TECHNICAL ASSISTANCE REPORT

TONGA

Modernizing the Monetary Policy Framework and Operations of the NRBT

June 2025

Prepared By

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Glossary

Afs	Autonomous Factors of Liquidity
AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
ELA	Emergency Liquidity Assistance
ER	Exchange Rate
ERPT	Exchange Rate Pass Through
ESA	Exchange Settlement Account
FED	Foreign Exchange Dealer
FX	Foreign Exchange
IMF	International Monetary Fund
IRC	Interest Rate Corridor
LLMICs	Low and Lower-middle Income Countries
MCM	Monetary and Capital Market Department
MCMCO	Monetary and Capital Market Department—Monetary Operations Division
MDF	Marginal Deposit Facility
MLF	Marginal Lending Facility
MLMO	Main Liquidity Management Operation
MPS	Monetary Policy Statement
NLP	Natural Language Processing
NRBT	National Reserve Bank of Tonga
OMO	Open Market Operations
RMP	Reserve Maintenance Period
RR	Reserve Requirements
SRD	Statutory Reserve Deposit
TA	Technical Assistance
TOP	The Pa'anga

Preface

At the request of the National Reserve Bank of Tonga (NRBT), a Monetary and Capital Markets (MCM) Department conducted a virtual Technical Assistance (TA) mission from January 27–February 7, 2025, to assist the authorities in modernizing the monetary policy framework and operations of the NRBT. The mission team was led by Roger McLeod (MCM) and comprised Meguy Kuete Ngougning (MCM), Thiago Christiano Silva (MCM), and Bernard J. Laurens (Short-term Expert).

The purpose of the mission was to assist with implementing a modernized and more market-based monetary operational framework. In so doing, this mission focused on: (i) developing the appropriate mix of reserve requirements and effective monetary operations to enable the NRBT to employ market-based mechanisms to influence market conditions and mitigate vulnerabilities to the peg; (ii) improving the collateral policy for monetary policy operations; and (iii) comprehensively strengthening NRBT communications. To assist with the implementation of the mission's recommendations, virtual follow-up TA will be provided.

The mission met with the following NRBT officials: Tatafu Moeaki, Governor; Ms. Ungatea Latu, Deputy Governor; Daniel Taumoepeau, Assistant Governor Policy; Mrs. Mefilina Tohi, Chief Manager Economics and Research; Ms. Nanuma Fakatava, Chief Manager Financial Markets; Mrs. Kueni Fifita Chief Manager Financial Systems; Mrs. Vasi Taufaloa, Senior Manager Finance. The mission also met with representatives from the NRBT Board, the treasury department of the Government of Tonga, and several commercial banks.

This report incorporates comments from the NRBT and those received in the context of the IMF's internal review process.

Executive Summary

Exchange rate stability is the de jure and de facto primary objective of the NRBT with the Tongan pa'anga pegged to a basket of currencies. The NRBT employs capital and exchange controls to support this regime. While maintenance of this exchange rate regime has been the main anchor for monetary policy, persistently high levels of excess liquidity (emanating from unsterilized FX reserve accumulation) continues to impede effective monetary policy transmission. Consequently, the interbank market has remained inactive for over a decade. Moreover, key components for an effective operational framework are still absent. To comprehensively address these issues, the NRBT should focus on modernizing its monetary policy framework and operations to support the peg.

The monetary operational framework can be modernized to strengthen the role of interest rates and enhance monetary policy transmission. This modernization requires active liquidity management by the NRBT to align money market rates with the NRBT policy rate, for subsequent transmission to domestic financial conditions. It also requires key supporting measures. As such, the work of the mission focused on the following building blocks: (i) the design of the currency basket; (ii) the Interest Rate Corridor (IRC); (iii) the design of the Statutory Reserve Deposit (SRD) instrument; (iv) the design of a short-term liquidity monitoring and forecasting framework; (v) the collateral policies to support liquidity providing monetary operations; and (vi) NRBT communications.

The mission recommends that the NRBT starts a gradual process of monetary policy modernization. This would involve two complementary workstreams to: (i) develop the analytical capacity to assess what should be the monetary policy stance; and (ii) develop the operational capacity to determine and assess actions in the money market to align short-term money market rates with the desired monetary policy stance. The mission focused on point (ii) to set the conditions for the emergence of an interbank market in Tonga, allowing the NRBT to be "in the driver's seat" regarding setting the level of short-term money market interest rates through its liquidity management operations.

To modernize monetary policy, the mission recommends adjusting the current IRC. That would involve moving to a conventional IRC with the policy rate at the center (mid corridor framework). In that context, the NRBT should activate regular open market operations (OMOs) aimed at aligning short-term interbank market interest rates with its policy rate. The mission recommends reliance on the Main Liquidity Management Operations (MLMOs) to mop up excess liquidity through the auctioning of seven-day NBRT Notes. Should the banking system's liquidity position shift to a deficit situation, the NBRT would then auction seven-day repos properly collateralized. The associated standing facilities-SFs (i.e., a marginal lending facility-MFL, and a marginal deposit facility-MDF) should be freely accessible to the banks and operated on an overnight basis. The MLF will also need to be properly collateralized.

The choice of the MLMO tender mechanism may evolve over time. Currently, the NRBT capacity to forecast excess liquidity is limited to monthly forecasts. Moreover, the NRBT needs to improve data management to effectively monitor liquidity changes and forecast autonomous factors. Therefore, at this juncture, given this constrained capacity to monitor and forecast short-term liquidity, the MLMO should be operated through fixed rate, and full allotment tenders. Later, when the requisite capacity is in place, and market participants adequately understand the NRBT monetary policy operational framework, the NBRT can consider shifting to variable rates, fixed amounts tenders and introduce fine-tuning OMOs.

At this juncture, to stimulate interbank trading, the mission recommends adopting a wide IRC. Actions are also needed to evaluate obstacles to interbank trading that may remain even when the excess liquidity has been reduced, and price incentives restored. The NRBT should engage in

discussions with the banks to assess what actions the NRBT can take to support interbank market trading. Actions could include enhancing the availability of financial information to allow market participants to assess counterparty risks and bolstering the legal framework for collateralized lending.

The mission recommends that the NRBT starts to develop a weekly short-term liquidity monitoring and forecasting framework based on an analysis of the NRBT balance of accounts available on a daily basis. By forecasting changes in liquidity using appropriate methods, the NRBT will be able to calibrate its MLMOs operated through variable rates, fixed amounts tenders. The development of this capacity needs to be supported by reforms in the Treasury cash flow management frameworks: the NRBT should recommend to the Treasury to stop placing time deposits with commercial banks (and concomitantly operationalize an emergency liquidity assistance-ELA framework), and engage in a study to assess the feasibility of setting up a Treasury Single Account (TSA). The NRBT should also engage the Treasury for the regular (weekly) exchange of short-term cash flow forecasts.

The mission recommends that the SRD function be reorganized to support the proposed IRC framework. In the context of an interest rate based monetary policy framework and the related IRC, the SRD would serve exclusively as an instrument to adjust the structural liquidity position, while changes in the policy rate would signal the monetary policy stance. The following technical adjustments would also need to be considered by the NRBT: (i) consider some remuneration of the SRD; (ii) consider allowing banks to meet the SRD on average over the reserve maintenance period (RMP) at the more advanced stage of the modernization process; and (iii) link SRC non-compliance penalty to the policy rate.

Considering the level of development of the building blocks for active liquidity management, the mission recommends a two-stage sequencing for the implementation of the IRC and the SRD instrument. In Stage 1, the NRBT should start monetary policy modernization through the Introduction of a mid-rate IRC with fixed rate and full allotment tenders for its OMOs. In Stage 2, once the NRBT has developed a robust short-term liquidity monitoring and forecasting capacity, a move to variable rate, fixed amount OMOs should be done. In Stage 2, moving committedly to SRD averaging over the RMP would be highly desirable, as well as introducing fine tuning OMOs.

The NRBT should develop a comprehensive policy to align its collateral framework with best practice. Starting with eligibility criteria, the mission assessed that the current restriction of collateral eligibility for monetary policy operations to public sector securities is appropriate. However, the NRBT should eliminate the current preference order among monetary policy collateral, as a collateral preference order is only advisable for discretionary operations such as Emergency Liquidity Assistance (ELA). Additionally, counterparties' balance sheets should be continually monitored.

The eligibility criteria should be part of a broader collateral policy that incorporates sound collateral valuation techniques and robust risk mitigation measures. In the absence of an active and liquid securities market, the NRBT should invest in theoretical pricing, leveraging the implied yields from bond issuances as an alternative to mark collateral to market. Similarly, a scheme for applicable risks should be developed, considering key financial risks including market, liquidity, default, and maturity risks. The report also provides considerations for a future ELA collateral framework.

This mission assessed NRBT's communication and recommended key adjustments. The mission assessed the adequacy of the institutional framework for NRBT communication (and supporting measures) and employed Natural Language Processing (NLP) to assess the effectiveness of communications. The NLP analysis was conducted using lexical, syntactical, and semantical dimensions, key communication metrics, and comparative insights with regional peers. Several recommendations for enhancing the institutional framework and effectiveness of communications were provided by the mission.

Recommendations

Table 1. Key Recommendations

Recommendations and Authority Responsible for Implementation	Priority	Timeframe 1/
Operational Framework for Monetary Policy Implementation		
Recommendation 1 (NRBT) Consider a gradual modernization of monetary policy implementation by setting up an active liquidity management framework to allow the NRBT to steer short-term money market rates to its announced policy rate. ¶48	High	Near-term
Recommendation 2 (NRBT) Start monetary policy modernization by Introducing a conventional mid-rate interest rate corridor (IRC) with fixed rate and full allotment tenders. ¶57	High	Near-term
Recommendation 3 (NRBT) Move to mid-rate IRC with variable rates and fixed allotment tenders once a liquidity monitoring and forecasting framework is fully operational. (¶62)	Medium	Medium-term
Recommendation 4 (NRBT) Engage discussions with the banks to assess what specific actions the NRBT could take to support interbank market activities. (¶64)	High	Medium-term
Recommendation 5 (NRBT) Adopt a wide IRC at the start (¶65)	High	Near-term
Recommendation 6 (NRBT) Strengthen liquidity monitoring and forecasting by developing a capacity to analyze and forecast the autonomous factors of liquidity (Afs) on a weekly basis. (¶68)	High	Medium-term
Recommendation 7 (NRBT) NRBT should recommend to the Treasury to stop placing time deposits in the commercial banks, and to engage in a study to assess the feasibility of setting a Treasury Single Account (TSA) framework. (¶73)	High	Near-term
Recommendation 8 (NRBT) Develop operational guidelines for the activation of an ELA framework. (¶74)	High	Medium-term
Recommendation 9 (NRBT) Engage in discussions with the Treasury for the exchange of cash flow forecasts. (¶75)	High	Near-term
Recommendation 10 (NRBT) Rely on the SRD to adjust the structural liquidity position: Consider remunerating the SRD. (¶81) Consider introducing averaging over the reserve maintenance period and linking noncompliance penalty to the policy rate. (¶85)	High	Near and Medium-term

Recommendations and Authority Responsible for Implementation	Priority	Timeframe 1/
Collateral Policy		
Recommendation 11 (NRBT) Remove the preference order for monetary policy collateral and undertake necessary actions to standardize the mobilization procedures for assets ¶97	Medium	Medium-term
Recommendation 12 (NRBT) Develop sound valuation methodologies to mark collateral to market. ¶98-¶99	High	Medium-term
Recommendation 13 (NRBT) Coordinate with the Government of Tonga to issue bonds (consistent with the Government's financing priorities) at maturities that could help calibrate a term-structure sovereign yield curve. ¶100	Medium	Medium-term
Recommendation 14 (NRBT) Develop and implement risk mitigation measures, including haircuts that capture key financial risks such as market, liquidity, and credit risk. ¶97	High	Medium-term
Communication		
Recommendation 15 (NRBT) Develop a formalized institutional policy for communications along with key complementary frameworks. ¶109-¶110	High	Medium-term
Recommendation 16 (NRBT) Develop a Financial Stability Report. ¶111	High	Medium-term
Recommendation 17 (NRBT) Clearly communicate, following international best practice, the implementation of the proposed monetary operational framework. ¶116	High	Near-term
Recommendation 18 (NRBT) Expand outreach and adopt multitiered communication for monetary policy communication. ¶117-¶118	Medium	Medium-term
Recommendation 19 (NRBT) Enhance the effectiveness of communication by: (i) improving readability indices of monetary policy decisions by reducing the wording complexity; (ii) producing more focused monetary policy statements in terms of topics; and (iii) integrating more forward-looking elements in monetary policy statements. ¶135	Medium	Medium-term

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

Introduction

1. **The de jure and de facto monetary policy objective of the NRBT is to maintain internal and external price stability.** Internal price stability is defined as the maintenance of inflation below a reference rate (currently set at five percent)[1] while external price stability is the stability of Tonga's currency, the Pa'anga (TOP). In addition to this, the Monetary Policy Statement (MPS) released by the NRBT notes that the central bank aims to ensure an adequate level of foreign reserves and low and stable inflation, while supporting macroeconomic stability and economic growth. The NRBT has not formally announced a hierarchy of monetary policy objectives. Notwithstanding, the NRBT has relied on exchange rate stability as a nominal anchor to achieve internal and external price stability due to the small domestic production base and high proportion of imports.

2. **Amendments to the NRBT Act are currently being considered to clarify the monetary policy objectives.**[2] A key amendment includes establishing price stability as the core priority with the primary focus on low and stable inflation. Other amendments being pursued include establishing financial stability as the second objective and developing provisions for the NRBT to proactively facilitate and nurture private sector growth.

3. **The Tongan pa'anga is pegged to a basket of currencies.** The currency basket comprises the US dollar, New Zealand dollar, Fijian dollar, and the Australian dollar. There is a ±five percent monthly adjustment limit, with the US dollars used as an intervention currency. Tonga also employs capital flow management measures which have helped to curtail capital mobility and vulnerabilities to the peg. The largest component of capital flows is remittances, but this remains insensitive to the interest rate differential. In addition to this, the largest institutional investors (two pension funds) are required to invest domestically.

4. **The NRBT determines the weights of the currency basket with the primary objective of stabilizing the basket.** This approach is underpinned by Tonga's high import propensity and the fact that headline inflation is predominantly influenced by import prices. The design of the currency basket allows for some amount of exchange rate flexibility given the presence of currencies other than the US dollar, thereby creating some amount of US dollar hedge to the extent that currency movements counter movements in the US dollar.

5. **Amendments to the NRBT Act are currently being considered to clarify the monetary policy objectives.** A key amendment includes establishing price stability as the core priority with the primary focus on low and stable inflation. Other amendments being pursued include establishing financial stability as the second objective and developing provisions for NRBT to proactively facilitate and nurture private sector growth.

6. **The balance sheet of the NRBT has grown significantly over the last two decades due to significant FX reserve accumulation.** As is typical of a central bank in a small open economy, FX reserves are the main item on the asset side of the balance sheet. On the liability side, the

[1] The NRBT lowered the indicative reference rate to five percent per annum from six to eight percent in 2016 to be more consistent with historic inflation rates and better aligned to the medium-term outlook following the recommendation by the Article IV mission.

[2] The NRBT was established in 1989. The NRBT Act 2020 (Revised Edition), states that the principal objectives of the Reserve Bank are to maintain internal and external monetary stability, and to promote financial stability and a sound and efficient financial system. The NRBT should conduct its activities in a manner that supports macroeconomic stability and economic growth.

main items are currency in circulation, statutory reserve deposits, and demand deposits (i.e., excess reserves). The large build-up of demand deposits resulted from the accumulation of FX reserves, which created excess liquidity as NRBT FX purchases remained unsterilized (see Table 2). This excess liquidity has also remained unremunerated by the NRBT since 2012. As a result, there have been no trading activities in the interbank market and the NRBT has maintained a de facto zero-interest rate monetary policy stance that has been left unchanged since 2012.

7. **While the NRBT could issue NRBT notes to mop up excess liquidity, it has not activated this instrument for the last 10 years.** Instead, it has relied on changes in the ratio of the Statutory Reserve Deposit (SRD) on several occasions in response to macroeconomic developments (see Section I on Monetary Policy Implementation Over the Last 10 Years). The FX assets are the main contributor to the structural liquidity position and continue to strongly influence the size and variability in the autonomous factors (Afs).

8. **A previous IMF TA mission was completed in 2017 to review the monetary policy framework and operations,** but implementation of the TA recommendations was only partially achieved due to natural disaster shocks and the COVID-19 outbreak. Policy responses to those shocks relied largely on the implementation of non-market-based measures.

9. **Moreover, key components for an effective operational framework are still absent.** Such absences include: (i) there is no clear operational target; (ii) an interest rate that would incentivize savings in Tongan pa'anga has not been developed, and the interbank market has remained inactive; and (iii) other components such as liquidity forecasts, standing facilities, open market instruments and supporting arrangements for decision-making thereof are not in place. Against this background, the Tongan authorities requested assistance in implementing a modernized monetary policy framework to improve monetary transmission and incentivize interbank trading. Implementing a modernized approach to monetary policy with appropriate instruments to absorb excess liquidity is crucial in restarting the interbank market, therefore making it possible for the NRBT to conduct short-term liquidity management operations aimed at steering short-term interbank rates towards the NRBT policy rate.[3]

10. **The subsequent sections of the report will discuss the considerations for modernizing the NRBT's monetary operational framework and improving monetary transmission.** The sections are arranged as follows: Section I provides an overview of monetary policy implementation over the last ten years. Section II reviews the FX operation and determines the optimal FX basket weights that can be applied by NRBT. Section III covers the design of an interest rate corridor (IRC) supported by an appropriate SRD instrument to absorb excess liquidity and allow an alignment of short-term interbank market rates with the NRBT policy rate. Section IV discusses the collateral policy and recommends a best practice mechanism for estimating collateral haircuts. Section V examines the communication employed by the NRBT using natural language processing (NLP), then provides recommendations on a modernized communication policy framework.

[3] While this is not within the scope of this TA, the basis on which the monetary policy rate is determined is also important in ensuring the monetary policy rate adequately reflects adherence to the central bank's mandate.

I. Monetary Policy Implementation Over the Last 10 Years

11. **IMF recommendations in the context of capacity building missions (i.e., November 2016 MCM TA mission—final report February 2017) and surveillance (i.e., 2024 Article IV consultations) emphasized the benefits of a more market-based monetary policy framework.** The implementation of such recommendations would enhance monetary policy effectiveness and support economic stability and growth. A market-based monetary policy framework would include the following: (i) relying on the NRBT policy rate to communicate and implement monetary policy; (ii) establishing an interest rate corridor (IRC); (iii) reviewing the indicative inflation reference rate; and (iv) implementing an enhanced and effective communication strategy.[4]

12. **The transition to an interest rate-based monetary policy framework recommended by the November 2016 IMF TA mission remains incomplete.** This has occurred in a context of structural excess liquidity and a related weak monetary policy transmission.[5] In 2012, the unsterilized FX reserve accumulation, along with a discontinued issuance of NRBT notes and a reduced rate on excess reserves to zero to eliminate monetary policy costs, undermined monetary policy transmission (see Table 2).

Table 2. NRBT Balance Sheet Evolution in percent of GDP

ASSETS	2023	2013	2003
Foreign Assets			
Short/Long Term Investments	69.77	33.88	7.02
Accrued Interest	1.61	0.74	-
International Monetary Fund (IMF)			
	0.89	0.66	1.16
	4.86	2.75	0.14
Domestic Assets			
Advance to Banks	-	-	0.86
Claim on Government of Tonga	-	-	3.93
Cash on Hand	0.00	0.01	-
Accrued Interest	0.00	0.00	-
Other Assets	1.81	3.74	5.68
Total Assets	**78.94**	**41.78**	**18.79**

LIABILITIES	2023	2013	2003
Currency in circulation	9.67	5.46	3.83

[4] See Annex I for a review of progress in the implementation of MCM recommendations.

[5] See Annex I for a review of progress in the implementation of MCM recommendations.

Deposits			
Statutory Reserve Deposits	10.11	2.30	4.75
Demand Deposits	47.66	26.52	8.75
Non-Bank Deposits	2.05	-	-
Payable to Government	1.17	0.39	-
Other Liabilities	5.59	4.65	0.28
CAPITAL AND RESERVES			
Paid up Capital	0.41	0.71	0.23
General Reserves	1.86	1.42	0.29
Revaluation Reserve Account	0.42	0.34	0.67
Total liabilities & Capital and Reserves	**78.94**	**41.78**	**18.79**

Source: NRBT.

13. **The 2016 IMF TA mission recommended that the NRBT formally implements a floor IRC, with the policy rate initially set at zero.** It was also recommended that the NRBT should tighten monetary policy should signs of overheating emerge, however, this recommendation has not been implemented (see Annex I for details on the implementation of past IMF recommendations). In November 2016, the Board of the NRBT approved and implemented the following floor system as follows:

- NRBT Policy Rate: zero percent (July 2016), applied to the NRBT's standing deposit facility (interest on commercial banks' Exchange Settlement Accounts).
- NRBT Note Rate: two percent below banks' average one month deposit rate.
- Repo Rate: 3.9 percent (two percent above interbank lending rate). The Repo is the facility whereby the NRBT can provide liquidity support to commercial banks as the "lender of last resort".

14. **The NRBT policy rate has remained unchanged**. The NRBT decided to keep the policy rate at zero after running cost/return analyses. The NRBT discussed potential policy rate increases with the commercial banks, but it was intimated by the banks that they would, as expected, not react to such policy rate movements due to the excess liquidity. GDP recovery considerations have also carried a lot of weight in the NRBT decision to keep interest rates at zero, notwithstanding the inability to impact the interbank market if the excess liquidity is not absorbed. This delay in effectively implementing the monetary operational framework has led to a largely inactive interbank market and therefore no indicator of short-term market interest rates, and a weak transmission of monetary policy actions.

15. **In its April 19, 2024, meeting, the Board of Directors of the NRBT discussed the Interest Rate Corridor (IRC) (Board Paper No. 25/2024).** It endorsed the following resolutions: (i) NRBT Policy Rate (Interest on the banks' Exchange Settlement Accounts): zero percent—floor rate; (ii) NRBT Notes Rate: two percent—mid-rate; and (iii) Repo Rate: fixed at four percent as the ceiling rate. It was also announced that the conditions for the Repo Facility will remain the same except for the revised interest rate policy, and that the IRC shall be reviewed annually as the NRBT moves towards a more interest rate based monetary policy framework (see Table 3, and Annex

II). The rate at which the NRBT would be issuing its Notes is considered internally as the rate that would be appropriate for short-term money market conditions. While the two standing facilities have been disclosed to market participants, the rate that would be applied to NRBT Notes when they are issued has not been communicated to market participants. So far, no issuance of NRBT Notes has occurred.

Table 3. Structure of the Current Interest Rate Corridor (IRC)

Categories of Monetary Operations	Interest Rate	Maturity	Frequency	Comments
Repo Operations	4%	Seven-day or longer as requested by banks	At banks' discretion	Collateral: NRBT Notes; Government of Tonga bills and bonds.
NRBT Notes	2%	N/A	At NRBT's discretion	Undisclosed to the market. No issuance of NRBT Notes so far.
Deposits with NRBT	0%	N/A	At banks' discretion	The interest rate is the NRBT Policy Rate.
Source: NRBT Board Paper No. 25/2024 (See Annex II).				

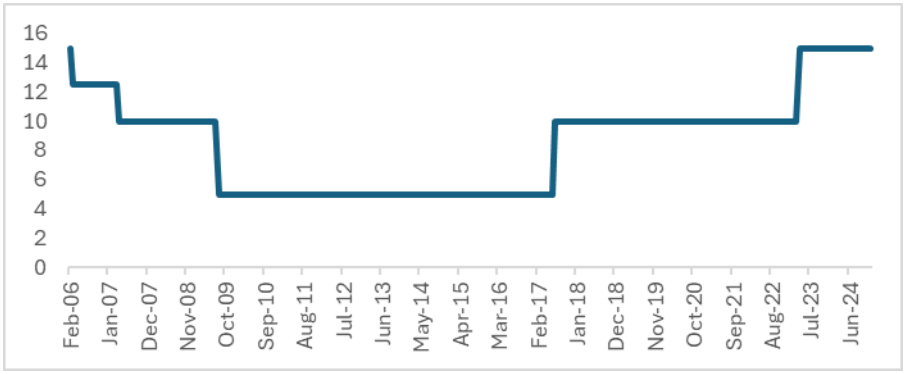
16. **The Statutory Reserve Deposit (SRD) requirement has been in practice the only conventional monetary instrument used by the NRBT (See Box 1)**. Periodic changes in the SRD ratio have been implemented in response to macroeconomic developments as follows: (i) pre-2006 the SRD was 15 percent. It was reduced to 12.5 percent effective March 3, 2006, to 10 percent effective April 2, 2007, and to five percent effective August 4, 2009; and (ii) it was increased to 10 percent effective July 2017 as a signaling device to the market that lending needed to be more prudent, and to 15 percent effective April 2023 (See Box 1 for further details on the SRD).

Box 1. Current Design of the Statutory Reserve Deposit (SRD)

Banks are required to maintain unremunerated deposits with the NRBT as a percentage of their local and foreign currency denominated deposits (all types of deposits being included) as measured at the end of the month. The maintenance period is monthly; no averaging provisions are in place. All SRD are in local currency.

In view of the low level of financial dollarization, maintenance of SRD in local currency for foreign currency denominated deposits is appropriate.

Evolution of the SRD Ratio



Source: NRBT.

17. **The NRBT has not developed an appropriate analytical and forecasting framework to guide the use of its monetary policy instruments**. In particular, the NRBT does not have in place a well-developed framework to assess when, and by how much, its policy rate should react in response to adverse past or forward-looking macroeconomic developments, in particular inflation, and economic growth. In addition, the NRBT has not developed a framework that would help to decide which monetary policy instrument should be utilized (i.e., policy rate, SRD ratio) given monetary policy cost considerations.

18. **The NRBT capacity to monitor and forecast short-term liquidity developments is incomplete**. The NRBT conducts a short-term liquidity forecasting exercise with a view to determining how much estimated excess liquidity is in the system can be mopped up. This exercise is conducted monthly on the basis of the NRBT monthly balance sheet produced by the Accounting Department. It involves a forecast of the NFA and of currency in circulation. Information provided by the commercial banks is utilized to assess the demand for reserves. Discrepancies between NRBT forecasts and actual outcomes tend to be large.

19. **In that context, to effectively achieve its objectives the NRBT predominantly influences domestic monetary conditions through additional unconventional tools.** NRBT response to macroeconomic shocks has relied on such tools to make monetary policy more accommodative during periods of low growth, or more restrictive to fight inflationary pressures, in conjunction with changes in the SRD ratio as already discussed:

- In 2016, the NRBT introduced a minimum loan to deposit ratio of 80 percent for banks (instead of a maximum) to encourage lending by banks. Due to high deposit inflows the targets were never achieved but the NRBT did not enforce the regulation due to the increase in credit growth.

- In 2017, in response to elevated inflation, following a recovery of the economy, while the NRBT did not raise its policy rate, it increased the SRD ratio from five to 10 percent, as a signaling device to the market that lending needed to be more prudent.

- While the NRBT has not issued notes to mop up excess liquidity, at times (in particular in 2023) it has offered deposit facilities for the Government and the retirement funds at the NRBT for targeted mopping of excess liquidity. The deposit facilities for the retirement funds

were discontinued in 2024 in order to support the banks' lending activities and their liquidity needs.

- The NRBT has supported the development of financial instruments to address internal imbalances including increased financial instruments to support credit easing in consultation with the Ministry of Finance. This has involved an effort to establish a credit guarantee facility as well as concessional credit facility which are still to be implemented. These actions do not have resulted in direct financial costs for the NRBT.

- The NRBT also reduced the spread of exchange rates that authorized dealers can offer to their customers. This helped make foreign exchange cheaper for importers and better for exporters, with smaller margins for FX dealers.

- During times of high inflation, the NRBT has utilized exchange rate adjustments[6] to cushion the impacts of high import costs. Internal studies conducted by the NRBT suggest that such measures may have been the most effective tool for cushioning inflation.

- The NRBT has also consistently relied on a comprehensive set of exchange controls, therefore limiting the ability of residents (individuals, corporations, or financial institutions) to undertake arbitrage transactions (see section below).

II. Foreign Exchange Regime and Currency Composite Framework

A. Foreign Exchange Regime and Operations

Current Institutional Arrangements

20. **The Tongan pa'anga is pegged to a basket of currencies comprising the US dollar (USD), New Zealand dollar NZD), Fijian dollar (FJD), and the Australian dollar (AUD).** There is a ±five percent monthly adjustment limit, with the U.S. dollars used as the intervention currency. The NRBT also attempts to maintain an adequate level of foreign reserves above three to four months of imports cover. Information on the currency basket, including the weight of the currencies in the basket, is not publicly disclosed.

21. **To maintain the peg, the NRBT has relied on a comprehensive set of exchange controls.** All foreign currency payments from pa'anga accounts, through either the commercial banks or the NRBT, are subject to the exchange control requirements. Banks must provide underlying documentation when they purchase foreign exchange from the NRBT to certify the bona fide nature of the transactions. While the NRBT has delegated to banks and authorized foreign exchange dealers (FEDs) the approval authority for current and capital payments up to a given ceiling, all other payments require NRBT approval. Exports proceeds are subject to repatriation and surrender requirements. As for capital account transactions, banks and authorized FEDs are delegated the authority to approve payments up to ceiling; NRBT prior approval is required for

[6] The NRBT policy allows for an adjustment to the prevailing exchange rate. This adjustment is limited to five percent monthly.

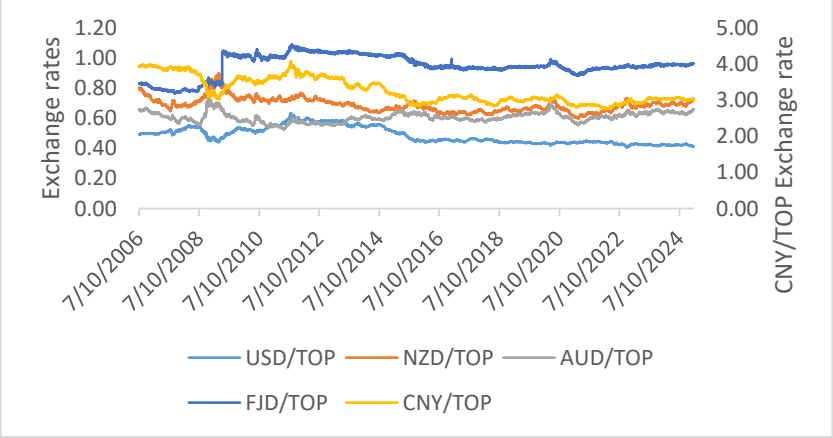
amounts above that ceiling. Finally, banks' balances of their nostro accounts are also subject to a daily ceiling, and any excess must be sold to the NRBT within two business days (see Annex III for further details on exchange and capital controls).

22. **For its foreign exchange interventions (FXI) the NRBT relies on a foreign exchange standing facility, whereby licensed commercial banks can purchase FX from the NRBT to cover their bona fide transactions with customers.** The NRBT sets the US dollar–pa'anga rate on a daily basis and buys and sells foreign exchange at these exchange rates to the commercial banks. Commercial banks are required to list all the underlying customers, and all foreign currency payments from pa'anga accounts are subject to the exchange control requirements, so supporting documents are provided accordingly, which verify whether the transactions are bona fide.

23. **Licensed commercial banks may trade among themselves in the FX interbank market**. There are no limits on the spreads for interbank foreign exchange transactions among commercial banks. The NRBT does not intervene directly with market participants at their quoted rates. Commercial banks are also allowed to maintain nostro accounts, but their total balances may not exceed T$1 million daily. Any excess must be sold to the NRBT within two business days.

24. **Historically, the exchange rate peg has provided the NRBT with a certain degree of flexibility against global events that have affected the value of the US dollar**. The pa'anga currency has depreciated relative to the USD over the long term since 2006 (see Figure 1) with a period of appreciation from 2008 to 2012. In terms of the currency dynamics in the basket, the long-term movement in the USD/TOP exchange rate has been somewhat countered by the long-term trend in the other exchange rates, most notably since 2020. Of note, the AUD/TOP and the NZD/TOP exchange rates have countered the impact of the USD/TOP exchange rate movements on the stability of the basket throughout the period. This provides the NRBT with some amount of protection against the currency basket's exposure to the USD/TOP exchange rate.

Figure 1. Currency Basket Exchange Rates



Source: IMF Staff.

25. **Once the NRBT has modernized its monetary operational framework along the lines recommended by the mission, consideration may be given to gradually liberalizing the FX regime.** The overriding objective would be to gradually shift from the current reliance on FX

controls (to limit the ability of residents to undertake arbitrage operations), towards a framework that would more directly rely on market-based incentives to that end.

B. Currency Basket Design

Current Currency Basket

26. **An optimal currency basket should have weights designed to stabilize the basket and ensure price stability.** Achieving this involves a mathematical approach to determine the most effective weights, which helps in minimizing the foreign exchange (FX) impact on import prices.

27. **The weights of the currencies within a basket are sensitive to the choice of policy objective.** It is important to clarify the operational target and avoid multiple objectives of the basket. For a basket peg to serve as nominal anchor, as in the Tongan case, then the policy objective must be price stability. A review of economic literature shows estimated currency baskets using objectives that differ from price stability (see Table 4 which summarizes a survey on the choice of the currency basket and its intended policy objective). These objectives, however, are not optimal and would not be aligned with best practice methods in the context of price stability.

Table 4. Survey of Policy Objective and Recommended Basket Peg

Policy Objective	Recommended Peg	Source
Minimize deviations of exports from a target level.	Basket peg with weights reflecting the export shares of each currency, modified by the covariance terms between exchange rates and price levels.	Edison and Vardal (1987)
Minimizing deviations in the production of tradable goods from a target level.	Basket peg with weights reflecting the trade (export and import) shares of each currency, modified by the covariance terms between exchange rates and price levels.	Edison and Vardal (1990)
Stabilization of the real exchange rate.	Peg to elasticity-weighted basket modified by covariance between price and exchange rate movements.	Lipschitz and Sundararajan (1980)
Stabilization of the current account.	Basket peg with weights reflecting elasticities of demand with respect to exchange rates.	Flanders and Helpman (1979)
Stabilization of output and prices.	Basket peg with weights reflecting the impact of the level of foreign-currency debt and imported inflation.	Rajan (2000)
Stabilization of output for oil exporters.	Basket that includes oil price index.	Jeffrey Frankel (2017)
a. Value of trade (exports plus imports) stability. b. Output stability.	a. Basket peg with weights equal to trade weights (under certain assumptions). b. Basket peg with weights depending on parameter values.	Yoshino, Kaji, and Suzuki (2000)

Source: IMF Staff.

28. **In Tonga, the official objective of the currency basket is to maintain low and stable inflation in line with the primary NRBT mandate of price stability.** In the absence of operational targets for inflation, exchange rate stability brought about by the currency basket serves as the main tool to maintain price stability.

29. **Tongan imports are predominantly sourced from 15 countries,** accounting for around 92 percent of its total import. The composition of imports partners has changed significantly over time, with sharp movements in recent years. For instance, while the import share from China increased steadily from one percent in 1998 to nine percent in 2022, the share rapidly gained momentum in just two years with the ratio moving to 14.1 percent in 2024. Meanwhile, the import share from Fiji has fluctuated significantly between one and ten percent since 1998. The ratio for the US, New Zealand and Australia, on the other hand, has been more stable.

30. **The NRBT utilizes data compiled from its Overseas Exchange Transactions database to assess Tonga's currency exposure**. Official trade data disaggregated by currency is however not available. Therefore, for the purposes of the mission, trade invoicing data was estimated using assumptions guided by the NRBT (see Table 5).[7] Information on the current weights applied by NRBT is not disclosed to the public.

Table 5. Trade Data by Country and Currency

Currency	Trade Data by Country			Trade Invoicing Data (est.)
	1998	2010	2024	2024
American Samoa	2.35	0.00	4.51	
Australia	11.16	6.54	7.97	7.5 (AUD)
China	0.32	3.56	7.05	2.0 (CNY)
Fiji	10.38	5.58	6.36	5.5 (FJD)
France	0.00	0.03	0.01	
Hawaii	0.23	0.07	0.00	
Hong Kong	0.15	22.45	0.67	
Indonesia	0.47	0.67	3.08	
Japan	24.09	6.48	1.94	
Korea Republic of	0.66	0.30	0.25	
New Zealand	24.56	24.17	25.96	25.0 (NZD)
Singapore	0.53	10.08	12.06	
United States	22.27	14.55	18.76	60.0 (USD)
Other	2.84	5.52	11.39	

2024 data is as of March 2024.
Source: NRBT Data and IMF Staff Calculations.

31. **The currency basket index has displayed low volatility over the review period.** In relation to the individual currencies, the USD has been the most stable currency relative to the TOP, with the FJD being most volatile over the past two decades (see Table 6). AUD and NZD relative to the TOP has displayed moderate volatility. The relative movement of the currencies and prevailing weight have produced low volatility in the basket index. An optimization of the weights has the potential to further lower this volatility. As such, the mission assisted the authorities with

[7] To estimate trade data by currency, following the instructions of the NRBT, it is assumed that the respective country currencies are used to import goods and/or services, with some key exceptions, such as for example, countries including Singapore, China, etc., are assumed to be intermediated by the USD. The USD is also used as a residual as the main anchor currency.

optimizing the currency basket weights and trained NRBT staff in estimating the requisite models that enables the optimization

Table 6. Descriptive Statistics of NRBT Announced Foreign Exchange Rates

Statistics	TOP/USD	TOP/NZD	TOP/AUD	TOP/CNY	TOP/FJD	Current Basket Index
Mean	-0.003	0.000	0.003	-0.005	0.011	0.002
Median	0.000	-0.014	-0.015	0.000	0.000	-0.003
Max	2.789	3.833	5.157	2.686	24.955	3.296
Range	5.714	6.980	9.021	5.598	27.850	5.982
Mean Abs Dev.	0.361	0.428	0.417	0.350	0.451	0.293
Variance (n)	0.258	0.371	0.415	0.244	0.803	0.196
Standard Deviation (n)	0.508	0.609	0.644	0.494	0.896	0.443
Skewness	-0.348	0.546	1.255	-0.271	14.853	0.684

Source: NRBT Data, IMF Staff calculations

Methodology for Determining Optimal Weights

32. **Based on Tonga's objectives of the currency basket, weights should be chosen to stabilize the basket and minimize the fluctuations of import prices.** An FX composite model, developed by the Monetary Operations Division of MCM (MCMCO), is a quantitative tool that enables one to apply this approach to determine the optimal weights of a currency basket.

33. **Exchange rate volatility is linked to import prices volatility using a pass-through equation.** The specification and selection of invoicing currency for constructing the basket could significantly influence how import prices respond to exchange rate fluctuations. We assume time lags in the pass-through using the reduced form equation below.[8]

$$\Delta \text{Log}\,(\pi_t) = \sum_{j=1}^{N} \beta_j \,\Delta \log\left(e_{j,t-p}\right) + \varepsilon_t \quad (1)$$

Where π_t: import price index at time t.

β_j: pass-through coefficient of exchange rate to import price index.

e_{jt}: bilateral exchange at time t.

p: number of lag.

N: number of trade partners.

[8] The mission kept the reduced form specification as simple as possible to ensure the model remains tractable and to facilitate the derivation of a closed-form relationship between import price and exchange rate volatilities.

Δ: Difference operator

ε_t : Error term

34. **The formulation of import price volatility is critical for determining the weight of the basket.** The volatility of import price as a function of exchange rate volatility using the reduced form equation (1) can be expressed in the form of a variance as follows:

$$\sigma_\pi^2 = F(w,.) = \sum_{J=1}^{N} (\beta_j w_j)^2 \sigma_j^2 + 2 \sum_{i \neq j} \beta_i \beta_j w_i w_j \, cov(e_i, e_j) \quad (2)$$

Where the variance of $e_{jt} = \sigma_j^2$, and w_j is the weight assigned to each exchange rate.

35. **In equation (2), the import price volatility is linked to the weight,** following the assumption that the central bank assigns a weight w_j to each currency in the basket to adjust its corresponding pass-through. Therefore, the variance of the right-hand side of equation (1) becomes equation (2) because the volatility of import prices is a function of the passthrough of the different currencies, with the magnitude by which each currency impacts import prices determined by the corresponding currency weight in the economy.

36. **The import price volatility is a function of two key statistics:** (i) exchange rate variances σ_j^2 and (ii) exchange rate co-movements $cov(e_i, e_j)$.

37. **The optimal basket is obtained by solving a minimum variance portfolio optimization.** The central bank sets a vector of weights $w = \begin{pmatrix} w_1 \\ \vdots \\ w_N \end{pmatrix}$ to minimize the variance of the basket index, which equals w'Zw, with Z being the variance-covariance matrix of bilateral exchange rates under the three constraints: (i) the sum of the weights is equal to one; (ii) each weight is between zero and one; and (iii) the variance of inflation expressed as a function (F) of weights and the bilateral exchange rate should be less than a desirable inflation variance ($\bar{\sigma}^2$). Annex IV provides details on the choice of $\bar{\sigma}^2$.

$$\begin{aligned} & \min_{w} w'Zw \\ \text{st} \quad & \sum_{\text{j=1}}^{\text{N}} w_j = 1 \quad \text{(i)} \\ & 0 \leq w_j \leq 1 \quad \text{(ii)} \\ & \text{F}(w,.) \leq \bar{\sigma}^2 \quad \text{(iii)} \end{aligned}$$

38. **Based on Tonga's current currency framework, we consider five currencies (USD, AUD, NZD, FJD, and CNY).** Estimated trade invoicing data indicates that all currencies, have a non-negligible proportion in invoicing trade, with the US dollar and the New Zealand dollar having the largest impacts.[9]

[9] CNY has been added to the analysis to incorporate the economic exposure to that currency and to determine: (i) whether the currency helps to stabilize the basket and (ii) what is the optimal weight of its inclusion.

Results

39. **The mission estimated this FX composite model and optimized weights for Tonga's currency basket using monthly data from 2006 to 2024.** The currency basket index produced by the optimized weights demonstrated greater stability over the sample period relative to the index produced by the current currency basket weights. The detailed results, including the optimal weights for all currencies, were discussed with the authorities. The mission also delivered a technical presentation on the model's methodology and introduced an Excel-friendly tool that the NRBT staff could employ without any prior programming skills to estimate the FX composite model. The model was programmed using Python.

III. Monetary Policy Conduct

A. Some Conceptual Considerations

40. **IMF research that is based on country experiences shows that monetary policy design and implementation can follow similar principles and processes under an exchange rate-based operating framework, as under an interest rate-based monetary policy framework.**[10] In particular:

- The short-term interest rate and the exchange rate are tied by an interest rate parity condition when there is some level of de facto capital mobility. Therefore, they should be managed coherently, with a view to achieving the final monetary policy objective.
- Inflation can be defined as the final objective using an exchange rate anchor, while the interest rate remains the monetary policy instrument.
- Exchange rate anchors are more prone to policy inconsistencies, calling for fiscal and monetary discipline. An exchange rate anchor is hardly compatible with fiscal dominance and with a conventional monetary targeting regime.

41. **This research work also supports active liquidity management by the central bank.** The main lessons indicate that developing an effective operational strategy can be pursued along the following lines:

- Liquidity management retains the important role of stabilizing money market rates, influencing domestic financial conditions, and anchoring market expectations. The framework should be designed to curtail liquidity surpluses and limit the over-injection of central bank liquidity that can put pressure on international reserves and threaten the exchange peg.
- Liquidity management operating under peg regimes have the following similarities: (i) the majority introduced reserve requirements (RR), usually with an approximately one-month averaging period; (ii) many of them use short-term open market operations (OMOs), though not always calibrated according to autonomous factor forecasts; (iii) some of them have an

[10] See in particular Working Paper WP 20/180, Monetary Policy Under an Exchange Rate Anchor, and Working Paper WP 19/58, Liquidity Management under Fixed Exchange Rate with Open Capital Account.

interest rate corridor in place; and (iv) in some cases, the interest rate is used to offset FX flows.

- Operational objectives can be clearly defined and achieved with an adequate combination of monetary policy instruments (RR, OMOs, and standing facilities-SFs) and a calibration of OMOs according to autonomous factors' forecasts, to: (i) offset short-term liquidity shocks, dampen interest rate volatility, and foster money market stability and development; (ii) lower the precautionary demand for reserves, funding costs, and lending rates; and (iii) build liquidity buffers in good times and contain the buildup of financial stability risks, while releasing liquidity in times of reversals in liquidity conditions (capital outflows or adverse current account shocks).

Recommendation

Recommendation 1: Consider a gradual modernization of monetary policy implementation by setting up an active liquidity management framework to allow the NRBT to steer short-term money market rates to its announced policy rate.

42. **At this juncture, the mission recommends the NRBT to consider engaging in a gradual process of monetary policy modernization.** This should involve the setting up of a framework for market-based and active liquidity management to support better control of excess reserves to manage financial conditions and to support the peg. That would involve steering short-term money market rates to an announced NRBT policy rate. The policy rate would be set at the level that is considered appropriate to support the achievement of the NRBT monetary policy objectives. Implementing this plan would involve two complementary workstreams. The first one would involve having the analytical capacity to assess what should be the stance of monetary policy, that is, what would be a suitable level of short-term interest rates that best suits Tonga's circumstances given the peg to the basket or currencies. The second would involve developing the operational capacity to determine and assess the interventions in the money market to align short-term money market rates with the desired stance of monetary policy. That would involve developing a framework for the activation and calibration of the NRBT's operational framework aimed at absorbing excess liquidity.

43. **Regarding the NRBT policy rate, it would be highly relevant to maintain a level of short-term money market interest rates that is well aligned with those in place in the countries included in the currency basket**. From an operational point of view, that would imply setting the NRBT policy rate at a level aligned with the policy rates in place in the countries included in the currency basket adjusted with a risk premium. The following benefits could be expected from such a move: (i) maintain the covered interest rate parity condition; (ii) limit arbitrage opportunities; (iii) support attractiveness of local currency for residents; (iv) limit incentives to circumvent capital controls (i.e., repatriation of export proceeds); and (v) limit the need to rely on capital controls which lose their effectiveness over time.[11] The inclusion of some forward-looking aspect could be considered to align inflation expectations.

44. **The NRBT needs to develop its monetary operations framework to influence the local currency money market through operations exclusively with the commercial banks as its**

[11] A discussion on these issues is provided in the following IMF Working Paper: (i) WP/19/58, Liquidity Management Under Fixed Exchange Rate with Open Capital Account, by Mariam El Hamiani Khatat, and Romain Michel Veyrune; and (ii) WP/20/180, Monetary Policy Under an Exchange Rate Anchor, by Mariam El Hamiani Khatt, Mark Buessing-Loercks, and Vincent Fleuriet.

counterparts. Central banks have a monopoly on the short-term local currency money market with appropriate short-term liquidity management operations undertaken with the banks that hold an account at the central bank. The NRBT needs to enhance short-term liquidity management to achieve a level of liquidity to align market conditions with the desired stance of monetary policy, as expressed in the policy rate. To that end, the NRBT needs to develop a clear and effective operational framework, with a policy rate used to communicate the policy stance that is clearly linked to the attainment of a medium-term inflation objective. The NRBT liquidity management operations should aim at aligning market conditions (short-term interbank market interest rates) with this announced policy stance. An effectively implemented operational framework supports the functioning of money markets, allowing commercial banks to predictably place surplus liquidity with, and obtain short-term funding from each other, or the central bank at rates that are reasonably stable.

45. **The current reliance on the SRD to that end does not offer the NRBT an adequate level of flexibility**. From a macro perspective, analyses undertaken by IMF staff (see IMF 2024 Article IV consultation report: Annex VI: Monetary Policy Transmission Mechanisms in Tonga) suggest that the use of the SRD as monetary policy tools has various limitations. Its impact on lending rate and inflation appears modest at best, and the presence of sizeable excess reserves can significantly reduce the SRD effectiveness as banks would simply shift the excess reserves into the mandatory reserve category.[12] Furthermore, from a short-term perspective, changes in the SRD ratio cannot be relied upon to adjust liquidity conditions to short-term changes in the autonomous factors of liquidity in a timely fashion.

46. **Recent experiences provide some evidence of the limited effectiveness of the SRD framework** (see the above-mentioned Annex VI of the IMF 2024 Article IV consultation report). In 2023 the NRBT had to offer deposit facilities for the retirement funds for targeted mopping of excess liquidity, then had to cancel them in 2024 to support the banks' lending activities and their liquidity needs.

47. **Therefore, the most immediate priority for the NBRT is to enhance short-term liquidity management by relying on the IRC to achieve a level of liquidity to align short-term money market conditions with the desired stance of monetary policy**. In that context, the NBRT would offer liquidity facilities to the banks only, either to mop up or to provide liquidity to offset any undesirable changes induced by evolution of the autonomous factors. An additional benefit would be to avoid the possibility of NBRT undertaking financial intermediation operations that compete with the banking sector. Whitin such a framework, reliance on the SRD is still possible and desirable as explained in the subsequent discussion in part IV, section B.

48. **Critical for the implementation of short-term liquidity management and the operation of an IRC is the ability of the central bank to conduct short-term liquidity monitoring and forecasting.** While information provided by the commercial banks on their expected liquidity position can be useful, it does not allow the central bank to develop an accurate view of the demand and supply of liquidity. Such information can only be derived from the balance sheet of the central bank. It involves developing a framework to monitor the autonomous factors of liquidity on the basis of an analysis of the NRBT balance sheet. As such, the NRBT should develop this capacity.

[12] See in particular the 2024 Article IV Consultation Annex VI "Monetary Policy Transmission Mechanism in Tonga".

B. Design of the Interest Rate Corridor (IRC)

Current Situation

49. **The current interest rate corridor (IRC) has several features that are not fully consistent with best practices** (see Table 3 and corresponding paragraphs for a detailed description). On the one hand, some of its features are aligned with best practices: (i) the IRC includes two standing facilities that banks can access at their initiative, therefore setting a fluctuation band for short-term money market conditions, and OMOs in the form of the issuance of NRBT Notes that correspond to the needs of an active liquidity management in a context of a structural excess liquidity, and (ii) the calibration of the interest rates for those instruments is anchored on what the NRBT Board considers an appropriate level at this juncture for short-term money market conditions (the interest rate decided for NRBT Notes). On the other hand, some critical features are missing: (i) the NRBT has not started the issuance of its Notes, although there is a large structural liquidity surplus that has resulted in an inactive interbank market; (ii) the "announced" policy rate (i.e., the rate applied to the deposit standing facility) sends a confusing signal as to where the NRBT would want the short-term money market to trade; and (iii) the structure of the IRC and its objective (steer short-term money market rate to its desired level) has not been fully disclosed to market participants.

50. **Therefore, the current IRC (its design and its actual activation, or lack thereof) does not allow the NRBT to be in "the driver's seat" regarding the operational objective of monetary policy.** It is important that the NRBT aligns short-term money market conditions with the desired stance of monetary policy as communicated in its policy rate.

Recommendations

Recommendation 2 (NRBT): Start monetary policy modernization by the Introduction of a conventional mid-rate interest rate corridor (IRC) with fixed rate and full allotment tenders.

51. **The mission recommends the implementation of a mid-rate IRC to support NRBT's active liquidity management**. That would involve: (i) announcing a policy rate[13] which would serve to communicate the monetary policy stance and that would be the NRBT target for short-term interbank market rates; (ii) a commitment to use OMOs (i.e., auctions of NRBT Notes) to steer interbank market rates close to the operational target; and (iii) setting SFs that banks can use at their initiative, bearing an interest rate pre-set by the NRBT, and allowing banks to borrow from the NRBT (refinance standing facility), or deposit funds with the NRBT (deposit standing facility).

52. **Mid-rate IRC systems provide stronger incentives for interbank trading than floor IRC where the standing deposit facility rate serves as target for interbank rates and as policy rate.** While they are more demanding to operate than floor systems[14] they can be designed in a way that does not require sophisticated liquidity forecasting frameworks, or active and liquid money markets. Annex V provides additional information on the use of IRC, some guiding principles on the technical specifications regarding the maturity of OMOs and SFs; and setting the IRC width.

[13] This policy rate would serve as the interest rate for conducting sterilization operations (where the forecast is one of excess liquidity) and for liquidity providing operations (where the liquidity forecast indicates a liquidity shortfall).

[14] They require better liquidity forecasting frameworks, more frequent OMOs, and supporting measures such as RR with reserve averaging to properly steer interbank rates and contain volatility.

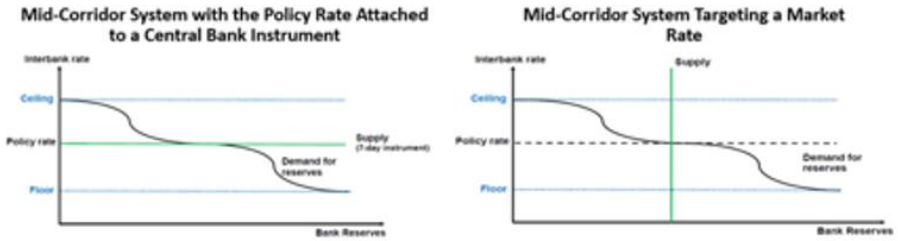
53. **The mission recommends introducing a seven-day main liquidity management operation (MLMO), conducted weekly and anchored on the NRBT policy rate (see Table 7).** Given the current situation of structural excess liquidity, that would mean issuing seven-day NRBT Notes at the NRBT policy rate to reduce excess liquidity. When the structural liquidity position of the banks turns negative, the NRBT would conduct seven-day repo operations at its policy rate. Adopting such a framework will help market participants better understand the objective of aligning the interbank market with the policy rate.

54. **At this juncture, given the limited short-term liquidity forecasting capacity at the NRBT, the mission recommends operating the MLMO through tenders at a fixed rate (the NRBT policy rate) and with full allotment**. Therefore, the NRBT will not need to define the volume of MLMOs, as it will be determined by the banks, and the NRBT will accept all bids from the banks. However, a meeting of the NRBT liquidity management team may be conducted before each weekly MLMO to practice and learn how to assess liquidity developments. This will help to prepare the NRBT for the calibration of OMOs once the NRBT would be shifting to variable-rate, fixed-amount tenders (Box 2). Once the NRBT has developed a short-term liquidity forecasting capacity, a move to variable rates, fixed amounts MLMO can be envisaged, as well as introducing fine-tuning OMOs.

Table 7. Design of the Proposed Interest Rate Corridor

Categories of Monetary Policy Operations		Types of Instruments		Maturity	Frequency	Procedures
		Liquidity Absorption	Liquidity Provision			
OMOs (NRBT discretion)	Main liquidity management operation-MLMO	Issuance of NRBT Notes	Repo operations 1/	Seven-day	Weekly	Fixed-rate, full allotment or variable rate fixed amount tenders
	Fine-tuning OMOs	Deposits with NRBT	Repo operations 1//	Overnight	As needed	Policy rate serves as maximum/minimum bid rate on absorbing/providing operations
Standing Facilities (Banks' discretion)	Marginal lending facility-MLF		Overnight repo operations	Overnight	IRC Upper bound (policy rate + 100/200 pbs). Collateral: NRBT Notes, Government of Tonga bills and bonds	
	Marginal deposit facility-MDF	Overnight deposits		Overnight	IRC Lower bound (policy rate – 100/200 pbs)	
1/ Collateral similar as for MLF. Source: Mission's elaborations.						

Box 2. Types of Mid-corridor Systems and Tenders



Tender type: **Fixed rate, Full allotment**

- Operations at Policy rate
- Setting the marginal price of liquidity
- Full allotment to avoid distortion
- Over bidding a problem

Tender type: **Variable rate, Fixed allotment**

- Banks offer their rates
- Challenges in forecasting
- Reserve averaging can help
- Incentivizes market activity

The Variable rate, Fixed allotment system may perform better than the Fixed rate, Full-allotment system when the central bank's short-term liquidity forecasts are accurate. There is some evidence that banks tend to overbid for liquidity under the Fixed rate, Full-allotment system, and for post-allotment interbank rates to dip below the tender rate.

Source: IMF Working Paper: (i) WP/20/26, Monetary Policy Implementation: Operational Issues for Countries with Evolving Monetary Policy Frameworks by Nils Mæhle.

55. The standing facilities-SFs (Marginal Deposit Facility—MDF, and Marginal Lending Facility—MLF) must play the important role of buffers to limit interest rate volatility, and the NRBT must ensure automatic access to them. Banks must be able to access SFs on a daily basis through overnight operations. The criterion for accessing the MLF must be the availability of collateral to be provided by banks. The NRBT must not limit the volume of MDF operations. Any restrictions on SFs due to cost or any other considerations could cause interbank rate to exceed MLF or fall below MDF, undermining the objective to align interbank rates with the NRBT policy rate.

Recommendation 3: Move to mid-rate IRC with variable rates and fixed allotment tenders once a liquidity monitoring and forecasting framework is fully operational.

56. At a later stage, the mission recommends moving to fixed-quantity, variable-rate OMOs. The timeline to begin this migration will depend on progress in: (i) market participants' understanding of the role of the NRBT's liquidity management operations; (ii) improving NRBT's liquidity forecasting capacity; and (iii) coordination with the Ministry of Finance on receiving reliable government cash-flow forecasts.

C. Interbank Market development

57. A functioning interbank market is essential for market-based monetary policy implementation through an interest rate corridor (IRC). The interbank market, particularly the overnight market, is important from the point of view of any central bank. This is because a well-

functioning interbank market is key for efficient distribution of liquidity among the banks, in a context where the central bank manages overall liquidity conditions through its discretionary and market-based monetary operations of an IRC. It is through this segment of the money market that the central bank attempts to influence the systemic liquidity and stabilize short-term interest rates, with the ultimate objective to align short-term interbank market rates with its policy rate. In the process, it transmits the impulse of monetary policy.

Recommendations

Recommendation 4: Engage discussions with the banks to assess what specific actions the NRBT could take to support interbank market activities.

58. **Banks have indicated a general willingness to participate in interbank activities once the structural excess liquidity has been absorbed and incentives restored.** Since the interbank market has remained inactive for over a decade due to the large structural excess liquidity, the survey of the interbank market participants did not provide significant information. While open to participating in interbank market activities, some banks expressed concerns regarding the capacity to assess potential counterparties' soundness, in a context where limited financial information is available that would allow to conduct such an assessment. Uncertainties with regard to the availability of a suitable legal framework for entering into collateralized interbank lending operations could also be an additional obstacle to interbank market activities. Some foreign banks have also mentioned the policy of their group that prevents them from entering into interbank operations with counterparties that do not comply fully with AMLCFT regulations.

Recommendation 5: Adopt a wide IRC at the start.

59. **To stimulate interbank trading, the mission recommends adopting a wide IRC at the start.**[15] As elaborated in detail in Annex V, while there are no specific rules on the IRC width, a wide corridor increases the opportunity cost for banks, discouraging them from using the SFs because it would be less profitable compared to interbank transactions. This helps distribute liquidity from banks with excess reserves to those with a deficit, enabling the central bank to target aggregate liquidity in the system rather than the individual needs of individual banks. Therefore, setting the IRC on the wide side would increase incentives for overnight interbank trading, and can be useful in the initial stages of the introduction of an IRC, so as to de-incentivize banks to rely on the central bank for their short-term liquidity management. Once the interbank market has become mature, and banks have in place an efficient treasury function, a narrow IRC can be useful to better anchor short-term rates, which would help developing the market for longer-term securities and thereby transmission along the yield curve. Those considerations are of less concern in countries with underdeveloped financial markets, or at the launch of an IRC framework.

D. Short Term Liquidity Monitoring and Forecasting

60. **Short term liquidity monitoring and forecasting involves an analysis of the projected changes in the main items of the central bank's balance sheet,** distinguishing the demand and the supply of liquidity (see Annex VI for further details). Simplifying a typical balance sheet, by netting the external position of the central bank and the position against the government, and

[15] Currently most of the central banks which currency are included in the basket for the Tonga currency have a width of the IRC of 50 bps (Reserve Bank of Australia; Reserve Bank of New Zealand; European Central Bank; US Fed; Bank of England). Therefore, when it is introduced in Tonga, the width of the corridor would be larger.

summarizing all other assets and liabilities (other items net/net domestic assets), results in the following (Table 8):

Table 8. Stylized Balance Sheet of the Central Bank

Assets	Liabilities
Net foreign assets	Currency in circulation
Net lending to banks/OMOs 1/	Bank reserves (required and excess)
Other items net/Net domestic assets	Net position of the government 2/
1/ In countries where there is a structural excess liquidity, the net "policy" position with banks can be on the liability side, for instance when the central bank absorbs liquidity by issuing its own securities. 2/ In countries where the central bank is allowed to provide direct credit to the government, the net position of the government may appear on the assets side.	

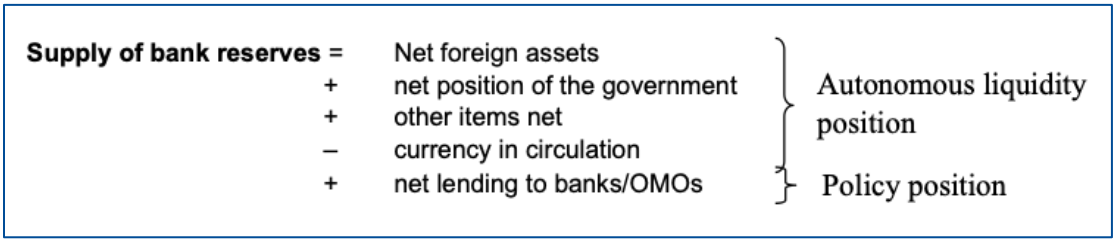
Source: Mission's elaborations.

61. The demand for bank reserves can be divided into the demand for required reserves and excess reserves:

Demand for bank reserves = Required reserves + excess reserves

62. The supply of bank reserves can thus be derived as shown in Figure 2. The first four items contain all factors that are beyond the control of the central bank in the very short run or—more generally—not related to monetary policy actions. These items are, therefore, called the "autonomous liquidity position."[16] In contrast, the central bank's "policy position" which comprises central bank direct lending to banks and net lending through OMOs is under the immediate control of the central bank. The supply of bank reserves is defined as the sum of the autonomous liquidity position and the policy position. To steer the supply of liquidity according to its objectives, the central bank needs adequate information on the autonomous factors of liquidity supply.

Figure 2. Supply of Bank Reserves



Source: Mission's elaborations

63. By comparing the forecasted demand and the projected autonomous factors of the supply of bank reserves, the central bank receives an estimate of the excess supply of (or excess demand for) liquidity that results if the central bank does not intervene. Based on this estimate, the central bank decides how to adjust its net policy position to achieve the desired liquidity conditions. The net policy position accounts for policy operations that have been carried

[16] NFA are categorized as an autonomous item regardless of the exchange rate regime. This assumes that under flexible exchange rates the central bank does not intervene in the very short run and NFA are, therefore, constant. On the other hand, under fixed exchange rates NFA changes are outside the control of the central bank as it is committed to intervene to hold the exchange rate stable.

out in the past and come into effect later like the redemption of repo or reverse repo agreements, maturing refinance credit and the like.

64. **When the central bank targets a short-term interest rate (typically overnight) it uses the projected daily excess supply or demand reserves to define the amount it has to withdraw or inject daily into the market with its OMOs.** The relationship is less strict if the central bank steers the overnight interest rate within a corridor or has reserve requirements with averaging provisions in place. Then, the central bank only reacts to cumulated disequilibria over the entire maintenance period, since the system of reserve requirements works as a stabilizer. In contrast, if the central bank operates without reserve requirements, or without reserve averaging, it may then need to manage liquidity conditions more on a day-to-day basis.

65. **Very often the net position of the government with the central bank accounts for the most significant changes in the autonomous liquidity supply (as discussed in Annex VI).** To ensure a high degree of overall forecast accuracy, it is therefore crucial that the government cooperates closely with the central bank in providing on a timely basis all information available on government transactions that affect the liquidity supply.

Recommendations

Recommendation 6: Strengthen liquidity monitoring and forecasting by developing a capacity to analyze and forecast weekly the autonomous factors of liquidity based on the NRBT balance of accounts.

66. **The mission recommends starting to develop a short-term liquidity monitoring and forecasting framework based on an analysis of the NRBT balance of accounts on a weekly basis**. Follow-up technical assistance will be provided to the NRBT to assist with the implementation of this recommendation.

Recommendation 7: NRBT should recommend to the Treasury to stop placing time deposits in the commercial banks, and to engage a study to assess the feasibility of setting a Treasury Single Account-TSA framework.

67. **Preliminary information provided to the mission shows that the Treasury maintains a wide range of accounts at the NRBT as well as in the commercial banks.** Currently the Treasury makes time deposits in some commercial banks. These deposits are decided based on the interest rate offered by the banks, and with no consideration given to the credit risk that may be involved. Given the current structural excess liquidity, one cannot dismiss totally the possibility that such liquidity provision may have been an emergency liquidity assistance (ELA)-type operation, something that is a core responsibility of the NRBT (see paragraph below). Currently, one such time deposit is in place for an amount of 41 million. In addition, the Treasury maintains current accounts with all the banks, through which it conducts its regular operations. The aggregated balances of these accounts were about 100 million. Finally, the Treasury maintains several accounts with the NRBT, including a number of project accounts, and a main operating account which is utilized when needed to replenish the current accounts maintained in the commercial banks. Currently, these accounts represent about 175 million.

Recommendation 8: Develop operational guidelines for the activation of an ELA framework.

68. **Liquidity provisions for financial stability purposes must be administered by an ELA instrument.** Currently, the NRBT does not have in place an active ELA framework. However,

promoting financial stability as well as a sound and efficient financial system is institutionally mandated, as stated in Article 4 of the NRBT Act. In that context, in addition to its liquidity management function, the NRBT is exclusively responsible for the regulation and supervision of banks and other financial institutions and should participate in the process of resolution of troubled banks and financial institutions. Therefore, the mission recommends that the NRBT should develop operational guidelines for the activation of an ELA framework.

Recommendation 9: Engage in discussions with the Treasury for the exchange of cash flow forecasts.

69. **While currently the Treasury does not provide short-term cash flow forecasts to the NRBT, such information is available on a weekly basis.** The Treasury officials met by the mission have expressed their willingness to share such information with the NRBT.

IV. Reserve Requirements

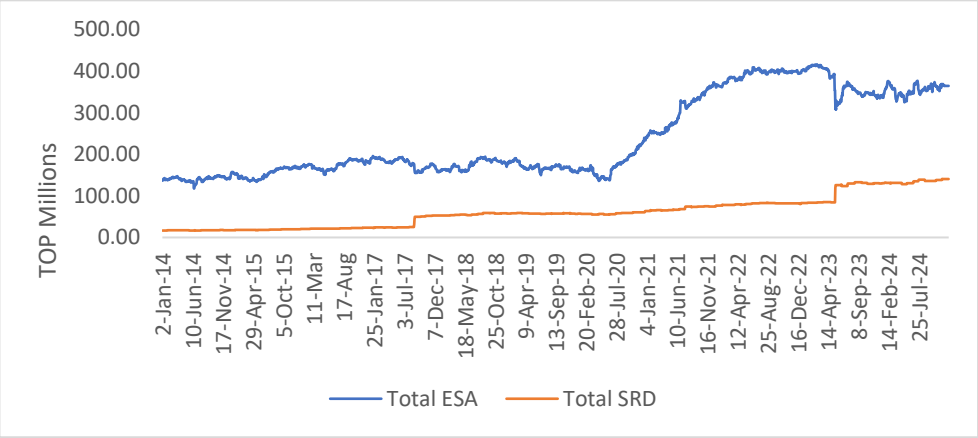
A. Overview of NRBT Reserve Balances

70. **The commercial banks' statutory reserves balances, denoted as the SRD, have steadily increased over the last two decades.** As shown in Figure 3, SRD balances have steadily increased over time, including spikes in 2017 and 2023, reflecting changes in the SRD ratio. Excess reserve balances, denoted as total Exchange Settlement Account (ESA) balances, have significantly outpaced SRD balances overtime and most notably since 2020. In 2023, the NRBT increased the SRD ratio to 15 percent, and attempted to mop up a portion of the ESA liquidity. ESA balances have remained flat since that time but remain highly elevated at 364 million TOP as of July 2024.

71. **The share of SRD balances is not well distributed across banks, reflecting the disparity in the size of the banks**, but the individual bank shares have remained moderately stable over time. Most of the SRD balances are held by Bank B as shown by Bank B having the largest shaded area in Figure 4. The SRD size of Bank B has also marginally increased over time.

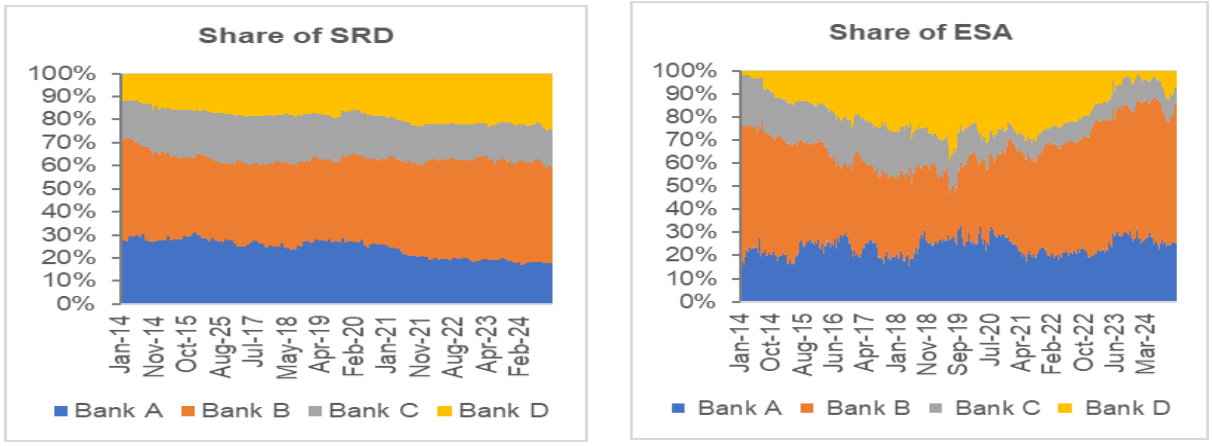
72. **ESA balances have followed a similar long-term trend to the SRD, albeit with more short-term volatility.** The ESA can be calculated as total reserves held by commercial banks in excess of the SRD. Most of the total ESA balance is held by Bank B, in line with the distribution of the SRD. Notwithstanding, there is more short-term volatility than that of the SRD balances. In addition to this, Bank D's share of the ESA is significantly lower than its share of the SRD. Moreover, the ESA share of Bank D has sharply declined to almost nil, which has coincided with the sharp increase in the ESA share for Bank B. As shown in Box 3, the fifth percentile of Bank D's ESA balances is five million TOP, which may complicate further increases in the SRD ratio to absorb a portion of the current ESA.

Figure 3. Total SRD and ESA Balances



Source: NRBT.

Figure 4. Share of SRD and ESA Balances

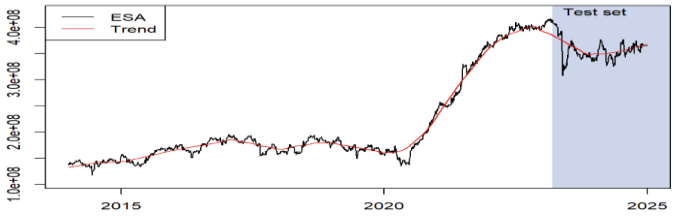


Source: NRBT.

Box 3. Statistical Properties of the ESA

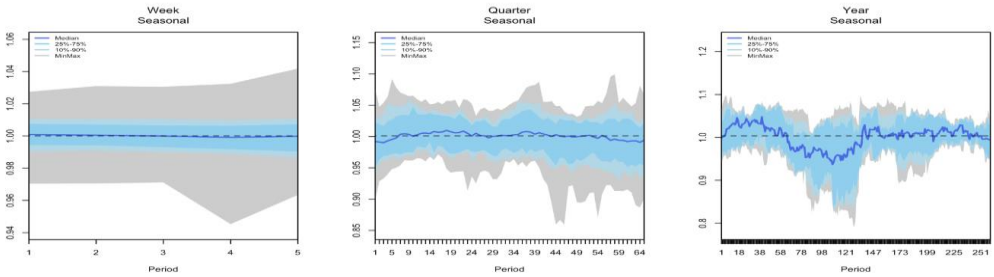
A comprehensive analysis of the Exchange Settlement Account (ESA) is important for developing options for absorbing excess liquidity and for designing the reserve requirement system in transition. The daily time series of the ESA exhibits seasonal patterns: it demonstrates seasonality on both a quarterly and yearly basis. Projections indicate that the ESA will remain elevated under the current conditions.

Historical Trend of ESA



Source: NRBT, IMF staff calculation.

Seasonality of ESA

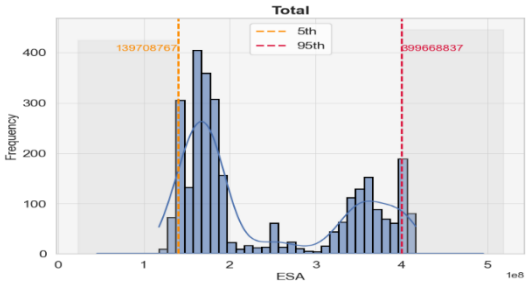


Source: IMF staff calculation.

The periodical review of the ESA distributions can serve as the threshold to track the precautionary liquidity buffers. From January 2014 to the end of 2024, the 95th percentile for the entire banking system's ESA was 399.67 million TOP, and the fifth was 139.70 million TOP.

ESA Percentiles for Individual and Aggregated Banks

The distribution of total ESA is skewed…



Banks' percentiles differ significantly, and Bank D's fifth percentile is close to zero…

	Percentile	
Bank #	**5th**	**95th**
Bank A	28	98
Bank B	47	219
Bank C	18	38
Bank D	5	93

Source: NRBT, IMF staff calculation.

B. Design of the Statutory Reserve Deposit (SRD)

Conceptual Considerations[17]

73. **The function of the SRD currently employed by NRBT would need to be reconsidered to support the proposed IRC framework**. As already discussed, changes in the SRD ratio have been decided in response to macroeconomic developments. Within the context of an interest rate based monetary policy framework (and related IRC system), the SRD would serve exclusively as an instrument to adjust the structural liquidity position, while changes in the policy rate would be relied upon to signal the monetary policy stance. In that context, changes in the SRD ratio, when considered appropriate, would not convey a message regarding the stance of monetary policy, something that needs to be clearly communicated to the market.

74. **The structural liquidity position is influenced by trends in the autonomous factors**.[18] An increase in the SRD ratio reduces the structural liquidity position (that is, it makes it more negative or reduces its positive position, depending on the starting point) as it locks away liquidity. In this case, when starting from a liquidity surplus, OMO liquidity absorbing operations would have to be reduced to leave interest rates unchanged. Therefore, the SRD may be used to adjust the structural position—although other options using market-based instruments could be preferable—but not short-term liquidity fluctuations, for which short-term OMOs are a better fit. Changes in the SRD should be supported by medium-term forecasts of the structural liquidity position.

75. **Close control of liquidity conditions (both the supply and the demand) is needed in a mid-IRC system, and for this purpose averaging provisions are helpful**. Allowing banks to comply on average over the reserve maintenance period (RMP) facilitates intertemporal smoothing of autonomous factor shocks during the earlier part of the RMP. Such shocks arise because the central bank may not always have full advance information about the transactions across its balance sheet, a situation that frequently arises from government activity across its account at the central bank. Therefore, interest rate volatility is lower than it would be without averaging for any given liquidity shock, although not at the end of the maintenance period when there are few if any opportunities to compensate for the shock.

76. **Ideally, the SRD should be remunerated at the opportunity cost to avoid interfering with the monetary policy stance and undermining financial deepening,** unless the SRD is aimed at taxing specific funding sources. SRD remuneration will influence the interest rates that banks will transmit to their deposits and loans. When central banks do not offer remuneration, it represents a tax on the financial system. When there is a remuneration, it is typically linked to the central bank policy rate, since the key dimension is the level of remuneration relative to the opportunity cost of the reserves, that is the central bank policy rate, which is expected to determine the marginal borrowing cost in the money market. A remuneration below the opportunity cost creates a wedge between funding and lending rates. The lower is the remuneration relative to the opportunity cost; the greater is the impact of changes in the requirement ratio on the intermediation spread. Therefore, one could assess the wedge between short-term deposits and the policy rate (due to a remuneration of the reserve requirement that

[17] For a detailed discussion see MCM Technical Assistance Handbook," Reserve Requirements".

[18] Autonomous factors are items in the central bank balance sheet that have an impact on banks' reserves at the central bank that are generally outside the direct and immediate control of the monetary authorities. These items include foreign and domestic assets, and currency in circulation (see chapter on Liquidity Forecasting).

deviates from the opportunity cost) by computing the breakeven deposit rate, based on the policy rate presented below. The deposit breakeven rate is the maximum deposit remuneration rate that ensures a non-negative intermediation margin. It assumes that deposits, net of the reserve requirement, are reinvested at the policy rate. Marginal funding costs in efficient markets tend to converge toward this breakeven rate. The minimum LR (or lending break-even rate) is the minimum lending rate necessary for a null gross interest rate margin at a given deposit rate.

77. **Penalties for non-compliance of the SDR should be financial and higher than the central bank's standing marginal facility rate**. Penalties should provide a significant incentive for compliance. They must be higher than the central bank's end-of-day marginal lending facility rate because banks should be encouraged to fulfill the requirement with available central bank instruments and facilities. If the rate on the marginal lending facility were higher than the penalty rate, banks would under-fulfill the requirement rather than access the marginal lending facility. In practice, penalty rates are often anchored either to the policy rate or a short-term market rate. The penalty generally consists of applying an interest rate to the shortfall vis-à-vis the requirement for the duration of the shortfall. Penalties should not be excessive as they would encourage reserve hoarding. Large financial penalties together with heightened vigilance and supervisory intrusion may generate an unnecessary stigma of being noncompliant. This may encourage banks to significantly over-comply and to frontload compliance within the maintenance period, undermining market functioning and complicating the central banks' calibration of operations.

78. **Regarding the governance of the SRD, the decision on the organizational unit that owns the framework depends on the SRD objectives**. Multiple objectives for the RR may necessitate an assessment of tradeoffs by the decision-making bodies, which emphasizes why there should ideally be only one objective. If the SRD mainly aims at implementing monetary policy, then the operational department or the implementation committee (sometimes called the liquidity committee) would propose changes to the decision-making bodies that are relevant for policy implementation. If the purpose is macroprudential, it would be the financial stability committee.

Recommendations

Recommendation 10: Rely on the SRD to adjust the structural liquidity position—Consider remunerating the SRD; Consider introducing averaging over the reserve maintenance period and linking SRD noncompliance penalty to the policy rate.

79. **The mission recommends considering the following changes to SRD design over time**:

- Rely on the SRD to adjust the structural liquidity position. Therefore, its administration should be entrusted to the NRBT unit in charge of monetary policy implementation.

- Consider some remuneration of the SRD. Ideally, SRD should be remunerated at a level close to the policy rate to avoid interfering with the monetary policy stance and support more effective interest rate transmission for intermediation. Given the circumstances in Tonga (i.e., large excess liquidity and weak financial position) in the short-term, a remuneration at a lower interest rate, or even no remuneration would be acceptable.

- Consider allowing banks to meet the SRD on average over the maintenance period. The SRD with averaging provisions lessens the impact of un-forecasted AFs shocks on the volatility of short-term interbank market interest rates in the early part of the SRD

maintenance period. It allows banks to offset an under-fulfillment of the SRD on any given day of the maintenance period, with an over-fulfillment on another day.

- Link SRD non-compliance penalty to NRBT's Policy Rate. While there are no specific rules regarding the margin applied to these reference rates, the mission recommends setting the penalty level above MLF to incentivize compliance but cautions against setting it too high to avoid liquidity hoarding.

V. Collateral Policy

A. Current Collateral Policy

80. **The National Reserve Bank of Tonga Act (NRBTA) serves as the legislative framework governing the lending operations of the NRBT.** Under Section 38, the NRBT is empowered to extend loans to banks to fulfill its objectives of price stability and financial stability, as outlined in Sections 4(1) and (2). The NRBTA also mandates the Board to establish the terms and conditions for collateralized lending (Section 38(e)). Additionally, Section 48A of the NRBTA explicitly authorizes the NRBT to repurchase government and government-guaranteed securities as part of its monetary policy operations. However, the NRBTA is comparatively less explicit regarding the types of assets that the NRBT may accept in its financial stability operations, as well as the related modalities for collateral mobilization.

81. **The current collateral framework established by the NRBTA is limited to monetary policy operations.** This framework is detailed in the "Standard Policy" document on repurchase agreements (Repos), released by the Financial Markets Department and revised in June 2024. The policy explicitly identifies Repos as instruments of Open Market Operations (OMO) that can be employed to alleviate short-term liquidity shortages within the banking system. At the NRBT, the Repo facility functions as the standard lending facility, with the Repo rate set as a ceiling for short-term market rates to effectively implement monetary policy (refer to Board Paper No. 26/2024). The collateral policy for Repos can be described as follows:

- ***Eligibility criteria—***Three types of assets are eligible for Repos, with the Repo policy establishing a preference order. In descending order, these are NRBT notes, Government of Tonga Bonds, and Government Treasury Bills.

- ***Valuation—***NRBT notes are issued at a discount, while Government Treasury Bills are priced at their settlement price (issuance price). In contrast, coupon-paying NRBT Notes and Government Treasury Bonds are valued at their face value.

- ***Risk mitigation—***The NRBT does not implement risk mitigation measures such as haircuts, concentration limits, or overcollateralization. Instead, it permits counterparties to borrow up to the value determined by the NRBT.[19]

[19] It is important to note that Section 48A(2) of the NRBTA establishes a maximum limit on the amount of government debt that the NRBT can hold at any given time, set at 30 percent of the average ordinary income of the Government over the previous three years.

82. **The remainder of this section discusses best practices for the collateral framework**. It evaluates the current situation, noting that the NRBT has not established a collateral policy for financial stability lending at the time of the mission. As such, the following paragraphs will provide recommendations for a collateral policy for OMO at the NRBT. For descriptive purposes, aspects of the collateral policy for Emergency Liquidity Assistance (ELA)—the appropriate instrument for ensuring financial stability—are introduced; however, further details on a comprehensive collateral policy could be addressed in follow-up TA exclusively focused on ELA.

B. Modernizing the Collateral Policy

Conceptual considerations

83. **The mission has assessed the NRBT collateral policy in conjunction with key elements of a state-of-the-art collateral framework,** namely: (i) eligibility requirements; (ii) valuation processes; and (iii) risk control measures. This includes haircuts and margining, concentration limits, and overcollateralization procedures**.** For each component, policy parameters should be established to manage financial and operational risks within the central bank's identified risk appetite, while minimizing price distortions across asset classes that could adversely affect credit allocation. Additionally, the framework should promote market development, for instance, through standardized approaches.

84. **In designing its collateral policy, the NRBT should differentiate between collateral frameworks for monetary policy operations and for ELA.** The current Repo policy document characterizes Repos as instruments of OMO, mentioning the financial stability objective but failing to specify when or if Repos can be utilized for that purpose. Generally, the two frameworks should be distinct while ensuring coherence between them. For the sake of comparison, stylized components of an ELA collateral policy will be outlined.

85. **While the principles underpinning collateral frameworks are similar—for monetary operations and ELA—there are some key differences (Table 9).** Monetary operations involve counterparts that are not under stress, and so generally the risk of lending is lower. Consequently, eligible collateral is predefined, publicly communicated and generally of a higher quality. The valuation methodologies and risk mitigation measures will also be public. In contrast, for ELA, the counterparty is under stress and would have used all its monetary operations-eligible collateral—meaning lower credit quality and less liquid collateral must be utilized. While transparency must be high in the case of monetary operations—because participants need certainty on the modalities of all monetary instruments—the same is not true for ELA since some ambiguity may contain moral hazard.

Table 9. Monetary Policy versus ELA Frameworks

	Monetary policy operations	ELA
Objective	Price stability	Financial stability
Eligibility	High-quality and liquid assets	Broader collateral acceptance
Collateral preference	None (Asset selection by banks)	Defined by the central bank
Rule versus discretion	Rules	Central bank discretion
Valuation	Disclosure of key methodological elements	Nondisclosure to the public
Haircuts	Public	Non-public
Concentration limits	(Generally) None	Applicable

Source: Mission's elaborations.

Eligibility

86. **The mission assesses that the current restriction of collateral eligibility to public sector securities (NRBT Notes, Government of Tonga Bonds, and Government Treasury Bills) is appropriate.** The banking system currently enjoys ample liquidity conditions, and the Repo facility has not been activated for more than a decade. The NRBT should monitor the distribution of government bond holdings and ensure that the amount held by each entity is sufficient to meet its short-term refinancing needs at the NRBT for effective monetary policy implementation. As noted during the mission, while all banks hold a significant amount of liquid assets (primarily in deposits, including with the NRBT), only one bank has government bonds exceeding five percent of its total assets, and some banks do not hold any government bonds at all. Consequently, these latter banks would, in practice, lack access to the Repo facility if needed.

Valuation

87. **A fair collateral valuation is essential to safeguard the central bank's balance sheet while minimizing its market footprint.** Collateralized lending necessitates that central banks accept assets that may ultimately appear on their balance sheets in the event of a counterparty default. Therefore, collateral should be marked to market based on sound valuation principles. While central banks possess unlimited authority to intervene in local currency markets, the lending operations discussed in this report are designed to absorb residual liquidity risk without disrupting traditional market pricing of risk.[20]

88. **In the absence of a secondary securities market, accurate price discovery is hindered, so the NRBT should develop suitable theoretical models to price all eligible collateral.** To uphold these principles, central banks primarily rely on a market-based valuation approach to mark eligible collateral to market. Market-based valuation involves collecting quotes from market participants and aggregating them into a composite price after filtering out outliers, based on specific criteria. When reliable quotes are not available, central banks should then resort to theoretical models.

Risk Mitigation Measures

89. **Risk mitigation measures manage the financial and operational risks of holding collateral across all operations, and generally fall into three categories:** [21]

- *Haircuts* are calibrated to mitigate liquidity, market, credit, and other risks.
- *Margining provisions* allow for additional collateral to be requested in the event the value of the collateral falls during the period of the loan. Other things equal, haircuts should be lower with margining provisions in place.
- *Concentration limits* limit the exposure to a certain class of assets and diversify the collateral pools.

[20] This statement holds also for ELA.

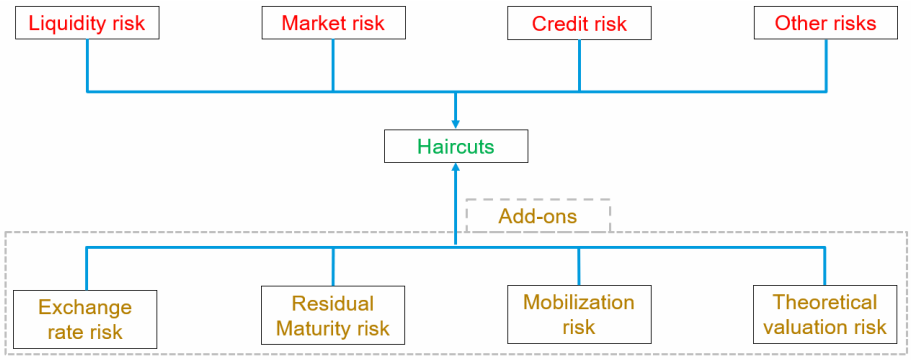
[21] IMF Special Series on COVID-19 note: "Expanding the Central Bank's Collateral Framework in Times of Stress," M. Buessing-Loercks, D. King, I. Mak, and R. Veyrune, July 2020.

- *Over-collateralization* requires additional collateral where there is an increased risk of counterparty default, as in the case of ELA.

90. **Haircuts should be calibrated to effectively protect the NRBT's balance sheet while achieving risk equivalence across asset classes.** Risk equivalence seeks to equate all risks across asset classes—that is, haircuts are calibrated such that expected losses are the same for all collateral types and a given level of central bank's risk appetite. To achieve risk equivalence, the haircut calibration should follow a model featuring key components of the financial risks (Figure 5) including:

- *Liquidity risk*—which captures the time-to-liquidation that is the expected time at which the collateral can be liquidated at a reasonable discount. The time-to-liquidation depends on the size of the position of the central bank relative to the market absorptive capacities.
- *Market risk*—the framework should allow to model the price volatility over the time-to-liquidation period. For a marketable security this typically boils down into interest-rate volatility models, with the yields considered derived from the security's discount curve.
- *Credit risk*—the model should explicitly account for the eventuality of the default of the ultimate debtor during the time-to-liquidation period and the related expected losses and/or expected shortfalls.
- Additional risks, for example exchange rate risk for collateral denominated in foreign currencies, valuation risk accounting for pricing-model uncertainty for illiquid collateral, residual maturity risk where collateral cannot be sold, and mobilization risk (e.g., legal risk for assets held abroad such as FX deposits).

Figure 5. Haircut Calibration Components



Source: Mission's elaboration.

Recommendations

Recommendation 11: Remove the preference order for monetary policy collateral and undertake necessary actions to standardize the mobilization procedures for assets.

91. **The NRBT should eliminate the preference order between its monetary policy collateral.** Monetary policy operations are standard procedures, and international best practices recommend against maintaining a preference order for collateral that supports them. The current preference

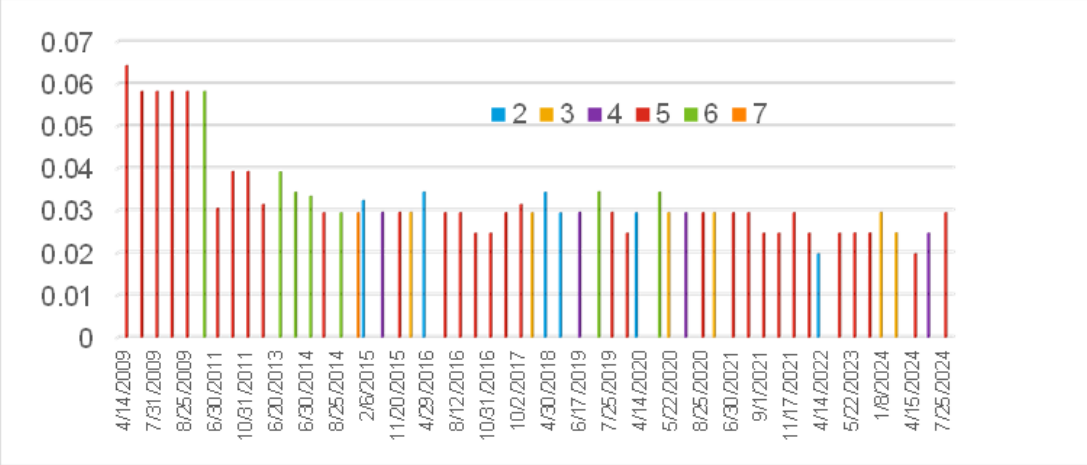
for NRBT Notes could potentially create price distortions among the country's risk-free assets, leading to implications that extend beyond the liquidity risks that OMO are designed to address. Given that the NRBT indicated that this preference arises from operational constraints, it is recommended that the NRBT undertake necessary actions—such as the establishment of a Central Securities Depository and the creation of master agreements—to standardize the mobilization procedures for both asset classes.

Recommendation 12: Develop sound valuation methodologies to mark collateral to market.

92. ***The* current valuation methodology for collateral should be reviewed.** First, the NRBT should adopt a consistent valuation methodology across asset classes. Currently, zero-coupon securities are valued at their settlement price (i.e., their discounted issue price), while coupon-paying securities are priced at their nominal values. Beyond this apparent valuation discrepancy, the methodology for zero-coupon securities fails to account for the time elapsed since issuance, whereas the valuation of coupon-paying securities does not consider the schedule of coupon payments.

93. **The NRBT could leverage issuance implied yields to develop theoretical valuation models, although these yields are only observable on days of government debt issuance.** Figure 6 displays the yield-to-maturity at issuance for Government Treasury Bonds over the last 15 years. Tonga's Government bonds have an average maturity at issuance of five years. In 2024, maturities have become more diversified: two bonds have been issued with a maturity of three years, one with a maturity of four years, and two with a maturity of five years. Given that bonds are priced at their face value upon issuance, the most recent implied yields to maturity for 2024 are 2.5 percent, 2.5 percent, and three percent for maturities of three, four, and five years, respectively. By combining these with the NRBT Note rate, the NRBT can interpolate yields for different maturities to calculate the price of a bond as the sum of discounted cash flows (see Annex VIII) between the pricing date and bond maturity.

Figure 6. Yield-to-Maturity for Government treasury Bonds



Source: IMF Staff Calculations.

Recommendation 13: Coordinate with the Government of Tonga to issue bonds (consistent with the Government's financing priorities) at maturities that could help calibrate a term-structure sovereign yield curve.

94. **The NRBT is advised to coordinate with the government to issue bonds with maturities that allow for the construction of an entire yield curve, which can be utilized in theoretical bond pricing models.** One approach for the theoretical pricing of government securities is detailed in Annex VIII and employs sovereign curves to generate discount factors for each coupon payment. The Nelson-Siegel (NS) methodology, a widely recognized analytical framework for calibrating term structure curves, is recommended for this purpose. As discussed above, the model-based mark-to-market value of the security will then be calculated as the sum of its discounted cash flows, encompassing both coupon payments and redemption (see Annex VIII for further details on fixed-income security valuation).

Recommendation 14: Develop and implement risk mitigation measures, including haircuts that capture key financial risks such as market, liquidity, and credit risk.

95. **The NRBT should adopt a granular approach to calibrating haircuts while considering international comparisons**. Due to a lack of data, the NRBT faces constraints in utilizing structural models such as Value-at-Risk. Therefore, it is recommended that the NRBT assess each risk individually and aggregate these assessments into a final haircut. Standalone values could be determined based on international comparisons (see Annex VIII). For example, the ECB applies six percent haircut for BBB-rated government securities. This could serve as the minimum haircut for NRBT covering the three financial risks for government securities with maturities less than one year. This minimum can be adjusted upward to account for: (i) market risk—if Tonga's yields exhibit greater volatility than those of its peers in the Eurozone; (ii) liquidity risk—if Tonga's public securities are less liquid; and (iii) credit risk—if the likelihood of sovereign default in Tonga is higher than that of BBB-rated government securities within the Eurosystem. Additionally, the haircut may be increased by five percent based on maturity brackets (see Annex VIII for further details on haircut methodology).

VI. Communication

A. Institutional Framework and Supporting Measures

Current Situation

96. **Enhancing communication is a key component in NRBT's Strategic Plan of 2023-2028**.[22] The NRBT plans to establish effective, open, and clear communications by creating effective communication channels for NRBT operations; encourage open communication and feedback from employees including guiding policies; and clearly communicate and monitor measurable key strategic results areas (KSRAs) for capacity building, organization transformation, and compliance.

[22] See National Reserve Bank of Tonga Strategy 2028 5-year Plan.
http://www.reservebank.to/data/documents/Publications/NRBT_SP2028_Dec23.pdf

97. **Communication is also an important part of NRBT's operations**, with several reports, articles, and statements published on the NRBT website. Table 10 list all communication instruments employed by the NRBT. The description of each instrument, frequency of distribution, and availability are also detailed in Table 10.

Table 10. NRBT Communication Instruments

Communication Instrument	Frequency	Available Since	Available Electronically Since	Description
Monetary Policy Decision/Statement	Semiannual	2007	2014	Flagship semiannual publication (akin to Monetary Policy Report) indicating how the Bank intends to conduct monetary policy over the coming six months to achieve its objectives of maintaining sufficient foreign reserves and promoting price stability.
Monetary Policy Decision/Statement Press Release	Semiannual	2007	2014	Press release of the monetary policy decision/statement.
Annual Report	Annual	Early 90s	2002	The Annual Report provides an overview of NRBT's policies and operations for a specific year including the balance sheet, income statement, and the statement of cash flows from the Audited Annual Financial Statement.
Quarterly Bulletin	Quarterly	2002	2002	The Quarterly Bulletin provides a comprehensive overview of the economic and financial conditions in Tonga, including statistical data on money supply, banking operations, interest rates, and government operations, to inform policymakers and the public. It serves to promote accountability and data transparency.
Monthly Economic Update	Monthly	2014	2014	The Monthly Economic Update provides a comprehensive overview of the current state of the global economy, highlighting growth projections, inflation trends, and economic indicators for the Pacific Island Countries while assessing the associated risks and outlook for the Tongan economy.

Financial Data - Monetary Policy Data	Monthly	2010	2010	Accountability and data transparency.
Other publications and data repositories				Tonga also publishes the audited financial statements and several economic releases with economic indicators, including those on banking sector development, overseas exchange transactions, remittances, GDP nowcast, and inflation nowcast.

Source: NRBT.

98. **The NRBT has intensified its communication in recent years, but further improvements are warranted.** Monetary policy communication instruments are regularly released along with NRBT policies and statistics on the real sector and on the financial markets. Several 'by-demand' press releases are also done in response to demands, from parliament and other stakeholders, to explain NRBT decisions. A financial stability report is not produced by the NRBT, although one is currently being developed. Moreover, stakeholders have opined that more information is needed on Tonga's financial markets and on the health of the financial system. While NRBT's banking sector developments provides a brief outlook on these considerations, more depth and market analytics are warranted.

99. **An institutional policy governing communication of the NRBT has not been established.** In the absence of this policy, the governance of NRBT communications—including the objectives, messages, audiences, channels, spokespersons, products, impact assessment and crisis communication strategy—are not documented. The mission was able to summarize elements of the NRBT's de facto institutional policy from the NRBT's elaborations during the mission, as follows:

- **The Objective** of NRBT's communications is to enhance public awareness of NRBT's policies and actions. It would however be beneficial if the NRBT establishes a second objective of enhancing the effectiveness of monetary policy by strengthening public understanding and transparency.

- **Spokespersons** for NRBT communication include the Governor, and Deputy Governor. The areas of responsibility among the spokespersons have however not been delineated, and there is no established role for the Board Members, Executive Directors, Department Directors, and other potential communications personnel. An established institutional policy should address these absences.

- **Messages.** NRBT has an internal review process for the formulation of messages on monetary policy. This is executed by the Economics and Research Department, which also holds the responsibility for recommending monetary policy actions. The Governor then approves the articulation of the policy messages. No communications personnel are involved in policy deliberations and the formulation of policy messages. The proposed institutional policy should address this shortcoming, but in the wider context of the overall management of NRBT's messages. Moreover, the procedures related to the formulation and dissemination of messages, including to staff, should be included in the institutional policy.

- **Audiences.** The different audiences are well defined by the NRBT. Target audiences comprise financial market participants, media, economists and finance experts, real sector corporates, government, academia, and the public. The NRBT could augment this identification of audiences, by developing guidelines for tailoring communication to the various audiences.

- **Channels, tools, and formats.** The NRBT's website is a vital intermediary-free channel to communicate with the public. It provides a comprehensive overview of the decisions on monetary policy and FX operations and serves as a statistical data repository. The NRBT has not made significant strides, however, in developing additional communication channels and formats beyond traditional methods. The NRBT only has a marginal presence on social media platforms and there is no online media to rebroadcast its messages to a wider audience.

- **Communications products**. A range of products on policy communications has been established (as shown in Table 10), including a calendar of policy decisions, press releases, press conferences and periodic reports. Notwithstanding, there are some notable absences in the list of products, such as a financial stability report or its equivalent.

- **An assessment of the impact** of communications is not done by the NRBT. The NRBT should establish techniques that enable an analytical approach to impact assessment. A general commitment to assessing communication should be included in the institutional policy. For the purposes of this mission, machine learning techniques are employed to assess the effectiveness of NRBT communications. This assessment will be discussed in subsequent sections of the report, with tailored recommendations provided.

100. **The organizational capacity for communications is limited.** The governance of communications is subsumed solely by the Governor. Moreover, there is no centralized communication unit or division, . Currently, only one communications officer has been employed by NRBT in the Risk and Compliance department. The communications officer, however, does not review or manage communications. The role was established with the objective to assist with liaising with the media and planning press conferences. Considering this, a gradual enhancement of the organizational capacity would assist in the design and implementation of effective communications.

101. **NRBT's internal reporting is sparce.** Currently, there are no internal communication reports. As such, communication planning and monitoring are not done in support of the objective of enhancing communication noted in the NRBT's Strategic Plan of 2023 to 2028. Notwithstanding, the NRBT has in place internal guidelines governing the role and responsibilities of each department and corresponding officers.

Recommendations

102. **Effective communication plays an important role in modern central banking, but several gaps remain in the NRBT framework**. To successfully implement monetary policy and build public trust, an effective framework is essential. The NRBT recognizes the importance of enhancing communication to best practice methods and plans to implement significant changes towards achieving this objective. To coordinate these changes, an implementation strategy should be developed. This strategy should reflect well-throughout milestones balancing the need for implementation and the capacity constraints. In so doing, the NRBT should define the priorities and gradually proceed with implementing the mission's recommendations. The NRBT

should also glean insights from the experience of other small central banks around the world facing capacity constrains in building their communication frameworks.[23]

Recommendation 15: Develop a formalized institutional policy for communications along with key complementary frameworks.

103. **Implementing a sound institutional framework for communications can help central banks to better achieve their objectives**. International experience has shown that the key elements of such a framework include the following:

- **Principles** for effective communications, such as clarity, timeliness, precision, consistency, predictability, transparency, and equal access to information.
- **Communication framework** that covers the objectives, principles, spokespersons, messages, audiences, channels, tools, and formats, and effectiveness assessment. This framework provides a basis for developing more effective communication strategies, tactics, and products.
- **Internal organization of the communications function,** including the organization of the flow of information, procedures, guidelines and processes, and structure and staffing.
- **Communications products,** including a calendar of policy decisions, press releases, press conferences to further explain the decisions, periodic monetary policy and financial stability reports, minutes of policy discussions, speeches, social media publications, and interviews.

104. **To assist with the implementation of this institutional policy**, the NRBT should simultaneously pursue the following as key complementary frameworks:

- ***Develop a tool for the regular assessment of the effectiveness of its communications.*** Developing a media monitoring function would allow the NRBT to track the media for NRBT-related publications**.** In addition to this, the NRBT should maintain a database tracking the numbers of its own communication activities and the statistics of the owned communication channels—the central bank's website and pages on social media. The media and social media monitoring should also be supplemented with periodic surveys. The surveys will help assess the level of trust in the central bank, awareness of its mandate, monetary policy objective, inflation target, confidence in the central bank's ability to reach its objectives, etc. It is also important that NRBT enhances the internal capacity to conduct such an analysis through capacity-building training and cross-departmental rotation.
- ***Establish a proactive external communication policy, supported by an internal message management process*****.** The transition to a proactive communication policy would enhance the effectiveness of NRBT communications. This would mean shifting from reactive communications (i.e., "we answer the questions determined by stakeholders") to proactive communications (i.e., "we determine the key information—messages—we want to deliver to stakeholders"). Message formation and determination should be conducted in advance and on a regular basis (e.g., weekly), independent of upcoming public engagements of the central

[23] See for example, "Seychelles: Central Bank Transparency Code Review." IMF Country Report No. 22/319 https://www.imf.org/en/Publications/CR/Issues/2022/09/27/Seychelles-Central-Bank-Transparency-Code-Review-523940

bank's speakers. Messages should be delivered proactively whenever the central bank sees the need to do so to reach its policy and communication objectives.

- ***Develop an organizational structure to manage communications a*nd message content.** The staffing solely responsible for communications should be increased, and the skills mix should be enhanced. In so doing, a communications division should be created. This would enable NRBT to better align its communications capacity with established international practices. The priority at this time should be to add one staff member to the existing communications officer, both of which would be the members of the newly established Communications division. The two positions would be dedicated to developing and later monitoring adherence to the institutional policy, as well as assisting with governance of communications, message management and content creation.

- ***Develop and execute crisis communication simulation exercises*.** The NRBT would benefit from holding a crisis simulation exercise. It would enable the NRBT to be better prepared for unexpected adverse developments, test its crisis communications protocol, and further fine-tune crisis communications procedures and plans.

Recommendation 16: Develop a financial stability report.

105. **A financial stability report is an important and well-established communication tool of central banks**. The report serves as an early warning system, identifying potential vulnerabilities and risks within a country's financial system. It also supports the development of the interbank market, providing participants with important information. A financial stability report can explain the proactive measures taken by the authorities to maintain stability or prevent financial crises. Given that a central aspect of this report is the identification of risks, the report improves transparency and accountability for the central bank. Central banks must also ensure that market participants are well-informed about the overall health of the financial system, to ensure confidence is maintained in the central bank. It is important that financial distress is highlighted and addressed before they escalate, thus maintaining economic stability and promoting sustainable growth.

B. Monetary Policy Communication

Current Situation

106. **It is important that central banks clearly articulate monetary policy decisions and operations.** The strategy for achieving monetary policy objectives, policy interest rates movements, expected developments in economic conditions, and the constraints and risks associated with these policies, must be clearly understood by the public. By explaining the rationale behind policy decisions, the central bank can reduce uncertainty and enhance the effectiveness of its policies. Stakeholders, including NRBT'S monetary policy counterparts, advised the mission that they are unaware of the central bank's current monetary policy instruments and the availability of deposit facilities.

107. **The NRBT has a well-developed set of tools to communicate its monetary policy framework and decisions, (see Table 12).** The key monetary policy communication instrument employed is the monetary policy statement. This instrument covers the key critical elements of monetary policy conduct in Tonga in view of its current monetary policy framework. There are no other instruments providing a periodic review of monetary policy. Periodic reviews such as the

quarterly bulletin and the monthly economic update, are expositions of statistics and data. All communication is homogeneously distributed given that the NRBT does not distribute tiered communication for varying audiences.

108. **The NRBT also communicates its reliance on non-conventional monetary policy tools, particularly in its Annual Report** (i.e., activation of non-conventional liquidity mopping operations, reliance on the minimum loans/deposit ratio to influence bank's lending). The adverse impact of persistently high level of excess liquidity on monetary policy transmission and on the interbank and repo market activities is also mentioned in the various communication tools (Annual Report, Monetary Policy Statement). Such communications can provide a background to motivate and support a policy shift that would aim at engaging a process of monetary policy implementation.

109. **The NRBT communicated its decision in 2017 to implement a floor system at an interest rate of zero,** but further communication on the framework remained absent reflecting the incomplete implementation of the framework**.** Currently, there is no strategy for communicating the operationalization of the existing or proposed framework. Moreover, no plan has been developed to engage banking counterparties and members of the public to promote greater awareness of the implementation of a new modernized framework.

Recommendations

Recommendation 17: Clearly communicate, following international best practice, the implementation of the proposed monetary operational framework.

110. **To communicate the operationalization of NRBT's modernized monetary policy framework, clear and strategic communication to the market is needed.** NRBT statements could include policy measures to absorb excess liquidity in the first stage, and subsequent measures to induce interbank lending and the steering of interbank rates towards the policy rate in the second stage. Possible key messages are:

- The essential reason for the change in approach (to enable the NRBT to rely on market-based mechanisms to influence conditions and mitigate vulnerabilities to the peg) and how this will connect to other economy-wide objectives, e.g., mitigating the pandemic, dealing with a potentially systemic crisis, etc.

- The process of monetary policy implementation in coming months/years, including the role to be played by counterparties and the design of the SRD.

- The commitment of NRBT to modernizing monetary policy regardless of the financial cost, given the important benefits of an effective transmission mechanism to macroeconomic stability.

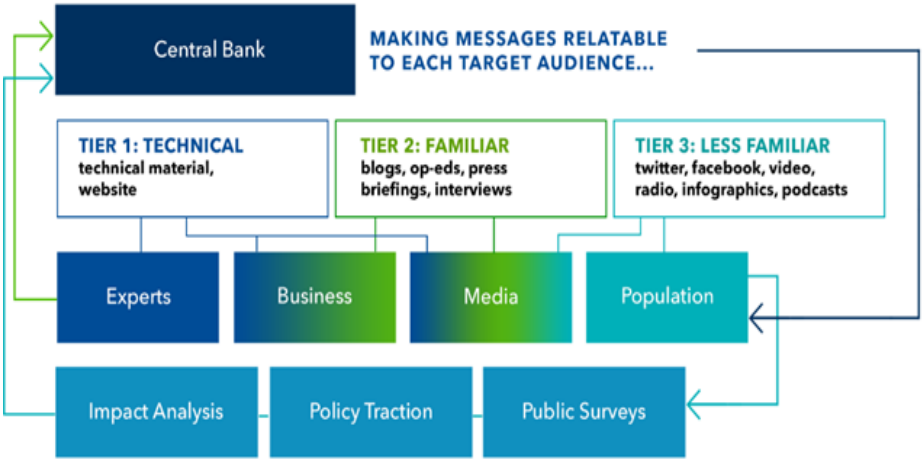
Recommendation 18: Expand outreach and adopt multitiered communication **for monetary policy communication.**

111. **NRBT communication needs to be tailored to the audience by considering the appropriate technical depth and level of detail.** Market participants (domestic and foreign) and specialized journalists require specific information, and as such communication must be tailored. Academic institutions and/or think tanks can be enlisted by the central bank to help explain the operationalization of policy consistent with best practice. Calibrating the level of engagement with

each stakeholder, as well as the identification of the appropriate channels and platforms for communication, is essential for maintaining a strategic approach with impact. The NRBT can customize its communications to send the appropriate message through the most suitable channels (traditional communications, social media, and the NRBT's website), maximizing impact and effectiveness (see Figure 7).

112. **The NRBT should also extend the outreach on monetary policy issues**. Regularly meeting with external stakeholders (experts, media, Ministry of Finance, and other officials) will be useful. During the initial stages of monetary policy implementation, it is important for the NRBT to communicate its strategy effectively. In order to achieve this, it would be beneficial to increase dialogue with financial market participants and expand the current outreach to other counterparties. Gathering feedback on its policy, the communication effectiveness, the operational framework and expectations can be crucial information for a central bank. This feedback can potentially enhance the efficiency of monetary policy implementation and strengthen the interest rate transmission.

Figure 7. Tiering Communications by Content and Channels



Source: "Frontiers of Economic Policy Communications," IMF Communications Department Paper No. 19/08, 2019.

C. The Effectiveness of NRBT Communications

113. **A quantitative analysis of the NRBT communication was performed to examine its effectiveness.** Communication is examined along the lines of the publications' readability, clarity, and thematic breadth. The analysis employs a multifaceted framework that includes lexical, syntactical, and semantical analyses to assess central bank communication practices. The lexical analysis uses readability metrics to determine the wording complexity, an essential component of communication comprehensibility. The syntactical analysis focuses on sentence structure complexity using dependency measures, which is relevant to identifying potential clarity barriers. The semantical analysis examines the meaning of the text in four dimensions: what the text is talking about (topic), the communication stance (backward or forward-looking), to whom the text is addressed (audience), and the policy sentiment. A novel text-based classifier finetuned for the domain of central bank communications was employed for the semantical analysis. This model is based on the recent development of novel multilingual Large Language Models (LLM) similar to

ChatGPT. This analysis aims to profile the NBRT's messaging style and pattern comprehensively and objectively.

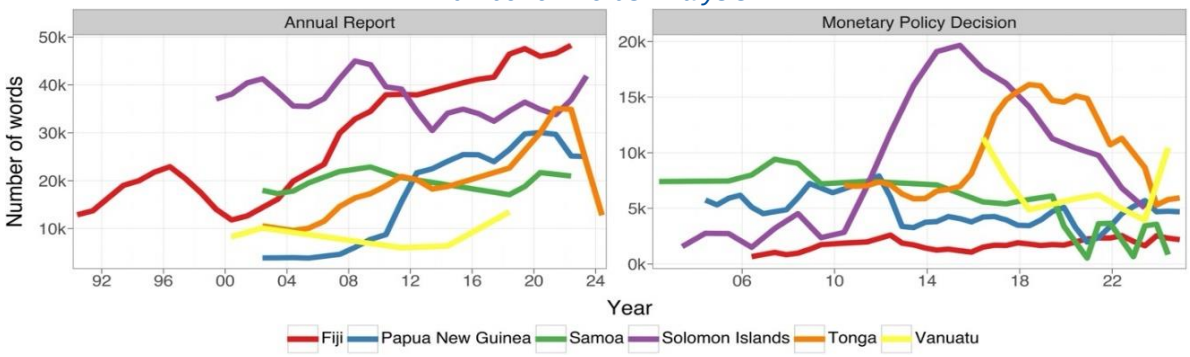
114. **The mission examined more than 20 years of published documents, including annual reports, monetary policy statements, and press releases of the monetary policy decisions.** The mission also collected similar central bank publications from Fiji, Papua New Guinea, Samoa, Solomon Islands, and Vanuatu to facilitate cross-comparisons of the evaluated metrics.

Lexical Analysis

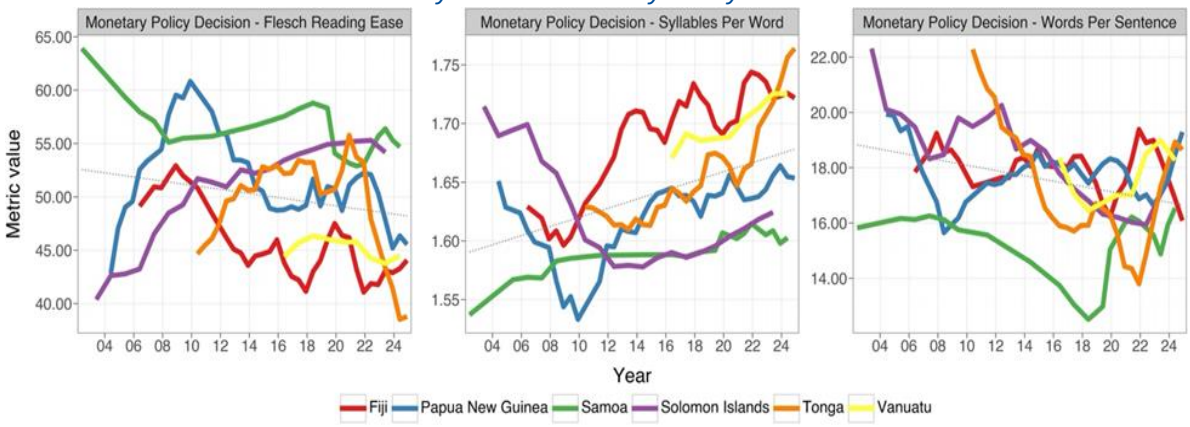
115. **Tonga has significantly streamlined traditional publications in the last few years** (Figure 8). Tonga's monetary policy decisions were among the largest regarding the number of words compared to the peer group, but the length has decreased since 2019. As a result, the monetary policy decisions are now of similar size to other peer group countries. The length of Tonga's annual reports has substantially decreased since 2022, while other countries have maintained or increased the size.

Figure 8. Lexical Analysis

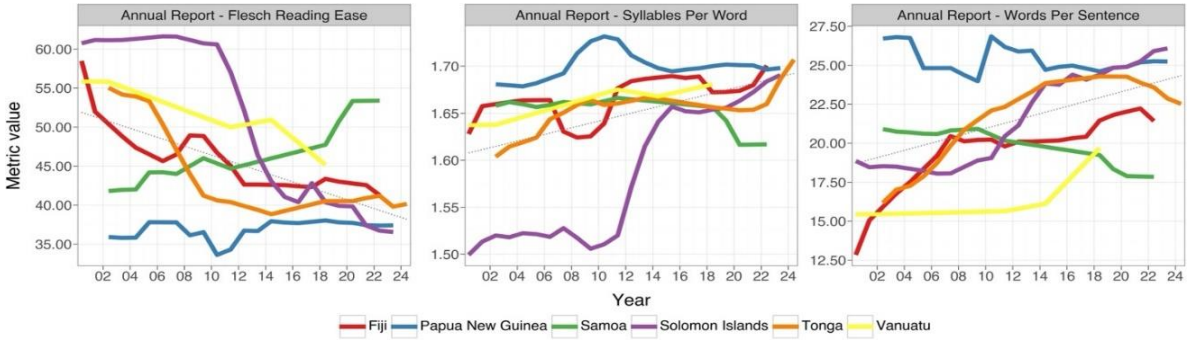
Number of Words Analysis



Readability Level – Monetary Policy Decisions



Readability Level – Annual Reports



Notes: This figure displays trends in the volume and readability of central bank communications of Tonga (orange line) and benchmarking countries (Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu). The top panel shows the number of words (in thousands), reflecting the overall length of the documents. The middle and bottom panel presents the readability and its components for monetary policy decisions and annual reports, respectively. The readability is estimated using the widely employed Flesch Reading Ease score. The score ranges from 0 to 100, with higher values indicating simpler, more accessible language. As a general guideline, scores above 60 are considered easily understandable by a broad audience (around 8th to 9th grade reading level), scores between 30 and 60 suggest content suited for a college-educated audience, and scores below 30 indicate complex, technical language typically requiring postgraduate-level comprehension. The components that comprise the Flesch Reading Ease score are also presented: the average wording complexity (syllables per word in the document) and the average sentence length. Together, these panels help assess how the clarity and accessibility of communication have evolved over time.
Source: IMF Staff Calculations.

116. The lexical readability of Tonga's monetary policy decisions was one of the highest among the peer group, but it has substantially fallen since 2021 (see Figure 8). The lexical readability, measured by the Flesch-Kincaid Reading Ease score,[24] of NRBT's monetary policy decisions was trending upward and was among the peer group's three most readable decisions until 2021.[25] The decrease in readability after this period is explained by the increased use of more complex wordings (measured in average syllables per word) and lengthier sentences (measured in average words per sentence). By 2024, NRBT's monetary policy decisions reached a readability score of below 40, placing the readability classification of Tonga's monetary policy decisions as "difficult" for the public.

117. The lexical readability of Tonga's annual reports is well-placed compared to other peer countries (Figure 8). In the last few years, the word complexity has increased, a factor that reduces readability. However, the sentence length has shortened in the same period, driving the readability score up. As a net effect, the overall readability did not change much from 2023 to 2024, even though the individual factors changed substantially. Lengthy and complex documents can overwhelm readers, reducing comprehension and retention of key information. Streamlining content by focusing on essential key messages and adopting clear, concise language could enhance readability and ensure critical messages reach a wider audience effectively.

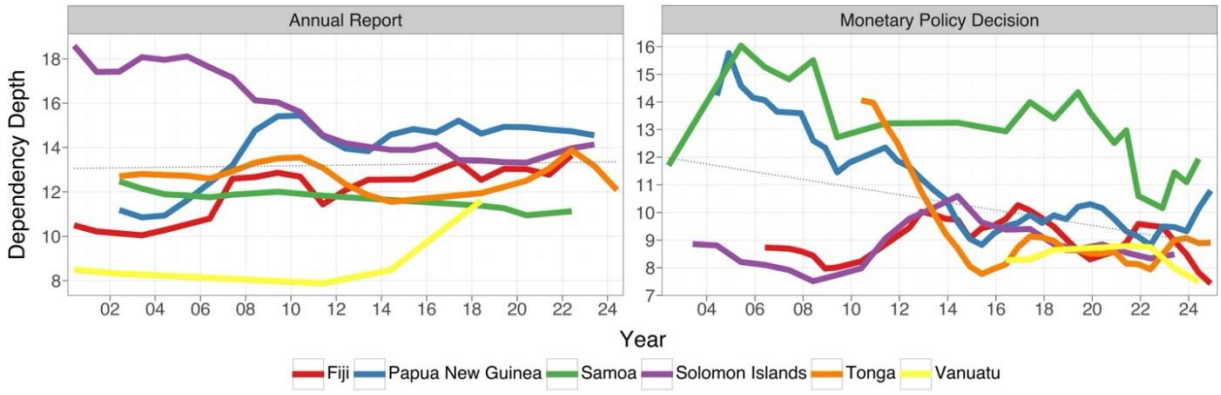
[24] The Flesch-Kincaid Reading Ease score evaluates the readability of English text based on sentence length and word complexity (measured by syllables per word). The score ranges from 0 to 100, with the following interpretive categories: 90–100 indicates very easy text; 80–89 is easy; 70–79 is relatively easy; 60–69 is standard; 50–59 is relatively difficult; 30–49 is difficult (appropriate for college students); and 0–29 is very difficult (suitable for advanced readers, such as professionals or academics). Higher scores reflect more straightforward, accessible text, while lower scores indicate increased complexity and advanced vocabulary or structure.

[25] Readability indices assess the structural complexity of a text based on lexical and syntactical features but do not capture its semantic clarity or policy intent. While they cannot measure the depth of economic reasoning, they effectively capture pro-forma aspects, such as clarity and accessibility, which are crucial for communication with different audiences. For example, a monetary policy statement that is overly technical may hinder understanding among the general public, even if its economic content is sound.

Syntactical Analysis

118. **Tonga's monetary policy decisions are written have simpler sentence structures than the average country in the peer group, favoring clarity** (see Figure 9). The document clarity is measured using the sentence's average syntactic dependency depth,[26] in which higher (lower) values indicate more convoluted (direct) sentence structures. The sentence structure of Tonga's monetary policy decisions was one of the simplest to understand but has become more convoluted since 2022. On the other hand, Tonga's annual reports sentence structure is similar to Fiji's and has become more direct (less complicated) since 2022.

Figure 9. Syntactical Analysis



Notes: This figure displays trends in the syntactical complexity of annual reports (left) and monetary policy decisions (right) of Tonga (orange line) and benchmarking countries (Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu). The measure of syntactical complexity used is the average dependency depth of sentences, a linguistic indicator that captures how deeply nested the grammatical structure of a sentence is. Higher values reflect more complex sentence constructions that may be harder for readers to follow, while lower values indicate simpler and more direct sentence structures. Dependency depth is calculated using syntactic parsing techniques and reflects the number of hierarchical levels in the dependency tree of a sentence. By tracking this metric over time, the figure provides insights into the structural complexity of central bank communications and how it may affect accessibility and clarity for different audiences.
Source: IMF Staff Calculations.

119. **Simplifying the sentence structure can improve public understanding and engagement, especially among audiences without specialized financial knowledge**. Improving clarity aligns with best practices for effective communication and enhances public accessibility. By ensuring sentences in a document are direct and easy to understand, Tonga's central bank can strengthen its outreach and ensure key policy messages are well-understood across diverse audiences.

Semantical Analysis

120. **This section employs a state-of-the-art methodology utilizing Large Language Models (LLMs) to classify and interpret text in an automated manner.** LLMs are effective in extracting semantic information from text, making them invaluable tools for better understanding the

[26] Syntactic dependency depth measures sentence complexity by examining how words are connected within a sentence. Lower depth indicates simpler structures with fewer layers of connections, making text easier to read. For example, "The central bank raised interest rates" has a low dependency depth, as each word connects directly without extra layers. In contrast, "The central bank, after assessing economic indicators, decided to raise interest rates" has a higher depth due to additional phrases that add layers of complexity.

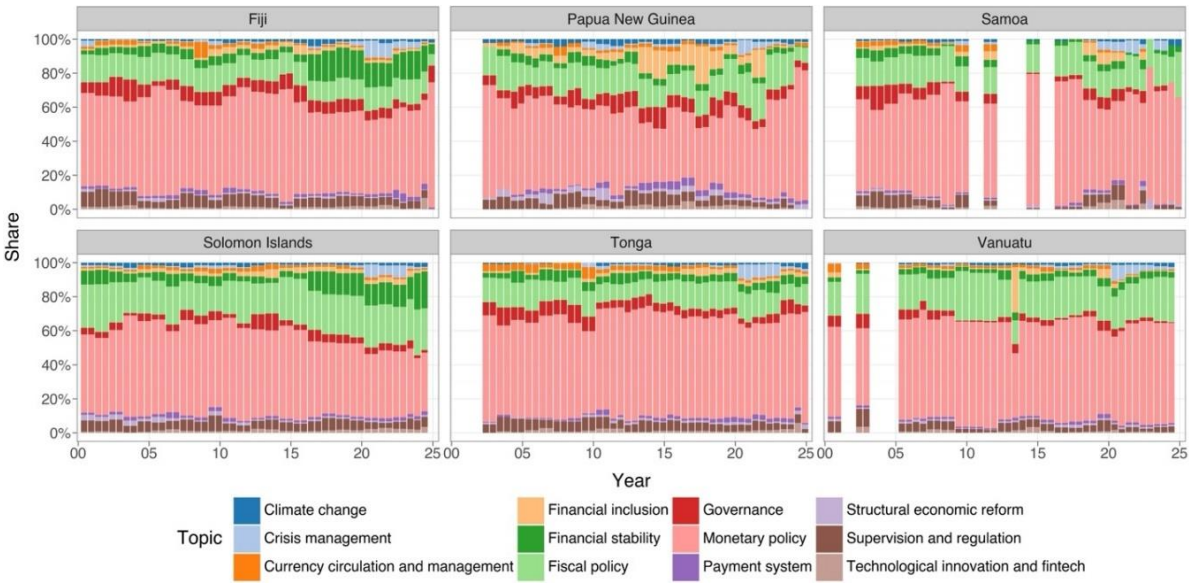
macroeconomic context conveyed through language. By leveraging the power of LLMs, the analysis in this section discerns topics, communication stances, audiences, and policy sentiment at the sentence level for each document, providing a deeper insight into central bank communications. The LLM was finetuned to excel at understanding and reasoning in central bank communication, making it a valuable tool for analyzing complex communication patterns. This LLM was then used to classify each sentence across all documents in the sample. The analysis in this section aggregates these sentence-level classifications considering different heuristics (e.g., by topic).

121. **For over 25 years, the topic distribution of Tonga's central bank communication has remained roughly unchanged, with monetary policy being the most prevalent topic** (see Figure 10). Exceptions are during global adverse events, such as the global financial crisis in 2008 and the COVID-19 outbreak and following inflation surge, events in which the topic of crisis management was more discussed.

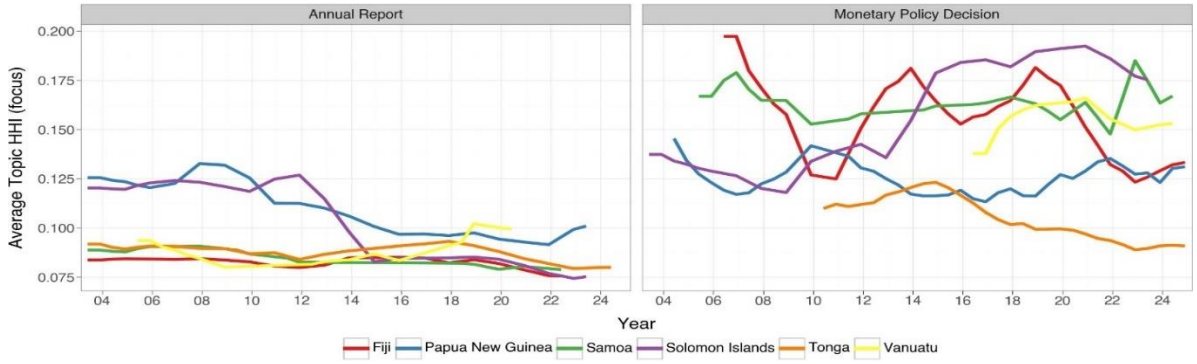
122. **Tonga's monetary policy decisions are substantially more diversified in terms of topics than the average country in the peer group,** which may undermine the policy messages and economic reasoning of central bank actions (see Figure 10). The topic concentration is evaluated using the Herfindahl-Hirschman Index (HHI), in which higher (lower) values indicate more concentration (more diversification) of the discussed topics. Tonga's monetary policy decisions discuss more topics than other country's monetary policy decision and there is a trend toward even more diversification since 2015. In contrast, Tonga's annual reports have similar concentration levels in terms of topics when compared to other countries in the sample.

Figure 10. Communication Topics

Distribution of Topics (Annual Reports, Financial Stability Reports, Monetary Policy Reports, and Monetary Policy Decisions)



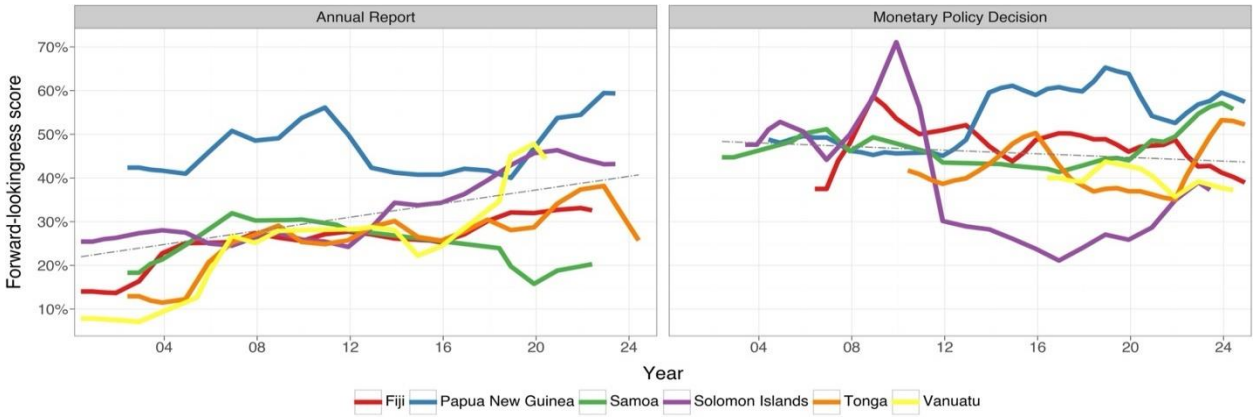
Concentration of Topics (Annual Reports and Monetary Policy Decisions)



Notes: This figure presents information of what central banks are discussing in their publications and the level of focus (or concentration). Information is provided for Tonga and benchmarking countries (Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu). These are based on the output of the sentence-level classifier. The top panel shows the distribution of topics discussed across key document types, including all regular and available central bank publications. The bottom panel displays the concentration of topics using the Herfindahl-Hirschman Index (HHI), calculated for annual reports (left) and monetary policy decisions (right). Higher HHI values indicate a greater focus on fewer topics (i.e., higher concentration), while lower values suggest more diverse thematic coverage. Together, these panels illustrate how the breadth and focus of central bank communication have evolved over time.
Source: IMF Staff Calculations.

123. **Tonga's monetary policy decisions has become more forward-looking in the last few years, but there is still room for improvement considering the peer countries.** Figure 11 displays a forward-looking score, which is measured as the share of sentences classified as forward-looking as a percentage of the total sentences, irrespective of the topics. The NRBT monetary policy communication pattern mainly comprises statements regarding exchange rates, inflation, and economic activity, with an increased emphasis on inflation in the last years. Until 2022, Tonga had one of the least forward-looking monetary policy decisions compared to peer countries. Forward-looking statements are critical to anticipating external shocks and maintaining macroeconomic stability. The reliance on imported goods amplifies the impact of global economic trends, requiring proactive measures to address inflationary pressures and manage liquidity. By incorporating forward-looking elements, the NRBT can better align monetary policy with expected changes in international reserves, trade dynamics, and remittance flows.

Figure 11. Forward-Looking Score



Source: IMF Staff Calculations.

Notes: This figure shows the degree of forward-lookingness in annual reports (left) and monetary policy decisions (right). This information is based on the output of the sentence-level classifier. The forward-looking score is defined as the share of forward-looking sentences with respect to the total sentences in the document. Curves are shown for Tonga (orange line) and benchmarking countries (Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu). This figure helps assess how central banks differ in the way they communicate prospective content over time.

Textual Metrics

124. The mission analyzed textual metrics to assess policy signaling, tone, and consistency in central bank communication (see Table 11 for the formal metric definitions). The Net Policy Sentiment (NPS) metric quantifies the balance between hawkish (tightening) and dovish (easing) communication signals in monetary policy communication outlets, providing insight into the actual central bank's monetary policy stance. The Net Confidence Index (NCI) captures the central bank's tone by comparing confidence-building and risk-highlighting statements, offering a measure of optimistic versus cautious communication. The Straightforwardness Index (SI) measures the prevalence of a unidirectional monetary policy communication signal by assessing the co-occurrence of hawkish, dovish, and neutral sentences in the same monetary policy decision. The Explanation Index (EI) gauges the degree of explanation of monetary policy actions in monetary policy decisions. Together, these metrics provide a comprehensive framework for evaluating the signaling and coherence of central bank communications.

Table 11. Definition of the Textual Metrics Evaluated from Central Bank Communications

Metric	Equation	Rationale
Net Confidence Index (NCI)	$NCI = \frac{C - R}{C + R}$ in which *C* and *R* are the quantity of confidence-building and risk-highlighting sentences. Domain: $[-1, 1]$	*Motivation* • The net confidence index captures the central bank's tone by comparing confidence-building and risk-highlighting statements, reflecting optimism versus caution in communication. *Interpretation* • Higher values indicate a predominantly optimistic communication tone, suggesting confidence in the economy or policy effectiveness. Lower values indicate a cautious communication tone, highlighting rising risks and uncertainties in the economic outlook.
Straightforwardness Index (SI)	$SI = \frac{N + \lvert H - D \rvert}{N + H + D}$ in which N, H and D are the quantity of neutral/balanced, hawkish and dovish sentences. Domain: $[0, 1]$	*Motivation*: • The straightforwardness index measures the homogeneity of communication signals in the same monetary policy decision. *Interpretation*: • An increased co-existence of hawkish and dovish sentences in the same monetary policy decision suggests the existence of multiple contingency scenarios or inconsistency in monetary policy communication. • The co-existence of risk-highlighting and confidence-building sentences that are typical to explain policy stances do not change the straightforwardness index.

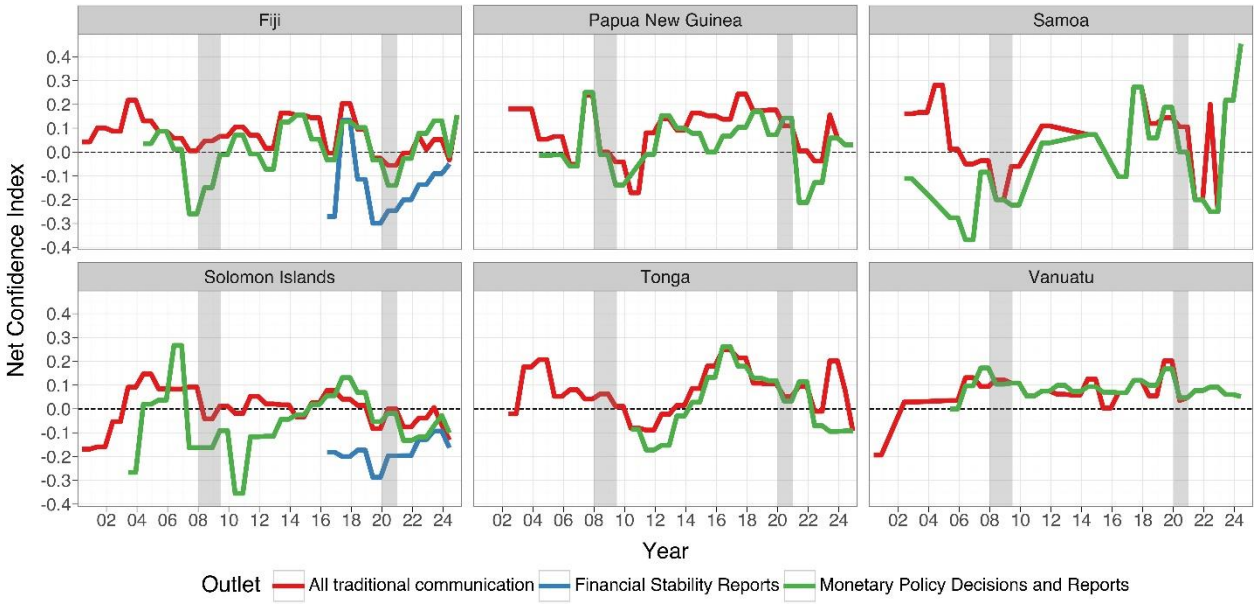
Explanation Index (EI)	$EI = \frac{C + R + N}{H + D}$ in which C, R, N, H, D are the quantity of confidence-building, risk-highlighting, neutral/balanced, hawkish and dovish sentences. Domain: ≥ 0	*Motivation*: • Monetary policy decisions have (i) policy-stance and (ii) explanatory sentences. Typically, authorities explain policy-stance statements with explanatory sentences. • Policy-stance statements are typically explained with statements about the economy, which have either a risk-highlighting, confidence-building, or neutral connotation. • The numerator contains the quantity of explanatory statements, which are classified by the model as confidence-building, risk-highlighting, and neutral. • The denominator contains policy-stance statements, which are hawkish or dovish. *Interpretation*: • The index measures the number of explanatory sentences per stance-related sentence. • If the *EI* = 2, it means that for every policy stance statement, there are, on average, two explanatory sentences

Source: Mission's elaborations.

125. The net confidence index effectively captures the evolving concerns of Tonga's central bank, providing a quantitative measure of shifts in communication tone regarding risks (see Figure 12). The net confidence index is evaluated in three different samples of communication outlets. The first uses monetary policy decisions and monetary policy reports (if available), capturing central bank concerns focused on monetary risks and resilience factors. The second uses only financial stability reports, with concerns typically concentrated on sources of systemic risk. The third uses all traditional reports, capturing both monetary and non-monetary, idiosyncratic or system-wide risks and resilience factors. Overall, the net confidence index is a valuable metric for understanding how Tonga's central bank communicates evolving economic risks and confidence levels in response to changing conditions.

126. Tonga's central bank communication strongly leaned toward confidence-building statements after 2014, especially about monetary factors. The significant rise in net confidence-building statements in monetary policy communications from 2014 to 2017 aligns with the decline in lending interest rates to the private sector. In recent years, communication on monetary factors remains confidence-building, albeit to a lesser degree than observed between 2014 and 2017.

Figure 12. Net Confidence Index

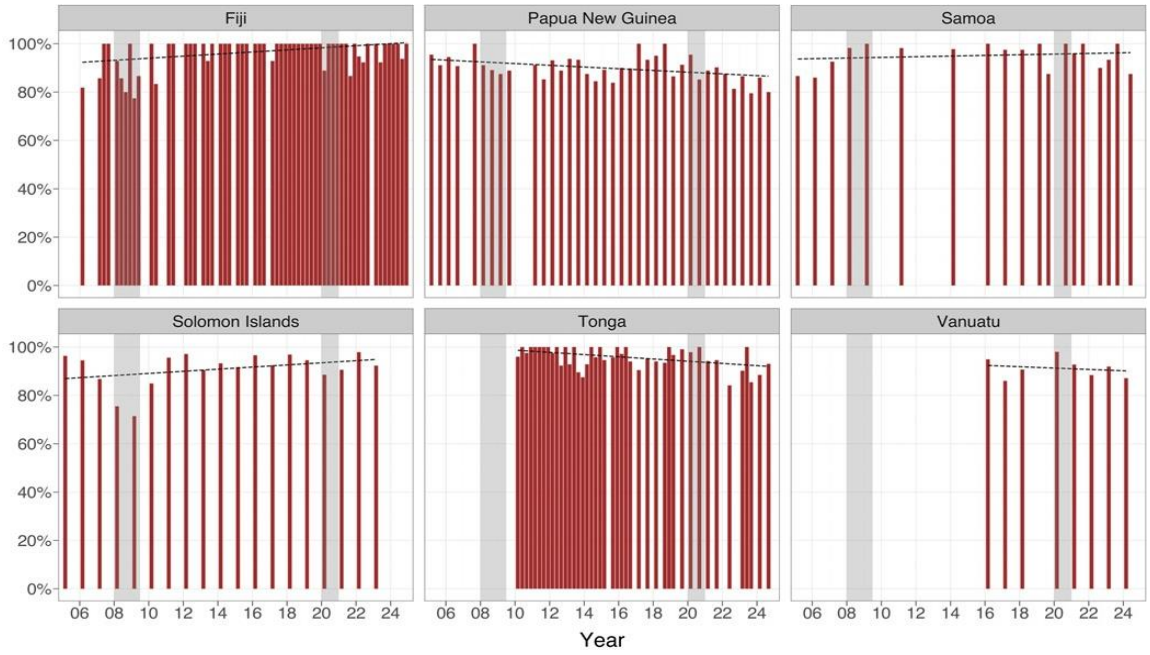


Note: The net confidence index metric (see Table 11 for the formal definition) is evaluated using three samples of communication outlets: (a) only monetary policy decisions and monetary policy reports (green line); (b) only financial stability reports (blue line); and (c) all traditional central bank communications (red line). The shaded areas denote global adverse events.

Source: IMF Staff Calculations.

127. **While Tonga's monetary policy decisions generally have an unidirectional communication signal, the recent downward trend in clarity suggests an increasing inclination towards discussing multiple contingency scenarios.** As illustrated in Figure 13, Tonga's straightforwardness index has notably declined after 2022, reflecting a growing prevalence of mixed signals within the same monetary policy decisions. This trend aligns with the observation that, during adverse economic conditions the straightforwardness of some peer countries also diminished. This index is useful for central banks to evaluate the clarity of their policy communications, ensuring coherence and avoiding unintended ambiguity in monetary policy announcements.

Figure 13. Straightforwardness Index



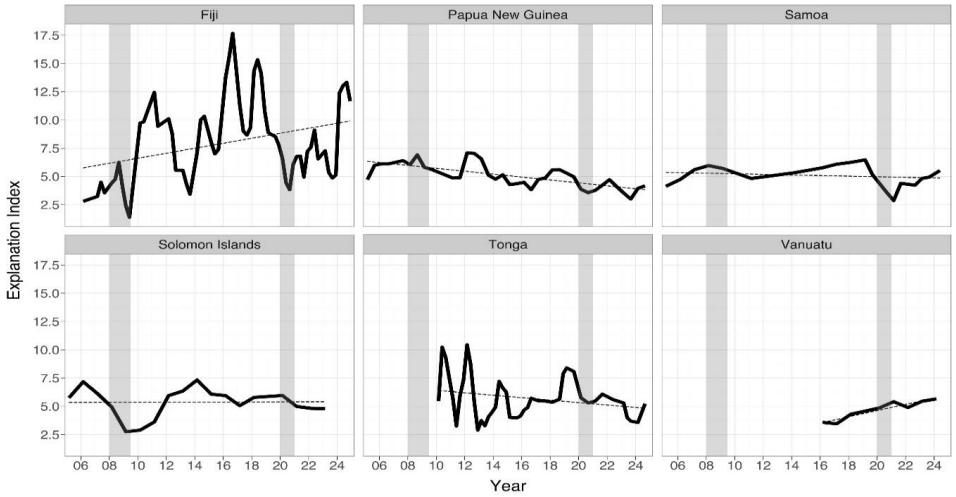
Note: The straightforwardness index (see Table 11 for the formal definition) is evaluated only across monetary policy decisions. The shaded areas denote global adverse events. This metric is evaluated using only the monetary policy decisions.

Source: IMF Staff Calculations.

128. **Tonga's explanation level of its policy actions in monetary policy decisions is roughly constant and comparable to peer countries.** Tonga's monetary policy decisions devote five sentences to explain each stance-based sentence. Each stance-based sentence in Tonga's monetary policy decisions is supported by five explanatory sentences. Other countries in the sample exhibit a similar ratio of explanatory to stance-based sentences, except for Fiji, which typically includes more explanations for each policy action (see Figure 14)**.**[27]

[27] It is worth noting that Tonga publishes other documents alongside its monetary policy decisions, which may complement the explanations of policy actions. The explanation index only considers sentences comprising the main body of the monetary policy decision.

Figure 14. Explanation Index



Notes: The explanation index (see Table 11 for the formal definition) is evaluated only across monetary policy decisions. The shaded areas denote global adverse events. This metric is evaluated using only the monetary policy decisions. Source: IMF Staff Calculations.

Recommendations

Recommendation 19: Enhance the effectiveness of communication by: (i) improving readability indices of monetary policy decisions by reducing the wording complexity; (ii) producing more focused monetary policy statements by better managing the variety of topics discussed; and (iii) integrating more forward-looking elements in monetary policy statements.

129. **The mission derived recommendations for enhancing the effectiveness of NRBT communication from the NLP analysis.** As part of the aforementioned implementation strategy for communication, the NRBT should incorporate the following:

- **Improve readability of all communication.** The NRBT should prioritize clear and concise language, focusing on delivering essential messages. Simplifying content will enhance accessibility and engagement, particularly for non-specialized audiences. Shorter and more direct sentence structures facilitate understanding, which should be a priority in future communication strategies.

- **Produce more focused monetary policy statements.** The overly diversified monetary policy statements risk diluting the central policy messages and their implications to relevant stakeholders. When too many topics are addressed, the main objectives of monetary policy are less prominent, making it challenging for stakeholders to discern priorities and intended policy directions. This diffusion may lead to misunderstandings or a lack of clarity about the central bank's core intentions, ultimately affecting the effectiveness of communication.

- **Integrate more forward-looking elements in monetary policy statements.** Enhancing this aspect would better prepare stakeholders for potential economic changes (such as inflationary pressures or fluctuations in international reserves) and improve their understanding of policy decisions.. Strengthening the integration of forward-looking elements across monetary policy decisions and related publications can also significantly enhance policy credibility and stakeholder confidence.

VII. Implementing the Proposed Monetary Operational Framework

130. **The implementation of the proposed monetary operational framework needs to be gradual, properly articulated, and well explained.** Once the new framework has been internally defined, it is important that NRBT engages with market participants to explain the rationale of the changes, the expected effects, and the broad timeline to ensure their readiness. This applies to both the changes in the monetary operating framework, and the changes to the SDR framework.

131. **Follow-up virtual technical assistance will be provided to assist with the implementation of the proposed monetary operational framework.** The mission proposes that virtual TA be conducted from 2025 Q2 to 2026 Q2 to assist with: setting up a short-term liquidity monitoring and forecasting framework and estimation of demand for reserves; and developing the collateral framework for liquidity-providing monetary operations (see Table 12 for further details on the scope and objectives of the follow-up TA).

132. **Although the different components of the monetary operational framework mutually reinforce each other, and represent a consistent package of measures, they do not need to be implemented all at the same time**. Two stages can be identified in that regard (Table 12):

- **Stage 1.** In terms of priority, the most important and pressing priority is the transition to the new IRC framework based on the regular conduct of MLMO, that is weekly issuance of 7-day NRBT Notes at the policy rate, through fixed rate, full allotment tenders. Implementation of all the recommended changes to the SDR could occur at this stage, except for moving to SDR averaging over the RMP.

- **Stage 2.** Once the NRBT has developed a proper liquidity forecasting capacity anchored on a standard monitoring of the autonomous factors, a move to variable rate, fixed amount MLMOs can be envisaged. At this stage, moving committedly to SDR averaging over the RMP would be highly desirable, as well as introducing fine tuning OMOs.

Table 12. Stages in the Implementation of the New Operational Framework

Stages	Open Market Operations	Statutory Reserve Deposits	Supporting Actions and Conditions	MCM Technical Assistance Support
Stage 1	MLMO: Weekly issuance of NRBT Notes at fixed rate (policy rate), full allotment tenders.	- Consider increasing SRD ratio. - Consider some SRD remuneration. - Link SRD noncompliance penalty to policy rate.	- Develop capacity to assess the level of the policy rate. - Start developing a ST liquidity monitoring and forecasting framework based on the AFs. - Rely on current collateral framework with the addition of haircuts.	

			- Develop communication strategy to outline MP implementation and modernization.	
Stage 2	MLMO: Weekly issuance of NRBT Notes at variable rate, fixed allotment tenders. Fine tuning OMOs.	- Introduce averaging provisions over the RMP. - Remunerate SRD at opportunity cost.	- ST liquidity forecasting framework fully operational. - Implement a modernized collateral framework. - Communication strategy fully operational.	
Source: Mission's elaborations.				

Table 13. Proposed Program of MCM Technical Assistance

MCM Follow-Up Technical Assistance	Comments
TA Scope: Setting up a short-term liquidity monitoring and forecasting framework and estimation of demand for reserves. **Objectives:** Improve understanding of the short-term autonomous factors forecast to calibrate short-term liquidity operations, and estimation of demand for reserves.	Virtual TA from 2025 Q2 to 2026 Q2
TA Scope: Collateral framework for liquidity-providing monetary operations **Objectives:** Develop operational arrangements for collateral valuation, haircut, and margin requirements.	Virtual TA from 2025 Q2 to 2026 Q2
Source: Mission's elaborations.	

VIII. Conclusion

133. **The implementation of the mission's recommendations will support effective monetary operations and transmission**. The report recommends a mix of reserve requirements and effective monetary operations to enable the NRBT to employ market-based mechanisms to influence market conditions and mitigate vulnerabilities to the peg. If implemented, by the end of Stage 1 of the implementation plan, the NRBT would have transitioned to the new IRC framework based on the regular conduct of MLMO, through fixed rate, full allotment tenders. By developing a proper liquidity forecasting capacity anchored on a standard monitoring of the autonomous factors, the NRBT would enable a market-based framework to influence money market conditions. The move to variable rate, fixed amount MLMOs would then be developed. If implemented, along with RMP averaging and fine-tuning OMOs, this would complete the transition to a modernized framework with effective monetary operations and transmission.

134. **The mission reviewed the collateral policy and produced recommendations that can bridge the gaps in the collateral framework and institutionalize best practice methods.** These recommendations serve as an important guide to enhancing the eligibility, valuation and risk mitigation frameworks that underpin liquidity providing monetary operations. The mission recommended that the NRBT remove the preference order for monetary policy

collateral (and undertake necessary actions to standardize the mobilization procedures for assets), develop sound valuation methodologies, assist with the calibration of a term-structure sovereign yield curve, and implement risk mitigation measures. These recommendations, once implemented, would facilitate market development and adequately protect the central bank's capital from adverse market developments..

135. **Recommendations were provided to enable the transition to a modernized, comprehensive, and effective communications framework.** In relation to the institutional framework for communications, the report provides detailed guidelines for developing an appropriately designed and well-articulated institutional policy to govern communications. It also suggests the development of frameworks to complement this institutional policy. In relation to monetary policy communication, the report provided guidelines for effectively communicating the implementation of the proposed monetary operational framework, as well as for producing multitiered communication and expanding outreach. The report provides several recommendations for modifying the message content of all NRBT communications to improve its effectiveness by improving readability; being more focused; integrating more forward-looking elements;and reducing mixed signals.

136. **Follow-up missions would allow IMF staff to support NRBT with the implementation of the mission's recommendations.** Virtual TA from 2025 Q2 to 2026 Q2 will be scheduled to assist with: setting up a short-term liquidity monitoring and forecasting framework, as well as estimation of demand for reserves; and developing the collateral framework for liquidity-providing monetary operations. The NRBT may also consider requesting the IMF to conduct future missions on the following: the activation of an ELA framework; financial stability communication; and a Central Bank Transparency (CBT) review.

Annex I. Implementation of Past IMF Recommendations

IMF recommendations in the context of capacity building and surveillance missions emphasized the benefits of a more market-based monetary policy framework.[15]

- Rely on the NRBT policy rate to communicate and implement monetary policy. While adjusting the SDR ratio offers a basic mechanism for influencing inflation and economic activity, its effectiveness is hampered by sticky lending rates and the presence of sizeable excess reserves. IMF staff recommended reliance on the policy rate to enhance monetary policy effectiveness.

- Establish an interest rate corridor (IRC). Reliance on the policy rate can be implemented by adjusting the design of the already established IRC. Even in absence of an active and liquid interbank market, setting the interest rate floor on excess reserves (the de facto policy rate) at a level consistent with macroeconomic conditions, and aligned with the NRBT's policy objectives, would more directly impact banks' lending rates by influencing the relative attractiveness of lending versus idle reserves. Such an operational framework would enhance the NRBT's influence over price stability through critical financial channels, including credit, interest rates, and exchange rates.

- Review of the indicative inflation reference rate: The NRBT has adjusted the indicative inflation reference rate to five percent per annum, down from the prior 6–8 percent, aligning more closely with historical inflation rates and the medium-term economic. IMF staff recommended that the NRBT implements a regular review process for the reference rate, ensuring it remains relevant against evolving economic conditions.

- Enhanced and effective communication strategy. To enhance the effectiveness of monetary policy transmission, IMF staff recommended that the NRBT commits to a policy of transparent communication, including by actively engaging with stakeholders to understand their feedback and concerns, and investing in public education about its role and mandate, ensuring that its objectives are clearly understood.

The September 2016 MCM TA mission (final report dated February 2017: "*Monetary Policy Framework and Developing Securities Market*") recommended that the NRBT enhance its monetary policy framework in several key areas. In particular, the mission noted that the indicative inflation reference range of six–eight percent was too high compared to the historical average, and it recommended that it would be appropriate to reduce the reference rate. Subsequently, the authorities have reduced the reference rate to five percent per annum. The mission also suggested that the NRBT ensure its operational independence by clarifying the operational process of recapitalization and enhancing accountability and promote transparency by announcing policy decisions approved by the Board shortly after each meeting. Table A.1 summarizes MCM key recommendations and progress in their implementation.

Table A.1 Implementation of past IMF recommendations

Recommendations	Progress	Comments
Monetary Policy Framework		
Continue to ensure consistency between the indicative inflation reference rate and the historical inflation as well as the medium-term inflation outlook.	Last adjustment in 2016 when the indicative inflation rate was lowered to 5 percent from 6–8 percent.	
Clarify the detailed process of recapitalization and enhance accountability to ensure operational independence.	No progress.	
Continue to take advantage of the existing flexibility of the exchange rate (ER) to enhance the effectiveness of monetary policy transmission.	NRBT has used ER flexibility to enhance monetary policy effectiveness.	
Announce policy decisions approved by the Board shortly after each policy meeting to enhance the transparency of monetary policy.	NRBT releases a Press Release of policy decisions by the Board the same day it is approved.	Monetary policy decisions communicated to the public through press releases, monthly economic publications and Monetary Policy Statements.
Monetary Operations		
Introduce a floor system under which the interest rate on the excess reserves serves as the monetary policy rate and announce the current monetary policy rate of zero percent.	Floor system introduced in November 2016.	Revised IRC system announced in April 2024 (see Annex II).
Should signs of overheating emerge, tighten monetary policy by raising the interest rate on excess reserves.	The NRBT's has not moved its policy rate in over a decade.	Decision taken following a cost/return analysis: banks would not react to policy rate movements due to excess liquidity; cost for the NRBT would be very high; GDP recovery consideration carried weight on decision to keep low interest rates.
Strengthen the liquidity forecasting and management framework by developing the capacity to analyze autonomous factors.	No progress.	Exercise conducted on a monthly basis exclusively with data provided by the commercial banks.
Consider issuing the NRBT notes to encourage interbank transactions and establish interbank interest rates.	No progress.	The NRBT has not issued notes. At times it offered deposit facilities for the Government and the retirement funds for targeted mopping of excess liquidity.
Introduce SRD averaging.	No progress.	

Source: NRBT, Mission's elaborations

Annex II. NRBT Board Paper No. 26/2024 (April 2024)

Interest Rate Corridor

Background

This is a re-submission of the interest rate corridor policy seeking approval to be in place should the financial institutions require to use these facilities. The current interest rate policies of the NRBT are as follows:

Policy Rate: Zero percent (July 2016)

In November 2016 (BP 95/2016) the Board approved and adopted a floor system, whereby the interest rate on the NRBT's standing deposit facility rate (interest on commercial banks' Exchange Settlement Accounts) serves as the policy rate. This system is simple to operate and robust to market imperfections and liquidity forecasting weaknesses typically found in developing countries. It primarily requires maintaining a structural liquidity surplus and allows for interest rate-based operations even when the interbank market is shallow.

NRBT Note Rate: Two percent below banks' average one month deposit rate (since March 2010**)**

Repo Rate: 3.9 percent (since October 2010) - two percent above the interbank lending rate

The repurchase agreement (repo) is the facility whereby the NRBT can provide liquidity support to commercial banks as the "lender of last resort". The last repo rate was approved by the Board in October 2010 (BP 66/2010) linking the repo rate to the interbank rate at a two percent margin.

The conditions for the Repo facility are as follows:

Eligible Securities

The NRBT executes Repurchase Agreements with the following eligible securities in order of preference:

NRBT Notes

Tonga Government Bonds

Tonga Government Treasury Bills

Note: As of Friday, 12 April, 2024, the total banks' holdings of eligible securities was $37.12 million (all Government Bond holdings).

Interest Rate

The current annual interest rate on Repo was based on the overnight interbank rate plus 200 basis points. The last Board approved repo rate was 3.9 percent in October 2010 (BP 66/2000 refers).

Term

The Repo is for a period of seven days or any other longer period as the commercial bank may request.

Limit

The minimum amount for Repos is T$50,000. The amount advanced should not exceed the market value of the securities pledged.

However, due to excess liquidity in the financial system, the repo facility and the interbank lending market have been inactive for over a decade and so there is no indicative interbank lending rate. Furthermore, since the interbank rate is normally set by the Association of Banks or by each individual bank, basing the repo rate on the interbank rate allowed the market to dictate what the repo rate would be when it should be the contrary. The NRBT's policy rate should influence the interbank lending rate and not the other way around.

Interest Rate Corridor

To support the strengthening of the monetary policy transmission mechanism, the NRBT can introduce an interest rate corridor that would encompass all interest rates, including the interbank rates, with the NRBT being able to influence interest rates through setting of the policy rate. A corridor is implemented by having the interest rate on the standing lending facility (repo) as the ceiling and the interest rate on the standing deposit facility as the floor. Other interest rates such as the interbank rate can be set within this corridor. Having a corridor for setting interest rates would reduce uncertainty and thereby limit volatility, support the functioning of the payment system, and strengthen the effectiveness of monetary policy. This is also a step towards developing a market-determined interest rate framework, as recommended by the IMF technical assistance on "Enhancing the Monetary Policy Framework and Developing Securities Market" in November 2016.

To help establish interbank interest rates, issuance of the NRBT notes could be considered in the medium term. Given the underdeveloped government bond market, including the need to confirm with the Ministry of Finance their appetite for Government bond issues in line with their debt strategy, and the size of structural liquidity surpluses, issuance of the NRBT notes would be a market-friendly approach to absorb the excess liquidity. Unlike other facilities, it will facilitate interbank transactions and enhance the development of financial markets. The issuance of notes would indicate to the commercial banks a target for a market overnight interbank rate. The notes can be issued through the open market operations (OMOs) and can be used as securities by the commercial banks for their dealings (e.g., accessing the repo facility or the interbank market) and thus align the overnight interbank rate with the NRBT's policy rate.

Recommendations:

Directors are invited to endorse the following draft resolutions:

That the implementation of NRBT's new interest rate corridor is as follows:

Policy Rate (Interest on the banks' Exchange Settlement Accounts): zero percent —Floor rate

NRBT Notes Rate: two percent—mid-rate

Repo Rate: Fixed at four percent as the ceiling rate.

That the conditions for the Repo Facility will remain the same except for the revised interest rate policy.

That the corridor be reviewed annually as the NRBT moves towards a more interest rate-based framework for monetary policy.

Annex III. Tonga's Exchange Controls and Foreign Exchange Interbank Market

The NRBT has consistently relied on a comprehensive set of exchange controls, as established in the Foreign Exchange Control Act 2018. The key features of the framework are as follows:[28]

- *General framework*. All foreign currency payments from pa'anga accounts, through either the commercial banks or the NRBT, are subject to the exchange control requirements, so supporting documents are provided accordingly, which verify whether the transactions are bona fide. Commercial banks must provide underlying documentation when they purchase foreign exchange from the NRBT so as to certify the bona fide nature of the transactions.

- *Administration of FX controls.* The NRBT has delegated to licensed commercial banks and authorized foreign exchange dealers (FEDs)[29] the approval authority for current and capital payments up to a given ceiling. All other payments require NRBT approval.[30] Lending institutions in Tonga may lend to nonresident individuals and businesses without NRBT approval.

- *Current account transactions*. Exporters of goods must repatriate to a pa'anga account with a commercial bank licensed in Tonga within six months of exportation at least 60 percent of foreign exchange earnings, unless the NRBT has approved an extension of this period or the retention of funds in a foreign currency account with a local bank or overseas. Export proceeds must be surrendered on repatriation, unless the NRBT has approved an extension of this period or the retention of funds in a foreign currency account with a local bank or overseas.

- *Capital account transactions.* Commercial banks and authorized FEDs are delegated the authority to approve capital payments not exceeding T$100,000 an application, subject to provision of unaudited accounts and company resolution. NRBT approval is required for outward capital payment transactions exceeding T$100,000 accompanied by the audited accounts and company resolution.

- *Provisions specific to financial institutions.* The following specific regulations apply on commercial banks' FX operations: (i) balances of commercial banks' nostro accounts may not exceed T$1 million daily; any excess must be sold to the NRBT within two business days; (ii) Commercial banks' FX denominated loans to their customers must be financed from overseas banks or customer foreign exchange receipts; they may not buy FX from the NRBT to finance such loans; (iii) The statutory reserves deposit amount is 10 percent of deposits and similar liabilities of banks in both local and foreign currency. There are no separate reserve requirements for foreign currency and local currency; and (iv) commercial banks' net FX positions are subject to prudential

[28] Source: IMF 2022 Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) .

[29] The NRBT has licensed four commercial banks and sixteen FEDs.

[30] Commercial banks and authorized FED have approval authority for (i) transfers not exceeding the equivalent of T$100,000 with supporting documents, except for travel payments, whose limit is T$20,000; (ii) capital and current payments below T$5,000 a month without supporting documents; and (iii) gift payments up to T$50,000 a remitter a beneficiary a year without supporting documents. All current and capital payments and transfers exceeding T$100,000 require NRBT approval.

limits, on overall net positions (25 percent of eligible capital) and single currency net positions (12.5 percent of eligible capital).

Key features of NRBT FX interventions and the foreign exchange interbank market are as follows:

- *Regarding NRBT FX interventions,* the NRBT relies on a foreign exchange standing facility whereby the four licensed commercial banks can purchase foreign exchange from the NRBT on demand/at their initiative. The NRBT sets the US dollar–pa'anga rate on a daily basis and buys and sells foreign exchange at these exchange rates to the commercial banks. Commercial banks are required to list all the underlying customers, and all foreign currency payments from pa'anga accounts are subject to the exchange control requirements, so supporting documents are provided accordingly, which verify whether the transactions are bona fide.

- *Licensed commercial banks may trade among themselves in the FX interbank market.* The NRBT does not intervene directly with market participants at their quoted rates. Commercial banks also maintain nostro accounts, and their total balances may not exceed T$1 million daily. Excess foreign exchange must be sold to the NRBT within two business days. There are no limits on the spreads for interbank foreign currency transactions among commercial banks.

- *The NRBT has also granted FX licenses to non-bank foreign exchange dealers (FED) that can only transact with commercial banks.*[31] Licensed commercial banks and FEDs may freely set their exchange rates and commissions in transactions with their clients, with the exception of banks' spreads on telegraphic transfers in US dollars, Australian dollars, and New Zealand dollars, which are limited to 220 basis points, 300 basis points, and 350 basis points, respectively.

[31] FEDs may conduct money conversion (conversion of foreign currency notes to or from pa'anga) and/or remittance business (inward and outward remittances). Ten FEDs hold Type A licenses, five hold Type B licenses, and one holds a Type C license. FEDs with Type A licenses are authorized to conduct money conversions, make foreign currency payments on behalf of their clients, and receive funds from overseas (both inward and outward remittances). FEDs with Type B licenses are authorized to receive funds only from overseas (inward remittances), and the Type C license is for money conversion only.

Annex IV. FX Composite Model and Currency Basket Weight Determination

Sensitivity of Weights to the Volatility of Inflation Constraint

The weights are determined as those that minimize the volatility of exchange rates under the condition that the volatility of inflation passthrough be less than the specified value $\overline{\sigma}^2$ which is set by the central bank.

$$F(w, .) \leq \overline{\sigma}^2$$

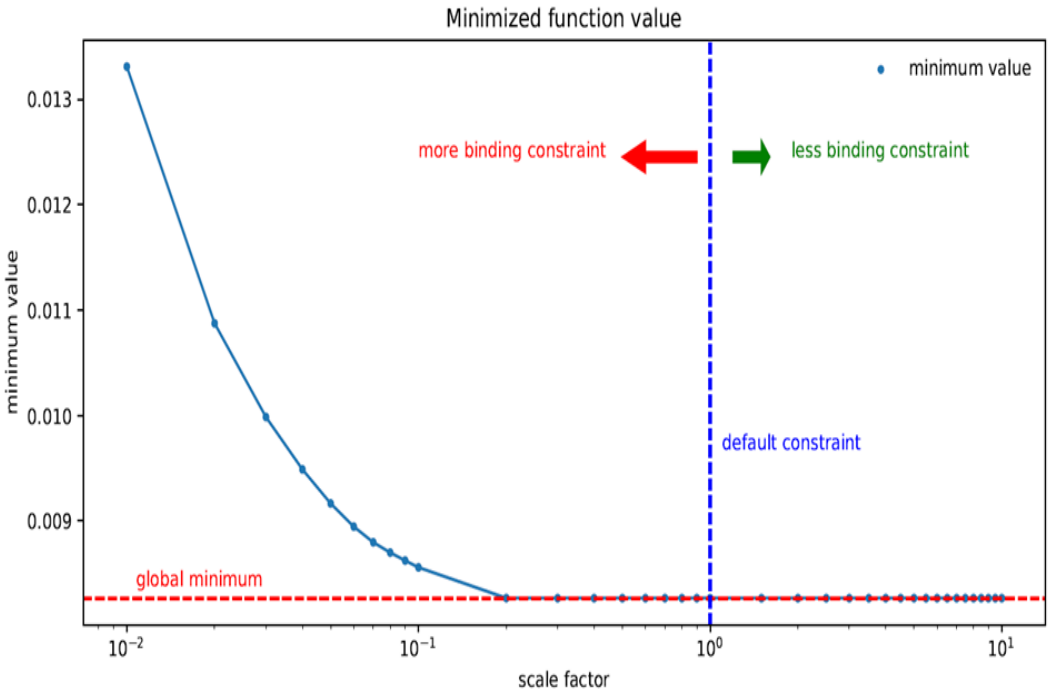
The constraint above can be seen as the transformation of a first-order problem (setting an inflation target) to a second-order problem (defining a desirable level of inflation volatility). The lower is $\overline{\sigma}^2$, the more the central bank is willing to set the weights to limit the pass-through of the exchange rate to inflation. For our baseline value, we set this parameter to the minimum of a rolling window 60-month volatility of the log of imported CPI over the sample period.

To see the impact of different values of $\overline{\sigma}^2$, the optimization program was modified so that a scale factor was multiplied to the above calculated constant so that if the scale factor is one, it reproduces the original result, and a lower (higher) value corresponds to tighter (looser) constraints on the optimization.

Figure B.1 shows the minimized function value as this scale factor is changed. The dashed vertical line corresponds to a scale factor of one which is the original result. As shown in the figure below, above a certain scale factor the inflation constraint is too high and does not affect the minimization, leading the value to be the global minimum (shown as the dashed horizontal line). When the scale factor is below a certain value, the additional constraint results in the optimization to find a sub-optimal solution that satisfies the additional constraint, and the optimal value rises.

Table B.2 and Table B.3 display the passthrough results.

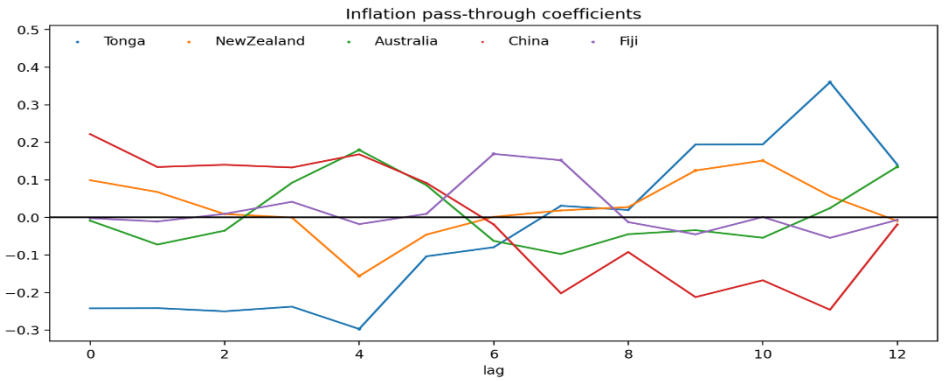
Table B.1 Volatility of Inflation Constraint



Source: Mission's elaborations.

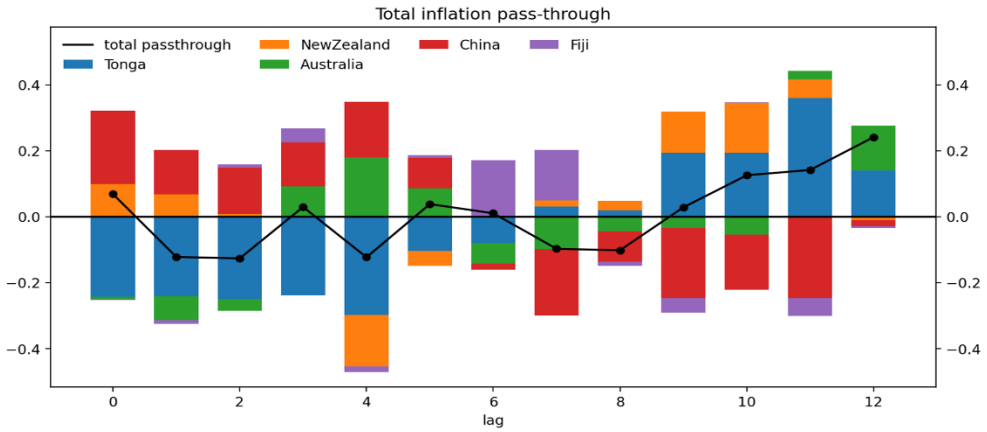
The figure below shows the weights obtained for each currency, again against the scale factor. Above a certain scale factor, the weights are constant corresponding to the global minimum. Below this level, the weights are modified to satisfy the additional constraint.

Table B.2 FX Composite Model Results: Inflation Passthrough Coefficients



Source: IMF Staff Calculations.

Table B.3 FX Composite Model Results: Total Inflation Passthrough



Source: IMF Staff Calculations.

Annex V. The Use of Interest Rate Corridors in Monetary Policy Implementation

Introduction

The migration from reliance on direct (administrative tools) to indirect (market-based) monetary instruments has led central banks to pay closer attention to short-term money market rates, leading to growing reliance on interest rate corridors (IRCs) to stabilize short term money market rates. Banks' discretionary access to central bank liquidity, and at a pre-set interest rate, provides an automatic mechanism to limit the volatility of interbank market rates, upwards in the case of the lending standing facility (ceiling), or downwards in the case of the deposit standing facility (floor), for maturities equivalent or close to those applying to the standing facilities. While up to the 1990s central banks relied on a variety of arrangements to combine deposit and lending standing facilities,[32] later reliance on a combination of a lending and of the deposit facility to set an IRC within which short-term interbank market rate could fluctuate has become a prevalent practice (Table C.1).

Table C.1 Interest Rate Corridors Width in Selected Countries

2013*	2018**	Corridor Width
Australia, Canada, Chile, Colombia, Czech Republic, Israel, Kazakhstan, Malaysia, New Zealand	Albania, Australia, Canada, Chile, Israel, Jordan, Malaysia, New Zealand, Saudi Arabia, United Kingdom	50bp and less
Jordan, United Kingdom	Denmark, European Central Bank,	75bp
Afghanistan, Egypt, Fiji, Norway, Thailand, Tunisia	Czech Republic, Egypt, Fiji, Hungary, Norway, Paraguay, Philippines, Sri Lanka, Thailand	100-149p
Euro Area, Sweden, Peru	Brazil, Indonesia, Peru, Sweden	150-199bp
Argentina, Colombia, DRC, Costa Rica, Dominican Republic, Guatemala, Hungary, Indonesia, Korea, Morocco, South Africa	Colombia, Costa Rica, Georgia, Guatemala, Iceland, Kazakhstan, Korea, Morocco, Pakistan, Poland, Romania, Russian Federation, South Africa, Tunisia	200bp
Albania, Bhutan, Brazil, Croatia, Honduras, Iraq, Mauritius, Moldova, Mongolia, Mozambique, Nigeria, Romania, Rwanda, Serbia	Afghanistan, Algeria, Argentina, Armenia, Belarus, Croatia, Dominican Republic, Honduras, Jamaica, Kyrgyz Republic, Moldova, Nigeria, Qatar, Republic of North Macedonia, Serbia, Seychelles, Tajikistan, Turkey, Ukraine	200bp and more

Source: IMF, *ISIMP database, and **Monetary Operations and Instruments Database (MOID).

[32] See Laurens, Bernard: *"The Use of Standing Facilities in Indirect Monetary Management: Country Practices and Operational Features"*. Washington D.C.: International Monetary Fund, MAE Operational Paper OP/97/4, 1997.

Standing facilities have been used by central banks under different monetary policy frameworks and in countries at all stages of money market development. Standing facilities are monetary instruments used at the initiative of commercial banks, and bearing an interest rate pre-set by the central bank. They allow commercial banks to borrow from the central bank (refinance standing facility) or deposit funds with the central bank (deposit standing facility). Following the practice in the 1980s and 1990s in advanced countries, many developing and emerging market economies have also introduced standing facilities in their monetary policy toolkit.

Primary Purpose of an IRC

The primary monetary policy purpose of an IRC is therefore to set boundaries for short-term market interest rates volatility. When market rates tend to rise above the rate of the standing lending facility, banks will increase their borrowing from the central bank rather than borrowing from the market; consequently, market rates will not move above the standing facility rate. Conversely, when market rates tend to fall below the rate of the standing deposit facility, banks lend to the central bank and market rates will stabilize at the level of the interest rate applied by the central bank. Thus, short-term market interest rates cannot deviate sharply or for a long time from the level of the standing facilities. Provided the width of the IRC is sufficiently wide, there is still room for interbank market trading and development and deepening.

Short-term liquidity management by the central bank must aim at stabilizing short-term interest rates, most notably for countries that have adopted an IT regime, but also for countries that rely on monetary aggregates for guiding policy formulations, or country that rely on an exchange rate anchor. In countries that have adopted IT, the IRC will facilitate steering short-term money market rates to the level desirable to achieve the inflation target. In a monetary targeting framework although the longer-term development of market interest rates is endogenous, focusing short–term liquidity management on reserve money instead of banks' reserve balances and short-term interest rates is likely to result in unwarranted short-term interest rates volatility that muddles the policy signal and hamper its transmission to longer-term interest rates. Thus, containing the high-frequency (day-to-day) volatility of short-term interest rates is essential for anchoring the yield curve, strengthening the transmission along the yield curve to other rates, and enhancing monetary policy transmission more broadly. The same applies for countries with a peg exchange rate regime, where the IRC can facilitate steering short-term interest rates to a level that is aligned with the relevant foreign interest rate adjusted with the risk premium.

Mapping of the IRC with the Other Monetary Policy Instruments

An adequate pairing of the IRC with the other monetary policy instruments is critical for its effectiveness. In countries with developed money markets, an IRC is operated in support of OMOs, in particular to limit short-term money market interest rate volatility. The ability of the central bank to conduct frequent and flexible OMO and its degree of willingness to accept some volatility of market rates will affect the function of standing facilities. In particular, greater willingness to accept market rates volatility will result in lower reliance on standing facilities and/or a wide corridor, and vice versa.

An important element of an IRC framework has to do with the frequency of OMOs. Central bank practices reflect a number of circumstances such as: (i) the degree of development of the interbank market; (ii) the width of the corridor; (iii) the design of the RR and its capacity to absorb large and unexpected liquidity shocks; (iv) the accuracy of the short-term liquidity forecasting framework; and (v) the possibility to conduct fine-tuning (i.e., overnight OMOs). Therefore, the frequency of OMOs may vary, not only between countries, but also in time based on the market conditions.

- *Some countries operate daily OMOs.* This can reflect several conditions: (i) the interbank market is shallow and therefore does not guarantee a smooth allocation of liquidity amongst the banks; (ii) the accuracy of the short-term liquidity forecasting framework is not ensured and the RR cannot absorb large liquidity shocks (absence of averaging or buffer small compared to the size of the shocks); (iii) market volatility is high and the central bank considers it a high priority to stabilize short-term interbank rates.

- *Some countries prefer to have less frequent OMOs (i.e., weekly).* When the interbank market allows for a smooth allocations amongst the banks of the overall liquidity, weekly OMOs provide an incentive for interbank market trading, therefore enhancing the signals the central bank gets from short-term market developments. The inclusion in the monetary policy toolbox of fine tuning OMOs (i.e., overnight maturity) allow the central bank to respond to large and un-planned liquidity shocks, or liquidity shocks at the end of the maintenance period.

An important consideration has to do with averaging provisions for reserve requirements. Such a framework will tend to diminish banks' recourse to the IRC (i.e., use of the standing facilities), since such provisions will tend to stabilize the demand for and provision of interbank funds. Conversely, the absence of reserve requirements or of averaging provisions, combined with the desire of the central bank to limit short-term interest rates volatility, will most likely result in a frequent use of the IRC by the banks, unless fine-tuning OMO are conducted to absorb short-term shock to liquidity conditions.

Options for Operationalizing an IRC

How to operate an interest rate corridor system (with or without the use of some form of formal policy rate) is a critical issue for countries with evolving monetary policy regimes. In all corridor systems, a short-term (overnight) lending standing facility is combined with a deposit standing facility to provide a corridor for market rates. Central banks may also carry out OMOs to influence the level of the market rate within the corridor. The options available to a central bank differ based on its liquidity forecasting capabilities; the overall development of money markets; and the overall monetary policy framework.

An important issue to consider when setting up a corridor relates to the suitability of introducing a formal policy rate. Introducing a policy rate can help strengthen policy signaling and guide interbank rates. However, certain conditions must be met for successful implementation.[33] In that regard, three configurations can be considered:

- *A corridor with no official policy rate*. This framework fits countries that rely on reserve money as operational target wanting to start transitioning towards an interest-rate based framework. The lack of a point policy rate may make it harder to stabilize interbank rates within the corridor. However, this configuration provides the flexibility to ensure that day-to-day (short-term) monetary operations are consistent with the (longer term) reserve money targets. This is because interbank rates can fluctuate within the corridor without being inconsistent with the stated (money-based) policy stance. Yet, persistent drifts under strict reserve money targeting should trigger a shift of the corridor in the same

[33] In particular, the central bank should successfully demonstrate its ability and willingness to consistently steer the interbank money market rate close to the policy rate.

direction, and under flexible monetary targeting a reassessment of the targeted longer-term reserve money path.

- *A floor system* where the standing deposit facility rate serves as the target for interbank rates and policy rate. Such a system reduces the need for fine-tuning operations (to steer market rates to the policy rate), making it attractive for countries with weak liquidity forecasting capacity and/or structural liquidity surpluses. However, floor systems also provide fewer incentives for banks to engage in interbank trading.

- *A mid-rate corridor system* where the policy rate is an announced target and can be used to price the OMO and to align interbank rate. This also involves a commitment to use OMOs to steer interbank rates close to the target. Mid-rate IRC systems are more demanding to operate than floor systems: they require better liquidity forecasting frameworks, more frequent OMOs, and supporting measures such as reserve requirements with reserve averaging to properly steer interbank rates and contain volatility.[2] However, they provide stronger incentives for interbank trading.

Maturity of the Standing Facilities

In most cases, an IRC is operated at the shortest maturity of the money market (i.e., overnight). This is the maturity where the central bank has a monopoly over the supply of liquidity, and the maturity where most of the interbank trading is taking place as banks try to constantly adjust their reserve position to the planned level in the face of unexpected liquidity shocks. On the last day of the maintenance of reserve requirement, the incentive is also to trade overnight, as banks often want to avoid the liquidity effect of longer term operations that carry over to the next period.

The Optimal Width of the IRC[34]

Setting the IRC too wide may hamper market development and the transmission of policy signals, and could lead to reserve hoarding. A wide corridor discourages reserve intermediation via the central bank and create incentives for banks to deal among themselves in the overnight interbank market, but can also result in relatively high day-to-day interest rate volatility. This high interest rate volatility, moreover, would complicate banks liquidity management, and could discourage trading by making it riskier to rely on the market to fine tune their reserve holdings and lead to reserve hoarding. Banks in low and lower-middle income countries (LLMICs) with opaque operational frameworks and high liquidity and counterparty credit risks tend to self-insure by hoarding liquid assets (excess reserves and other deposits at the central bank and short maturity securities) and by predominantly lending short term.[35]

Setting the corridor on the wide side, which would increase reduce incentives for overnight interbank trading, can be useful in the initial stages of the introduction of an IRC, so as to de-incintivise banks to rely on the central bank for their short-term liquidity management. Once the interbank market has become mature, and banks have in place an efficient treasury function, a narrow IRC can be useful to better anchori short-term rates, which can help developing the market for longer-term securities and thereby transmission along the yield curve. However, those considerations are of less concerns in countries with underdeveloped financial markets.

[34] See Bindseil and Jabłecki (2011) for a discussion of this.
[35] The theoretical model presented in Bindseil and Jabłecki (2011) suggest that when interbank markets break down because of (perceived) elevated counterparty credit risks, a narrower corridor would (i) lower lending, (ii) increase intermediation among households and corporations, but also (iii) reduce interbank trading and (iv) increase the use of the standing facilities.

High interest rate levels and the existence of other volatility absorption mechanisms could, however, justify having a wider corridor. Requiring banks to only meet reserve requirements on average over a sufficiently long maintenance periods and not daily can help the market absorb liquidity shocks. High interest rate levels may also justify a somewhat wider corridor because the lower relative volatility and because policy rate adjustments tend to be larger in absolute term the larger the interest rate level is.[36]

Across central banks the width of the corridor can go from 50 bps to above 200 bps. Some central bank experts suggest that 200 bps are optimal. The tradeoff is between interest rate volatility and market development (Bindseil 2011).

Implications of an IRC for Central Banks' Costs

Managing liquidity so that short-term rates are stable and aligned with the policy rate can be costly for the central bank when structural liquidity surpluses are large, but failure to do so could be costlier. Most of the structural surplus would have to be drained through OMOs under the conventional flexible-rate fixed-quantity and the fixed-rate full-allotment systems, or be remunerated at the deposit rate under the floor system. The associated interest cost can be high. Therefore, many central banks, at least during the transition, may have to rely on un-remunerated reserve requirements to reduce the structural liquidity surplus. Failing to do either would, however, result in below-target market rates and a looser-than-intended policy stance. Attempting to save costs by only periodically draining excess liquidity could be equally damaging to the economy. It would result in high liquidity risk and volatile interest rates, high risk premiums and a steeper yield curve, and weak policy transmission.

The costs may, however, be fairly similar irrespectively of the chosen configuration of the operational framework. In particular, providing an interest-earning deposit facility may be relatively less costly than one might assume. It does involve paying interest on banks precautionary demand for excess reserves—that is, the excess liquidity consistent with keeping market rates at target—but:[37]

- *Precautionary demand for overnight balances can be very low and the use of the deposit facility can be close to zero in a well-managed mid-corridor system*. Theory suggests that the precautionary demand should be zero when the target is set at the middle of the corridor and the distribution of payment shocks is symmetric with a zero mean. In that case, targeting a zero-overnight balance would minimize the bank's liquidity costs because the opportunity cost of being long or short would then be equal. It would thus in principle be possible to operate a mid-corridor system with a target for the aggregate overnight balance in the system at, or close to, zero, and some central banks have indeed done that.[38] It will, however, in practice be a need for some small excess reserves even in the best functioning mid-corridor system as banks that are long may not find it profitable to lend smaller amounts to banks that are short because of fixed trading costs and credit risks. Banks may, however,

[36] To minimize potential arbitrage activity when policy rate changes are expected, with reserve averaging, the corridor should be wider than the usual, or potential, change in the policy rate. Otherwise, banks could use the standing facilities to lend (borrow) in large volumes before the rate decision and borrow (lend) after the rate decision and still meet the reserve requirements. Aligning the maintenance period with the timing of policy rate decisions would help preventing such round-tripping.

[37] It could in principle be possible to only remunerate excess reserves above a certain minimum if precautionary demand for some reason is high.

[38] Bank of Canada operated with a zero targeted for a short period, and subsequently with a small positive target, for overnight settlement balances (Howard, 1998, with subsequent updates). Similarly, the Reserve Bank of New Zealand for a time operated with an overnight reserve target of only US$20 million, and Bank of England with an overnight reserve target of only £45 million.

prefer to keep these small amounts in their unremunerated reserve or settlement account as the administrative cost of transferring them to a remunerated account may be too high.

- *The cost of paying interest on excess reserves could in some cases be partly or fully offset by reduced OMO costs under a floor system*. In the case of a large structural surplus, the alternative to remunerate excess reserves at the policy rate would be to mop most of them up using longer-maturity OMO instruments. There should be a small but positive difference between the interest rate on these instruments and the interest on the deposit facility as long as the term premium is positive.[39] Similarly, in the case of a structural liquidity deficit, the funds placed in the deposit facility would first have to be injected trough central bank term-lending or OMOs. In either case, their maturity would typically be longer than overnight and carry a higher interest rate. Thus, compared to mid-corridor system, or a system without a deposit facility, that is well-managed and where excess reserves would be low, moving to a floor system could in fact result in increased central bank profit.[40]

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[39] In New Zealand, the spread between the policy rate and the 30-day bank bill averaged 17bps in 2010-14 when they operated a two-tier floor system. There can also be a persistent small positive spread between the central bank deposit rate and the overnight interbank rate under a floor system. In the case of Norway, interbank rates were on average around 20-30 bps above the deposit rate in 2010-2011 when they operated a conventional floor system.

[40] See Goodfriend (2002) for an early discussion of this in the case of the US, and Keister, Martin, and McAndrews (2015) for a fuller theoretical discussion.

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Annex VI. Key Features of a Liquidity Monitoring and Forecasting Framework

Objectives of Liquidity Forecasting

The main purpose of producing short-term liquidity forecasts is to generate information which allows the central bank to smooth changes in liquidity conditions. The purpose of smoothing fluctuations in liquidity demand and supply is to create stable liquidity conditions and steer the central bank's operating target. These are conditions to effectively conduct monetary policy, since they help market participants to distinguish between changes in the monetary policy stance and temporary "noises." Clear signaling reduces market participants' uncertainties about the central bank's policy intentions, thereby contributing to efficient monetary policy transmission. Stable liquidity conditions facilitate also banks' liquidity management: by moderating volatility and uncertainty, liquidity management costs are reduced and settlement risks limited.

Liquidity forecasting is the process of centralizing all relevant information that determines the future stance of liquidity without central bank activities. Upon these projections, central banks decide on how much liquidity they should add or withdraw from the system. It is, therefore, a process that precedes the implementation of liquidity management. It is important to note that central banks will want to conduct liquidity forecasts no matter whether their operating target is an interest rate or a quantity (monetary base or bank reserves) target. The liquidity forecasting process is the same in both cases, but the use of the information (how a central bank utilizes its policy instruments) differs.

Liquidity Forecasting and Monetary Policy Instruments

Central banks that conduct monetary policy through direct monetary policy instruments have no immediate need for liquidity forecasts. Without market forces at play, a central bank exerts direct control over the liquidity situation by controlling interest rates, directing credit, or setting bank-to-bank credit ceilings. When moving from direct to market-based indirect monetary policy instruments, it is crucial to develop a thorough liquidity forecasting framework, including its institutional and organizational setup.

Certain indirect monetary policy instruments can contribute to reducing fluctuations in liquidity conditions. Reserve requirements with averaging provisions and standing facilities can limit interest rate volatility. Reserve averaging acts as a buffer to changing liquidity conditions by allowing banks to over- and under fulfill reserve requirements during the maintenance period. The interest rate elasticity of demand for reserves tends to be higher in systems with reserve averaging, thereby reducing the degree of fluctuations in money market rates from liquidity supply shocks.

In the context of an interest rate corridor (IRC) standing facilities set an upper and lower boundary for interbank money market rates with the same maturity. A narrow IRC limits market volatility fluctuations, but has several disadvantages: (i) liquidity is injected or absorbed at the initiative of banks rather than the central bank; (ii) interbank activity is discouraged, with negative consequences for market deepening; and (iii) the central bank's ability to extract information on liquidity conditions and banks' expectations from the money market is reduced. Most interest rate targeting central banks therefore conduct their main operations through a policy instrument which is at their initiative; they aim at an IRC that is wide enough to encourage interbank transactions. Liquidity forecasting then serves to consolidate information on the expected liquidity conditions and to avoid unwarranted excessive volatility.

Liquidity Forecasting and the Payment System

Another factor relevant to the central bank's liquidity forecasting and liquidity management process is the payment system, the features of which affect the demand and the effective supply of bank reserves. If the payment system is undeveloped and inefficient, the banking system typically holds large, often highly volatile amounts of excess reserves. Moreover, in some cases an inefficient payment system goes along with large and unstable reserve floats. Both deficiencies complicate liquidity forecasting, can weaken the central bank's control on the liquidity supply, and hence hamper monetary management. The quality of liquidity forecasts will increase with the efficiency of the payment system.

Determinants of Liquidity

The liquidity forecasting exercise involves an analysis of the projected changes in the main items of the central bank's balance sheet. The main components of banks' demand for liquidity and the autonomous supply of liquidity (i.e., all supply factors that are in the short run beyond the control of the central bank) can be derived from the central bank balance sheet. Based on the projected gap between the liquidity demand and autonomous supply the central bank can decide on the level of liquidity to be added to or withdrawn from the market. The autonomous factors of liquidity supply comprise: (i) net foreign assets; (ii) net position of the government with the central bank; (iii) currency in circulation; and (iv) other items net. Liquidity demand consists of demand for required and excess reserves. To forecast the demand and autonomous supply of liquidity, one has to identify their determinants and decide on the appropriate forecasting techniques.

Very often the net position of the government with the central bank accounts for the most significant changes in the autonomous liquidity supply. To ensure a high degree of overall forecast accuracy, it is therefore crucial that the government cooperates closely with the central bank in providing on a timely basis all information available on government transactions that affect the liquidity supply (i.e., cash flow projections on revenues, expenditures and funding instruments). In countries with heavily managed exchange rates and large and volatile capital flows, significant changes in liquidity supply can also result from changes in net foreign assets. In the very short run, however, variations in net foreign assets are normally known with certainty, since settlements of foreign exchange typically lag transactions by two days. Currency projections can under certain circumstances also underlie large uncertainties—for example, after a period of high inflation.

Liquidity Monitoring and Forecasting Framework

A clear and efficient organization of the liquidity forecasting process is essential to produce accurate and timely projections. Liquidity forecasts should be arranged as a rolling process under which every new piece of information is promptly incorporated. A useful way to organize the process is to assign the forecasting responsibility to a dedicated unit in the monetary operations department to ensure a close link between liquidity forecasting and liquidity management. The unit should be responsible for: (i) communicating with the different information sources and ensuring the timely receipt of the data; (ii) supervising the consistency of the forecasted components; (iii) producing an overall liquidity projection which is regularly (daily) updated; and (iv) assessing forecasting errors.

Liquidity forecasting horizons and forecasting intervals differ with institutional setups. In systems with reserve requirements, the forecasting horizon should comprise at least the current maintenance period; in systems without reserve requirements the horizon should comprise at least the time period between two discretionary monetary interventions. Optimally, liquidity forecasts should be at daily intervals. If data is not available at this frequency, the central bank might initially start producing forecasts at weekly intervals.

Conceptual Background

The demand and supply of liquidity can be derived from the balance sheet of the central bank. Simplifying a typical balance sheet, by netting the external position of the central bank and the position against the government, and summarizing all other assets and liabilities (other items net/net domestic assets) results in the following (Table D.1):

Table D.1 Stylized Balance Sheet of the Central Bank

Assets	Liabilities
Net foreign assets	Currency in circulation
Net lending to banks/OMOs 1/	Bank reserves (required and excess)
Other items net/Net domestic assets	Net position of the government 2/

1/ In countries where there is a structural excess liquidity, the net "policy" position with banks can be on the liability side, for instance when the central bank absorbs liquidity by issuing its own securities.
2/ In countries where the central bank is allowed to provide direct credit to the government, the net position of the government may appear on the assets side.

Source: Mission's elaborations.

The demand for bank reserves can be divided into the demand for required reserves and excess reserves:

Demand for bank reserves = Required reserves + excess reserves

The demand for bank reserves is primarily determined by the institutional relationship between the central bank and the banking system, the degree of money market development, the variability and timeliness of payments, and the bank's expectations about the central bank's liquidity management. Important components are the characteristics of reserve requirements, the design and efficiency of the payment system, and access to central bank credit. It is important to note that identifying determinants for short-run fluctuations in liquidity demand is the main purpose of the day-to-day liquidity forecasting exercise. Institutional factors are more relevant for the long-run level of liquidity demand. They must, particularly, be taken into account in case of structural changes.

The liability side comprises the two uses of base money—currency and bank reserves—which are mirrored by the four sources of base money creation on the asset side. The supply of bank reserves can thus be derived as:

Supply of bank reserves =	Net foreign assets	}	Autonomous liquidity position
+	net position of the government		
+	other items net		
–	currency in circulation		
+	net lending to banks/OMOs	}	Policy position

Source: Mission's elaborations

The first four items contain all factors that are beyond the control of the central bank in the very short run or—more generally—not related to monetary policy actions. These items are, therefore, called the "autonomous liquidity position."[41] In contrast, the central bank's "policy position" which comprises central bank direct lending to banks and net lending through open market operations (OMOs) is under the immediate control of the central bank. The supply of bank reserves is defined as the sum of the autonomous liquidity position and the policy position. To steer the supply of liquidity according to its objectives, the central bank needs adequate information on the autonomous factors of liquidity supply.

By comparing the forecasted demand and the projected autonomous factors of the supply of bank reserves, the central bank receives an estimate of the excess supply of (or excess demand for) liquidity that results if the central bank does not intervene. Based on this estimate, the central bank decides how to adjust its net policy position to achieve the desired liquidity conditions. The net policy position accounts for policy operations that have been carried out in the past and come into effect later like the redemption of repo or reverse repo agreements, maturing refinance credit and the like.

In general, the way in which a central bank adjusts its policy position to disequilibria depends on the underlying operating target, which can be a quantity target (reserve money or bank reserves) or an interest rate target. In addition, the time horizon of the operating target needs to be considered. A central bank can, for example, target the overnight rate or reserve money on a daily basis or aim at a certain weekly or monthly path and allow for daily deviations from the target path.

- *If the central bank targets the overnight interest rate*, it nevertheless still uses the projected daily excess supply or demand reserves to define the amount of liquidity to withdraw or inject daily. The relationship is less strict if the central bank steers the overnight interest rate within a corridor or has reserve requirements with averaging provisions in place. Then, the central bank only has to react to cumulated disequilibria over the entire maintenance period, since the system of reserve requirements works as a stabilizer. In contrast, if the central bank operates without reserve requirements, or without reserve averaging, it may then need to manage liquidity conditions more on a day-to-day basis.

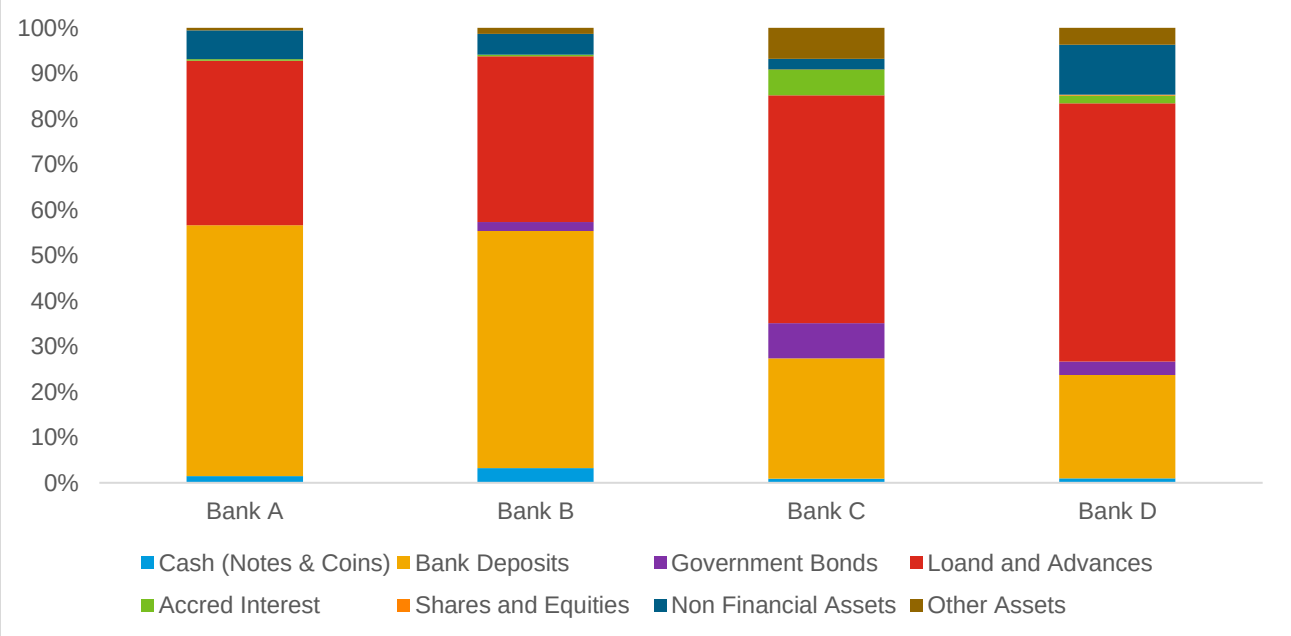
- *In the case of quantitative (reserve money or bank reserves) operating targets*, the central bank adjusts the supply of bank reserves so that it confirms with the target level. For all remaining excess demand or supply, the central bank would allow the interbank money market rate to adjust. However, if the demand for bank reserves is interest inelastic, as might be the case at the end of the reserve period, the central bank would have to accommodate the demand to avoid disturbances within the financial system even if this leads to short-term deviations from the quantitative operating target.

[41] NFA are categorized as an autonomous item regardless of the exchange rate regime. This assumes that under flexible exchange rates the central bank does not intervene in the very short run and NFA are, therefore, constant. On the other hand, under fixed exchange rates NFA changes are outside the control of the central bank as it is committed to intervene to hold the exchange rate stable.

Annex VII. Balance Sheet Composition

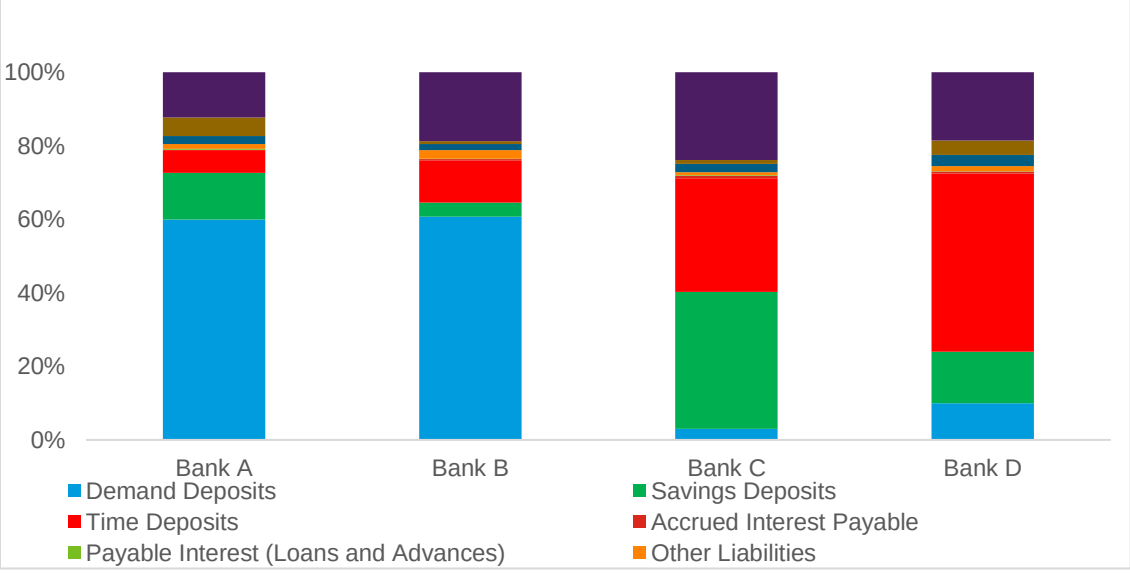
NRBT asset and liability distribution is uneven with the share dominated by Bank A and Bank B. The vast majority of NRBT assets are bank deposits and loans and advances. On the liability side, this is predominantly composed of demand deposits (see Figure E.1 and Figure E.2).

Figure E.1 NRBT Asset Distribution



Source: NRBT.

Figure E.2 NRBT Liabilities



Source: NRBT.

Annex VIII. Fixed-income Security Valuation and Haircut Methodology

A. Fixed-income Security Valuation

Theoretical valuation is used to price collateral when no reliable market prices are available. In the case of fixed income securities, central banks rely on yield curves to compute a price for a hypothetical zero-coupon used for discounting cashflow payments.[1] The idea is based the arbitrage-free theory with the rational that the discount factor for a specific asset type can be inferred from the observed market prices of assets with the same characteristics. Calibrating a yield curve consists in disciplining parameters of an analytical model by means of observed bond market prices.

Formally, if $z_{Bond}(t)$ is zero rate at term t, C the coupon rate and $t_1, \dots, t_N$ the coupon dates, the bond theoretical price is given by:

$$P_B = \sum_{i=1}^{N} P_{\text{risky}} P(0, t_i) C + P_{\text{risky}}(0, t_n) \text{ , where } P_{\text{risky}}(0, t) = e^{-t * z_{Bond}(t)}$$

The zero rate $z_{Bond}(t)$ is the derived from the sovereign curve of the Government of Namibia, which is calibrated as below.

A Model for Yield Curve Calibration

Let $P^M(B_i) \dots P^M(B_n)$ be the observed market prices of the bonds $B_1, \dots, B_n$ and $P_{B1} \dots P_{Bn}$ their theoretical values.

Let now write $P(B; z)$ to denote a function which returns the theoretical price of bond B given a yield curve z. The vector of theoretical prices $(\vec{t})$ is given by:

$$\vec{t} = \begin{pmatrix} P(B_1; z) \\ \vdots \\ P(B_n; z) \end{pmatrix}.$$

Let $\vec{m}$ denote the vector of the bonds' market prices, with:

$$\vec{m} = \begin{pmatrix} P^M(B_1) \\ \vdots \\ P^M(B_n) \end{pmatrix},$$

Then the vector of absolute[2] pricing errors $(\overrightarrow{\epsilon_A})$ is defined by:

$$\overrightarrow{\epsilon_A} = \vec{t} - \vec{m}.$$

[1] See also "Zero-coupon yield curves estimated by central banks" under Introduction (bis.org).

[2] Here, "absolute" is to be understood in the sense of the actual value of the difference, and not in the sense of "absolute value of the difference."

Following these notations, the vector of relative pricing errors ($\overrightarrow{\epsilon_R}$) can be written as:

$$\overrightarrow{\epsilon_R} = \begin{pmatrix} (P(B_1; z) - P^M(B_1))/P^M(B_1) \\ \vdots \\ (P(B_n; z) - P^M(B_n))/P^M(B_n) \end{pmatrix}.$$

If $\overrightarrow{\epsilon_{Sq}}$ is the vector of squared relative pricing errors, that is:

$$\overrightarrow{\epsilon_{Sq}} = \begin{pmatrix} \epsilon_{R,1}^2 \\ \vdots \\ \epsilon_{R,n}^2 \end{pmatrix}.$$

Calibrating the yield curve consists of minimizing, the cost function F measuring the squares of sum of squared relative pricing errors:

$$F(z) = \left\| \overrightarrow{\epsilon_{Sq}}^T \right\|,$$

Where T is the transposition operator. That is finding $\hat{z}$ so that $\hat{z} = \arg\min_z F(z)$. Nelson-Siegel types of yield curves are used to assume a parametric form for the yield curve z.

Among Nelson-Siegel models are:

(1) The original Nelson-Siegel (NS) yield curve parametrical function

$$\boldsymbol{NS(\tau; \beta_0, \beta_1, \beta_2, \lambda_0) = \beta_0 + \beta_1 \cdot \frac{1 - e\left(-\tau/\lambda_0\right)}{\tau/\lambda_0} + \beta_2 \cdot \left(\frac{1 - e\left(-\tau/\lambda_0\right)}{\tau/\lambda_0} - e\left(-\tau/\lambda_0\right) \right)},$$

Where τ is a given time interval and $(\beta_0, \beta_1, \beta_2, \lambda_0)$ are given parameters.

Table F.1 Interpretation of the Nelson-Siegel Parameters

Parameter	Interpretation
$\boldsymbol{\beta_0}$	The parameter is independent of time to maturity, and so it is often interpreted as the long-run yield level.
$\boldsymbol{\beta_1}$	The parameter is weighted by a function of time to maturity. This function is unity for λ = 0 and exponentially decays to zero as λ grows. Hence, the influence of this parameter is only felt at the short end of the curve.
$\boldsymbol{\beta_2}$	The parameter is weighted by a function of λ, but this function is zero for λ = 0. As λ grows, it first increases and then decreases back to zero. It thus adds a hump to the curve.
$\boldsymbol{\lambda}$	The parameter affects the weight functions for β_1 and β_2; in particular it determines the position of the hump.

Source: Mission's elaborations.

(2) The function's monotone form obtained by applying the constraint:

$$\beta_2 = -\beta_1,$$

Such that:

$$NS(\tau;\beta_0,\beta_1,-\beta_1,\lambda_0) = NS_{monotone}(\tau;\beta_0,\beta_1,\lambda_0) = \beta_0 + \beta_1 \cdot e\left(-\tau/\lambda_0\right).$$

(3) The six-parameter Nelson-Siegel-Svensson model:

$$\boldsymbol{NS(\tau;\beta_0,\beta_1,\beta_2,\beta_3,\lambda_0,\lambda_1) = \beta_0 + \beta_1 \cdot \frac{1-e\left(-\tau/\lambda_0\right)}{\tau/\lambda_0} + \beta_2 \cdot \left(\frac{1-e\left(-\tau/\lambda_0\right)}{\tau/\lambda_0} - e\left(-\tau/\lambda_0\right)\right)}$$
$$\boldsymbol{+\beta_3 \cdot \left(\frac{1-e\left(-\tau/\lambda_1\right)}{\tau/\lambda_1} - e\left(-\tau/\lambda_1\right)\right)}$$

B. Haircut Methodology

Haircuts are a key risk mitigation measure calibrated to achieve "risk equivalence," which results in the central bank facing the same risk across all asset classes.[1] Haircuts must account for liquidity, market and credit risks with *add-ons* for additional specific risk, such as maturity risks, exchange-rate risk, valuation risk (model uncertainty) and mobilization risk (if assets are difficult to gain title to and liquidate). Box F.1 provides a high-level description to calibrate haircuts.

Box F.1 A Primer on Haircut Estimation

In case of a counterparty default, the submitted collateral would need to be sold. This typically takes some time (i.e., *T2L > 0*). In the specific case of less liquid markets this is even more relevant. To reduce the likelihood of losses, a certain percentage *(h)* of the collateral value is deduced when accepting it (i.e., 'cash equivalent' = *(1 – h) ´ P_0*, where *P0*, stands for the value of the collateral before applying any risk mitigation measures).

The haircut *(h)* should depend on the price volatility of the relevant asset and on the expected *T2L.* For example, one may set the haircuts to cover 99 percent of the price changes within the assumed orderly liquidation time of the respective asset type. An additional haircut (i.e., add-on) may address uncertainty regarding the initial value of the asset.

To illustrate the calibration of haircuts to achieve risk equivalence, consider two assets, asset *A* and asset *B*. Assume asset *A* is traded regularly on a market with transparent prices, such that every day a true market price can be established—a price without valuation uncertainty and an orderly liquidation can be done immediately without negative implications for its value. On the contrary, asset *B* is assumed not to be traded regularly on markets and, thus, a theoretical value needs to be calculated every day. Moreover, for asset *B*, an orderly liquidation of four weeks is assumed and specific risk factors (e.g., spread and credit risk can negatively influence prices over *T2L*).

The uncertainty of the liquidation value of asset *A* is thus driven by only one factor, namely the general market price risk within a one-week liquidation period driven by the volatility, at the horizon, of the risk-free yield curve. Let's assume that this risk is normally distributed, and that the related one-week price change is $N\left(0,\sigma_{M,A}^2\right)$, where *M* is the index that stands for market risk and *A* for the asset. By contrast, the uncertainty of the liquidation of asset *B* is driven by three factors, which we assume to be normally distributed and independent of each other. The *T2L* for asset *B* is 4 weeks, and the four-week price change due to market risk follows a $N\left(0,\sigma_{M,B}^2\right)$.

The uncertainty on the true value of the asset at the moment of valuation is $N\left(0,\sigma_{V,B}^2\right)$, where *V* stands for 'valuation;' the value uncertainty stemming from spread and migration risks during the liquidation period is

[1] European Central Bank. 2017. "The Eurosystem collateral framework explained."

$N(0, \sigma^2_{S,B})$, where *S* stands for 'spread and migration'. Hence, the total uncertainty on liquidation values of asset A will be $N(0, \sigma^2_{M,A})$, where of asset B will be $N(0, \sigma^2_{M,B} + \sigma^2_{V,B} + \sigma^2_{S,B})$, assuming that the risk factors are uncorrelated. For simplicity, call $\sigma^2_{T,i}$ the variance of total liquidation value uncertainty for asset $i = A, B$.

If the risk tolerance of the central bank has been defined as "preventing with 99 percent probability that the asset value of the liquidation falls short of the last valuation post-haircut", then haircuts need to be set for each asset at $\sigma_{T,i}\Phi^{-1}(0.01)$, where $\Phi(.)$ is the cumulative standard normal distribution. For example, if $\sigma^2_{M,A} = 1\%$, and $\sigma^2_{M,B} = 4\%$, $\sigma^2_{V,B} = 2\%$, and $\sigma^2_{s,B} = 2\%$, then the haircut array that established risk equivalence is $H = \{h_1; h_2\} = \{2.33\%; 6.60\%\}$.

The final calibration of haircuts could also benefit from additional market risk intelligence (i.e., complementary information provided by specialized entities), not to mention a thorough discussion among the experts involved in the process. Ideally, a comprehensive methodology should be developed and approved by the Board of the central bank and reviewed periodically.

Note: This box draws heavily on "Monetary Policy Operations and the Financial System" (pp.116-117), by U. Bindseil, 2014. Further detail on the methodology currently used for the haircut calibration at the Eurosystem could be found in "The valuation haircuts applied to eligible marketable assets for ECB credit operations," ECB OP 312/2023, by M. Adler, G. Camba-Méndez, T. Džaja, A. Manzanares, M. Metra, and G. Vocalelli.

Source: Mission's elaborations.

The approach outlined (Box F.1) uses the Value-at-Risk (VaR) methodology which is likely not workable in Tonga because of the paucity of pricing. The alternative approach requires a relative assessment of standalone risk components. Table F.2 below illustrates how the methodology could be operationalized. It is a relative risk assessment among asset classes with respect to each risk dimensions. The attributed values will depend on the NRBT risk appetite or could be set according to properly chosen international benchmarks. Considering the aggregation of the balance sheets, NRBT Notes are the most liquid securities; liquidity risk is set to zero. Liquidity risk then increases from government securities, Government Loans, Loans and Advances (corporate and households), Shares and Equities and Non-financial Assets. The same logic applies for market and credit risk, reflecting asset volatility and debtor-default risk respectively. The second-last row displays the array of applicable adds-on, namely residual maturity, exchange rate, theoretical valuation, and mobilization risks. For government securities for example, maturity add-ons can increase by 2.5 percent with the maturity brackets. By the same token, mobilization risk for government securities is zero.

Table F.2 Tentative Standalone Risk Assessment

Risk	NRBT Notes	Govt securities	Govt Loans	Loans and Advances	Share and Equities	Non-financial Assets
Liquidity	0	5	7.5	10	15	20
Market	0	2.5	2.5	2.5	20	10
Credit	0	2.5	2.5	7.5	0	5
Add-ons (Mat, Ex, Theo, mob)		(2.5, 0,2.5,0)	(2.5,0,0,0)	(5,0,0,5)	(0,0,10,0)	(5,0,5,15)
Haircuts	0	10 - 12.5	15	30	45	60

Source: Mission's elaborations.