK would benefit from targeted technical assistance on best communication practices.

D. Database and Data Management

66. The CBK does not yet have a unified FPAS database. The database and data management framework are key components of the FPAS. The CBK maintains a centralized database—the Enterprise Data Warehouse (EDW)—launched in February 2022 and managed by the Statistics Division and the IT department. The modeling team maintains data in multiple Excel files, updating them from various sources at the beginning of each forecasting round. This data management practice requires significant amount of time from forecasters to update data before each forecasting exercise. Moreover, keeping data in different Excel files is prone to errors.

Recommendations

67. The mission recommended that CBK establish an FPAS database that consolidates all relevant data, including national accounts, inflation, foreign sector, BOP, and financial sector data. The FPAS database should also include metadata for all variables, detailing the source, frequency, unit, and format. If data transformations are applied, the transformation method and type should also be clearly documented. This initiative would allow forecasters to dedicate more time to the analytical aspects of forecasting process and reduce the risk of technical errors during database updates.

68. This database should be maintained in a single Excel file located in a shared folder. Data should be updated as soon as it becomes available, by at least two dedicated data managers. The data managers should have full access rights to the file, while other team members should have read-only rights. This unified and centralized structure will strengthen data governance, ensure data consistency across models, and facilitate efficient and timely updates for regular forecasting exercises.

69. The effectiveness of monetary policy largely depends on quality and timeliness of data produced and shared by the KNBS. The accuracy of economic analysis—particularly in assessing the domestic and external sources of aggregate demand pressures—would improve if data for quarterly GDP by expenditure becomes available. While outside the scope of this TA mission, KNBS should work toward developing and publishing this detailed national account data, potentially with IMF TA support. Moreover, as central banks are responsible for price stability, it is customary for them to receive new data a few days before official release. Therefore, the CBK and the KNBS could establish a memorandum of understanding (MoU) requiring the KNBS to share preliminary detailed CPI data with the CBK on a confidential basis prior to the official release. This arrangement would allow more time for CBK monthly inflation analysis and shorten the time needed for the forecasting process.

Conclusion

70. Developing and maintaining a structural macroeconomic model for monetary policy analysis and forecasts in an emerging economy like Kenya presents several challenges. Data limitations remain a key constraint, as many key macroeconomic indicators—such as quarterly GDP by expenditure components, wage data, and long time-series for expectations—are either unavailable, subject to large revisions, or published with significant delays. Institutional capacity constraints, including frequent staff turnover and competing priorities, can also hinder model continuity and refinement. Moreover, policy transmission mechanisms are still evolving, with structural changes in financial markets, fiscal policy, and external conditions affecting the stability of estimated or calibrated relationships. Finally, ensuring effective integration of model-based analysis into the policy decision-making process requires sustained commitment from both management and technical teams, supported by ongoing capacity building and institutionalization of model use within the forecasting and policy framework.

71. The mission team, together with the CBK team, worked to overcome some of these challenges. To the best of their efforts, CBK's core QPM was thoroughly reviewed and redeveloped into a new QPM model consistent with the CBK's inflation-targeting framework. Building on the progress made during the 2024 TA mission, the mission team developed a fully revamped QPM model that incorporates key characteristics of the Kenyan economy and features significantly improved forecasting accuracy and more realistic representations of the economy and policy transmission channels. In particular, the mission:

- enhanced the fiscal block in the QPM to better capture the impact of the (exogenous) fiscal policy.
- introduced three individual PC equations for core, food, and energy inflation, leveraging newly published inflation measures, and re-estimated a new core inflation equation.
- improved the UIP equation to better capture risk premium shocks and exchange rate dynamics, including through the addition and calibration of a BOP channel.
- evaluated the performance of the new QPM model and conducted simulations (impulse responses, scenarios, judgement- and uncertainty-based analysis) to enhance capacity for model-based policy analysis.
- added a preliminary model extension to incorporate weather shocks, using the World Bank climate data for Kenya.
- prepared two manuals: "An Overview of CBK QPM Equations" and "How to Run CBK QPM".
- developed and improved a set of tools to facilitate model updates and model development.
- prepared several mock-up presentations for model changes, staff projections, and risk scenarios.

72. An additional key contribution of the mission was the preliminary model extension to incorporate weather shocks, using the World Bank's climate risk data for Kenya. A new climate index was introduced into the PC equation for food inflation to explicitly capture weather-related supply-side shocks. During the mission, simplified simulations were conducted to explore the macroeconomic impacts of climate shocks in Kenya.

73. The follow-up mission has been planned and will assess the implementation of mission's recommendations (see Table 1. Key Recommendations). They center on QPM's policy application and maintenance, including (1) applying the new QPM model to monetary policy analysis and decision-making, (2) regularly updating the overview and how-to manuals, (3) encouraging training and experimentation to ensure continued model development and learning, and (4) further increasing the size of the FPAS-related modeling teams. The follow-up mission should also focus on FPAS process, especially the areas identified by this mission.

74. Risks of implementation of the new core QPM and other TA recommendations have diminished considerably. The forecasting team is diligent, keen on improving the QPM model, and has the support of the Governor. Team members rotate through all tasks related to the forecast exercise (nowcasting, QPM, etc.). In line with our previous recommendations, the size of the team has been increased, and efforts have been made to improve specialization and deepen modeling skills. These efforts should be supported by further follow-up FPAS TAs and continued capacity building. It is expected the next follow-up mission will take place within the next 6–12 months.

Annex I. QPM–Key Variables and Equations

This section provides an overview of the key variables in Kenya's QPM Model (section A1) and its key model blocks (section A2).

Section A1: Model Variables (mnemonics)

CPI Inflation……………………….…….….*dl_cpi*
Core inflation…………….......….*dl_cpi_core*
Food inflation………………….….…*dl_cpi_food*
Energy inflation……………….…*dl_cpi_energy*
Food imports core..….*dl_cpi_foodimp_core*
Oil imports core……..….*dl_cpi_oilimp_core*
Total imports core…………*dl_cpi_imp_core*
Non-agri. Output…….gap*l_y_non_agr_gap*
REER Gap (import-weighted)……..…*l_z_gap*
World food price gap…………..*l_rfood_gap*
Relative prices……..……………………….*l_rp*
Relative price gap……………….……*l_rp_gap*
Relative price trend growth….…..*dl_rp_tnd*
Gap Real Exchange Rate………..*l_z_us_gap*
Real oil price gap…………………..*l_roil_gap*
Imported food inflation……………*dl_foodm*
Trend Real Exchange Rate…….*dl_z_us_tnd*
World food price inflation…………..*dl_food*
Oil price inflation……..………………….*dl_oil*
Effective foreign inflation…….……..*dl_cpif*
Inflation Target………………...*dl_cpi_target*
Nominal KES/USD FX rate…………………*l_s*
Nominal foreign interest rate…………*rn_us*
Nominal interest rate trend………....*rr_tnd*
Real foreign interest rate trend…*rr_us_tnd*
Real interest rate……………………………..…*rr*
Real interest rate gap……………..…..*rr_gap*
REER Gap…..………………*l_reer_trade_gap*
Gap Real Exchange Rate..……..*l_z_us_gap*
Balance of payment..……….*Bob_cbal_Rat*

Real Exchange Rate…………………..l_z_us
Trend REER Growth…………………dl_z_tnd
REER……………………………………………l_z
REER Gap……………………………….l_z_gap
Trend REER..…………………………….l_z_tnd
US CPI level..………………………….l_cpi_us
US output gap…………………….l_y_us_gap

Nominal KES/USD depreciation……….*dl_s*
Inflation of Eq. real oil price……*dl_roil_tnd*
Trend REER Growth………………….*dl_z_tnd*
Imported food inflation……………*dl_foodm*
Imported oil price inflation…………*dl_oilm*
Agriculture output gap…………*l_y_agr_gap*
Real Monetary Condition Index………..*mci*
Government spending-to-gdp ratio..*G_rat*
Government revenues-to-gdp ratio...*T*_rat
Government deficit……..……………*def_rat*
Non-agriculture output level…*l_y_non_agr*
Agriculture output level………………*l_y_agr*
Output gap…………………………..………*l_y_gap*
Output……..……………………………..……..*l_y*
Potential output………..……………….*l_y_tnd*
Central bank rate…………………………….*rn*
Policy neutral nominal..…………*rn_neutral*
Interbank rate nominal…………………*rn_ib*
Real foreign interest rate………………rr_us
Interest rate spread……………………spread

Section A2: Model Blocks

Block A2.1: Monetary Policy and Rates

$$rn_t = \beta_1 rn_{t-1} + (1-\beta_1)(rn\_neutral_t + \beta_2 dev\_cpi_t + \beta_3 l\_y\_non\_agr\_gap_t) + shock\_rn_t$$

Block A2.2: IS Curve

Aggregate Output Gap

$$l\_y\_gap_t = \beta_1 l\_y\_non\_agr\_gap_t + (1-\beta_1) l\_y\_agr\_gap_t$$

Non-Agriculture Output Gap

$$\begin{aligned} l\_y\_non\_agr\_gap_t \\ &= (1-\beta_4)(\beta_1 l\_y\_non\_agr\_gap_{t-1} + \beta_2 l\_y\_non\_agr\_gap_{t+1} + \beta_3 l\_y\_us\_gap_t \\ &- \beta_5 rr\_gap_t - \beta_6(-l\_z\_us\_gap_t)) + \beta_4(g\_rat_t - g\_rat\_ss) + shock\_l\_y\_non\_agr\_gap_t \end{aligned}$$

Agriculture Output Gap

$$l\_y\_agr\_gap_t = \beta_1 * l\_y\_agr\_gap_{t-1} + \beta_2 * disc\_rat_t + shock\_l\_y\_agr\_gap_t$$

Block A2.3: Inflation Phillips Curve

Total Inflation

$$l\_cpi_t = w\_core * l\_cpi\_core_t + (w\_food) * l\_cpi\_food_t + (w\_energy) * l\_cpi\_energy_t + l\_cpi\_disc_t$$

Core Inflation

$$\begin{aligned} dl\_cpi\_Core_t &= \beta_1 dl\_cpi\_Core_{t+1} + (1-\beta_1-\beta_2-\beta_3-\beta_4) dl\_cpi\_Core_{t-1} + \beta_5 l\_y\_non\_agr\_gap_t \\ &+ \beta_2 dl\_cpi\_foodimp\_Core_{t-1} + \beta_3 dl\_cpi\_oilimp\_Core_{t-1} + \beta_4 dl\_cpi\_imp\_Core_t \\ &+ \beta_6(l\_z\_gap - l\_rp\_core\_gap_t) + shock\_dl\_cpi\_Core_t \end{aligned}$$

Food Inflation

$$\begin{aligned} dl\_cpi\_food_t &= \beta_1 dl\_cpi\_food_{t-1} + (1-\beta_1) dl\_cpi\_food_{t+1} + \beta_2 l\_y\_non\_agr\_gap_t + \beta_3 \\ &* (l\_z\_gap_t - l\_rp\_food\_gap_t + l\_rfood\_gap\_t) - \beta_4 l\_y\_agr\_gap_t + shock\_dl\_cpi\_food_t \end{aligned}$$

Energy Inflation

$$\begin{aligned} dl\_cpi\_energy_t &= \beta_1 dl\_cpi\_energy_{t-1} + (1-\beta_1) dl\_cpi\_energy_{t+1} + \beta_2 l\_y\_non\_agr\_gap_t \\ &+ \beta_3(l\_z\_gap_t - l\_rp\_energy\_gap_t + l\_roil\_gap\_gap\_t) + shock\_dl\_cpi\_energy_t \end{aligned}$$

Block A2.4: UIP and REER

UIP

$$l\_s_{t+1} - l\_s_t = (rn_t - rn\_us_t - prem_t)/4 + \beta_1(bob\_cbal\_rat_{t-1} - ss\_bob\_cbal\_rat) - shock\_s_t$$

$$prem_t = \beta_1 prem_{t-1} + (1-\beta_1)(ss\_prem) + \beta_2(\mathrm{def}\_rat_t - ss\_def\_rat_t) + shock\_prem_t$$

Real Effective Exchange Rate (REER)

$$l\_z_t = l\_z\_tnd_t + l\_z\_gap_t$$

$$l\_z\_tnd_t = l\_z\_tnd_{t-1} + dl\_z\_us\_tnd_t/4$$

$$l\_z\_gap_t = l\_z\_us\_gap_t$$

$$l\_z\_us_t = l\_s_t + l\_cpi\_us_t - l\_cpi_t$$

Block A2.5: Fiscal Block

Government Spending (as a share of GDP)

$$G\_rat_t = \beta_1 G\_rat_{t-1} + (1-\beta_1)\mathrm{ss\_g}\_rat_t + \beta_2\, l\_y\_gap_{t-1} + shock\_g_t$$

Aggregate Deficit ex. grants

$$Def\_rat_t = \beta_1 Def\_rat_{t-1} + (1-\beta_1)ss\_def\_rat_t + \beta_2 l\_y\_gap_t + \mathrm{shock\_disc}\_rat_t$$

Government Revenues

$$T\_rat_t = G\_rat_t + \mathrm{Def\_rat}_t$$

A2.6: Foreign Block

US Short-Term Interest Rate

$$rn\_us = \beta_1 rn\_us_{t-1} + (1-\beta_1)(rr\_us\_tnd + ss\_dl\_cpi\_us + \beta_2(dl\_cpi\_us_t - ss\_dl\_cpi\_us) + \beta_3 l\_y\_us\_gap_t) + shock\_rn\_us_t$$

US Output Gap

$$l\_y\_us\_gap_t = \beta_1 l\_y\_us\_gap_{t-1} - \beta_2(rr\_us_t - rr\_us\_tnd) + shock\_l\_y\_us\_gap_t$$

US Inflation

$$dl\_cpi\_us_t = \beta_1 dl\_cpi\_us_{t-1} + (1-\beta_1)ss\_dl\_cpi\_us + \beta_2 l\_y\_us\_gap_{t-1} + shock\_dl\_cpi\_us_t$$

Annex II. QPM–How to Update Projections

1. **This "Read Me" document provides an overview of the key steps to update the projection as well as the different outputs created at each step.** The document also highlights some scripts that can be useful at different steps.

A. Overview

Updating Data
- Domestic data
- External data

Updating results
- Nowcast
- Imposing expert judgement

Key outputs
- Databases
- Reports

Organizing and archiving results
- Examples of structure

Analysing results
- Historical shocks
- Tables
- Databases

Scenario analysis
- Assumptions
- Outputs

Communicating results
- Shock-Control
- Dynamics

B. Updating Data

Domestic Variables

- Add excel sheet with data dictionary (variable name, full name, unit, scale)
- Domestic data are in the data folder. There are three CSV files based on the frequency of the data (monthly, quarterly, annual)

External Variables

- External data are in the data folder. There are three CSV files based on the frequency of the data (monthly, quarterly, annual). External data are identified by "ext_"

Key Data Transformation

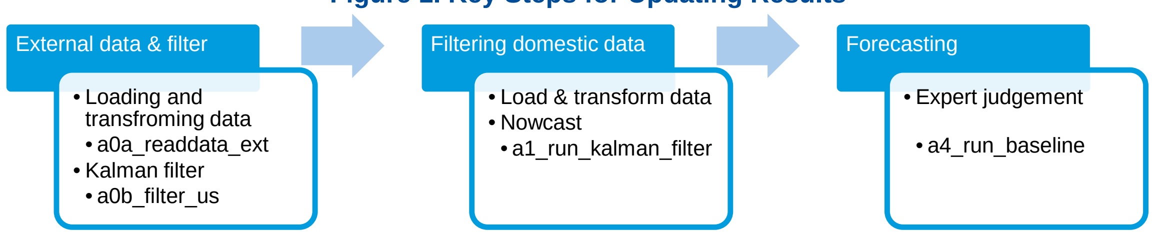
- The main data transformations are logs, diff logs (q/q, annualized and y/y). These transformations are summarized below.

Table 1. Key Data Transformations	
Series name in MATLAB	**Transformation**
l_var	100*log(var)
dl_ var	4*diff(log(var))
d4l_ var	l_var – l_var {-4}
Source: IMF staff.	

C. Updating Results

2. **After updating the CSV data files, there are three key steps to update the results.** The user can update config.m and run main.m to generate the results. The main scripts are gathered in the "sections" folder.

Figure 1. Key Steps for Updating Results



Source: IMF staff.

Configuration Script

3. **The script *run_config.m* gathers the essential user inputs that need to be adjusted from rounds to rounds.** This simplifies the update process as the user does not have to make the same adjustments in different scripts.

- **Data paths**: the user needs to specify where the updated data is located and what control should be used. The use of a control database is relevant for the creation of reports.
- **Dates & ranges**: the user needs to specify dates (end of history, filtering, forecast, plotting) for different parts of the scripts.
- **Switches for the reports**: User need to specify if they want to produce reports (Yes = 1, No = 0) for filtering report, executive report and full report.

Main Forecast Script

4. **This script *main.m* contains the list of scripts that need to be run when the forecast is updated.**

Bottom line: the user needs to modify the user inputs in *run_config.m* and adjust a data path in a1 script and run the file *main.m* to update the forecast, unless changes in nowcast and judgement are also required.

Scripts in Short

- **A0a_readdata_ext.m:** Loads and transforms the external data. The data path is set in run_config.m script. No user input is required directly in the script.

- **A0b_filter_US.m:** Loads and transforms the US data. The data path is set in run_config.m script. User can include nowcast for US data, this is done in the script judgement_us.m. This script can update a pdf report (run_report_us.m).

- **A1_run_kalman_filter.m:** Loads and transforms the domestic data. The data path is set in the script. User can include nowcast for domestic data, this is done in the script judgement_domestic.m. It then loads the model and runs the Kalman filter. Results are saved in results_baseline. Key outputs are filtered_db.mat and the filtered report

- **A4_run_baseline.m:** This script updtes the forecast. It loads the data and the model. Exogenous variables are exogenized. The user can add expert judgement (judgement_forecast.m). Model generates confidence bands based on different assumptions. Final forecast results are saved in result_baseline (db_fcast). A report (charts and tables) can be produced.

D. Key Outputs

5. **There are two types of output, 1) databases, and 2) reports.** More details are provided in Annex III on intermediate inputs.

Databases (.mat files):

- Final forecast database: db_fcast.mean

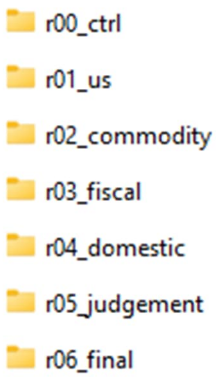
Reports (pdfs):

- Report for the external sector
- Filter_report
- Forecast_report
- Executive report
- Key assumptions reports

E. Organizing and Archiving Results

6. **When the user is updating the forecast, it is recommended to save the results into different folders to ease the interpretation of the results.** For example, r00_ctrl represents the first round of the update cycle and could be a copy of the previous forecast. In the example below, the user would first update the US data (r01_us), in the second step, the user would update commodity prices

(r02_commodity). Next, the user would update the fiscal assumptions (e.g., g_rat), and so on. This type of structure makes it easy to track the contribution of the key data inputs as well as the user judgement.



F. Analyzing the Results–Additional Scripts

Historical Shocks

- To plot the model historical shocks the user can run/analysis/starting_point_package.m.
- The script requires a few user inputs (path for databases), sample size for the charts.
- The script will create charts of each shock of the model. This script can be used to assess the overall fit of the model or to assess if over recent periods, some of the historical shocks present some bias. If a series shows some bias, it could require some treatment / expert judgement over the projection horizon or could be flagged as a risk. Persistent bias over history could signal a disconnect between the data and the model.

Model Properties / Impulse Responses

- To run impulse responses: ./impulse/impulse_response_main.
- The script requires a few user inputs (model path, shocks) which are set at the beginning.
- This script is useful to understand model properties and to compare different calibrations of the model.

Annex III. The List of QPM Scripts

Several new scripts were created during the mission to help staff assess and complete model changes and analyze projection outputs.

- **Impulse response script**: Comprehensive and flexible impulse response (IRF) script that allows staff to compare different model files to key model shocks (*impulse_response_main.m*).

- **Starting point package**: Script generates a graph package with the model 'shocks' to allow staff to assess their in-sample properties and determine possible bias (*starting_point_package.m*).

- **Confidence bands**: Script generates a graph package showing the median projection for selected variables along confidence bands that reflect the uncertainty level around the median forecast given the standard deviation of selected shock(s) (*compute_comfbands.m*).

- **Eviews inflation PC estimation and decomposition:** Eviews script that estimates key parameters for the new inflation PC and compares their in-sample performance. Script also generates a decomposition of the dynamics of total CPI based on the evolution of core, energy and food CPI (*cpi_calibration.prg*).

- **Judgement scenarios:** Script provides a set of examples to produce projection scenarios using judgement on top of the baseline projection (*judgement_examples.m*).

- **Eviews programs for estimating neutral rate**: Eviews script provides an example for estimating a neutral rate estimate (available under reference material as part of mission folder).

Annex IV. QPM–The Foreign Block[1]

1. The 2024 TA mission developed a small model for the United States to complement the domestic model. The US model is used to approximate the foreign block of the Kenya QPM. Whereas the US policy rate, output gap, and inflation gap still enter the domestic block of the QPM as exogenous variables, they are now endogenously determined and can be forecasted within a three-equation NK model for the US.

The Previous Specification

2. The previous US block relied on simple AR processes to model US inflation, GDP and policy rate. Since judgement relying on public forecast for the US economy is used for the inputs, the model structure had limited implications on the forecast. Moreover, it is useful to have better macro linkages within the foreign block when looking at impulses responses and doing scenario analysis, including not to overestimate the impact of depreciation induced by higher US rates. For example, under the previous specification, an unexpected U.S. monetary policy tightening would lead to a depreciation of the Kenyan currency and boost output through higher exports. Under the new specification, the higher U.S. rate would also reduce U.S. demand and therefore lower Kenyan exports. The net effect will thus depend on the relative strength of these two channels.

Improvements

3. The following macro linkages were introduced in the model. The new parameters were calibrated based on impulse responses from [FRB/US model.]

1. The monetary policy reaction function (equation 1) includes the US output gap (*l_y_us_gap*). This allows for the US policy rate (*rn_us*) to react to both the output gap and inflation (*dl_cpi_us*).
2. The demand equation (3) now includes the real policy rate gap, such that changes in the policy rate affect the output gap. Previously, this link was missing.
3. The PC (equation 3) now includes the output gap, such that changes in the output gap affect inflation.

a) $rn\_us_t = \beta_1 * rn\_us_{t-1} + (1 - \beta_1) * (rn\_us\_neutral_t + \beta_2 * dl\_cpi\_us_t + \beta_3 * l\_y\_us\_gap_t) + shock\_rn\_us_t$

b) $l\_y\_us\_gap_t = \beta_1 * l\_y\_us\_gap_{t-1} - \beta_2 * rr\_us\_gap_t + shock\_us\_gap_t$

c) $dl\_cpi\_us_t = \beta_1 * dl\_cpi\_us_t + (1 - \beta_1) * dl\_cpi\_us\_target_t + \beta_2 * l\_y\_us\_gap_{t-1} + shock\_cpi\_us_t$

[1] Prepared by Fotios Raptis (Bank of Canada).

Annex V. A Summary of 2024 Technical Assistance and Key Recommendations and Implementation

1. The April 2024 TA mission assisted the CBK in further developing the FPAS by enhancing its capacity for model-based policy analysis, with a focus on improving the QPM. Specifically, the mission explored various methods to incorporate external shocks (such as foreign demand and terms of trade) and assessed the impact of fiscal policy. Additionally, the mission assessed the significance of the exchange rate channel of monetary policy. The mission assisted CBK staff in improving model codes, preparing forecasts, conducting forecast evaluations, and began to explore alternative scenarios. These enhancements are expected to better inform CBK monetary policy decision-making and improve policy communication.

2. The highly interactive daily technical sessions were attended by the entire CBK FT as well as staff from Monetary Analysis, External Sector Analysis, Real Sector Analysis, Fiscal Analysis, Financial Sector Analysis, and Statistics Divisions. The mission team also met with CBK governor Dr. Kamau Thugge. The discussion with the governor centered on the effective implementation of FPAS TA efforts, including the need to increase the size of the modeling team and plan a follow-up mission within six months. Issues related to data adequacy, policy transmission channels, and communication were also discussed.

3. The mission team completed the following tasks:

- Trained CBK staff in MATLAB and the IRIS time series econometrics toolbox exercises. This training enhanced the capacity of the CBK to better understand their QPM model and codes.
- Conducted model simulations (impulse responses, scenarios, judgement) that enhanced capacity for model-based policy analysis.
- Reassessed and adjusted the model steady states to reflect the domestic economy more accurately.
- Improved the aggregate demand block to better capture policy, domestic, and external shocks.
- Improved the UIP and policy rule blocks to better capture the working of the inflation targeting framework.
- Improved the external block by setting up a simple three-equation model for the U.S. economy (IS curve, monetary policy reaction function, and PCs).
- Recalibrated the model, including making the non-agricultural output less sensitive to a change in the real bilateral exchange rate with the U.S.

- Made suggestions to better structure the model code and improve projection output tables and figures for easy comparison to past baseline projections.

4. The mission made the following recommendations to further improve the QPM model, and the implementation process as of April 2025 is summarized in the parentheses:

- Augment the model to include a breakdown of the gaps in GDP expenditure components for private domestic demand, government, exports, and imports, relying on monthly BOP and fiscal data. (Delayed, pending the data publication of GDP expenditure components)

- Update the CPI block to include separate equations for food and energy inflation. Refine core inflation to reflect new definitions for food and energy, pushing the weight of non-food, non-energy inflation to more than 70 percent of total CPI (Implementation was in process, the new core CPI was updated and accounted for more than 70 percent of the total CPI and the CBK team was estimating the new inflation equations).

- Further improve tools used to communicate the baseline projection and risk scenarios to the MPC. (Implemented. The CBK started to use the particularly revamped QPM for analysis and forecasting)

- Explore the possibility of developing a semi-structural model similar to the core projection model used by the Bank of Canada which is based on an error correction estimation framework that captures both short-term dynamics (the speed of adjustment) and long-term relationships between variables. Such a model could usefully serve as a complement to, or ultimately replace, the current model (Delayed, pending the completion of the full database).