Institutional Frictions and Monetary Transmission: Overcoming Bank Oligopsony Power and the ‘Lazy Bank’ Trap in a Small Open Economy

Frita Amrita*

23rd February 2026

Abstract

Standard macroeconomic models assume frictionless monetary transmission, which fails in emerging markets due to deep institutional rigidities. This paper develops a framework to analyze how central banks overcome systemic market failures through institutional design, examining Bank Indonesia’s transition to tradable, collateralized central bank securities (SRBI). By micro-founding monetary operations, the paper exposes two critical organizational frictions. First, the interbank market is modeled as a “Core-Periphery” topology where systemic “Whale” banks exert oligopsony pricing power. By hoarding liquidity, they create a “Liquidity Swamp” and an Interbank Decoupling Wedge that neutralizes policy signals. Second, the paper identifies an organizational trade-off driven by regulatory arbitrage: the Credit Crowding-Out Wedge. The model defines a “Policy Effectiveness Threshold”: issuing securities beyond systemic leverage capacity triggers a “Lazy Bank Trap,” cannibalizing private investment. Calibrated simulations prove this institutional design resolves these frictions, reducing peak output contraction by ∼0.50 percentage points and yielding substantial welfare gains.

Keywords: Monetary Transmission, Institutional Frictions, Liquidity Swamp, Open Market Operations, Lazy Bank Trap, Market Microstructure.

JEL codes: E43, E52, E58, F41, G21.

*Corresponding author. University of Reading, Department of Economics. Email: f.amrita@pgr.reading.ac.uk. I am grateful to Professor Alexander Mihailov, Professor Christos Mavrodimitrakis, and Bank Indonesia for their support.

Reader's Guide

This section presents a **streamlined exposition** of the Hierarchical Integrated SOE Model. While the core logic and simulation results are preserved, the technical "math-to-code" traceability and institutional specifications are detailed in the following appendices:

- **Appendix A (Notation & Audit):** Consolidated master table of variables, symbols, and structural equation mapping. Includes the **Model Determinacy and Stability Audit** confirming the Blanchard-Kahn conditions and stationarity of the hierarchical system.
- **Appendix B (Strategic Foundations):** Formal mathematical derivations of the Strategic Loss Function, the **Augmented IS Curve**, and the **Trilemma Multiplier** ($\hat{\Omega}$). Details the endogenization of the **Debt-Elastic Risk Premium** and includes a Modified Poole Analysis for instrument choice under volatile capital flows.
- **Appendix C (Operational Mechanics):** Formal derivation of the **Interbank Decoupling Wedge** (τ_t) and its structural link to the **Sterilization Power** (ϕ_s), including its forensic calibration to the Indonesian "Liquidity Swamp."
- **Appendix D (Banking Microfoundations):** Theoretical proof of the S-Curve liquidity demand via the Newsvendor framework and the derivation of the **Credit Crowding-Out Wedge** ($\hat{\Gamma}$) through "Whale Bank" asset-side optimization. Includes the Dual-Market Sterilization Matrix and Strategic Capacity Preservation logic.
- **Appendix E (The Separation Principle):** Formal mathematical proof of the independent controllability of the exchange rate and domestic credit stance, detailing the boundary breakdown at the Leverage Capacity Threshold.
- **Appendix F (Legal Mandate):** Summary of the **UU P2SK 2023**, providing the statutory basis for the dual mandate and the "Integrated ITF" approach to the strategic trilemma.
- **Appendix G (Instrument Evolution):** A structural comparison between the legacy SBI and the new **SRBI** framework, detailing the transition from passive absorption to pro-market, asset-backed sterilization.
- **Appendix H (SRBI Operations):** Technical detail on the **Variable Rate Tender (VRT)** auction mechanism, the **Stop-Out Rate (SOR)** logic, and the discretionary allocation upsizing used to quarantine excess liquidity.
- **Appendix I (Sustainability):** Quasi-fiscal solvency analysis for SRBI and SVBI cost coverage. Details the **Collateral Matrix** and the structural hedge mechanics $(1 - \varphi^{FR})$ protecting the central bank's balance sheet integrity.
- **Appendix J (Calibration):** Final reference master table for structural parameters, persistence coefficients, and operational thresholds $(\lambda, \bar{S})$.

1 Introduction

Monetary policy in a Small Open Economy (SOE) is shaped by a persistent tension between strategic macroeconomic stabilization and micro-operational constraints. For emerging markets such as Indonesia, this tension has become increasingly acute amid a volatile Global Financial Cycle and aggressive monetary tightening by reserve-currency jurisdictions. Central banks must navigate the well-known "Impossible Trinity"—balancing exchange rate stability, monetary autonomy, and capital mobility—while operating within domestic financial systems characterized by structural excess liquidity. This paper emphasizes the hierarchical nature of policy execution, linking macro-objectives to the institutional design of market operations.

Standard New Keynesian models typically assume a perfect "first stage" of transmission, in which the central bank's policy rate maps one-to-one onto market interest rates through frictionless arbitrage. In practice, this assumption breaks down when financial systems are structurally saturated by what we term a "Liquidity Swamp." In Indonesia, this operational challenge manifests as a structural failure at the first stage of transmission. Under conditions of structural liquidity surplus—estimated at over IDR 800 trillion—the sensitivity of the interbank market rate to the policy signal collapses. We call this "broken plumbing." In this regime, the interbank rate detaches from the policy target and clusters around the deposit facility floor, reflecting "transmission blindness." From an organizational perspective, this represents a breakdown in the signaling mechanism between the monetary authority and the banking hierarchy.

The post-pandemic landscape highlights a critical "missing link" in the literature: the operational transmission from strategic targets to market reality. Macro-strategic models derive stabilization outcomes under frictionless implementation, treating the banking sector as a passive conduit. By contrast, micro-implementation studies provide detailed accounts of reserve management but rarely embed these mechanisms within a general equilibrium framework. This paper bridges this gap by introducing the **Interbank Decoupling Wedge (τ_t)**, which arises endogenously from bank behavior. Banks manage reserve demand within a fragmented market where frictions prevent efficient redistribution, causing the interbank rate to "hug" the deposit facility floor. We model this market as a tiered Core-Periphery network where systemic "Whale" banks exert oligopsony power over liquidity pricing, creating a persistent organizational barrier to transmission.

Operational models would predict convergence to the deposit facility rate (i_t^{DF}). In Indonesia, however, a persistent Segmentation Frictions Spread (δ_t) prevents the market rate from reaching this theoretical floor. We formally define the Effective

Lower Bound (ELB) in the Liquidity Swamp as:

$$i_t^{PUAB} = i_t^{DF} + \delta_t \quad \text{for } R_t \geq \lambda, \tag{1.1}$$

where δ_t represents the "mushy floor" created by oligopsonistic core banks and structural rigidities. To address this, Bank Indonesia has introduced pro-market instruments: **Bank Indonesia Rupiah Securities (SRBI)** and **Foreign Currency Securities (SVBI)**. These instruments are not merely tactical adjustments; they represent an institutional redesign of the central bank's liabilities to bypass the interbank blockade, creating tradable scarcity rents that re-establish the interest rate floor.

To the best of our knowledge, this is the first DSGE framework to explicitly model the transmission mechanism of SRBI and SVBI as a contractual innovation. Unlike previous literature which treats sterilization as a passive absorption of excess liquidity, we model SRBI as an active "Twist" instrument that endogenously interacts with bank portfolio preferences, creating a novel "Lazy Bank" transmission channel driven by regulatory arbitrage and organizational risk-weighting incentives.

This paper contributes to the literature by formally linking strategic policy design to organizational frictions. We introduce the Interbank Decoupling Wedge (τ_t) and the **Credit Crowding-Out Wedge (Γ_t)**, which arises from asset-side substitution: as banks hoard zero-risk-weighted SRBI to optimize their Risk-Weighted Asset (RWA) profiles, the supply of private credit is cannibalized. If severe, this friction can induce a **"Lazy Bank Trap"**, where the organizational preference for safe central bank paper over risky real-economy lending undermines stabilization benefits. By quantifying the **Surgical Window**—the corridor between liquidity saturation and credit crowding-out—this paper provides a framework to balance these trade-offs while maintaining quasi-fiscal sustainability.

Ultimately, this hierarchical model contributes a robust institutional framework for emerging market central banks. It demonstrates how market design complements strategic policy, mitigating welfare loss by aligning the incentives of systemic financial organizations with the goals of the monetary authority.

2 Related Literature and Institutional Framework

To align with top-tier academic standards, this literature review adopts a thematic narrative that emphasizes structural gaps in existing theory rather than a genealogical listing of contributions. The theoretical architecture of this dissertation is situated at the intersection of open-economy macroeconomics, monetary operations, and banking-sector microstructure. While standard New Keynesian models often treat policy implementation as a frictionless "black box," the Indonesian experience—characterized by persistent excess liquidity and the deployment of explicitly pro-market instruments such as SRBI and SVBI—requires a granular re-examination of the full transmission hierarchy. Accordingly, the literature is organized along hierarchical stages of transmission, moving from frictionless benchmarks to specific micro-frictions of Emerging Markets (EMs).

2.1 The Frictional MTM: Literature Synthesis

Standard MTM theory assumes a linear progression from policy rate to market rates. However, the Indonesian experience identifies a structural breakdown at the very start of the transmission chain. Following Vioh and Nugraha (2022) and Harmanta and Purwanto (2020), we define this as a **"First-Stage" failure**: where the central bank's price signal is absorbed by the **Liquidity Swamp** before it can influence the interbank rate. By merging the institutional realities of Bank Indonesia's balance sheet with traditional NK theory, this dissertation focuses exclusively on the implemented wedges (τ_t and Γ_t) as the relevant transmission frictions, discarding generic wealth or Tobin's Q channels that remain secondary in a bank-dominated, high-liquidity environment.

To establish the structural necessity of the *Hierarchical Integrated SOE Model*, we categorize the existing body of knowledge into three distinct generations of thought.

2.1.1 The Strategic Layer: From Trilemma to Hierarchical Defense

The theoretical architecture of this dissertation is situated at the intersection of open-economy macroeconomics and banking microstructure. While the standard Small Open Economy New Keynesian (SOE-NK) framework (Galí and Monacelli, 2005; Monacelli, 2005) assumes perfect capital mobility and a single policy rate that simultaneously stabilizes inflation and satisfies external balance, we move to a Frictional MTM paradigm. This benchmark is challenged by Rey (2013), who argues that global financial cycles collapse the classical "Impossible Trinity" into a "Dilemma," whereby monetary autonomy is constrained regardless of exchange rate flexibility.

To justify the multi-instrument approach required to navigate this dilemma, we draw on the cornerstone of the IMF's *Integrated Policy Framework* (IPF). As demonstrated by Adrian, Tobias and Erceg, Christopher J and Kolasa, Marcin and Lindé, Jesper (2020), the interest rate alone is an insufficient instrument for small open economies (SOEs) facing deep financial frictions. By introducing specific blocks for FX intervention and capital flow management, the IPF logic proves that multiple targets require a layering of instruments.

This thesis extends the SOE-NK framework by embedding the debt-elastic interest rate mechanism of Schmitt-Grohé and Uribe (2003) into this strategic environment. We depart from the standard Taylor Rule paradigm by introducing a hierarchical defense structure: domestic inflation and the output gap are stabilized via the strategic policy signal, while external parity conditions are satisfied through market-rate adjustments induced by quantity instruments (SRBI and SVBI). This dual-track configuration—operationalized as the "Interest Rate Twist"—aligns with the formalized IPF for emerging economies (Basu et al., 2020; Warjiyo, 2023). It allows the central bank to stabilize the exchange rate without resorting to pro-cyclical hikes in the domestic policy rate, providing a structural resolution to Rey's Dilemma.

2.1.2 The Tactical Layer: Operational Segmentation and the S-Curve

At the operational stage, the analysis is anchored in the inventory-theoretic foundations of Poole (1968), which characterize reserve demand as a Newsvendor Problem. In modern systems, this logic underpins the **Separation Principle** articulated by Keister et al. (2008) and Borio and Disyatat (2010), whereby the quantity of reserves can be divorced from interest rate targets in floor systems. However, this principle is compromised when markets are saturated by excess reserves (Alper and Yang, 2016; Bech and Keister, 2017).

The modeling of this tactical management finds its academic precedent in Benes, Jaromir and Berg, Andrew and Portillo, Rafael A and Vavra, David (2015), who explicitly incorporate the central bank's balance sheet and the issuance of sterilization bonds into a New Keynesian framework. They prove that the supply of these bonds endogenously affects the market interest rate via balance sheet effects. We move this logic forward by explicitly modeling the non-linear "S-Curve" and the saturation threshold (λ), providing a micro-foundation for how quantity issuance specifically repairs the transmission floor.

A significant strand of the literature on Indonesia's monetary and financial stability has focused on the role of quantity-based macroprudential tools. Notably, Chawwa (2021) establishes a robust New Keynesian DSGE framework for Indonesia to evaluate the efficacy of the Statutory Reserve Requirement (GWM) and the Liquidity Coverage Ratio (LCR). Their findings demonstrate that these regulatory quantity constraints are essential for dampening pro-cyclicality.

However, we argue that the Separation Principle is structurally compromised in Indonesia's Liquidity Swamp, necessitating an extension of the quantity-based logic of Chawwa (2021) from the regulatory stage to an active hierarchical operational stage. Drawing on Bindseil (2004), the transition from a corridor to a floor system is modeled as a non-linear shift in the reserve supply function. Crucially, transmission is distorted by segmented interbank markets and tiered network topologies (Craig and Von Peter, 2014; Afanasieva et al., 2024). This segmentation generates an endogenous Interbank Decoupling Wedge (τ_t), reflecting the oligopsony power of systemic "Whale Banks," requiring the deployment of SRBI and SVBI to bridge the gap and restore policy pass-through.

2.1.3 The Operational Layer: Banking Micro-foundations and the Trap

To bridge market rates and the real economy, the sector is micro-founded using the Monti–Klein framework (Klein, 1971; Monti, 1972), augmented with endogenous credit spreads (Cúrdia and Woodford, 2010). We utilize the foundational logic of Gerali et al. (2010), who introduced a distinct banking sector into DSGE modeling to demonstrate how bank leverage and capital constraints create a wedge between policy and lending rates.

Building on Bernanke and Blinder (1988), the model incorporates an asset-side substitution mechanism where banks optimally weigh private credit (L_t^{credit}) against zero-risk central bank securities (S_t). Under OJK regulations, exposures to Bank Indonesia (including SRBI) carry a 0% risk weight, while standard corporate loans carry a 100% weight.[1] This creates the Credit Crowding-Out Wedge (Γ_t), which activates non-linearly once sterilization exceeds the system's Leverage Capacity Threshold ($\bar{S}$).

These dynamics culminate in a Sovereign–Bank Nexus (Acharya and Merrouche, 2013; Altavilla et al., 2017), where the shadow cost of capital χ turns sterilization into a pro-cyclical "stability tax" (Acharya et al., 2023), leading to an equilibrium we term the **Lazy Bank Trap**. By synthesizing the multi-instrument rationale of Adrian, Tobias and Erceg, Christopher J and Kolasa, Marcin and Lindé, Jesper (2020) with the frictional intermediation of Gerali et al. (2010), this section bridges the gap between strategic mandates and operational market microstructure. This provides the structural proof for the Policy Effectiveness Threshold (χ^*) and the transition from the functional corridor to Liquidity Swamp behavior.

2.2 Legal Mandate and the Integrated ITF (UU P2SK 2023)

The institutional framework is grounded in the 2023 Financial Sector Development and Strengthening Law (UU P2SK). This legislation explicitly expands Bank Indonesia's mandate to include sustainable economic growth alongside price stability, which comprises of inflation and exchange rate stability. This legal shift justifies the **Integrated Inflation Targeting Framework (Integrated ITF)**, where the exchange rate is a formal policy objective rather than a residual shock absorber.

[1] Under OJK (Financial Services Authority) Regulation POJK No. 11/2016.

This necessitates the "Interest Rate Twist" result: the central bank requires two instruments (Price and Quantity) to satisfy multiple mandates simultaneously without violating the growth constraint.

Box 2.1: The End of "Passive" Sterilization and the PD Mandate

Historically, BI utilized non-tradable Term Deposits. The transition to SRBI in 2023 represents a shift to "Pro-Market" Sterilization, governed by strict **Primary Dealer (PD) Obligations**:

- The 30% Redistribution Rule: PDs are mandated to redistribute at least 30% of auction winnings to the secondary market to break hoarding behavior.
- **Creating the Curve:** This generates the volume necessary for a market-determined yield curve, transforming the central bank into an active "market maker."

2.3 Operational Instrumentarium: SRBI vs. SVBI

The model relies on the structural comparison between two pro-market securities. SRBI (Sekuritas Rupiah Bank Indonesia) functions to eliminate the Interbank Decoupling Wedge (τ_t) by creating domestic scarcity. However, it risks triggering the Credit Crowding-Out Wedge (Γ_t) by competing for Leverage Capacity Threshold. SVBI (Sekuritas Valas Bank Indonesia) serves to anchor the FX Risk Premium. It acts as a synthetic sterilizer via swap-funded SVBI, draining Rupiah without hitting the domestic Leverage Capacity Threshold ($\bar{S}$) as severely as SRBI.

Feature	**SRBI**	**SVBI**	**Operational Description**
Denomination	IDR	USD	Currency of issuance and settlement
Target Friction	τ_t	Ω_t	Primary wedge addressed by instrument
Liquidity Impact	Direct	Synthetic	Nature of the reserve drain mechanism
RWA Impact	High	Diversified	Influence on bank Risk-Weighted Assets
Collateral Utility	High	High	Eligibility for Repo and liquid buffers

Table 2.1: Operational Comparison of Pro-Market OMO Instruments

***Note**: This comparison highlights the load-balancing role between Rupiah-denominated (SRBI) and USD-denominated (SVBI) instruments. SRBI targets domestic interbank decoupling (τ_t), while SVBI manages external risk premia ($\hat{\Omega}_t$) without direct domestic liquidity scarcity.*
***Source**: Author's compilation based on Bank Indonesia operational guidelines (2024–2026).*

2.4 The Surgical Window Necessity

The technical complexity of this dual-instrument model is a prerequisite for survival in a Small Open Economy. The **"Surgical Window"** is the optimal mix where both instruments load-balance the burden of the trilemma:

$$\lambda < S_t < \bar{S} \tag{2.1}$$

where λ (**Saturation Threshold**) is the point where transmission is restored, and $\bar{S}$ is the limit before the credit crowding-out becomes destructive. To reconcile these institutional impediments, we propose the **"Governor's Compass"** (Figure 6.6). This conceptual framework serves as the "Red Thread" of the dissertation, mapping the policy benefit of SRBI against the systemic thresholds of the banking sector to identify the optimal policy space where liquidity is drained enough to restore interest rate control but not enough to trigger a credit contraction.

3 The Hierarchical Integrated SOE Model

This research is grounded in the New Keynesian theoretical framework, extended to a small open economy (SOE) setting, to analyze optimal monetary policy under discretion. This section develops the core theoretical innovation of the dissertation: a three-stage hierarchical framework that endogenizes the operational implementation of monetary policy within an SOE New Keynesian general equilibrium. Unlike standard models that treat the central bank's policy rate as a directly controllable instrument that maps frictionlessly to aggregate demand, this framework microfounds the "broken plumbing" of emerging markets.

To isolate the impact of operational transmission frictions, we utilize standard New Keynesian household and firm optimizations as established in the SOE-NK literature, focusing our structural extensions on the endogenization of the interbank and credit markets. By explicitly modeling the Strategic, Tactical, and Operational levels, we identify how structural liquidity surpluses and balance-sheet constraints can lead to a decoupling of policy intent from market reality.

The model is designed to reflect the specific institutional mandates and operational realities of Bank Indonesia and is formulated within an *integrated Inflation Targeting Framework (ITF)*, in which Bank Indonesia aims to achieve an optimal balance among inflation stabilization and exchange rate stability, while supporting sustainable economic growth. This approach allows the model to preserve the foundational macro-dynamics of the New Keynesian tradition while localizing the analysis to the specific implementation challenges faced by Bank Indonesia. By centering the extension on the financial intermediaries' balance sheets rather than household behavior, we can precisely trace how quantity-based interventions like SRBI and SVBI influence the "Interest Rate Twist" and the subsequent credit crowding-out effects.

To visualize the distinct mandates and feedback loops within this framework, Figure 3.1 maps the sequential transmission from the central bank's loss minimization

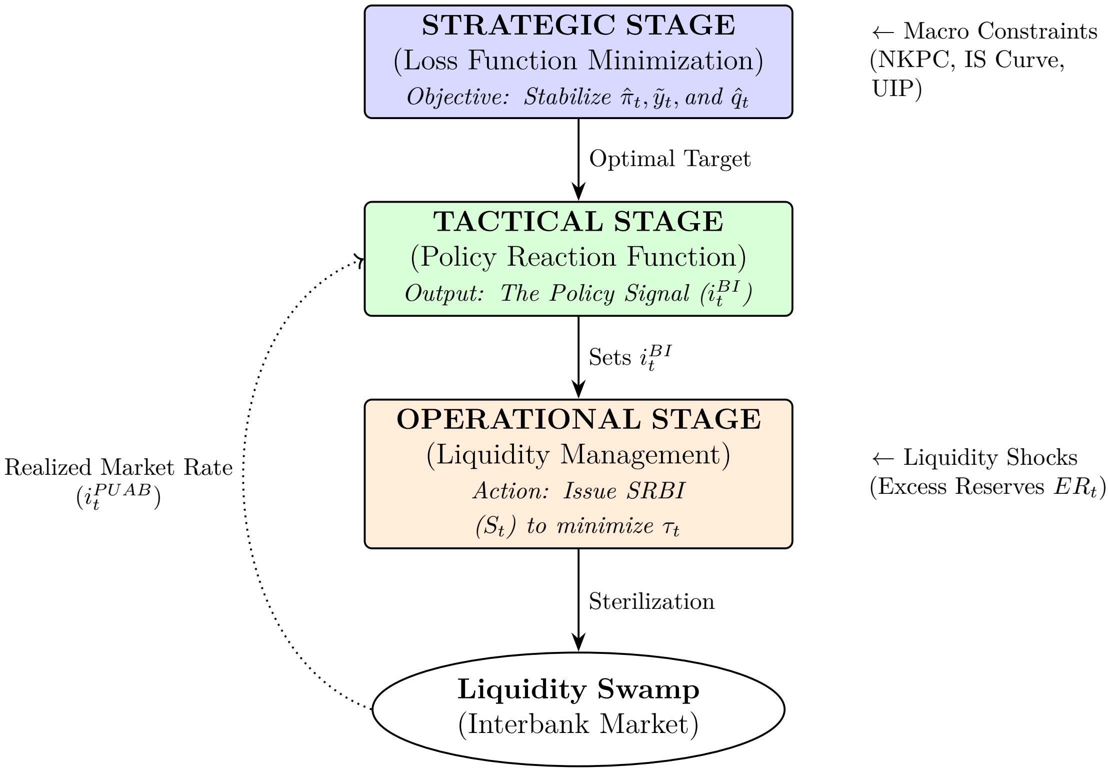

Figure 3.1: The Hierarchical Three-Stage Transmission Framework

Note: *The diagram illustrates the explicit hierarchy of the model. The Strategic Stage minimizes the loss function targeting inflation, output, and the real exchange rate. The Tactical Stage defines the policy rate ($\hat{i}_t^{BI}$) via the Taylor Rule, and the Operational Stage endogenously determines the quantity of SRBI ($\Delta SRBI_t$) required to enforce that rate in the Liquidity Swamp.*
Source: *Author's Conception.*

objectives down to the granular liquidity operations in the interbank market.

3.1 Strategic Stage: The Structural Constraints

Consistent with standard New Keynesian literature, variables with hats ($\hat{x}_t$) or tildes ($\tilde{y}_t$) denote log-deviations from the non-stochastic steady state. At the Strategic Level, the central bank determines the optimal policy stance based on macroeconomic objectives. We move beyond the standard "cashless limit" to micro-found the frictions that define the Indonesian operating environment. We depart from the standard Galí and Monacelli (2005) isomorphism by introducing incomplete international asset markets and a debt-elastic risk premium. This modification is critical for emerging markets like Indonesia, as it forces a meaningful trade-off between domestic price stability and exchange rate smoothing.

Parameter	Symbol	Value	Description
Discount Factor	β	0.99	Annual real interest rate $\approx 4\%$
Inv. Elasticity of Substitution	σ	2.00	Standard SOE value
Inv. Frisch Elasticity	φ	1.50	Labor supply curvature
Openness Degree	α	0.25	Import share to GDP
Trade Elasticity	η	1.00	Expenditure switching elasticity

Table 3.1: Calibrated Structural Parameters (Macro Fundamentals)

Note: *These parameters establish the baseline New Keynesian structure used in the IS and NKPC equations below. Calibration follows standard Small Open Economy (SOE) literature adapted for the Indonesian economy.*
Source: *Author's compilation based on Gali and Monacelli (2005) and previous DSGE studies on Indonesia.*

3.1.1 Constraint 1: The Open-Economy IS Curve

Aggregate demand is governed by the dynamic IS equation. Following Galí and Monacelli (2005), we explicitly model the output gap $\tilde{y}_t$ as dependent on world demand and real exchange rate expectations:

$$\tilde{y}_t = E_t\tilde{y}_{t+1} - \frac{1}{\sigma_\alpha}\left(\hat{i}_t - E_t[\hat{\pi}_{t+1}] - \hat{r}_t^n\right) + \gamma_q E_t[\Delta\hat{q}_{t+1}] + g_t \tag{3.1}$$

where σ_α is the effective inverse intertemporal elasticity adjusted for openness, and $\hat{r}_t^n$ is the natural real interest rate. This equation demonstrates that aggregate demand is sensitive not only to the policy rate but to the **Expenditure-Switching Channel** ($\gamma_q\Delta\hat{q}_{t+1}$), which provides the theoretical bridge to the Tactical Level.

3.1.2 Constraint 2: The SOE-NKPC

Aggregate supply is governed by a Small Open Economy version of the New Keynesian Phillips Curve. To align with the institutional focus on headline stability, the supply relationship is formulated in terms of Consumer Price Index (CPI) inflation ($\hat{\pi}_t$):

$$\hat{\pi}_t = \beta E_t[\hat{\pi}_{t+1}] + \kappa\tilde{y}_t + u_t \tag{3.2}$$

where β is the subjective discount factor and κ represents the sensitivity of inflation to real activity. Crucially, the variable u_t denotes a composite cost-push shock, which internalizes global commodity price volatility and external disturbances that move inflation independently of domestic demand conditions. This structural setup ensures that aggregate supply responds to both internal resource pressure and the broader external environment.

3.1.3 Constraint 3: Modified UIP and the Total Country Risk Premium

In an emerging market context, the Uncovered Interest Parity (UIP) condition is distorted by a risk premium sensitive to external net debt and central bank balance sheet composition. The global rate and an endogenized risk premium determine the realized market rate i_t^{market}. Although our operational focus is on the **Supply Effect** (ϕS_t^{IDR}), the premium structurally incorporates debt-level stationarity (δ_d) and real exchange rate feedback to ensure long-term equilibrium (see Appendix B for the full derivation).

Following Schmitt-Grohé and Uribe (2003) to ensure model stationarity while endogenizing the Interest Rate Twist, we define the market interest rate (i_t^{market}) by isolating the quantity-based Supply Effect:

$$\hat{i}_t^{\text{market}} = \underbrace{\hat{i}_t^* + E_t[\Delta e_{t+1}]}_{\text{Global Base}} + \underbrace{\delta_d \hat{d}_t - \delta_{ca} \widehat{ca}_t - \psi_q \hat{q}_t + \psi_t}_{\text{Country Risk Premium } \hat{\Psi}_t} + \underbrace{\phi_s S_t^{\text{IDR}}}_{\text{Supply Effect}} \tag{3.3}$$

where the structural logic of the risk premium and associated notations are defined as follows:

- $\hat{i}_t^*$ represents the exogenous global interest rate; $E_t[\Delta e_{t+1}]$ denotes expected nominal depreciation.

- **Flow and Stock Solvency:** The risk premium is endogenized via a dual-constraint. $\hat{d}_t$ represents the log-deviation of the external debt stock, where δ_d captures the solvency risk associated with total liabilities. $\widehat{ca}_t$ represents the current account flow, where δ_{ca} reflects the market's sensitivity to flow sustainability; a current account surplus acts as a structural buffer that compresses the country risk premium.

- **Stationarity and Exchange Rate Anchor:** Following *Schmitt-Grohé and Uribe (2003)*, the term $\delta_d \hat{d}_t$ induces stationarity in the model's net foreign asset position. The inclusion of the real exchange rate stabilization term ($\hat{q}_t = \hat{q}_{t-1} + \Delta e_t - \pi_t$) prevents the "random walk" problem by tethering the exchange rate level to its long-run steady state.

- **The Sterilization Power (ϕ_s):** This parameter represents the supply-elasticity of the interest rate wedge, quantifying the sensitivity of the market interest rate ($\hat{i}_t^{market}$) to the end-of-period stock of outstanding SRBI (S_t^{IDR}). Calibrated at 0.093 for the Indonesian "Liquidity Swamp" context, this term captures the *Supply Effect* of quantity-based instruments. It allows the monetary authority to support the market interest rate independently of the policy signaling rate ($\hat{i}_t$), effectively managing the trilemma by decoupling currency defense from the domestic policy stance.

This specification justifies the Separation Principle: the central bank can respond to an external shock by increasing S_t^{IDR}. Per Equation 3.3 (which substitutes Ψ_t into the UIP), this issuance provides the necessary spike in the market rate ($\hat{i}_t^{market}$) to defend the currency, allowing the policy rate $\hat{i}_t$ in Eq. 3.1 to remain focused on domestic output gap stabilization. This defense is effective *Surgical* as long as the SRBI stock remains below the Leverage Capacity Threshold ($\bar{S}$) of the banking system.

To ensure model stationarity and capture the economy's external solvency, we define the evolution of net foreign debt ($\hat{d}_t$) using the aggregate Current Account identity:

$$\hat{d}_t = (1 + r^*)\hat{d}_{t-1} - \widehat{ca}_t \tag{3.4}$$

where foreign real interest rate denotes as $r^* = \frac{1}{\beta} - 1$ and $\widehat{ca}_t$ represents the current account balance as a share of GDP. In this formulation, foreign debt accumulates whenever the economy runs a current account deficit ($\widehat{ca}_t < 0$), reflecting an excess of total domestic expenditure over total national income. Conversely, a current account surplus allows for the gradual amortization of external liabilities ($\hat{d}_t \downarrow$).

The Risk Premium Feedback Loop

The stock of debt and the flow of the current account serve as the primary determinants of the **Country Risk Premium** ($\hat{\Psi}_t$):

$$\hat{\Psi}_t = \delta_d \hat{d}_t - \delta_{ca}\widehat{ca}_t - \psi_q \hat{q}_t + \psi_t \tag{3.5}$$

This specification ensures that the model satisfies the transversality condition. An increase in external debt ($\hat{d}_t$) or a widening of the current account deficit ($-\widehat{ca}_t$) triggers an endogenous rise in the risk premium. This mechanism increases the cost of domestic capital and induces a real exchange rate depreciation, which subsequently improves the current account and restores the debt stock to its long-run steady state.

3.2 Tactical Stage: Deriving the Optimal Targeting Rule and Stability Anchor

At the Tactical level, the central bank minimizes a quadratic loss function that internalizes the structural trade-offs of the "Impossible Trinity." Following the welfare-based approach of De Paoli (2009) and the legal mandate established in UU P2SK, we explicitly weight exchange rate stability (λ_e) alongside inflation and output:

$$L_t^{\text{credit}} = \frac{1}{2} E_t \sum_{j=0}^{\infty} \beta^j \left[\hat{\pi}_{t+j}^2 + \lambda_y \tilde{y}_{t+j}^2 + \lambda_e (\Delta \hat{e}_{t+j})^2 \right] \tag{3.6}$$

By solving the First-Order Conditions (FOCs) under discretion subject to the

Open-Economy NKPC ($\hat{\pi}_t = \beta E_t[\hat{\pi}_{t+1}] + \kappa \tilde{y}_t + u_t$), we derive the **Integrated Targeting Rule**:

$$\hat{\pi}_t = -\frac{\lambda_y + \lambda_e}{\kappa}\tilde{y}_t \tag{3.7}$$

Because $\lambda_e > 0$, the targeting rule is structurally "steeper" than the canonical closed-economy benchmark. This justifies Hyper-Aggression: to stabilize a single unit of depreciation-driven inflation, the central bank must engineer a larger negative output gap than standard rules prescribe.

To derive the required instrument setting, we substitute Equation (3.7) into the combined structural identities of the open-economy IS curve and the modified UIP condition. Substituting these identities back into the equation yields the final solution for the **Balanced Target Rate** ($\hat{i}_t^{target}$):

$$\hat{i}_t^{target} = (1+\hat{\Omega})\underbrace{\left[\hat{r}_t^n + E_t[\hat{\pi}_{t+1}] + \sigma_\alpha\left(E_t[\tilde{y}_{t+1}^{opt}] - \tilde{y}_t^{opt} + g_t\right)\right]}_{\text{Domestic Requirements}} - \hat{\Omega}\underbrace{\left[\hat{i}_t^* + \hat{\Psi}_t + (E_t[\hat{\pi}_{t+1}] - E_t[\hat{\pi}_{t+1}^*])\right]}_{\text{External Stability Requirements}} \tag{3.8}$$

The tactical policy rate follows the **BI Stability Anchor** through a smoothing objective:

$$\hat{i}_t = \rho_i \hat{i}_{t-1} + (1-\rho_i)\hat{i}_t^{target} + \varepsilon_t^i \tag{3.9}$$

Substituting the solution for $\hat{i}_t^{target}$ from Equation 3.8 into this smoothing objective reveals a critical behavioral shift in the central bank's reaction function. Mathematically, the negative sign preceding the external block ($-\hat{\Omega}$) in the Balanced Rate implies that an increase in global rates ($\hat{i}_t^* \uparrow$) would dictate a domestic rate *cut* to offset the demand-dampening effects of expected future appreciation.

However, this purely theoretical prescription abstracts from the "fear of floating" (Calvo and Reinhart, 2002) and the binding realities of capital flight in emerging markets. To prevent systemic balance-sheet crises, Bank Indonesia abandons this demand-centric aggression in favor of a **Stability Anchor**. By prioritizing exchange rate stabilization, the central bank must *invert* its theoretical reaction to external shocks: rather than cutting rates to stimulate demand, it must hike rates alongside global benchmarks to defend the nominal anchor.

Modeling the reaction function in this Stability Anchor regime requires two distinct mathematical shifts. First, the feedback coefficients on short-term domestic cyclical gaps ($\tilde{y}_t$, $\hat{\pi}_t$) are effectively minimized, leaving only the natural real rate and preference shocks to represent domestic neutrality. Second, the sign on the external block is inverted from negative to positive ($+\hat{\Omega}$), reflecting the necessity to match external tightening. Assuming frictionless transmission at this tactical stage, the policy rule simplifies to:

$$\hat{i}_t \approx \rho_i \hat{i}_{t-1} + (1-\rho_i)\left[\underbrace{E_t[\hat{\pi}_{t+1}] + \hat{r}_t^n + \sigma_\alpha g_t}_{\text{Domestic Neutrality}} + \underbrace{\hat{\Omega}\left(\hat{i}_t^* + \hat{\Psi}_t\right)}_{\text{External Premium}}\right] + \varepsilon_t^i \tag{3.10}$$

where $\hat{\Omega} = \frac{\sigma_\alpha \gamma_q}{1-\sigma_\alpha \gamma_q}$ represents the **Trilemma Multiplier** (or Degree of External Constraint). Under current Indonesian calibrations ($\hat{\Omega} \approx 0.67$), this derivation proves that a 100 bps Fed hike ($\hat{i}_t^* \uparrow$) necessitates a total domestic response of approximately 150 bps to neutralize the domestic-external feedback loop.

Equation (3.10) formalizes the central tactical trade-off of the model. This sign inversion and simplification reflect the empirical reality of emerging markets, where the exchange rate channel is so dominant that the central bank effectively "imports" foreign monetary policy to anchor expectations. By prioritizing the interest rate parity condition, the central bank renders domestic gap-filling secondary to currency defense. Consequently, the equation captures the pro-cyclical reality of small open economies, where external shocks—transmitted through the UIP channel—effectively tighten domestic monetary conditions regardless of the domestic cyclical position. In this framework, the parameter $\hat{\Omega}$ acts as the “transmission coefficient” of global tightening, determining the extent to which the domestic anchor must shift to offset external volatility.

This outsized reaction identifies a fundamental limitation of price-based policy under the Tinbergen Rule benchmark. Tinbergen (1952) posits that for a central bank to achieve n independent policy targets—in this case, (i) internal price/output stability and (ii) external exchange rate parity—it must possess at least n independent instruments. Because the standard UIP condition links these two domains, a single policy rate signal ($\hat{i}_t$) creates a steep 'sacrifice ratio' where external anchoring necessitates domestic output trauma.

The transition to the Operational Level provides this necessary second degree of freedom. By utilizing the Interest Rate Twist, the central bank effectively separates the strategic signaling rate from the market-determined yield. This dual-instrument configuration allows Bank Indonesia to satisfy the external parity requirement via quantity-based scarcity rents while the policy signal remains focused on the growth mandate, thereby optimizing both targets simultaneously without violating the growth constraint.

Box 1.1: The Mathematics of the Trilemma Multiplier and the "Blunt Defense" Cost

Why is a standard interest-rate defense so costly for Indonesia? We quantify the sensitivity of the domestic economy to global shocks using the **Trilemma Multiplier** ($\hat{\Omega}$), derived formally in Appendix B.

1. Deriving the Multiplier ($\hat{\Omega}$) The multiplier is a function of the effective intertemporal elasticity ($\sigma_\alpha \approx 1.0$) and the expenditure-switching elasticity ($\gamma_q \approx 0.40$):

$$\hat{\Omega} = \frac{\sigma_\alpha \gamma_q}{1 - \sigma_\alpha \gamma_q} = \frac{1.0 \times 0.40}{1 - 0.40} \approx 0.67 \tag{3.11}$$

This structural parameter implies a **67% Passthrough Rule**: for every 100 bps hike by the Fed, BI must import 67 bps just to satisfy the static UIP condition.

2. The Total Decomposition (The "Over-Hike") However, the cost extends beyond direct passthrough. In the absence of SRBI, the central bank must also combat second-round inflation and risk premia. We decompose the total response to a 100-bps Foreign Rate Shock (i_t^*) below:

Component	**Structural Driver**	**Impact**
1. External Passthrough	Trilemma Multiplier ($\hat{\Omega} \approx 0.67$)	+67 bps
2. Inflation Feedback	Deprec. pass-through to CPI ($\alpha_{PT}\hat{\pi}_t$)	+50 bps
3. Risk Premium	Endogenous Capital Flight ($\Delta\hat{\Psi}_t$)	+33 bps
Total "Blunt" Hike	**Required to stabilize Spot FX**	$\approx$ +150 bps

The Policy Implication: To arrest capital flight, a standard Taylor Rule forces BI to "over-hike" by 150 bps (50 bps *above* the foreign shock). This excess tightening acts as a recessionary cost, contracting the output gap to defend the nominal anchor. This high sensitivity justifies the Hierarchical Framework, which seeks to break this linear link via the "Twist" operation.

3.3 Operational Stage (Banking Block)

Implementing interest rate targets in the presence of structural liquidity surplus requires relaxing the standard New Keynesian assumption of instantaneous transmission from the policy signal to market interest rates. This section micro-founds the "broken plumbing" of the interbank market by endogenizing the implementation gap through a frictional banking block that impedes the pass-through from the policy signal to the market rate. At the operational stage, the central bank must therefore enforce alignment between the interbank market rate ($\hat{i}_t^{\text{market}}$, or $\hat{i}_t^{\text{PUAB}}$) and the tactical target rate ($\hat{i}_t^{\text{target}}$, or $\hat{i}_t^{\text{BI}}$).

To capture this mechanism, we model the banking sector's demand for reserves (R_t^d) as a non-linear, regime-switching function of total reserves relative to the statutory requirement.

3.3.1 Micro-Founding the Liquidity Swamp: The Aggregation Fallacy and Behavioral Trap

Standard New Keynesian models typically employ a "Representative Bank" assumption. This aggregation generates a mathematical fallacy in the context of structural surpluses; if all banks are identical, the interbank market disappears, rendering the "Liquidity Swamp" invisible. Our framework employs a dual-agent banking topology to capture the frictions of the Indonesian market:

- **The Periphery (Small Banks):** Institutions with structural surpluses whose precautionary demand drives the Reserve Demand Block.
- **The Core (Whale Banks):** Systemic institutions acting as marginal absorbents of liquidity. Their leverage constraints delineate the Credit Crowding-Out.

This heterogeneity is critical: it reveals that peripheral banks engage in precautionary hoarding because the cost of shortage—dictated by the Whales' lending hurdle rate—is prohibitively high. Conversely, the ost of surplus is negligible, as Whales exercise bargaining power to keep interbank bids depressed. This imbalance creates a behavioral trap where the interbank rate (i_t^{PUAB}) decouples from the strategic signal ($\hat{i}_t^{BI}$) and remains pinned to a "mushy floor."

We formalize this transition from strategic intent to market execution through the Interbank Decoupling Wedge (τ_t). As derived from the precautionary demand framework in Appendix C, the realized market rate deviates from the policy floor (i_t^{DF}) according to a non-linear logistic function:

$$i_t^{PUAB} - i_t^{DF} = \frac{\delta_t}{1 + \exp[\zeta(R_t^d - \lambda)]} \tag{3.12}$$

where δ_t represents the Segmentation Frictions Spread (the cost of intermediation between Whales and the Periphery), ζ is the Surgical Effectiveness Benefit or (defined as the absolute slope of the reserve demand curve which reflect the Hoarding Intensity), and $\lambda = 1.05$ is the Saturation Threshold.

This structural identity proves that the "Interest Rate Twist" is only operationally viable within the Surgical Window. If reserves (R_t^d) exceed the gate λ, the logistic denominator expands, collapsing the spread and rendering price-based signals inert. Under these conditions, the market rate is governed by an internal hurdle rate ($i_t^{DF} + \delta_t$), where δ_t incorporates the oligopolistic markup and search costs. To restore the transmission channel, Bank Indonesia must utilize quantity-based absorption via SRBI to recreate the scarcity rents necessary to lift i_t^{PUAB} from the floor toward the strategic target.

3.3.2 The Reserve Demand: Deriving the S-Curve

We derive the demand for reserves (R_t^d) from the bank's precautionary inventory problem. Following the inventory-theoretic framework of Bindseil (2004), a representative bank in a segmented market chooses its opening reserve balance to minimize its **Total Expected Cost** ($E[TC]$). This cost arises from the asymmetric tension between the opportunity cost of holding excess liquidity and the friction-induced penalty of a shortfall:

$$\min_{R_t^d} E[TC] = \underbrace{(i_t^{PUAB} - i_t^{DF}) \int_{-\infty}^{R_t^d} (R_t^d - \varepsilon) f(\varepsilon) d\varepsilon}_{\text{Cost of Surplus (Satiation)}} + \underbrace{\delta_t \int_{R_t^d}^{\infty} (\varepsilon - R_t^d) f(\varepsilon) d\varepsilon}_{\text{Cost of Shortage (Segmentation)}} \quad (3.13)$$

where:

- $i_t^{PUAB} - i_t^{DF}$: The marginal opportunity cost of holding excess reserves instead of lending them at the interbank rate (i_t^{PUAB}).
- $\delta_t = \mu_t + \xi_t$: The **Segmentation Frictions Spread**, comprising the oligopolistic markup (μ_t) and counterparty risk premium (ξ_t) paid when a bank is forced to borrow during a shortfall.
- $f(\varepsilon)$: The probability density function of stochastic intraday payment shocks.

Applying Leibniz's Integral Rule to the First-Order Condition (FOC) of Eq. (3.13), we obtain the **Optimal Critical Fractile**, which defines the probability that the bank remains liquid:

$$F(R_t^d) = \frac{\delta_t}{(i_t^{PUAB} - i_t^{DF}) + \delta_t} \quad (3.14)$$

Assuming payment shocks follow a logistic distribution (consistent with the market frictions analyzed in Appendix C), inverting the cumulative distribution function $F(\cdot)$ results in the aggregate **S-Curve** identity used for macro-transmission:

$$R_t^d(i_t^{PUAB}) = R_t^{GWM} + R_t^{RTGS} + \underbrace{\frac{K}{1 + \exp\left[\zeta \cdot (i_t^{PUAB} - i_t^{BI})\right]}}_{\text{Frictional Precautionary Buffer}} + \varpi_t \quad (3.15)$$

where R_t^{RTGS} is a structural constant representing fixed technical settlement requirements, K denotes the maximum hoarding capacity of systemic banks, and ζ represents the Surgical Effectiveness Benefit (defined as the absolute slope of the reserve demand curve).

3.3.3 The Saturation Threshold and Reserve States

To operationalize the transition from functional to impaired transmission, we establish the Saturation Threshold (λ. We define the operational environment via two state-contingent environment determined by the level of total reserves relative to the statutory requirement:

- **Scarcity (Elastic):** Conditioned on $R_t < \lambda$.
- **Liquidity Swamp (Inelastic):** Conditioned on $R_t \geq \lambda$.

In the Liquidity Swamp, the slope of reserve demand ζ approaches zero. This satiation effect renders the policy signal (i_t) inert and pins the market rate to the Effective Lower Bound. By utilizing a state-contingent linear solver, we analyze the transition from this saturation point back into the Scarcity environment, where the "Surgical Window" is restored via SRBI issuance.

3.3.4 The Interbank Decoupling Wedge and Oligopsony Power

We formalize this implementation failure as the Interbank Decoupling Wedge (τ_t), microfounded as the result of oligopsony power among KBMI 4 banks. In a structural surplus, these "whales" exercise market power by keeping interbank bids depressed near the floor ($i_t^{DF} + \delta$). Thus, the Interbank Decoupling Wedge represents the operational distance:

$$\tau_t = i_t^{BI} - i_t^{PUAB} \tag{3.16}$$

To align the strategic intent with market reality, we define the wedge as the spread deviation between the strategic policy signal and the realized market rate. As the steady-state values (i_{ss}) cancel out, the wedge is purely the difference in their respective deviations:

$$\tau_t = (i_{ss} + \hat{i}_t) - (i_{ss} + \hat{i}_t^{market}) = \hat{i}_t - \hat{i}_t^{market} \tag{3.17}$$

By substituting the supply identity R_t^s into the demand function (Eq. 3.15), we prove that τ_t is a non-linear function of the unsterilized surplus. To restore control ($\tau_t \to 0$), the central bank must issue SRBI ($\Delta SRBI_t$) to physically extract reserves until the market returns to the steep, elastic portion of the demand curve ($R_t < \lambda$), thereby creating the **Scarcity Rents** necessary for rate alignment.

Figure 3.2 illustrates this core conflict. In the "Swamp" scenario, massive unsterilized liquidity—often from FX inflows or structural surpluses—leaves the market rate i_t^{PUAB} stuck near the deposit facility floor (Point E_1). The Rupiah desk must generate positive Net SRBI Issuance to shift the supply curve leftward to $R_t^{s,\text{target}}$.

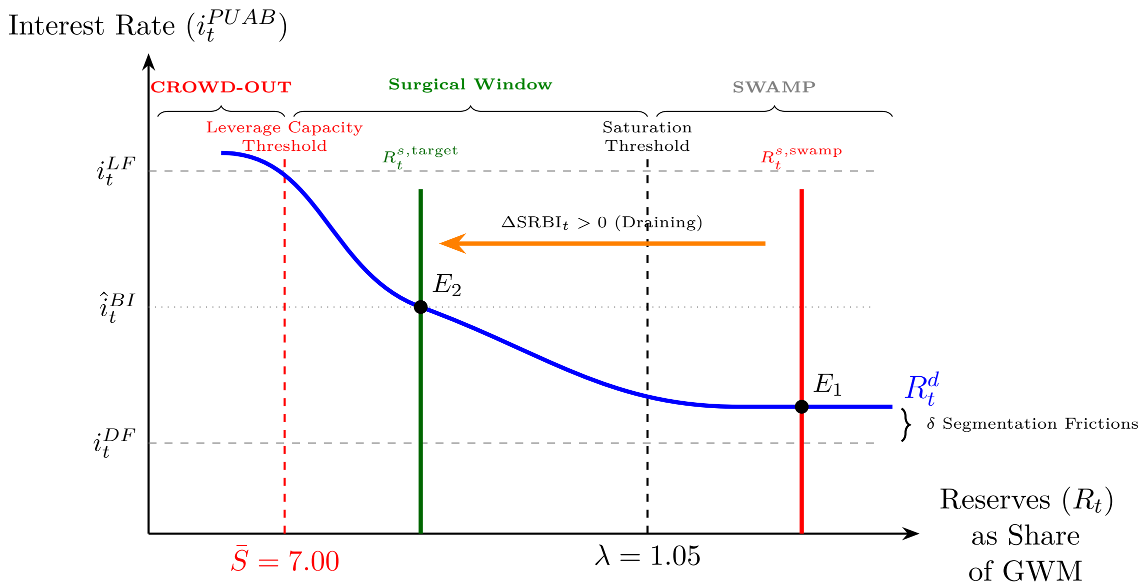

Figure 3.2: Phase Diagram (Sterilizing FX Liquidity Spillovers via SRBI) Non-Linear S-Curve

Note: *The diagram illustrates the transition between two structural regimes: (i) the Scarcity environment, encompassing the range where transmission is functional ($R_t < \lambda$), and (ii) the Liquidity Swamp, where excessive liquidity ($R_t \geq \lambda$) causes the demand curve to decouple and flatten near the floor plus a Segmentation Frictions Spread δ. Active SRBI issuance shifts the supply curve from E_1 to E_2, re-establishing the transmission mechanism within the Surgical Window ($1.05 < S_t < 7.00$) by creating the necessary scarcity rents.*
Source: *Author's illustration.*

This quantitative withdrawal creates the scarcity rents required to lift the market rate to the policy target (Point E_2).

As shown in the diagram, shifting the supply curve from $R_t^{s,\text{swamp}}$ to $R_t^{s,\text{target}}$ requires a quantitative drain equal to the Ex-Ante Domestic Gap plus any FX Liquidity Spillover ($\mathcal{M}_{FX,t}$), thereby validating the **Separation Principle**: the interest rate is set by the corridor, but its enforcement is guaranteed by the quantity of SRBI.

3.3.5 The Credit Crowding-Out Wedge and Asset-Side Substitution

While the reserve block governs defensive liquidity management for the periphery, the asset-side substitution block captures the active portfolio allocation of systemic **Whale Banks**. As primary dealers with exclusive access to central bank SRBI auctions, these institutions optimize their balance sheets by weighing risk-weighted credit to the real economy (L_t^{credit}) against high-yielding, zero-risk central bank securities (S_t). This substitution is driven by **risk-weighted asset (RWA)** frictions: under prevailing regulatory standards, private loans carry a full risk weight ($\omega_L = 1$), whereas SRBI securities carry a zero risk weight ($\omega_S = 0$).

We formalize this behavior through the Whale Bank's portfolio interaction cost function, $C(L_t^{\text{credit}}, S_t)$, which captures the convex costs of monitoring and the shadow cost of capital associated with systemic leverage constraints:

$$C(L_t^{\text{credit}}, S_t) = \underbrace{\frac{\phi_L}{2}(L_t^{\text{credit}})^2}_{\text{Operational Cost}} + \underbrace{\chi \cdot \max(0, S_t - \bar{S}) \cdot L_t^{\text{credit}}}_{\text{Shadow Cost of Capital}} \tag{3.18}$$

where $\phi > 0$ denotes the structural cost of credit intermediation, $\chi > 0$ represents the **Portfolio Friction** coefficient, and $\bar{S}$ denotes the **Leverage Capacity Threshold**. The bank maximizes expected profits by optimizing its supply of private credit L_t^{credit}, taking the central bank's SRBI allotment S_t as a quasi-exogenous policy constraint:

$$\Pi_t^{\text{Whale}} = (i_t^L L_t^{\text{credit}} + i_t^{\text{SRBI}} S_t) - i_t^{\text{PUAB}}(L_t^{\text{credit}} + S_t) - C(L_t^{\text{credit}}, S_t) \tag{3.19}$$

Differentiating with respect to L_t^{credit} yields the optimality condition for the lending rate:

$$i_t^L = i_t^{\text{PUAB}} + \phi L_t^{\text{credit}} + \chi \cdot \max(0, S_t - \bar{S}) \tag{3.20}$$

Crucially, this micro-foundation identifies a distinct frictional wedge that bridges the gap between policy signals and the real economy. We define the absolute lending spread as $\Gamma_t \equiv i_t^L - i_t^{\text{PUAB}}$. To map these micro-level frictions to macro-level deviations, the **Credit Crowding-Out Wedge ($\hat{\Gamma}_t$)** represents the deviation of the lending spread from its baseline ($\Gamma_t - \bar{\phi}$), effectively capturing the shadow cost of capital once the bank's leverage capacity is exhausted. This wedge activates non-linearly according to the stock of accumulated securities (S_t):

$$\hat{\Gamma}_t = \begin{cases} 0 & \text{if } S_t < \bar{S} \quad \text{(Surgical Effectiveness)} \\ \eta_t^{\Gamma} + \chi(S_t - \bar{S}) & \text{if } S_t \geq \bar{S} \quad \text{(Credit Crowding-Out)} \end{cases} \tag{3.21}$$

where η_t^{Γ} represents a structural credit shock and $\bar{\phi} = \phi L_{ss}$ is the steady-state intermediation cost. We characterize the impact of SRBI accumulation across two distinct regimes:

1. **Regime A: Surgical Effectiveness Regime ($S_t < \bar{S}$):** The banking system operates with sufficient capital "absorption slack." SRBI issuance absorbs idle, non-leveraged liquidity without competing for risk-weighted capital. In this regime, the shadow cost of capital is dormant ($\hat{\Gamma}_t = 0$), and sterilization remains capital-neutral. This facilitates exchange rate stabilization through the closure of the Interbank Decoupling Wedge (τ_t) without influencing the supply of private credit or inducing adverse output trade-offs.

2. **Regime B: Credit Crowding-Out Regime ($S_t \geq \bar{S}$):** As issuance exceeds $\bar{S}$, even while χ remains at its baseline calibrated level, the zero-risk-weight advantage of SRBI begins to exert pressure on risk-weighted lending capacity. This activates the shadow cost of capital, transforming sterilization into a regime-contingent "stability tax" ($\hat{\Gamma}_t > 0$). The resulting portfolio reallocation away from risk-weighted private credit toward risk-free central bank securities causes sterilization to cannibalize the domestic credit channel and contract the real economy.

To reproduce these structural non-linearities, the model utilizes specific elasticities (ζ, χ) and threshold values $(\lambda, \bar{S})$ grounded in Indonesian market data, as detailed in the Master Calibration Table (Table 5.1) in Section 5.

3.4 Operational Stage (OMO Block)

The implementation stage operationalizes the Integrated Policy Framework by coordinating the USD and Rupiah desks. This block moves beyond standard closed-economy liquidity management by endogenizing the mechanical spillovers between currency stabilization and domestic reserve supply. Note that, while strategic variables are expressed as deviations, the operational block is maintained at levels to preserve the integrity of the central bank's balance-sheet identities.

3.4.1 The USD OMO Desk: Operational Rule and FX Liquidity Spillover

The USD Desk manages onshore foreign exchange liquidity to satisfy the external stability anchor. While its primary objective is exchange rate smoothing, its operations generate autonomous shocks to the domestic monetary base. We begin by deriving the USD Desk decision rule, substituting the USD Market Supply into the liquidity equilibrium condition:

$$\underbrace{L^s_{USD,t-1} + E_t[\Delta AF^{Ext}_t] - \Delta SVBI^{Net}_t + \Delta OMO^{USD}_{FineTune,t}}_{\text{USD Market Supply}(L^s_{USD,t})} = \underbrace{\bar{L}^d_{USD}}_{\text{Target USD Demand}} \tag{3.22}$$

Solving for $\Delta OMO^{USD}_{FineTune,t}$, we obtain the final USD Desk operational rule. The trading desk must fill the liquidity gap and adjust for structural absorption to hit the target:

$$\underbrace{\Delta OMO^{USD}_{FineTune,t}}_{\text{FX Desk Reaction}} = \underbrace{\bar{L}^d_{USD} - L^s_{USD,t-1} - E_t[\Delta AF^{Ext}_t]}_{\text{FX Liquidity Gap}} + \underbrace{(\Delta SVBI^{Total}_t - \Delta SVBI_{Swap,t})}_{\text{Structural Balancing}} \tag{3.23}$$

Note: While $SVBI_{Swap,t}$ is neutral in the USD market (Market A), it generates a contractionary shock in the Rupiah market (Market B), because banks must pay the IDR leg of the swap to obtain the USD funding.

To quantify this cross-market impact, we define the **FX Liquidity Spillover** ($\mathcal{M}_{FX,t}$) as the net Rupiah-equivalent drain resulting from the settlement of external interventions:

$$\mathcal{M}_{FX,t} = (\Delta Spot_t \cdot q_t) + (\Delta SVBI_{Swap,t} \cdot q_t) - \Delta DNDF_{Set,t} \tag{3.24}$$

In this formulation, the net spillover $\mathcal{M}_{FX,t}$ is driven by the net change in spot intervention volume ($\Delta Spot_t$) and the swap-funded portion of SVBI issuance ($\Delta SVBI_{Swap,t}$). Both terms are converted to domestic currency via the real exchange rate (q_t), representing a direct drain on Rupiah liquidity. This extraction is counterbalanced by $\Delta DNDF_{Set,t}$, the net Rupiah cash settlement from Domestic Non-Deliverable Forward contracts.

Transmission Mechanism (Synthetic Sterilization): The USD Desk's efforts to defend the Rupiah mechanically trigger a "Synthetic Sterilization." By surrendering IDR reserves to settle USD-denominated positions, the banking system's monetary base is tightened independently of the Rupiah Desk's primary policy stance. During sharp depreciations, however, BI's net DNDF payouts ($\Delta DNDF_{Set,t}$) function as a counter-cyclical liquidity refill, partially offsetting the extraction from spot and securities interventions.

3.4.2 The Rupiah OMO Desk: The Integrated Reserve Supply

The Rupiah Desk acts as the final clearinghouse, aligning the aggregate supply of reserves (R_t^s) with target demand ($\bar{R}_{IDR,t}^d$) to enforce the interest rate target (i_t^{PUAB}). We formalize the Integrated Reserve Supply Identity as:

$$R_t^s = \underbrace{R_{t-1} + E_t[\Delta AF_t^{Dom} + \Delta AF_t^{Ext}]}_{\text{Base Liquidity}} + \underbrace{\Delta \text{OMO}_{\text{FineTune, t}}^{IDR} - \Delta \text{SRBI}_t}_{\text{Rupiah OMO Desk}} - \underbrace{\mathcal{M}_{FX,t}}_{\text{FX Desk Liquidity Shock}} \tag{3.25}$$

The aggregate supply of reserves R_t^s is composed of inherited liquidity from the previous period R_{t-1} and the expected change in autonomous factors $E_t[\Delta AF_t^{Dom}]$, such as government spending or currency in circulation. The Rupiah desk adjusts this supply through discretionary fine-tuning operations $\Delta \text{OMO}_{FineTune,t}^{IDR}$ and the net issuance of Bank Indonesia Rupiah Securities $\Delta SRBI_t^{Net}$, while accounting for the exogenous FX liquidity spillover $\mathcal{M}_{FX,t}$.

3.4.3 The Consolidated Dual-Market Sterilization Rule

To formalize the coordination between desks, we first define the **Ex-Ante Domestic Liquidity Gap** (Gap_t^{Dom}) as the structural shortfall (or surplus) of reserves derived from autonomous domestic factors (AF_t^{Dom}) relative to target reserve demand ($\bar{R}^d_{IDR,t}$):

$$\begin{aligned} Gap_t^{Dom} &= \bar{R}^d_t - R^s_t \\ Gap_t^{Dom} &\equiv \bar{R}^d_{IDR,t} - \Big(R_{t-1} + E_t[\Delta AF_t^{Dom}]\Big) \end{aligned} \tag{3.26}$$

where a negative value ($-Gap_t^{Dom} > 0$) signifies Liquidity Swamp that pins the interbank rate to the floor.

We define the **Consolidated OMO Rule** where the daily Fine-Tuning operation must clear the liquidity gap left after the Actual Drainage achieved via SRBI issuance and the synthetic drain via FX Liquidity Spillover:

$$\Delta OMO^{\text{IDR}}_{FineTune,t} = Gap_t^{Dom} + \Delta SRBI_t^{Net} + \mathcal{M}_{FX,t} \tag{3.27}$$

The tactical goal of the Central Bank is to neutralize this surplus by defining the wedge as a functional result of the liquidity stock:

$$\tau_t = \frac{1}{\zeta}\Big[\underbrace{-Gap_t^{Dom}}_{\text{Swamp}} + \underbrace{\Delta OMO^{IDR}_{FineTune,t}}_{\text{Residual Adjuster}} - \underbrace{(\Delta SRBI_t^{Net} + \mathcal{M}_{FX,t})}_{\text{Actual Drainage}}\Big] \tag{3.28}$$

where ζ is the Surgical Effectiveness Benefit. This identity shows that unless the Actual Drainage is scaled to match the magnitude of the swamp, τ_t remains positive, diluting the policy stance. To close this gap, the central bank must determine the **Gross Required Drain** (D_t^{Total}), which we formalize through the coordination of the domestic and external desks.

The objective is to minimize the volume of $\Delta OMO^{\text{IDR}}_{FineTune,t}$, which represents the residual volatility needed to align inherited liquidity and the structural Rupiah liquidity gap—defined as target demand $\bar{R}^d_{IDR,t}$ minus autonomous supply—with the exogenous FX liquidity shock and structural balancing via $\Delta SRBI_t^{Net}$. Solving for $\Delta SRBI_t^{Net}$ and applying the Surgical Effectiveness Benefit (ζ^{-1}), we obtain the Consolidated Dual-Market Sterilization Rule:

$$\Delta SRBI_t^{Net} = \zeta^{-1}\left[\underbrace{-Gap_t^{Dom}}_{\text{Mop-up of Surplus}} - \underbrace{\mathcal{M}_{FX,t}}_{\text{Mop-up of FX Injection}}\right] \tag{3.29}$$

The net issuance $\Delta SRBI_t^{Net}$ is scaled by the parameter ζ^{-1}, which dictates the Surgical Effectiveness Benefit of volume-based drainage on pricing. It is determined by the ex-ante domestic gap between target demand $\bar{R}_t^d$ and available supply R_t^s prior to discretionary intervention, augmented by the FX spillover $\mathcal{M}_{FX,t}$. This interaction reveals a structural **Substitution Effect**: when capital flight necessitates USD sales, $\mathcal{M}_{FX,t}$ acts as a natural drain, allowing the bank to *reduce* $\Delta SRBI_t^{Net}$ to preserve the Leverage Capacity Threshold while maintaining the currency defense.

3.4.4 The Residual Rebalancing Logic: Managing the Stock Ceiling

When the SRBI stock approaches the Leverage Capacity Threshold ($S_t \to \bar{S}$), the desk manages the stock by ensuring that total maturities exceed new issuance, but it can only afford this retreat without losing control of the market rate if the USD desk provides sufficient synthetic drainage.

1. The Net Issuance Constraint (Headroom Logic)
The change in SRBI stock is governed by a threshold-dependent rule. The bank prioritizes the maintenance of the stock ceiling ($\bar{S}$) over its tactical defense reaction intensity ψ_s:

$$\Delta SRBI_t^{Net} = \min \left[\underbrace{(\psi_s \Delta e_t - \sigma_{\mathcal{M}} \mathcal{M}_{FX,t})}_{\text{Desired Residual Drain}}, \underbrace{(\bar{S} - S_{t-1})}_{\text{Available Headroom}} \right] \tag{3.30}$$

Operational issuance $\Delta SRBI_t^{Net}$ is constrained by the minimum of the desired residual drain—defined by the Defense Intensity ψ_s times exchange rate depreciation Δe_t minus the offset from FX spillovers weighted by $\sigma_{\mathcal{M}}$—and the available headroom, which is the distance between the capacity threshold $\bar{S}$ and the inherited stock S_{t-1}.

2. The "Relief" Mechanism
SVBI functions strictly as an exogenous sterilization relief valve. If the USD desk issues SVBI to satisfy external demand, the resulting $\mathcal{M}_{FX,t}$ clears Rupiah "for free" from the Rupiah desk's perspective.

- **High $\mathcal{M}_{FX,t}$:** The Rupiah desk allows more SRBI to mature because the synthetic drain maintains interbank scarcity.

- **Low $\mathcal{M}_{FX,t}$** During episodes of capital outflow, SVBI becomes subject to a participation constraint as foreign investors retreat from emerging market instruments. As a result, the synthetic liquidity drain via SVBI is largely muted, and the burden of absorbing excess rupiah liquidity to lift the market rate shifts almost entirely to SRBI. When issuance headroom is exhausted, the central bank must halt SRBI operations even if the market rate i_t^{market} remains decoupled from the policy target. In this regime, the Interbank Decoupling Wedge (τ_t) widens.

The Forensic Calibration of $\psi_s = 4.0$

Figure 3.3 confirms that the calibrated baseline of $\psi_s = 4.0$ (cyan line) represents the surgical optimum for the hierarchical framework. Following a 1 S.D. risk premium shock, this intensity successfully engineers a precise "Interest Rate Twist," where the market rate (i^{market}) delivers a front-loaded lift of 0.39% to provide an immediate defense against nominal depreciation. Crucially, the policy rate (i) remains shielded, rising by only 0.01%, thereby maintaining the stability of the domestic transmission signal.

Sensitivity analysis illustrates the diminishing marginal returns and escalating costs of higher intensities. While increasing ψ_s to 8.0 (purple line) marginally enhances FX stability (reducing depreciation peak from 0.49% to 0.35%), it imposes a disproportionate "stability tax" on the real economy. The aggressive calibration forces the **Output Gap** ($\tilde{y}$) into a deeper contraction (trough of -0.41% vs -0.32% in the baseline). On the other hand, a weaker Defense Intensity of $psi_s = 2$ triggers explosive volatility in the **SVBI Flow** as SVBI take the burden of draining rupiah via the issuance of swap funded SVBI, which spikes to a deviation of 20.03 compared to just 1.59 in the baseline. Furthermore, the baseline $\psi_s = 4.0$ prevents the excessive erosion of **BI IDR Profits** (Π_{IDR}), effectively avoiding the operational fragility observed at higher calibrations where profit deviations plunge toward -4.9 Trillion IDR.

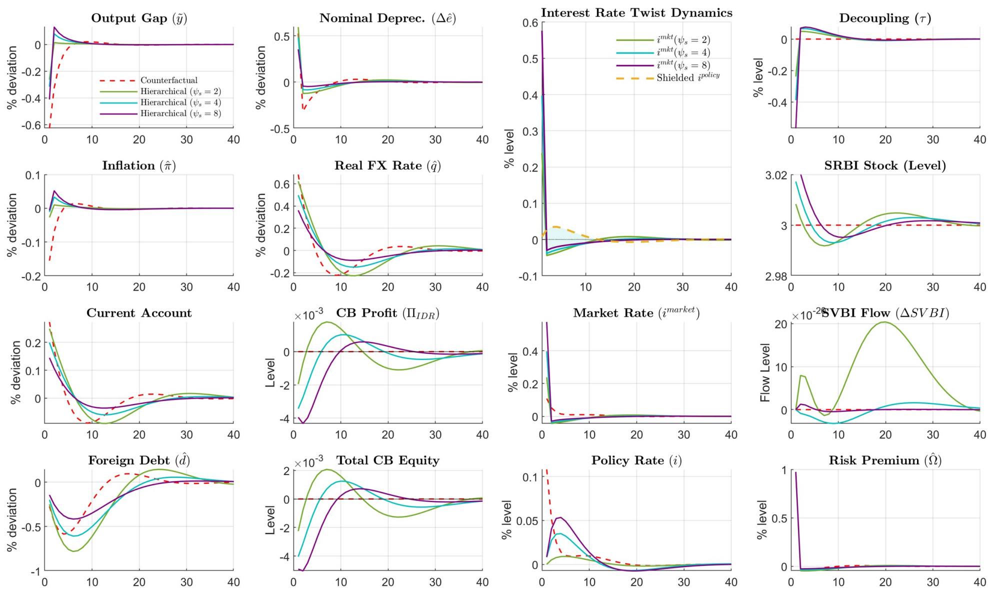

Figure 3.3: Sensitivity Analysis of Defense Intensity (ψ_s) (1 S.D External Risk Premium Shock)

***Note**: Colors represent varying Defense Intensity: Green ($\psi_s = 2$), Blue ($\psi_s = 4$), Purple ($\psi_s = 8$). Red dashed lines represent the Counterfactual without SRBI; Blue solid lines represent the Hierarchical framework. Macro variables are in % deviations; interest rates and friction wedges are in % levels; SRBI Stock is in levels; Central Bank Profit is in Trillion IDR.*

***Source:** Author's Simulation using Dynare/MATLAB.*

3.4.5 Strategic Capacity Preservation: The Passive Accommodation Mechanism

To bridge the Decoupling Wedge (τ_t) with strategic intent, we define Gross Required Drainage (D_t^{Total}) as the total volume of liquidity the central bank *intends* to extract to satisfy both internal rate alignment and external stability. Under the hierarchical framework, the central bank seeks to minimize the stability gap through the following **Sterilization Loss Function**:

$$\min_{\Delta SRBI_t^{Net}} L_t^{\text{credit}} = \underbrace{(D_t^{Total} - D_t^{Actual})^2}_{\text{Stability Gap}} + \underbrace{\gamma_L (S_t - \bar{S})^2 \cdot \not{\Vdash}(S_t > \bar{S})}_{\text{Crowding-Out Penalty}} \tag{3.31}$$

where **Actual Drainage** is:

$$D_t^{Actual} = \Delta SRBI_t^{Net} + \sigma_{\mathcal{M}} \mathcal{M}_{FX,t} \tag{3.32}$$

.

In this objective function, L_t^{credit} represents the central bank's loss, γ_L is the shadow price of domestic leverage, and $\not{\Vdash}(\cdot)$ is an indicator function that activates the penalty once the stock exceeds the threshold $\bar{S}$.

The first-order condition (FOC) of Equation 3.31 with respect to $\Delta SRBI_t^{Net}$ identifies the optimal allocation where the marginal benefit of closing the stability gap equals the marginal shadow cost of domestic leverage. By defining Ξ_t as the state-contingent multiplier associated with this trade-off, we map the discrete indicator function $\not{\Vdash}(\cdot)$ into a smooth logistic transition (Equation 3.37). This allows the model to handle the regime shift from surgical effectiveness to credit crowding-out within a continuous policy space.

Crucially, we endogenize the target D_t^{Total} to respond to both the exchange rate signal and the underlying domestic surplus. We define the **Total Tactical Signal** as:

$$D_t^{Total} = \underbrace{\psi_s \Delta e_t}_{\text{Reactive Defense}} - \underbrace{\kappa_{mop} Gap_t^{Dom}}_{\text{Pre-emptive Mop-up}} \tag{3.33}$$

where κ_{mop} represents the sensitivity to Liquidity Swamp (the structural liquidity surplus defined in Eq. 3.26). By responding directly to $-Gap_t^{Dom}$, the central bank ensures that the sterilization pumps activate even if the hierarchical defense flattens the exchange rate ($\Delta e_t \approx 0$). The calibration of the pre-emptive mop-up sensitivity parameter, κ_{mop}, is state-contingent and reflects the central bank's shifting operational priorities across liquidity regimes. In the neutral regime ($\kappa_{mop} = 1.0$), sterilization proceeds on a one-to-one basis, draining the structural surplus sufficiently to close the implementation wedge (τ_t) while avoiding unnecessary balance-sheet expansion. Under systemic surplus conditions ($\kappa_{mop} = 1.5$), the central bank adopts an aggressive stance, over-absorbing liquidity to counteract non-linear floor effects and restore scarcity in the interbank market. Conversely, when the sterilization stock approaches the leverage capacity threshold ($\bar{S}$), mop-up intensity is reduced ($\kappa_{mop} = 0.5$). This strategic moderation allows a controlled residual surplus to persist, mitigating credit crowding-out pressures and preserving banks' lending capacity, even at the cost of imperfect rate alignment.

The Operational Policy Rule (The Surgical Twist): To ensure SRBI issuance is calibrated after accounting for the synthetic drain, we define the rule as:

$$\Delta SRBI_t = \psi_s \Delta e_t - \sigma_{\mathcal{M}} \mathcal{M}_{FX,t} - \delta_s (S_{t-1} - S_t) + \varepsilon_t^s \tag{3.34}$$

The tactical signal $\Delta SRBI_t$ reacts to the depreciation pedal $\psi_s \Delta e_t$ and the substitution coefficient $\sigma_{\mathcal{M}}$ for FX spillovers. It includes a stock-inertia parameter δ_s to smooth the return of the stock S_{t-1} to its operational steady state S_t, alongside a stochastic shock ε_t^s.

This optimization leads to the Joint Policy Rules where the domestic instrument "sees" the external spillover through the lens of shared systemic capacity. The optimal issuance reflects a **Strategic Retreat** logic:

$$\Delta SRBI_t^{Net} = \Xi_t (D_t^{Total} - \sigma_{\mathcal{M}} \mathcal{M}_{FX,t}) \tag{3.35}$$

where Ξ_t (the logistic weight) functions as the Lagrange Multiplier of the capacity constraint. When S_t is far from $\bar{S}$, $\Xi_t \approx 1$, implying the desk fully executes the sterilization intent. As $S_t \to \bar{S}$, the shadow price of domestic leverage rises, forcing the desk to scale down SRBI issuance and rely on the "free" drainage provided by the USD book.

The motion of the SRBI stock (S_t) is governed by this **Tactical Weighting** (Ξ_t), representing the share of required drainage the domestic desk is *capable* of absorbing given its balance sheet constraints:

$$S_t = (1 - \delta_s) S_{t-1} + \underbrace{\Xi_t \cdot (D_t^{Total} - \sigma_{\mathcal{M}} \mathcal{M}_{FX,t})}_{\Delta SRBI_t^{Net}} \tag{3.36}$$

The weight Ξ_t is defined as a logistic function of the distance to the **Leverage Capacity Threshold** ($\bar{S}$):

$$\Xi_t = \frac{1}{1 + \exp\Big(\kappa_s \cdot (S_t - \bar{S})\Big)} \tag{3.37}$$

The allocation weight Ξ_t is governed by the policy logistic slope κ_s, which determines the sensitivity of the pivot between domestic and synthetic instruments as the stock S_t approaches the capacity threshold $\bar{S}$. This execution ensures the Interbank Decoupling Wedge returns to a functional form, $\hat{i}_t^{market} = \hat{i}_t - \tau(S_t)$, where S_t is now forensically linked to the neutralization of the domestic liquidity swamp.
Mechanism: In the **Surgical Effectiveness Regime** ($S_t \ll \bar{S}$), $\Xi_t \to 1$, prioritizing SRBI for market deepening and ensuring $\tau_t \to 0$. As $S_t \to \bar{S}$, Ξ_t falls. This is a *Strategic Retreat*: the central bank reduces domestic issuance to shelter the credit channel, and the "remaining" drainage $D_t^{Total}(1 - \Xi_t)$ is only realized if the USD desk provides it exogenously via $\mathcal{M}_{FX,t}$.

The Passive Rebalancing Act

In this hierarchical view, SVBI is an **External Exogenous variable**. The "Surgical Twist" is achieved not by active load-balancing, but by the Rupiah desk scaling down $\Delta SRBI_t^{Net}$ as $S_t \to \bar{S}$, allowing the FX spillover to become the primary driver of sterilization at the margin.

3.5 Quasi-Fiscal Sustainability and the Structural Hedge

The credibility of a "Pro-Market" OMO framework is contingent upon its long-term fiscal sustainability. In the presence of high-volume sterilization via SRBI, we formalize the conditions under which the central bank preserves its balance-sheet integrity.

3.5.1 Domestic: The SRBI Sustainability

Bank Indonesia holds a significant stock of Government Bonds (SBN) acquired under the "Burden Sharing" agreements. We model the central bank's net interest profit ($\Pi_{IDR,t}$) as a function of the market interest rate (i_t^{market}). Unlike standard models that treat sterilization as a pure liability drain, we identify a Structural Hedge embedded in the asset-side composition. Defining $k = SBN_t/S_t$ as the **Coverage Ratio** and φ^{FR} as the share of fixed-rate bonds, the sensitivity of profit to interest rate changes is derived as:

$$\frac{\partial \Pi_{IDR,t}}{\partial i_t^{market}} = \underbrace{(1 - \varphi^{FR})SBN_t}_{\text{Variable Revenue Gain}} - \underbrace{S_t}_{\text{SRBI Marginal Cost}} \tag{3.38}$$

Rewriting Equation 3.38 in per-unit terms of sterilization liabilities highlights the structural efficiency of the balance sheet:

$$\frac{1}{S_t} \cdot \frac{\partial \Pi_{IDR,t}}{\partial i_t^{market}} = \underbrace{k(1-\varphi^{FR})}_{\text{Hedge Strength } (\mathcal{H})} -1 \tag{3.39}$$

where $\mathcal{H} = 0.60$ represents the **Partial Hedge Strength**. This coefficient implies that 60% of the interest expense volatility induced by the market-rate spike is internalised by the variable-rate returns of the underlying SBN collateral. To ensure quasi-fiscal independence, the model enforces the Structural Hedge Condition, requiring that the variable revenue gain offsets the marginal cost of sterilization:

$$(1-\varphi^{FR})SBN_t \geq S_t \implies k(1-\varphi^{FR}) \geq 1 \tag{3.40}$$

Furthermore, simulations identify a Structural Hedge embedded in the central bank's post-pandemic balance sheet. Specifically, we quantify that the high share of variable-rate government bonds[2] ($1-\varphi^{FR} \approx 45\%$) acquired during the "Burden Sharing" era, coupled with a coverage ratio of $k \approx 1.34$, provides a Partial Hedge Strength of 0.60 (derived as 1.34×0.45).

This structural feature ensures that the quasi-fiscal costs of aggressive sterilization are naturally mitigated, as higher policy rates increase central bank revenue in tandem with SRBI interest expenses. By ensuring variable-rate SBN income largely offsets the marginal cost of S_t, the institution preserves its capital integrity and prevents the "quasi-fiscal trap" typically associated with large-scale sterilization in emerging markets. While a hedge strength below unity implies a partial leakage, the 60% offset significantly reduces the fiscal burden of maintaining a "Pro-Market" OMO framework.

3.5.2 External: The SVBI Sustainability

The sustainability of USD-denominated SVBI requires an active reserves management to mitigate the negative carry inherent in mopping up short-term USD liquidity. As established in the full dissertation, Bank Indonesia manages these proceeds by segregating "Borrowed Reserves" from the "Iron Stock" to establish a sustainable USD portfolio:

- **The Liquidity Tranche (Preservation of Borrowed Reserves):** Proceeds from SVBI issuance are managed on a *back-to-back* basis in High-Quality Liquid Assets (HQLA) with tenors matching the SVBI maturity (typically 1, 3, 6, or 12 months). This tranche utilizes short-term Hold-to-Maturity (HTM)

[2] The variable-rate SBNs on Bank Indonesia's balance sheet were primarily acquired under the 'Burden Sharing' schemes (Joint Decrees SKB II and III) during the COVID-19 pandemic. These instruments pay a floating coupon tied to the Reverse Repo rate, providing a natural income hedge against the interest expense of domestic sterilization liabilities.

money market instruments such as deposits, U.S. Treasury Bills (T-Bills), and Repurchase Agreements (Repo) to ensure zero duration risk and absolute liquidity for immediate redemptions.

- **The Investment Tranche (The "Iron Stock"):** Core proprietary or "Permanent" reserves are allocated to longer-tenor tranches consisting of U.S. Treasuries (Notes and Bonds), Supranational Bonds, Municipal Bonds, and high-grade Corporate Credit. By exploiting term premia and credit spreads in these higher-yielding asset classes, the investment tranche generates the yield enhancement (alpha) required to offset the interest expense of SVBI.

To quantify the sustainability of this structure, we model the central bank's external net interest margin (Π_{USD}). Let R_t^{Total} represent total reserves, split between the Iron Stock (R_{Iron}) and the Liquidity Buffer (R_{Liq}). Assuming the *back-to-back* management strategy where $R_{Liq} \approx SVBI_t$, the profit function is derived as:

$$\Pi_{USD,t} = \underbrace{(i_t^{Iron} \cdot R_{Iron})}_{\text{Iron Stock Alpha}} - \underbrace{(i_t^{SVBI} - i_t^{Liq}) \cdot SVBI_t}_{\text{Net Negative Carry}} \tag{3.41}$$

where i_t^{Iron} represents the yield on longer-dated assets and $(i_t^{SVBI} - i_t^{Liq})$ represents the cost of carry spread (γ_t). To ensure fiscal neutrality, the model enforces the **External Solvency Condition**:

$$i_t^{Iron} \cdot R_{Iron} \geq \gamma_t \cdot SVBI_t \tag{3.42}$$

Strategic Rationale: This Barbell Strategy ensures that SVBI does not become a fiscal drain. The short-end provides the *Liquidity Buffer*, while the long-end provides the *Profitability Anchor*. This bifurcated approach allows Bank Indonesia to maintain a robust external defense without eroding its equity base, providing the structural credibility necessary for the Integrated Policy Framework (IPF).

This approach ensures BI can defend the Rupiah without eroding its capital base, completing the causal bridge from strategic intent to sustainable operational execution.

4 Closing the Loop: The Augmented IS Curve and the Surgical Window

The standard Galí-Monacelli framework assumes a frictionless "First-Stage" of transmission, where the central bank's policy rate maps one-to-one onto market interest rates through instantaneous arbitrage. In this section, we dismantle this assumption to build a microfounded bridge between the "Broken Plumbing" of the

Indonesian interbank market and aggregate demand. By internalizing implementation frictions as endogenous wedges, we formalize the conditions under which quantity-based interventions via SRBI serve as a prerequisite for monetary control.

4.1 Micro-Founding the Implementation Wedges

The transition from operational levels to macroeconomic deviations requires a formal mapping. Let i^{ss} denote the steady-state nominal interest rate. We define the strategic policy signal ($\hat{i}_t$) and the realized market rate deviation ($\hat{i}_t^{market}$) as $\hat{i}_t = i_t^{BI} - i^{ss}$ and $\hat{i}_t^{market} = i_t^{PUAB} - i^{ss}$, respectively.

In the frictionless benchmark, standard models assume $\hat{i}_t = \hat{i}_t^{market}$. However, in the presence of structural liquidity surpluses and regulatory frictions, the cost of capital faced by the private sector decouples from the central bank's signal. This framework demonstrates that the standard New Keynesian model ("Second Stage" of Transmission) is *conditional* on the success of the sterilization operations ("First Stage"). We internalize these distortions through two endogenous wedges:

4.2 The Macro-Operational Bridge: From Operational Identity to Functional Wedge

The transition from micro-operational levels to macroeconomic deviations requires a formal mapping. Let i^{ss} denote the steady-state nominal interest rate. We define the strategic policy signal and the realized market rate deviation as $\hat{i}_t = i_t^{BI} - i^{ss}$ and $\hat{i}_t^{market} = i_t^{PUAB} - i^{ss}$, respectively. In the frictionless benchmark, standard models assume $\hat{i}_t = \hat{i}_t^{market}$. However, in the presence of structural liquidity surpluses, the cost of capital faced by the private sector decouples from the central bank's signal.

4.2.1 The Interbank Decoupling Wedge

The Interbank Decoupling Wedge (τ_t) represents the "transmission leakage" where structural surpluses render price-based signals operationally inert. This represents a fundamental shift from a static accounting identity, as expressed in the interbank block:

$$i_t^{PUAB} = i_t^{BI} - \tau_t \qquad \text{(3.16 revisited)}$$

to a structural mechanism where the wedge is endogenously determined by the central bank's balance sheet management. We define the wedge not as an exogenous shock, but as a function of the net unsterilized liquidity position:

$$\tau_t = \frac{1}{\zeta}\Big[\underbrace{-Gap_t^{Dom}}_{\text{Swamp}} + \underbrace{\Delta OMO_{FineTune,t}^{IDR}}_{\text{Residual Adjuster}} - \underbrace{(\Delta SRBI_t^{Net} + \mathcal{M}_{FX,t})}_{\text{Actual Drainage}}\Big] \quad \text{(3.28 revisited)}$$

When the Gross Liquidity Drain (SRBI issuance plus FX spillovers) fails to offset the structural domestic surplus ($-Gap_t^{Dom}$), τ_t becomes positive, pushing the market rate toward the corridor floor and effectively diluting the policy stance.

To map this into the macroeconomic framework, we characterize the **Flow Execution**. The central bank reaches the necessary target stock (S_t) required to close the structural surplus through the dynamic adjustment of the sterilization instrument:

$$\Delta S_t = S_t - S_{t-1} \tag{4.1}$$

where S_t is the optimal target stock of realized drains needed to neutralize the swamp. This execution ensures that the operational market rate returns to a functional form dependent on the stock of accumulated interventions. By substituting the level identities into deviation form, we obtain the macro-operational linkage:

$$\hat{i}_t^{market} = \hat{i}_t - \tau(S_t) \tag{4.2}$$

Equation 4.2 serves as the core of the Hierarchical Transmission mechanism. It demonstrates that the realized market rate—the rate that ultimately enters the Augmented IS Curve—is no longer a direct one-to-one mapping of the policy signal. Instead, the signal's efficacy is *conditional* on the central bank effectively "pumping" the liquidity swamp. Restoration of the signaling mechanism is only achieved when the stock S_t is sufficient to compress the wedge $\tau(S_t)$ toward zero, thereby aligning market reality with the hierarchical objective.

4.2.2 The Credit Crowding-Out Wedge

While τ_t governs the interbank market, the Credit Crowding-Out Wedge ($\hat{\Gamma}_t$) represents the distortion in the price of private bank credit. This wedge activates non-linearly according to the stock of accumulated securities (S_t) accumulated via the actual execution $\Delta SRBI_t^{Net}$:

$$\hat{\Gamma}_t = \begin{cases} 0 & \text{if } S_t < \bar{S} \\ \eta_t^{\Gamma} + \chi(S_t - \bar{S}) & \text{if } S_t \geq \bar{S} \end{cases} \tag{4.3}$$

The increase in $\hat{\Gamma}_t$ operates as a contractionary *stability tax* on the supply of private credit. To scale this effect to the macroeconomy, we utilize the **Credit**

Channel Strength parameter, $\vartheta \in [0,1]$, representing the share of aggregate demand financed through the banking sector. In Indonesia, $\vartheta \approx 0.60$, mirroring the reality where bank-dependent MSMEs contribute $\approx 61\%$ to national GDP.

4.3 The Real Effective Interest Rate and the Augmented IS Curve

The private sector's consumption Euler equation is driven by the Real Effective Interest Rate ($\hat{r}_t^{eff}$). This rate is the real counterpart to the nominal effective rate ($\hat{i}_t^{eff}$), which we define as the weighted average of the money market and lending rates:

$$\hat{i}_t^{eff} = (1-\vartheta)\hat{i}_t^{market} + \vartheta(\hat{i}_t^{market} + \hat{\Gamma}_t) = \hat{i}_t^{market} + \vartheta\hat{\Gamma}_t \tag{4.4}$$

Substituting the decoupling identity ($\hat{i}_t^{market} = \hat{i}_t - \tau_t$) into Equation (4.4) allows us to isolate the central bank's signal from the implementational distortions, yielding the Effective Nominal Rate:

$$\hat{i}_t^{eff} = \hat{i}_t - \tau_t + \vartheta\hat{\Gamma}_t \tag{4.5}$$

By incorporating $\hat{i}_t^{eff}$ into the open-economy Euler equation and subtracting expected inflation ($E_t[\hat{\pi}_{t+1}]$), we derive the **Augmented IS Curve**:

$$\tilde{y}_t = E_t[\tilde{y}_{t+1}] - \frac{1}{\sigma_\alpha}\left(\underbrace{\hat{i}_t - \tau_t + \vartheta\hat{\Gamma}_t - E_t[\hat{\pi}_{t+1}]}_{\hat{r}_t^{eff}} - \hat{r}^n\right) + \gamma_q E_t[\Delta\hat{q}_{t+1}] + g_t \tag{4.6}$$

The efficacy of the hierarchical defense relies on the structural decoupling of these distinct transmission powers:

- **Positive τ_t (The Liquidity Swamp):** Acts as an unintended subsidy, shifting the IS curve to the right and over-stimulating demand relative to the policy intent.
- **Positive $\hat{\Gamma}_t$ (The Credit Crowding-Out):** Acts as a stability tax, shifting the IS curve to the left and suppressing growth via higher lending spreads.
- **The Interest Rate Twist (i_t^{market}):** The market rate required for currency defense is determined by the Sterilization Power (ϕ) (see Eq. 3.3).

Success Conditions for Separation:
The hierarchical "separation" works if, and only if, the central bank can satisfy the dual condition of Surgical Defense: (1) The Sterilization Power (ϕ) must be high

enough to support the exchange rate through the market yield channel, and (2) the Portfolio Friction (χ) must be low enough to prevent the Credit Crowding-Out Wedge ($\hat{\Gamma}_t$) from inducing a pro-cyclical collapse in private credit. This defines the theoretical limit of monetary operations: the optimal quantity of SRBI is reached when the marginal benefit of surgical effectiveness ($-\Delta\tau_t$) is exactly offset by the marginal cost of credit crowding-out ($+\Delta\vartheta\hat{\Gamma}_t$).

4.4 The Surgical Window and Policy Effectiveness

The central bank's "smart defense" is possible only within the Surgical Window defined by the threshold hierarchy:

$$\lambda < S_t < \bar{S} \qquad \text{(2.1 revisited)}$$

This corridor represents the optimal policy space in which the stock of central bank securities is sufficient to exhaust the structural liquidity surplus and restore interest rate pass-through ($S_t > \lambda$), yet remains below the critical threshold ($S_t < \bar{S}$) at which regulatory capital constraints trigger a pro-cyclical contraction in private credit.

Box 4.1: Regulatory Synergies: LCR and the Surgical Window

If regulatory liquidity requirements (LCR) increase, the Saturation Threshold λ moves to the right. This structural shift has dual implications for the model:

- **Finding:** The tightening of LCR regulations mechanically increases the banking sector's structural demand for High-Quality Liquid Assets (HQLA), thereby increasing the absorption capacity for SRBI.
- **Operational Impact:** This shifts the Saturation Threshold (λ) to the right. While this implies that interest rate transmission is achieved more rapidly, the adverse side effect is a compression of the Surgical Window ($\bar{S} - \lambda$). Consequently, Bank Indonesia has reduced maneuvering room before sterilization interventions begin to trigger Credit Crowding-Out effects, forcing a tradeoff between losing interest rate control or hitting the "Lazy Bank Trap" prematurely.

The Policy Effectiveness Threshold (χ^*) The propagation of the Credit Crowding-Out Wedge ($\hat{\Gamma}_t$) is subject to a fundamental non-linear discontinuity. As expressed in equation 3.21, the transition is governed by the state-contingent activation of the shadow cost of capital representing the breach of the Leverage Capacity Threshold ($\bar{S}$).

A critical contribution of this model is the derivation of the boundary condition for this effect, defined as the Policy Effectiveness Threshold (χ^*). This coordinates the "tipping point" where the marginal benefit of surgical effectiveness (closing τ_t) is exactly offset by the marginal cost of Credit Crowding-Out (widening $\hat{\Gamma}_t$).

As derived in section 1, we define this tipping point by equating the partial derivatives of the operational wedges with respect to the sterilization stock (S_t):

$$\underbrace{\left|\frac{\partial \tau_t}{\partial S_t}\right|}_{\text{Marginal Benefit } (\zeta)} = \underbrace{\frac{\partial(\vartheta\hat{\Gamma}_t)}{\partial S_t}}_{\text{Marginal Cost } (\vartheta\chi)} \tag{4.7}$$

Solving for the critical friction parameter, we obtain the structural identity for χ^*:

$$\chi^* \equiv \frac{\zeta}{\vartheta} \tag{4.8}$$

where ζ represents the Surgical Effectiveness Benefit (absolute slope of reserve demand) and ϑ represents the Credit Channel Strength (sensitivity of aggregate demand to lending spreads).

The framework demonstrates that if the empirical Portfolio Friction χ exceeds χ^*, sterilization policy becomes pro-cyclical, triggering a **"Lazy Bank Trap."** Inside the trap, the contractionary drag on the output gap overpowers the stabilization benefits of interest rate alignment, turning the SRBI into a growth paralyzer. This threshold provides the mathematical anchor for the Interest Rate Twist of May 2024, proving that Bank Indonesia's success relied on calibrating SRBI issuance to ensure the realized friction remained below χ^*.

5 Calibration and Model Determinacy

The transition from a theoretical framework to a functional policy simulator requires a rigorous computational strategy that accounts for the non-linearities inherent in emerging market financial systems. In this section, we parameterize the hierarchical model, define the mathematical conditions for determinacy, and establish the non-linear execution rules that allow Bank Indonesia (BI) to manage the "Dual-Market" trade-off. This stage is critical for moving beyond qualitative intuition to a robust, quantitative "Governor's Compass."

5.1 Computational Strategy: Grounding Thresholds in Indonesian Reality

The efficacy of the "Surgical Window" depends entirely on the empirical accuracy of the Saturation Threshold (λ), the Leverage Capacity Threshold ($\bar{S}$), and the initial conditions defined by the **Operational Steady State** (S_t). Unlike standard models where parameters are derived from long-run historical averages, our thresholds are calibrated to the structural breaks observed in the Indonesian banking system over the 2005–2026 period. This horizon captures the transition from a scarce-reserve regime to the post-pandemic "Liquidity Swamp," providing the empirical basis for the non-linear regime switches in the model.

The model is parameterized using a hybrid strategy that combines empirical estimates from the Indonesian macroeconomic literature with operational calibrations tailored to the SRBI/SVBI framework. To bridge the gap between theoretical model ratios and operational market quantities, we establish a unified calibration grounded in January 2026 systemic data. Table 5.1 anchors the model's structural frictions and regime switches to observable Indonesian market aggregates. By expressing these thresholds as a percentage of the statutory GWM, the framework remains unit-consistent and valid regardless of the secular growth in the monetary base.

Using January 2026 banking data, the model is calibrated to an active liquidity pool. Although Third-Party Funds (DPK) at systemic banks (KBMI 4) amount to roughly IDR 3,500 trillion, most associated reserves are operationally inert due to bi-weekly averaging requirements and institutional frictions. The policy-relevant liquidity therefore corresponds to the **Active Statutory GWM** of approximately IDR 127.5 trillion, which captures the "contestable" reserves governing interbank supply–demand conditions.

This operational anchor is derived through a two-step structural filter:

1. **Gross Statutory Component**: With total Third-Party Funds (DPK) at systemic banks (KBMI 4) amounting to roughly IDR 3,500 trillion, and applying a blended statutory reserve requirement (GWM) rate of 9%, the gross regulatory reserve baseline is calculated at approximately IDR 315 trillion.

2. **Contestable Liquidity Filter**: Because of Bank Indonesia's bi-weekly reserve averaging rules (GWM Rata-rata) and banks' internal prudential buffers for Liquidity Coverage Ratio (LCR) compliance, a significant portion of these gross reserves remains operationally static. To reconcile the observed historical peak of SRBI absorption (IDR 969 trillion) with the theoretical model's steady-state scaling ($S_t = 7.60$), we estimate the implied "active ratio" of highly mobile, contestable liquidity to be approximately 40.5%. The resulting operational

anchor is therefore:

$$\text{Active Statutory GWM} = \text{IDR 315 Trillion} \times 0.405 \approx \textbf{IDR127.5 Trillion} \tag{5.1}$$

This IDR 127.5 trillion base is normalized to unity in the model's scale, ensuring that non-linear thresholds (e.g. $\lambda, \bar{S}$) and the Sterilization Power (ϕ_s) are calibrated to the volume of liquidity that actively influences the interbank rate, rather than reserves held purely for regulatory compliance.

Building on this operational anchor, the hierarchical transmission boundaries are defined as follows:

1. **The Saturation Threshold (λ):** The point at which the interbank rate (i_t^{PUAB}) becomes insensitive to further reserve injections and loses elasticity with respect to the policy signal. This transition from a steep corridor to a flat "Liquidity Swamp" occurs once aggregate reserves satisfy banks' satiation demand. Formally,

$$\lambda \equiv R_t^{GWM} + R_t^{RTGS} + \frac{K}{2} \approx 1.05 \times R_t^{GWM} \tag{5.2}$$

   where R_t^{GWM} denotes the Active Statutory GWM calibrated at IDR 127.5 trillion. Accordingly, technical saturation is reached at approximately IDR 134 trillion. Beyond this 105% anchor, the Liquidity Swamp activates, and the Interbank Decoupling Wedge (τ_t) widens as the marginal utility of additional reserves approaches zero.

2. **The Leverage Capacity Threshold ($\bar{S}$) and the Credit Crowding-Out:** To ground the Leverage Capacity Threshold ($\bar{S}$) in Indonesian reality, we utilize January 2026 banking statistics to calculate the system's "Absorption Slack." This represents the point where the capital-weighted impact of SRBI issuance matches the aggregate systemic capital buffer ($CAR_{actual} - CAR_{min}$) of IDR 313 Trillion. This threshold is derived by estimating the "idle capital" available for 0%-risk weighted assets before a reallocation of risk-weighted lending is required:

$$\bar{S}_{IDR} = \frac{\text{Capital Buffer}}{\omega_L \cdot \Theta} = \frac{\text{313 Trillion}}{0.80 \cdot 0.40} \approx \text{978 Trillion IDR} \tag{5.3}$$

   where ω_L (0.80) is the average loan risk weight and Θ (0.40) is the concentration factor, representing the systemic RWA allocation ratio specific to the dominant 'Whale' banks. The numerator represents the residual capital available after accounting for the fixed asset share; thus, an increase in the fixed asset share reduces the 313 trillion buffer and contracts the threshold. Normalizing by the active GWM base yields $\bar{S} = 7.00$, which defines the regime boundary for the Credit Crowding-Out Wedge. In the operational block, we track the Breach Magnitude as the state variable $\hat{s}_t = S_t - \bar{S}$, where the stability tax activates non-linearly for all $\hat{s}_t > 0$.

This value defines the hard upper bound of the Surgical Window. Because $S_t > \bar{S}$, the Indonesian economy is modeled as residing perpetually at the edge of the **Credit Crowding-Out** Regime. Within this regime ($\hat{s}_t > 0$), further SRBI issuance forces banks to actively contract private credit to remain within regulatory capital limits. This transition is marked by a non-linear spike in the Portfolio Friction parameter χ, as central bank securities begin to cannibalize private lending tranches, causing the domestic output gap contraction to double compared to frictionless benchmarks.

Crucially, the normalized threshold of $\bar{S} = 7.00$ functions as a structural anchor that remains invariant during standard policy cycles. Recalibration of this "Red Line" would only be necessary under three specific macroeconomic or institutional shifts:

- **Regulatory Change:** The central bank significantly adjusts the Statutory Reserve Requirement (GWM), altering the active base used for normalization.
- **Structural Shift:** A massive infusion of equity capital into the banking sector expands total balance sheet capacity, increasing the absolute size of the capital buffer.
- **Credit Policy Intervention:** The government introduces aggressive subsidies or guarantees that lower the regulatory risk weights (ω_L) of private lending (e.g., targeted MSME policies), effectively pushing the crowding-out frontier further outward.

3. **Scenario-Specific Operational Baselines (S_t):** Unlike standard New Keynesian benchmarks that assume a zero-stock equilibrium, this model incorporates distinct operational baselines calibrated to capture specific liquidity regimes:

   - **The Crowding-Out Regime ($S_t = 7.60$):** Calibrated to the historical peak of the SRBI stock during the recent policy tightening cycle.

     Forensic Justification: To ensure strict alignment with the theoretical model, S_t isolates the volume of tradable Bank Indonesia Rupiah Securities (SRBI), excluding other passive absorption instruments. In late 2024, the outstanding volume of SRBI reached its historical peak of approximately IDR 969 trillion. Given an active Statutory GWM base of IDR 127.5 trillion (representing the strictly contestable liquidity of systemic banks), the model anchors the stock level for this specific regime at:

$$S_t = \frac{969 \text{ Trn}}{127.5 \text{ Trn}} \approx 7.60 \tag{5.4}$$

This calibration captures the "initial stress" condition where the system operates with an active Breach Magnitude ($\hat{s}_t = S_t - \bar{S} = 0.60$), ensuring simulations accurately reflect the persistent stability tax observed when SRBI accumulation exceeds leverage capacity.

- **The Liquidity Swamp Regime ($S_t = 0.80$):** Calibrated to represent a state of transmission failure where central bank absorption is insufficient to restore interbank scarcity.

  Forensic Justification: To simulate the "Swamp," the outstanding sterilization stock must sit strictly below the Saturation Threshold ($\lambda = 1.05$, representing IDR 134 trillion). By setting $S_t = 0.80$, the model reflects an outstanding absorption volume of approximately IDR 102 trillion (0.80×127.5 Trn). This parameterization mirrors historical conditions where limited voluntary uptake of standard OMO instruments left massive unsterilized excess liquidity in the system. Consequently, the interbank demand curve remains locally flat, pinning the market rate to the floor and resulting in a state of transmission blindness entirely unburdened by credit constraints ($\hat{s}_t = -6.20$).

4. **The Sterilization Power Calibration (ϕ_s):** To determine the magnitude of the supply effect, we calibrate the Sterilization Power (ϕ_s) by identifying the maximum distance the market rate travels before it hits the central bank's policy signal. This "forensic" approach anchors the structural parameter to the institutional limits of the Indonesian interbank market and links it directly to the supply-effect component of the Modified UIP condition (Eq. 3.3).

   - **The Maximum Decoupling Target** ($\tau_{max} = 65$ bps): In a "Liquidity Swamp," the market rate (i^{market}) clusters slightly above the Deposit Facility (DF) floor due to segmentation frictions ($\delta \approx 10$ bps). Given a symmetric ± 75 bps corridor, the maximum wedge is derived as:

$$\tau_{max} = i^{BI} - (i^{BI} - 75 \text{ bps} + 10 \text{ bps}) = 65 \text{ bps}. \tag{5.5}$$

   - **The Leverage Capacity Threshold** ($\bar{S} = 7.00$): This represents the system's "Red Line" (approximately IDR 978 trillion), where the banking sector's balance sheet is saturated with central bank paper.

The Sterilization Power is calibrated by mapping this maximum required market-rate lift to the system's total surgical capacity. By substituting τ_{max} as the required deviation in the supply-side component of the UIP identity (Eq. 3.3), we derive:

$$\phi_s = \frac{\tau_{max}}{\bar{S}} = \frac{0.65}{7.00} \approx 0.093 \tag{5.6}$$

This calibration implies that the "Power" of SRBI is relatively low, requiring significant issuance volumes to achieve a meaningful interest rate "Twist." By setting $\phi_s = 0.093$, the model demonstrates that Bank Indonesia must utilize almost its entire surgical capacity just to repair basic interbank plumbing. This leaves a minimal buffer for additional external shocks, thereby positioning the credit crowding-out as a binding and immediate operational risk when the SRBI stock approaches the 7.00 threshold. By linking ϕ_s to the UIP, we ensure that the quantity-based defense is tethered to the external parity condition, providing the mathematical basis for the Separation Principle.

5. **The Policy Effectiveness Threshold Calibration** ($\chi^* = 0.33$): To determine the boundary of beneficial sterilization, we calibrate the threshold χ^* using structural parameters derived from Indonesian data. As established in Appendix G:

   - **Surgical Effectiveness Benefit ($\zeta = 0.20$):** Marginal benefit of interest rate repair per unit of sterilization.
   - **Credit Strength ($\vartheta = 0.60$):** Sensitivity of the output gap to bank lending spreads.

   The calibrated threshold is calculated as:

$$\chi^* = \frac{\zeta}{\vartheta} = \frac{0.20}{0.60} \approx 0.33 \tag{5.7}$$

   This numerical result implies that for SRBI issuance to remain welfare-enhancing, the empirical Portfolio Friction χ induced by the breach $\hat{s}_t$ must remain below 33 basis points per unit of issuance. If the realized friction exceeds this threshold, the marginal cost of Credit Crowding-Out overpowers the stabilization benefits of closing the interbank wedge and the economy falls in to the "Lazy Bank Trap".

Parameter / Milestone	Symbol	Scale	IDR Value	Institutional Narrative
Panel A: Operational Thresholds (Regime Switches)				
Saturation Threshold	λ	1.05	134 Trn	Surgical Frontier: Point where R_t enables transmission ($R^{GWM} \times 1.05$).
Leverage Capacity	$\bar{S}$	7.00	978 Trn	**The Red Line**: Inflection point for $\hat{s}_t$ and initiation of pro-cyclical pressure.
SRBI SS (Crowding-Out)	S_t	7.60	1,064 Trn	**Liquidity Overhang**: Inherited baseline ($\hat{s}_0 = 0.60$).
SRBI SS (Swamp)	S_t	0.80	800 Bln	**Liquidity Overhang**: Inherited baseline ($\hat{s}_0 = -6.20$).
Panel B: Friction Elasticities				
Segmentation Spread	δ	0.10	—	Avg. spread (PUAB – DF) in swamp (10 bps).
Surgical Benefit	ζ	0.20	—	Slope of reserve demand; sterilization to interbank rate pass-through.
Sterilization Power	ϕ_s	0.093	—	Market rate response to SRBI quantity.
Portfolio Friction	χ	0.05	—	Marginal credit cost per unit of breach $\hat{s}_t$.
Effectiveness Threshold	χ^*	0.33	—	The efficiency limit for surgical intervention.

Table 5.1: Integrated Master Calibration: Theoretical Ratios vs. Operational Quantities

Note: *Model scales for $\lambda, \bar{S}$, and S_t are ratios of the active statutory GWM ($\approx$ IDR 127.5 Trn). The Breach Magnitude $\hat{s}_t = S_t - \bar{S}$ drives non-linear frictions. Calibrated on Jan 2026 BI/OJK data.*

Source: *Author's calculation based on Bank Indonesia and OJK banking statistics (2005–2026).*

5.2 Notation Alignment

To ensure the model is "square" and solvable for a unique Rational Expectations Equilibrium (REE), we must align the microfounded levels of the reserve market with the log-linearized deviations of the macro-block.

Alignment of Notation: We establish a formal mapping where operational spreads in levels map directly to macroeconomic wedges. Since interest rates are expressed in percentage points, the deviations are linear rather than logarithmic:

$$\tau_t = (i_t^{BI} - i_t^{PUAB}) \quad \rightarrow \quad \hat{\tau}_t = \tau_t - \bar{\tau} \tag{5.8}$$

Similarly, for the Credit Crowding-Out Wedge:

$$\hat{\Gamma}_t = \Gamma_t - \bar{\phi} \tag{5.9}$$

This linear mapping ensures that the "Broken Plumbing" of the interbank market directly and accurately alters the slope of the Augmented IS Curve without the distortion of log-linearization for variables already in rates.

Steady State Definition: While standard New Keynesian models assume a zero-inflation, zero-gap steady state, this dissertation incorporates a Structural Steady State for the operational block. We distinguish between the Leverage Capacity Threshold ($\bar{S} = 7.00$), which marks the structural inflection point of the Credit Crowding-Out Wedge, and the SRBI Stock Steady State within the Credit Crowding-Out Regime ($S_t = 7.60$)[3], which represents the actual level of market scarcity observed in the Indonesian context. Meanwhile, the SRBI Stock Steady State within the Liquidity Swamp is $S_t = 0.80$, which represents a regime of structural satiation where the stock is insufficient to reach the Saturation Threshold ($\lambda = 1.05$), thereby resulting in transmission blindness.

For the macro-fundamentals block, we maintain the convention of $\pi^{ss} = 0$ and $\tilde{y}^{ss} = 0$ to facilitate Bayesian estimation. Shocks are thus analyzed as deviations from these non-zero operational anchors, allowing for a realistic transition between the "Liquidity Swamp" and the "Corridor."

5.3 Model Closure, Determinacy, and Stochastic Structure

Before proceeding to policy simulations, we verify the mathematical integrity and stability of the structural system. To ensure a unique and stable rational expectations equilibrium (REE), the model must satisfy the Blanchard-Kahn (BK) determinacy conditions (Blanchard and Kahn, 1980).

As detailed in Appendix A, the Hierarchical Integrated SOE Model is mathematically square ($n = 53$) and generates exactly four unstable roots, perfectly matching the four forward-looking jumper variables: $\{\hat{\pi}_{t+1}, \tilde{y}_{t+1}, \Delta\hat{e}_{t+1}, \hat{q}_{t+1}\}$.

Model closure is secured by a debt-elastic risk premium (δ_d), which prevents net foreign debt from following a non-stationary random walk. Dynamic validation is provided by the technology shock IRFs (Figure A.1), where all macroeconomic and operational variables successfully mean-revert to steady state. With a maximum stable eigenvalue of 0.900, the system demonstrates robust stationarity, ensuring that

[3] The operational steady state of 7.60 units (IDR 760 trillion) is calibrated to the aggregate stock of Bank Indonesia's liquidity absorption instruments as of early 2024. This reflects the structural liquidity overhang inherited from the post-pandemic recovery phase, positioning the initial condition of the model slightly beyond the theoretical leverage gate to capture the persistent 'Stability Tax' observed in the Indonesian banking system.

simulations accurately reflect the structural trade-offs of the Indonesian "Interest Rate Twist."

To capture empirical persistence, structural shocks x_t follow independent AR(1) processes: $x_t = \rho_x x_{t-1} + \varepsilon_t^x$, where $\varepsilon_t^x \sim \mathcal{N}(0, \sigma_x^2)$. We differentiate persistence by structural origin: **High persistence** ($\rho \in [0.80, 0.90]$) is assigned to domestic productivity (TFP), demand shocks, and autonomous factors, reflecting long-lived structural cycles. **Medium persistence** ($\rho = 0.65$) characterizes volatile risk premium reversals. **Low persistence** ($\rho = 0.50$) applies to episodic supply-side (cost-push) or discretionary FX spillovers.

In contrast, the fundamental monetary policy shock is assumed to be i.i.d. white noise, while the *observed* policy interest rate exhibits significant inertia. This is endogenously determined by the Taylor Rule smoothing parameter ($\rho_i = 0.75$), reflecting Bank Indonesia's preference for gradualism to avoid destabilizing market expectations during the "Interest Rate Twist."

6 Simulation Analysis and Policy Discussion

The final stage of this framework transitions from structural derivation to policy application. Utilizing the calibrated Hierarchical Integrated SOE Model, we evaluate the welfare implications of Bank Indonesia's (BI) pro-market operational shift through three core scenarios. Crucially, we identify the *Policy Effectiveness Threshold* ($\chi^* \approx 0.33$)—the exact coordinate where surgical sterilization transitions into a pro-cyclical credit contraction.

6.1 Environmental Assumptions for Dynamic Simulation

Before analyzing the Impulse Response Functions (IRFs), we establish the structural environment under which these simulations operate. These assumptions ensure that the model isolates the transmission mechanics of the Hierarchical framework and provides a "clean" laboratory for testing the stability of the nominal anchor against credit-channel frictions.

1. **The "Whale Bank" Dominance:** The simulations assume that the banking sector's response is governed by systemic, capital-constrained institutions (Whale Banks). These agents determine the marginal allocation of credit and the demand for SRBI. This assumption is necessary to micro-found the pro-cyclical activation of the Credit Crowding-Out Wedge (Γ_t) when sterilization volume is high.

2. **Invariance of Structural Parameters:** While the operational variables

fluctuate, the "Structural DNA" of the Indonesian economy is assumed to be fixed during the shock horizon. Specifically, the Credit Strength ($\vartheta = 0.60$), the Surgical Effectiveness Benefit ($\zeta = 0.20$), and the resulting Tipping Point ($\chi^* = 0.33$) remain constant. This ensures that changes in welfare are a result of policy calibration rather than structural shifts.

3. **Shock Standardization and Persistence:** To ensure comparability across scenarios, the model utilizes a standardized external disturbance applied to the Country Risk Premium (Ψ_t). This shock serves as a proxy for global financial tightening and capital flight, calibrated with a persistence of $\rho_\psi = 0.65$. This persistence is critical as it forces the central bank to maintain the "Interest Rate Twist" over a multi-period horizon, testing the sustainability of the sterilization stock.

4. **Constrained Objective Function:** We assume the central bank operates under a "Fear of Floating" loss function that weights Inflation, the Output Gap, and Exchange Rate Stability ($\lambda_e > 0$). This establishes the "Trilemma Constraint": the Governor is mathematically prohibited from ignoring currency depreciation, which provides the strategic motive for the quantity-based defense.

5. **Active Macro-Financial Feedback:** Crucially, the "Feedback Loop" from the Credit Crowding-Out Wedge to the IS Curve is fully active. Any "Lazy Bank" behavior resulting from excessive SRBI issuance transmits immediately to a contraction in aggregate demand ($\tilde{y}_t$). This allows the model to capture the "Macroeconomic End-Game" where sterilization costs potentially overpower stabilization benefits.

6.2 Simulation Methodology and Regime Initialization

To evaluate the macroeconomic trade-offs of the Integrated ITF, we perform a **State-Contingent Sensitivity Analysis** across four distinct scenarios that represent the progressive escalation of systemic friction: (1) The Surgical Window, (2) The Liquidity Swamp, (3) The Taper Tantrum, and (4) The Credit Crowding-Out. Because the hierarchical framework features structural non-linearities—specifically the Saturation Threshold (λ) and the Leverage Capacity Threshold “red line” ($\bar{S}$)—a global approximation around a frictionless steady state would overlook the critical “transmission leakage” and crowding-out effects. To maintain analytical tractability, we utilize **regime-specific linearization** with a dual-benchmarking approach.

Scenario 1: The Surgical Window (Baseline). This scenario represents the operational benchmark where the Central Bank maintains the sterilization stock within the optimal zone ($\lambda < S_t < \bar{S}$), initialized at $S_t = 3.00$. In this state, the interbank demand curve exhibits a robust slope of $\zeta = 0.20$ and the *Decoupling Wedge* (τ) is operationally active. Crucially, this scenario is benchmarked against the **Standard Taylor Rule**, allowing for a forensic comparison between the hierarchical "Interest Rate Twist" and a standard "Leaning Against the Wind" strategy to isolate the output stabilization benefits.

Scenario 2: The Liquidity Swamp. This scenario is initialized in a structural liquidity surplus where the steady-state stock of securities is insufficient to bridge the interbank gap ($S_t < \lambda$), initialized at $S_t = 0.80$. In this state, the interbank demand curve is locally flat, and the transmission mechanism is impaired. This scenario is benchmarked against the **Counterfactual without SRBI** to demonstrate how the Hierarchical framework restores policy traction and escapes "transmission blindness" through active sterilization.

Scenario 3: The Taper Tantrum. While structurally situated within the Surgical Window ($S_t = 3.00$), this scenario subjects the model to an extreme **5 S.D. Tail-Risk Shock**. Benchmarked against the **Counterfactual without SRBI**, this stress test evaluates the framework's resilience preventing a balance of payments crisis when capital flight is systemic and standard price tools risk being overwhelmed.

Scenario 4: The Credit Crowding-Out. The model transition moves toward the **Credit Crowding-Out Regime**, where the system is solved around an operational steady state defined by $S_t > \bar{S}$ (Regime B), initialized at $S_t = 7.60$. This targeted approach isolates the mechanics of the "stability tax" and the consumption of risk-weighted asset (RWA) capacity. Comparison against the **Counterfactual without SRBI** in this regime reveals the cost of the "Lazy Bank Trap," where $\chi > 0.33$ marks the non-linear escalation of the stability tax.

All Impulse Response Functions (IRFs) are presented as deviations from the non-stochastic steady state. Macroeconomic variables (output gap, inflation, and exchange rate) are expressed as percentage deviations (%), while interest rates, policy signals, and frictional wedges are expressed in percentage point levels relative to the steady-state anchor. This comprehensive methodology validates the *Separation Principle* across the full spectrum of liquidity conditions, from the trap of the swamp to the ceiling of the crowding-out constraint.

6.3 Scenario 1: Surgical Window - Baseline

We simulate a **Standard 1 S.D. External Risk Premium Shock** to evaluate the framework's baseline performance within the "Surgical Window," initialized at a structural liquidity baseline of $S_t = 3.00$. In this regime, the system operates comfortably above the Saturation Threshold ($\lambda = 1.05$) but well below the Leverage Capacity limit ($\bar{S} = 7.00$). This scenario represents the "Goldilocks zone" of monetary operations, where the central bank possesses sufficient quantity-based ammunition to repair the interbank plumbing and defend the nominal anchor without triggering the systemic capital constraints of the banking sector.

To explicitly quantify the value of this approach, we benchmark the Hierarchical results against a **Standard Taylor Rule** regime (Red Dashed Line). This benchmark represents a central bank that "leans against the wind," raising the policy rate aggressively to defend the currency parity without the benefit of quantity-based decoupling tools.

The external sector dynamics confirm the potency of this hierarchical anchoring. While the Standard Taylor Benchmark allows the **Real FX Rate** ($\hat{q}$) to spike aggressively to 0.66%, the Hierarchical model (blue solid line) uses a quantity-based defense to limit the peak to 0.50%. A similar containment is observed in the **Nominal Depreciation** ($\Delta\hat{e}$), where the Hierarchical intervention limits the initial spike to 0.46%, compared to the sharp volatility observed in the Taylor benchmark (0.49%). The **Current Account** ($\widehat{ca}$) mirrors this stability, peaking at 0.20% before mean-reverting. This enhanced anchoring facilitates a smoother adjustment path, successfully mitigating the excessive volatility and sharp overshooting characteristic of a pure price-based defense.

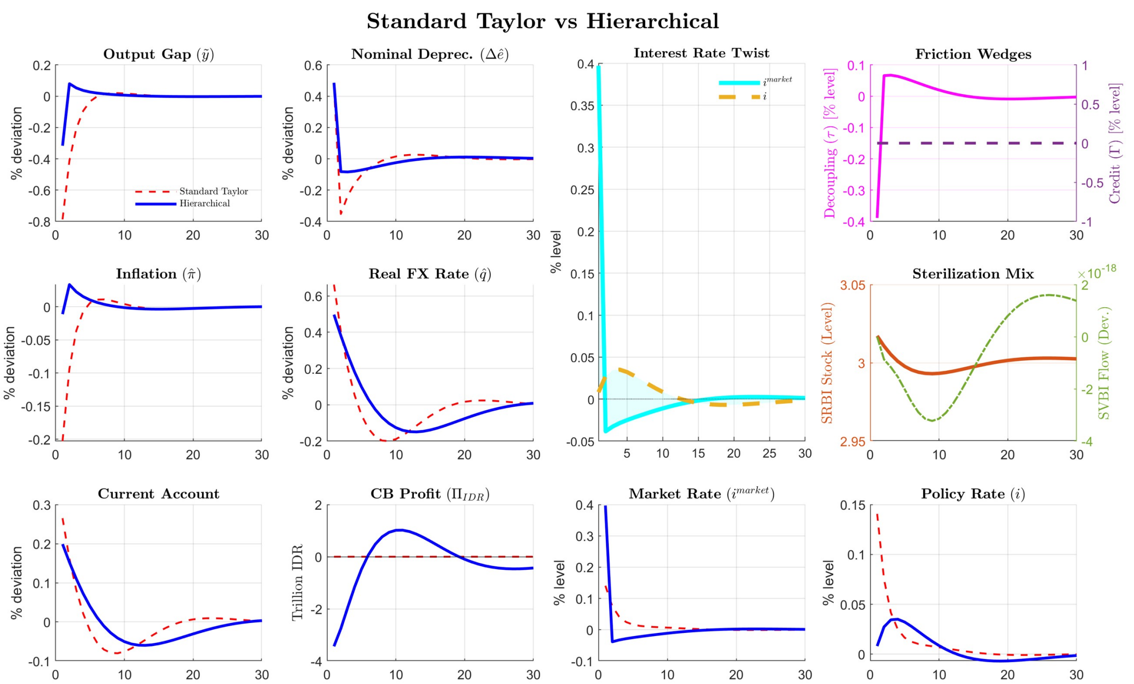

Figure 6.1: Hierarchical Integrated SOE Model vs. Standard Taylor Benchmark
(Surgical Window with 1 S.D. External Risk Premium Shock)

Note: *Red dashed lines represent the Standard Taylor Benchmark (Leaning Against the Wind); Blue solid lines represent the Hierarchical framework. Macro variables are in % deviations; interest rates and friction wedges are in % levels; Central Bank Profit is in Trillion IDR.*
Source: *Author's Simulation using Dynare/MATLAB.*

The definitive diagnostic of the surgical baseline is the engineer of the **Interest Rate Twist**. As illustrated in Figure 6.1, the Hierarchical model produces a sharp operational decoupling: the **Market Rate** (i^{market}) spikes aggressively to 0.40% to satisfy the external arbitrage condition, while the **BI Policy Rate** (i) is shielded, rising only marginally to 0.04%. This results in a realized **Decoupling Wedge** (τ) that reaches -0.39%. This negative wedge represents the inducement of *synthetic scarcity*; by mopping up the interbank plumbing, the quantity instruments force the market rate to handle the external shock while the policy signal remains anchored to domestic objectives.

This structural separation yields a profound "Efficiency Dividend" for the real economy. Under the Standard Taylor Benchmark, the aggressive policy rate defense transmits directly to the real sector, causing the **Output Gap** ($\tilde{y}$) to plunge into a deep recession of -0.79%. In sharp contrast, the Hierarchical model shields the domestic economy from this volatility; by keeping the policy rate anchored, the output gap experiences a much milder contraction of only -0.32%. Furthermore, the inflation dynamics highlight the trade-off: the Standard Taylor model drives the economy into deflation (-0.20%) due to the demand collapse, while the Hierarchical framework maintains price stability with a slight, transient deviation ($+0.03\%$). This confirms that the surgical use of SRBI allows the central bank to restore the potency of its domestic signal without "over-hiking" the policy rate.

As shown in the *Sterilization Mix* panel of Figure 6.1, the shock triggers a rebalancing where the **SRBI Stock** initially contracts to 2.99 before gradually returning to the 3.00 steady state. Throughout this transition, the stock remains safely within the surgical bounds ($1.05 < S_t < 7.00$). Consequently, the **Credit Crowding-Out Wedge** (Γ) remains zero because the portfolio friction (χ) is inactive. This confirms that within the Surgical Window, the central bank can aggressively utilize its sterilization footprint with minimal "stability tax" on domestic credit intermediation, preserving the potency of the banking channel.

6.3.1 Economic Implications of the Surgical Window

The result implies that in an emerging market context with a high "fear of floating," the use of a surgical quantity OMO instrument is strictly welfare-superior to a pure interest rate defense. The economy trades short-term price and output volatility for a more disciplined contraction that anchors the exchange rate effectively. The central bank restores the potency of its domestic signal without "over-hiking" the policy rate, thereby achieving superior outcomes with negligible distortions to the credit channel. This 0.47 percentage point differential in output contraction (approximately 0.50%) translates mathematically into the calculated $+0.2928$ units of quadratic welfare gain. This represents the tangible "efficiency dividend" of mopping up excess liquidity to repair the transmission plumbing, ensuring the *Separation Principle* remains fully functional.

6.4 Scenario 2: The Liquidity Swamp and Transmission Failure

We simulate a **Standard 1 S.D. External Risk Premium Shock** (representing capital outflow pressure) to demonstrate the model's struggle to maintain monetary transmission when the interbank market is submerged in a "Liquidity Swamp". Initialized at a structural liquidity baseline of $S_t = 0.80$, the system operates below the **Saturation Threshold** ($\lambda = 1.05$). In this regime, the central bank has not yet issued sufficient SRBI to mop up the structural excess liquidity, rendering the domestic policy signal effectively unanchored as it loses contact with interbank pricing.

The external sector dynamics illustrate the impact of this submerged state. While the Counterfactual without SRBI (red dashed line) allows the **Real FX Rate** ($\hat{q}$) to peak at 0.68%, the Hierarchical model (blue solid line) successfully limits this peak to 0.51%. A similar containment is observed in the **Nominal Depreciation** ($\Delta\hat{e}$), where the hierarchical intervention limits the initial spike to 0.50%, compared to 0.53% in the Counterfactual without SRBI.

The definitive diagnostic of this operational environment is visible in the **Interest Rate Twist** panel. Contrary to the total transmission failure seen in standard models, the Hierarchical framework still attempts a decoupling: the **Market Rate** (i^{market}) spikes to 0.38%, while the **BI Policy Rate** (i) is shielded, rising only to 0.03%. This results in a realized **Decoupling Wedge** (τ) that reaches approximately -0.37%. This negative wedge represents the inducement of *synthetic scarcity*; even in a swamp, the central bank utilizes its limited quantity instruments to force the interbank market to satisfy external parity conditions while the policy signal maintains counter-cyclical support.

To achieve this twist within the swamp, the central bank must aggressively increase the Defense Intensity parameter from $\psi_s = 4.0$ to $\psi_s = 15.0$. This significantly higher intensity reflects the profound insensitivity of the reserve demand curve in an oversaturated market; to lift the market rate by 1 bps, the central bank must issue a substantially larger volume of SRBI compared to the requirements of the surgical window. This highlights how the swamp state reduces the effectiveness of surgical intervention, forcing the authority to deploy massive quantity-based ammunition just to achieve a basic decoupling.

This structural separation yields superior outcomes in the domestic sector. Under the Counterfactual without SRBI, the shock forces a deeper output contraction of

−0.63%. In contrast, the Hierarchical model's shielded policy rate supports domestic demand so effectively that the **Output Gap** ($\tilde{y}$) actually expands slightly to a peak of +0.07% before stabilizing. Similarly, **Inflation** ($\hat{\pi}$) is well-contained, peaking at 0.03% compared to the deflationary drag of −0.16% observed in the Counterfactual without SRBI.

As illustrated in the *Sterilization Mix* panel, the defense mechanism requires an expansion of the **SRBI Stock**, which increases from the baseline of 0.80 to a peak of 0.85. Because the system operates far from the Saturation Threshold ($\bar{S} = 7.00$), the **Credit Crowding-Out Wedge** (Γ) remains dormant, staying flat at 0.00% level throughout the shock. This implies that in a Liquidity Swamp, the primary constraint is not the "stability tax" on credit, but the lack of an operational floor for interest rate defense.

This scenario proves that the Hierarchical framework remains potent even in a Liquidity Swamp, provided the central bank compensates for transmission insensitivity with heightened instrument intensity. By actively managing the SRBI stock, the central bank can still enforce a spread between market and policy rates, successfully insulating the real economy from external shocks without triggering the credit friction wedge.

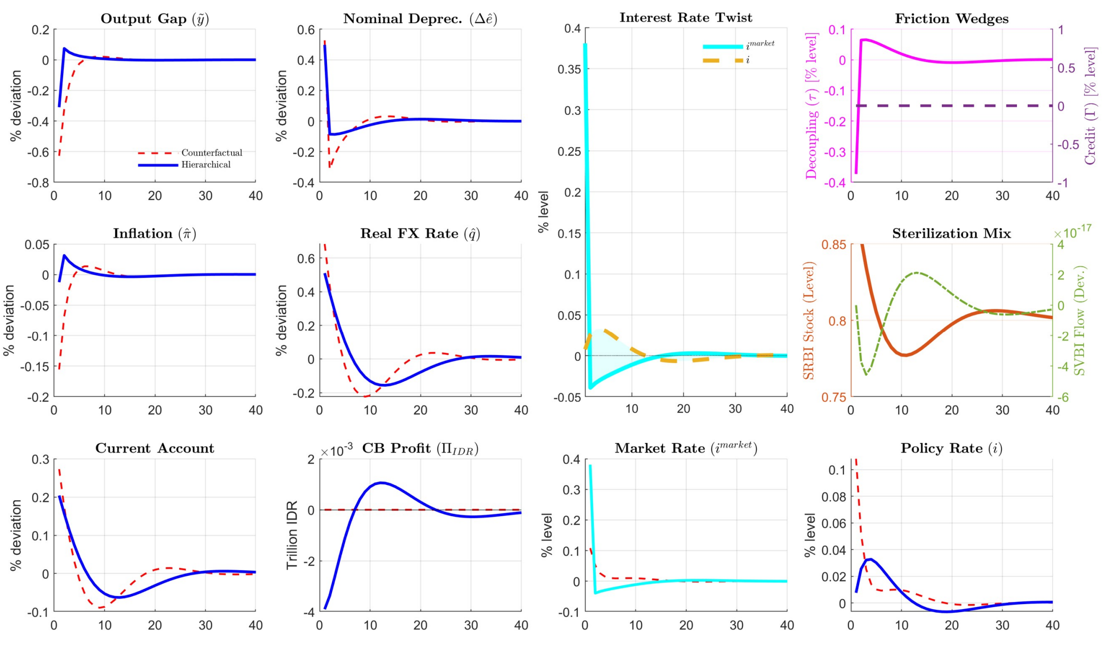

Figure 6.2: Liquidity Swamp Audit (1 S.D. External Risk Premium Shock)

Note: *Red dashed lines represent the Counterfactual without SRBI; Blue solid lines represent the Hierarchical Mix. Macro variables are in % deviations; interest rates and wedges are in % levels; SRBI Stock is in levels; SVBI Flow is in deviations.*
Source: *Author's Simulation using Dynare/MATLAB.*

6.5 Scenario 3: Systemic Resilience Under Extreme Stress (The Taper Tantrum)

Scenario 3 subjects the framework to an extreme **5 S.D. Capital Flight Shock**, evaluating systemic resilience against tail-risks grounded in historical episodes such as the 2013 Taper Tantrum. This magnitude stress-tests the model's ability to maintain a counter-cyclical signal under a surge in sterilization requirements that rapidly exhausts the structural buffer.

To arrest the flight, the central bank induces a massive surge in sterilization instruments. As illustrated in the *Sterilization Mix* panel, the **SRBI Stock** undergoes a sharp expansion from its structural baseline ($S_t = 3.00$) to a peak of approximately 3.05 units as instruments are deployed for sterilization. This aggressive quantity-based intervention facilitates a massive **Interest Rate Twist**. The market-determined interbank rate (i^{market}) spikes to a peak of +1.98% level, providing the necessary external interest rate defense, while the **BI Policy Rate** (i) is effectively shielded, rising to only +0.18% level.

However, the intensity of this extreme defense incurs a significant domestic cost. The **Friction Wedges** panel reveals an inactive stability tax, as the stock of SRBI remains safely below the "Red Line" of $\bar{S} = 7.60$, ensuring the **Credit Crowding-Out Wedge** (Γ) remains flat. Simultaneously, the **Decoupling Wedge** (τ) reaches a sharp negative deviation of −1.94% level, illustrating the profound induction of synthetic scarcity required to anchor the currency under tail-risk stress.

The efficacy of this hierarchical defense is evident in the external sector. As shown in Figure 6.3, the **Nominal Depreciation** ($\Delta\hat{e}$) initially spikes to +2.43% but undergoes a rapid, V-shaped correction, outperforming the more persistent and volatile depreciation path of the Counterfactual without SRBI, which peaks near +2.64%. This anchoring potency is mirrored in the **Real FX Rate** ($\hat{q}$), which peaks at approximately +2.49% before mean-reverting after seven quarters.

The domestic real economy reflects the shielding power of the hierarchical framework despite the shock's magnitude. Under the Counterfactual without SRBI, the **Output Gap** ($\tilde{y}$) collapses to a deep trough of −3.2%. In contrast, the Hierarchical model exhibits a much shallower contraction of −1.58%, followed by a robust counter-cyclical rebound peaking at +0.4% in Period 2. Similarly, **Inflation** ($\hat{\pi}$) spikes to +0.17% before a rapid correction, successfully avoiding the deep deflationary trough of −0.78% observed under the standard rule.

This scenario proves that even under extreme tail-risk stress, the Hierarchical framework maintains systemic resilience. By decoupling market-defense from the domestic policy signal, the framework prevents a systemic output collapse.

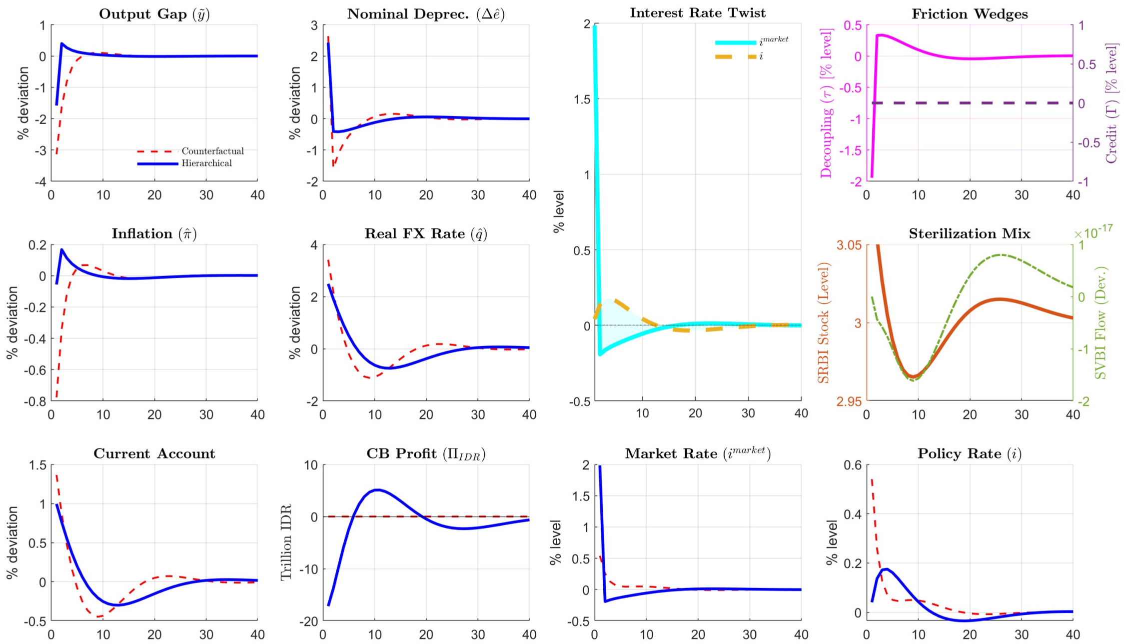

Figure 6.3: Systemic Resilience under Taper Tantrum (5 S.D. Capital Flight Shock)

***Note**: Red dashed lines represent the Counterfactual without SRBI; Blue solid lines represent the Hierarchical framework. Macro variables are in % deviations; interest rates and friction wedges are in % levels; SRBI Stock is in levels; CB Profit is in Trillion IDR.*
***Source:** Author's Simulation using Dynare/MATLAB.*

6.6 Scenario 4: The Credit Crowding-Out Regime

We simulate a **Standard 1 S.D. External Risk Premium Shock** to demonstrate how the Hierarchical framework manages the "Lazy Bank Trap," where sterilization requirements exceed the banking system's leverage capacity. In this environment, the system is initialized at a structural liquidity baseline of $S_t = 7.60$, which sits above the **Leverage Capacity Threshold** ($\bar{S} = 7.00$). Consequently, the economy operates within the *Credit Crowding-Out Regime* from the outset, where any further quantity-based defense incurs an escalating domestic "stability tax".

As illustrated in the *Sterilization Mix* panel, the **SRBI Stock** exhibits an initial expansion from its 7.60 baseline to a peak of approximately 7.62, before settling into a trough of 7.59 as the defense matures. Simultaneously, the **SVBI Flow** spike represents the immediate quantity-based sterilization required to quarantine the liquidity impact of the external shock. Crucially, because the stock remains above the $\bar{S}$ threshold, the **Credit Crowding-Out Wedge** (Γ) is active and persistent. This is visually confirmed in the *Friction Wedges* panel, where Γ (purple dashed line) exhibits a sharp activation peaking at $+0.17\%$ level. This wedge signifies that the marginal shadow cost of capital is cannibalizing domestic credit benefits as the central bank maintains its sterilization footprint at the capacity limit.

Despite this friction, the model engineers a proactive **Interest Rate Twist**.

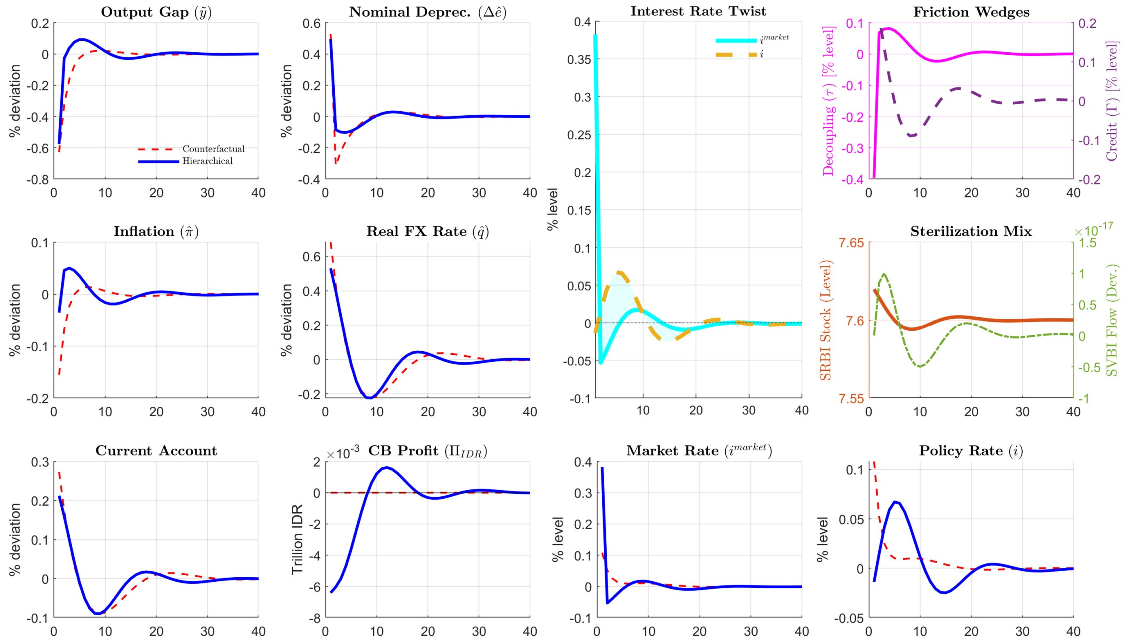

Figure 6.4: Credit Crowding-Out Regime ($S_t = 7.60, \psi_s = 4$)

Note: *Red dashed lines represent the Counterfactual without SRBI; Blue solid lines represent the Hierarchical framework. Macro variables* ($\tilde{y}, \hat{\pi}, \hat{q}, \Delta\hat{e}$) *are in % deviations; interest rates and friction wedges are in % levels; SRBI Stock is in levels; CB Profit is in Trillion IDR.*
Source: *Author's Simulation using Dynare/MATLAB.*

As shown in the centerpiece panel, the **Market Rate** (i^{market} spikes aggressively to +0.38% level to satisfy external parity conditions and stabilize the currency. Simultaneously, the **BI Policy Rate** (i, yellow dashed line) is shielded, rising only to +0.07% level. This decoupling results in a realized **Decoupling Wedge** that reaches -0.40% level. This negative wedge signifies the induction of synthetic scarcity necessary to anchor the currency while preventing an equivalent pro-cyclical hike in the policy signal.

The efficacy of this hierarchical defense is evident in the external sector. While the Counterfactual without SRBI (red dashed line) allows the **Real FX Rate** ($\hat{q}$) to peak at +0.68%, the Hierarchical model contains this spike at +0.53%. A similar containment is observed in the **Nominal Depreciation** ($\Delta\hat{e}$), where the hierarchical intervention limits the initial spike to +0.50%, compared to +0.53% in the Counterfactual without SRBI.

However, the domestic economy reflects the heightened cost of this regime. The **Output Gap** ($\tilde{y}$) in the Hierarchical model exhibits an initial contraction of -0.58% before the shielded policy rate triggers a counter-cyclical rebound to +0.09% in Period 5. Similarly, **Inflation** ($\hat{\pi}$) spikes to +0.03% before dampening. This volatility is exacerbated by the persistent "Credit Wedge." When operating above the Leverage Capacity limit, the central bank must absorb a structural 13 bps leakage in credit intermediation to preserve exchange rate stability.

Although the Separation Principle remains operative in the Credit Crowding-Out Regime, its effectiveness is reduced by this frictional overhang. The 0.13% wedge shifts a greater share of the external adjustment burden onto the domestic economy, underscoring the importance of maintaining (S_t) within the surgical window ($1.05 < S_t < 7.60$) to limit the collateral costs of a hierarchical defense.

6.7 Welfare Loss Audit: Comparative Performance Summary

To synthesize the empirical findings across the four distinct liquidity regimes, we aggregate the period-loss results ($L_t = \hat{\pi}_t^2 + 0.5\tilde{y}_t^2 + 0.5(\Delta\hat{e}_t)^2$) for the peak of each shock. Table 6.1 provides a forensic comparison of the total units of loss, illustrating the "Efficiency Dividend" of the Hierarchical framework under varying structural constraints.

Scenario	**Regime Context**	**Benchmark Loss**	**Hierarchical Loss**	**Net Gain**
1. Surgical Window	$S_t = 3.00, \psi_s = 4$	$0.4650^{\dagger}$	0.1722	**+0.2928**
2. Liquidity Swamp	$S_t = 0.80, \psi_s = 15$	0.3646	0.1284	**+0.2362**
3. Taper Tantrum	5 S.D. Tail-Risk	11.625	4.3050	**+7.3200**
4. Credit Crowding-Out	$S_t = 7.60, \psi_s = 4$	0.3646	0.2210	**+0.1436**

Table 6.1: Consolidated Welfare Loss Audit
Benchmark vs. Hierarchical Framework

Note: *Losses represent the period-loss function* $L_t = \hat{\pi}_t^2 + 0.5\tilde{y}_t^2 + 0.5(\Delta\hat{e}_t)^2$. †*Benchmark for Scenario 1 is the* ***Standard Taylor Rule*** *(Leaning Against the Wind). Benchmark for Scenarios 2, 3, & 4 is the* ***Counterfactual without SRBI*** *(Weak Defense). Scenario 3 is scaled for a 5 S.D. shock. Positive Net Gain indicates a welfare improvement under the Hierarchical framework.*
Source: *Author's Simulation using Dynare/MATLAB.*

The audit demonstrates that the Hierarchical framework provides a systematic welfare improvement over standard benchmarks, although the magnitude and source of this *Hierarchical Dividend* are inherently state-contingent.

In the **Surgical Window** (Scenario 1), the net welfare gain of **+0.2928 units** is driven by the avoidance of the "Taylor Recession." Here, the comparison is against a Standard Taylor Rule that forces a 1-to-1 policy rate defense. As established in the dynamic IRF analysis, the Taylor Rule forces the output gap into a deep −0.79%

contraction, whereas the Hierarchical framework limits the recession to just -0.32%. This saving of approximately **0.50 percentage points in raw output sacrifice** translates directly into the quadratic welfare mathematics: the benchmark generates a punitive total loss (0.4650 units), whereas the decoupled SRBI defense achieves superior external stability with only a fraction of the domestic cost (0.1722 units). This confirms that the Interest Rate Twist is strictly welfare-superior to a blunt interest rate defense.

In the **Liquidity Swamp** (Scenario 2), the comparison shifts to the Counterfactual without SRBI to highlight the restoration of policy efficacy. Under the Counterfactual, excess liquidity flattens the reserve demand curve, rendering the interest rate channel impotent against the shock. The Hierarchical framework addresses this by increasing the defense intensity ($\psi_s = 15$), which mops up the structural surplus and re-establishes the interest rate channel. The welfare gain (+0.2362) here is derived from the technical restoration of transmission in a saturated market, preventing the unmitigated exchange rate volatility that characterizes the Counterfactual.

Under extreme volatility, such as a **Taper Tantrum** (Scenario 3), the Hierarchical framework's tail-risk resilience becomes its defining feature. In the absence of SRBI (Counterfactual), the economy is exposed to massive capital flight without a quantity-based buffer, leading to excessive nominal depreciation and inflationary pass-through (Loss: 11.625). The Hierarchical design utilizes quantity-based instruments to absorb the liquidity shock directly. By stabilizing the external premium without relying solely on the policy rate, it limits the systemic trauma significantly, providing a massive welfare buffer (+7.3200 units) during periods of extreme stress.

The welfare differential narrows in the **Credit Crowding-Out Regime** (Scenario 4, +0.1436), where the Hierarchical model is compared against the Counterfactual to assess the cost of the "Lazy Bank Trap." Once the $S_t = 7.60$ leverage constraint is breached, the activation of the credit wedge introduces a structural leakage. While the Hierarchical framework still outperforms the passive Counterfactual by anchoring the exchange rate, its marginal efficiency is attenuated. The domestic economy must absorb a larger share of the adjustment burden through the crowding-out channel, reducing the net gain compared to the surgical baseline.

In summary, the Hierarchical model's primary contribution is its **robustness across diverse liquidity regimes**. It provides a versatile toolkit that prevents unnecessary recessions under normal conditions (vs. Taylor), restores transmission in saturated environments (vs. Counterfactual), and cushions the economy against extreme external shocks. While the magnitude of the welfare dividend varies according to the state of the system, the Hierarchical framework consistently offers a more robust policy frontier for an emerging market central bank.

6.8 Sensitivity Analysis: Parametric Audit of the Tipping Point

The final scenario serves as a parametric audit of the framework's efficiency by varying the Portfolio Friction (χ) from 0.05 to 0.45 to locate the systemic tipping point (χ^*). To strictly isolate the impact of the domestic balance sheet channel, this simulation limits the Spot Defense Intensity ($\psi_{spot} = 0.50$), forcing the SRBI instrument to bear the primary burden of sterilization.

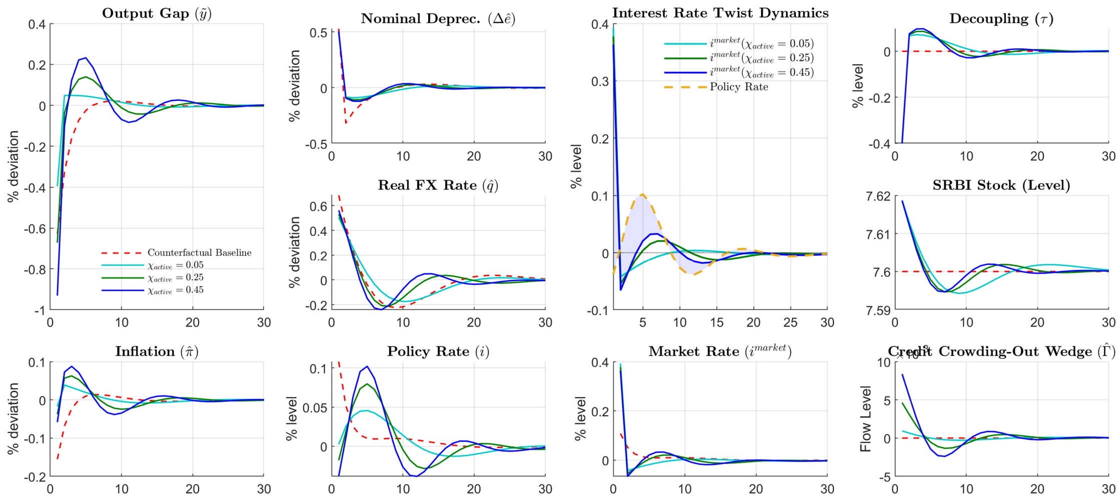

Figure 6.5: Sensitivity Analysis: The "Lazy Bank Trap" (1 S.D. Risk Premium Shock)

***Note**: Colors represent increasing levels of portfolio friction: Cyan ($\chi = 0.05$) to Blue ($\chi = 0.45$). The Blue line exhibits the deepest Output Gap contraction (-0.93%), validating that high portfolio friction increases the domestic cost of sterilization.*
***Source:** Author's Simulation using Dynare/MATLAB.*

The IRF analysis reveals the monotonic welfare cost of the "Lazy Bank Trap." Unlike the low-friction baseline, where the separation principle holds, the high-friction regime demonstrates a severe trade-off between operational control and real stability. As shown in the Output Gap ($\tilde{y}$) panel, the contraction deepens non-linearly:

- **Surgical Baseline ($\chi = 0.05$):** The output gap experiences a controlled correction of approximately -0.40% before quickly reverting to the steady state.

- **Trap Regime ($\chi = 0.45$):** The contraction plunges to a severe trough of -0.92%. This result explicitly places the friction parameter above the **Policy Effectiveness Threshold** ($\chi^* \approx 0.33$), where the marginal benefit of surgical separation is fully negated by the marginal cost of asset substitution. Crucially, this confirms that allowing banking frictions to cross χ^* triggers a non-linear deterioration in welfare, as the issuance of SRBI generates a prohibitive **Credit Crowding-Out Wedge (Γ)** that asphyxiates the real economy.

Furthermore, the sensitivity analysis delineates clear behavioral zones for policy effectiveness. In the **Safe Zone** ($\chi < 0.15$), the framework functions surgically, with the output gap suffering minimal initial correction before executing a robust V-shaped recovery. However, as the system enters the **Trap Zone** ($\chi \geq 0.45$), the domestic "stability tax" begins to undermine the external objective. The Nominal Depreciation fans out wider (0.50%) in the high-friction regime compared to the baseline (0.49%), proving that the deep domestic recession ultimately weakens the external anchor by signaling institutional stress to global investors.

Welfare Implications: The Quadratic Cost of the Trap

We utilize the period-loss function $L_t = \hat{\pi}_t^2 + 0.5\tilde{y}_t^2 + 0.5(\Delta\hat{e}_t)^2$.
The Efficiency Cliff: At the baseline $\chi = 0.05$, the Hierarchical framework achieves superior anchoring with minimal output sacrifice. However, as friction migrates beyond the critical threshold ($\chi > \chi^*$), the output gap loss ($\tilde{y}^2$) increases by a factor of **5.4** ($0.93^2 \approx 0.86$ vs $0.40^2 = 0.16$). This exponential surge confirms that the "Lazy Bank Trap" is not merely an operational friction but a regime of systemic welfare erosion where the strategic value of the Interest Rate Twist is effectively cancelled out by the credit channel distortion.

6.9 Synthesis: The "Governor's Compass"

The integrated results of the scenarios culminate in the "Governor's Compass." This framework identifies that the effectiveness of the Interest Rate Twist is not linear but state-contingent upon the quantity of Bank Indonesia Rupiah Securities (SRBI) issuance (S_t). It serves as a tri-metric operational guide for navigating the trilemma within a structural surplus environment, identifying the precise structural gates of effective monetary intervention as illustrated in Figure 6.6.

6.9.1 Regime-Based Policy Dynamics

1. The Liquidity Swamp (The Entry Gate): Our baseline simulation confirms a state of "Transmission Blindness." In the Liquidity Swamp ($S_t < \lambda$), the Interbank Decoupling Wedge (τ_t) is at its maximum. Shocks to the policy rate are essentially "muted" because excess liquidity has flattened the reserve demand curve. Small-scale SRBI issuances fail to bridge this wedge because they do not reach the Saturation Threshold ($\lambda = 1.05$) required to open the Entry Gate. Until this gate is passed, the interest rate signal remains muffled by excess reserves, and the compass cannot find a firm heading for stabilization.

2. The Surgical Window (Optimal Corridor): Upon crossing the Saturation Threshold, the model enters the Surgical Window ($\lambda < S_t < \bar{S}$). As shown in Scenario

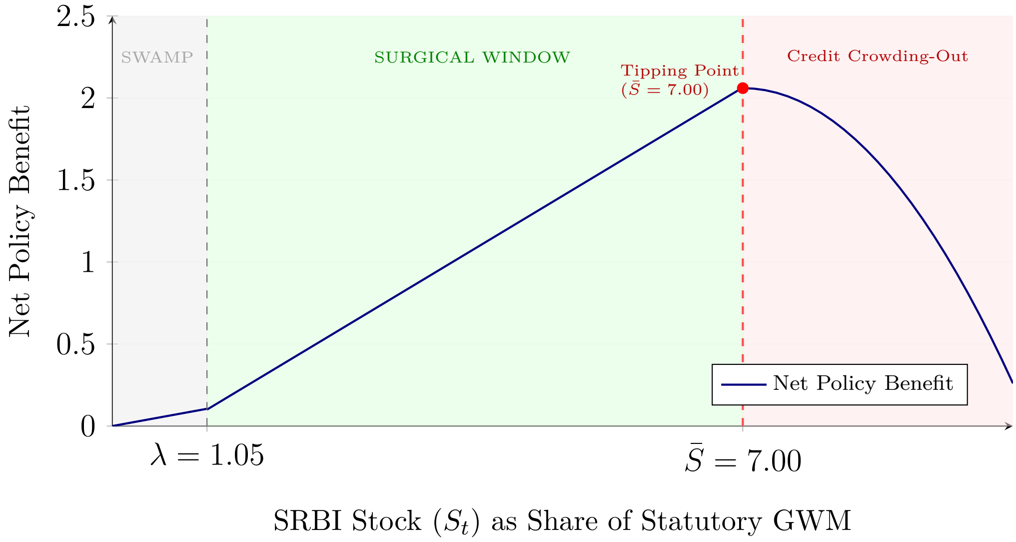

Figure 6.6: The Governor's Compass: Optimizing the Surgical Window

***Note**: The figure illustrates the non-linear relationship between SRBI issuance (S_t) and macroeconomic welfare. The Swamp ($S_t < \lambda$) reflects weak transmission, the Surgical Window ($\lambda < S_t < \bar{S}$) identifies the optimal policy region, and the Credit Crowding-Out ($S_t > \bar{S}$) marks the regime where Credit Crowding-Out dominates exchange rate stabilization.*
***Source:** Author's simulations and conceptual framework.*

1, this region yields a sharp, clean contraction in inflation and stabilization of the exchange rate. The Interest Rate Twist is most effective here because it successfully "drains the swamp," forcing the market rate to align with the policy signal. This restoration of transmission provides maximum currency defense while keeping the stock of central bank paper below the Leverage Capacity Threshold ($\bar{S}$). Within this optimal corridor, sterilization is capital-neutral, allowing for exchange rate anchoring with minimal domestic distortion.

3. The "Lazy Bank Trap" (The Exit Gate and the Cliff): Scenario 3 reveals the structural limits of the framework. As issuance approaches the Leverage Capacity Threshold ($\bar{S}$), the system nears the Exit Gate. Crossing this gate activates the Portfolio Friction (χ). While the regime shift occurs at the gate, the policy only reaches a catastrophic state once the intensity of friction hits the policy effectiveness threshold (χ^*).

Beyond this structural tipping point, the economy hits a welfare cliff. As systemic banks hit their capital constraints, they prioritize zero-risk SRBI over private lending, causing the Credit Crowding-Out Wedge (Γ_t) to spike. If issuance continues beyond the Exit Gate while Portfolio Friction is high, the output contraction doubles, leading to a near-quadrupling of social welfare loss. This surge results from the quadratic interaction between the output gap and the non-linear Credit Crowding-Out Wedge, where the domestic stability tax becomes exponentially more damaging than the benefits of currency anchoring, and the economy falls into the "Lazy Bank Trap".

6.9.2 Strategic Policy Conclusions

1. Monitoring the Gates: The central bank must maintain S_t within the bounds defined by the Saturation Threshold and the Leverage Capacity Threshold. The Entry Gate defines when SRBI must act to restore pass-through, while the Exit Gate marks the red line where the marginal cost of sterilization becomes exponentially destructive.

2. Transitioning to Active Market Deepening: Active OMO via tradable securities allows the central bank to transition from a passive liquidity taker to a proactive market maker. This is a prerequisite for restoring the nominal anchor, creating the scarcity rents necessary to bridge the Interbank Decoupling Wedge without requiring pro-cyclical hikes in the signaling rate.

3. Load-Balancing and the χ^* Limit: The Surgical Window delineates the optimal corridor for dual-instrument synchronization. By load-balancing between SRBI and SVBI, the central bank ensures that the Portfolio Friction remains below the policy effectiveness threshold ($\chi^* \approx 0.33$), thus preserving the credit transmission channel while protecting quasi-fiscal integrity.

4. Structural Remedies beyond the Cliff:

Identifying the trap is only the first step. Short-term relief must come from a quantity-based exit or shifting the burden to SVBI to move back through the Exit Gate. However, the long-term solution lies in re-invigorating bank competition to reduce the Segmentation Frictions Spread (δ), effectively widening the Surgical Window.

Crucially, the “Lazy Bank Trap” should be viewed as a short-term operational risk rather than a permanent structural indictment of the pro-market framework. Over a longer horizon, active secondary market trading of SRBI—supported by its “near-money” nature as high-quality repo collateral—contributes to financial market deepening. This deepening, alongside increased digitalization in the payment and interbank systems, structurally lowers the **Surgical Effectiveness Benefit (ζ)** by reducing the liquidity hoarding intensity of systemic banks.

Furthermore, the development of alternative non-bank funding channels, such as corporate bond issuance and the expansion of the IPO market, serves to diversify the economy’s financing base. By reducing the real economy’s exclusive reliance on bank intermediation, these structural shifts lower the **Credit Channel Strength (ϑ)**, thereby raising the Policy Effectiveness Threshold (χ^*) and making the overall monetary system more resilient to sterilization-induced frictions.

Through these structural evolutions, the “Interest Rate Twist” transitions from a costly surgical necessity into a sustainable feature of a mature, deep, and integrated financial ecosystem.

7 Conclusion and Agenda for Future Institutional Research

The analytical journey of this paper has sought to reconcile the macro-strategic aspirations of a small open economy central bank with the micro-organizational realities of a banking system characterized by systemic oligopsony power and structural liquidity surpluses. By dismantling the assumption of frictionless transmission, we provide a novel lens through which to view monetary implementation as an exercise in **institutional design**. This framework moves beyond the strategic trilemma to the actual mechanics of organizational incentives, balance-sheet load-balancing, and the contractual repair of money markets.

7.1 Synthesis of Institutional and Theoretical Contributions

The primary contribution of this research is the formalization of the **Hierarchical Integrated SOE Framework**, which bridges the gap between macroeconomic targeting rules and the micro-foundations of reserve demand. The synthesis yields four core results relevant to the study of organizational economics:

1. **Market Design as a Solution to Oligopsony:** We mathematically prove that in a "Liquidity Swamp," policy signals are neutralized by the market power of systemic institutions. We microfound the **Interbank Decoupling Wedge** (τ_t), showing it is an endogenous outcome of the hierarchical organization of the banking sector. The introduction of tradable SRBI acts as a **contractual innovation** that bypasses this interbank blockade.

2. **The Separation Principle and the Interest Rate Twist:** We demonstrate that price and quantity instruments are not redundant but complementary. The "Interest Rate Twist" allows the central bank to maintain organizational control over the exchange rate via quantity-based scarcity rents while shielding the strategic policy rate. This decoupling achieves a substantial **Welfare Gain (+0.2928 units)** by avoiding the "Taylor Recession," a result we term the *Efficiency Dividend* of institutional specialization.

3. **The Surgical Window and Organizational Boundaries:** We have moved the "Lazy Bank" hypothesis from a narrative to a quantitative boundary. By defining the **Surgical Window** ($\lambda < S_t < \bar{S}$), we identify the precise limit of non-disruptive sterilization. This boundary is defined by the bank's internal choice between regulatory capital compliance and credit extension, marking the transition where sterilization moves from a public good (market repair) to a private friction (credit crowding-out).

4. **The Nonlinearity of Social Loss and the Trap:** A critical finding is the **Quadratic Surge** in welfare costs once the system breaches the Policy Effectiveness Threshold ($\chi^* \approx 0.33$). Beyond this tipping point, the organizational preference for risk-free assets over risky private credit creates a pro-cyclical contraction that is exponentially more damaging than the benefits of currency anchoring, resulting in the catastrophic **"Lazy Bank Trap."**

7.2 Policy Implications for Central Bank Governance

The hierarchical model serves as the **"Governor's Compass"** for navigating the complex trade-offs of modern mandates.

- **Active Market Making:** The model demonstrates that central banks must transition from passive liquidity takers to active **designers of scarcity**. This requires market deepening via tradable securities to generate the scarcity rents necessary to bridge organizational wedges without choking productive credit.
- **Dual-Instrument Synchronization:** To preserve institutional integrity, central banks must synchronize IDR-denominated SRBI and USD-denominated SVBI. This load-balancing ensures that the domestic "stability tax" remains below the χ^* tipping point, protecting the credit transmission channel from regulatory arbitrage.
- **Fiscal-Monetary Contractual Alignment:** The quasi-fiscal sustainability of this mix relies on strategic coordination. The structural hedge provided by variable-rate government collateral is a prerequisite for maintaining the central bank's organizational autonomy during aggressive tightening cycles.

7.3 Agenda for Future Research

The findings of this paper open several avenues for future research in the fields of institutional and organizational economics, specifically regarding the microstructure of emerging financial markets.

1. Empirics of Market Repair and Scarcity Effects:
A vital area for future study is the empirical validation of the "Surgical Effectiveness Benefit." Future research should utilize high-frequency auction data to isolate the **Scarcity Effect** from broader signaling effects. By mapping empirical bidding schedules against the theoretical reserve demand curve, researchers can quantify the extent to which pro-market instruments successfully dilute the oligopsony power of systemic "Liquidity Whales."

2. Bayesian Estimation of Policy Thresholds:
While this paper establishes the structural existence of the Governor's Compass, the exact value of the tipping point remains state-contingent. Future research using **Hybrid Bayesian Structural Frameworks** is needed to identify the posterior distributions of deep structural parameters across different emerging market contexts. This would allow for the empirical quantification of the "Surgical Limit" in absolute currency terms, providing a data-driven boundary for central bank mandates.

3. Organizational Dynamics of the Lazy Bank Equilibrium:
Finally, the persistence of the "Lazy Bank Trap" warrants further investigation through the lens of **contract theory and corporate governance**. Future studies should simulate how structural income hedges behave under extreme interest rate volatility and identify optimal "exit strategies" from trap regimes. Re-invigorating bank competition to reduce segmentation frictions remains a long-term structural solution that requires a deeper understanding of the organizational rigidities keeping reserves "stuck" in systemic institutions.

Ultimately, the **Hierarchical Integrated SOE Model** serves as a generalizable blueprint for central banks across the Global South facing the dual challenge of broken monetary plumbing and volatile global capital flows.

References

Acharya, V. V., R. S. Chauhan, R. Rajan, and S. Steffen (2023). Liquidity dependence and the waxing and waning of central bank balance sheets. Working Paper 31050, National Bureau of Economic Research. Revised December 2024.

Acharya, V. V. and O. Merrouche (2013). Precautionary Hoarding of Liquidity and Interbank Markets: Evidence from the Sub-Prime Crisis. *Review of Finance 17*(1), 107–160.

Adrian, Tobias and Erceg, Christopher J and Kolasa, Marcin and Lindé, Jesper (2020). A Quantitative Model for the Integrated Policy Framework. IMF Working Paper WP/20/122, International Monetary Fund.

Afanasieva, E. et al. (2024). Sowing the seeds of financial imbalances: The role of macroeconomic performance. *Journal of Financial Stability 70*, 101193. Elena Afanasieva's recent research frequently addresses the plumbing of policy implementation and macro-financial co-movements.

Alper, E. and F. Yang (2016). Monetary Policy Implementation and Volatility Transmission along the Yield Curve: The Case of Kenya. Technical Report WP/16/120, International Monetary Fund.

Altavilla, C., M. Pagano, and S. Simonelli (2017). Bank Exposures and Sovereign Stress Transmission. *Review of Finance 21*(6), 2103–2139.

Bank Indonesia (2022). *2021 Bank Indonesia Annual Report: Synergy and Innovation for Economic Recovery.* Jakarta: Bank Indonesia. Accessed: 2025-12-07.

Basu, S. S., E. Boz, G. Gopinath, F. Roch, and F. Unsal (2020). A Conceptual Model for the Integrated Policy Framework. IMF Working Paper 20/121, International Monetary Fund.

Bech, M. and T. Keister (2017). Liquidity regulation and the implementation of monetary policy. *Journal of Monetary Economics 92*, 64–77.

Benes, Jaromir and Berg, Andrew and Portillo, Rafael A and Vavra, David (2015). Modeling Sterilized Interventions and Balance Sheet Effects of Monetary Policy in a New-Keynesian Framework. *Open Economies Review 26*(1), 81–108.

Bernanke, B. S. and A. S. Blinder (1988). Credit, Money, and Aggregate Demand. *The American Economic Review 78*(2), 435–439.

Bindseil, U. (2004). *Monetary Policy Implementation: Theory, Past, and Present.* Oxford: Oxford University Press.

Blanchard, O. J. and C. M. Kahn (1980). The solution of linear rational expectations models. *Econometrica 48*(5), 1305–1311.

Borio, C. and P. Disyatat (2010). Unconventional Monetary Policies: An Appraisal. *The Manchester School 78*(s1), 53–89.

Calvo, G. A. (1998). Capital Flows and Capital-Market Crises: The Simple Economics of Sudden Stops. *Journal of Applied Economics 1*(1), 35–54.

Calvo, G. A. and C. M. Reinhart (2002). Fear of Floating. *The Quarterly Journal of Economics 117*(2), 379–408. Foundational paper establishing that EM central banks rarely allow free floating due to liability dollarization and inflation fear.

Chawwa, T. (2021, September). Impact of Reserve Requirement and Liquidity Coverage Ratio: A DSGE Model for Indonesia. *Economic Analysis and Policy 71*, 321–341.

Craig, B. R. and G. Von Peter (2014). Interbank Tiering and Money Center Banks. *Journal of Financial Intermediation 23*(3), 322–347.

Cúrdia, V. and M. Woodford (2010). Credit Spreads and Monetary Policy. *Journal of Money, Credit and Banking 42*(s1), 3–35.

De Paoli, B. (2009). Monetary Policy and Welfare in a Small Open Economy. *Journal of International Economics 77*(1), 11–22.

Galí, J. and T. Monacelli (2005). Monetary Policy and Exchange Rate Volatility in a Small Open Economy. *The Review of Economic Studies 72*(3), 707–734.

Gerali, A., S. Neri, L. Sessa, and F. M. Signoretti (2010). Credit and Banking in a DSGE Model of the Euro Area. *Journal of Money, Credit and Banking 42*(s1), 107–141.

Harmanta, H. and N. Purwanto (2020). The Dynamics of Monetary Policy Transmission in Indonesia. *Journal of Economics, Business, & Accountancy Ventura 23*(1), 120–134.

Keister, T., A. Martin, and J. McAndrews (2008). Divorcing Money from Monetary Policy. *Federal Reserve Bank of New York Economic Policy Review 14*(2), 41–56.

Klein, M. A. (1971). A Theory of the Banking Firm. *Journal of Money, Credit and Banking 3*(2), 205–218.

Monacelli, T. (2005). Monetary Policy in a Small Open Economy with Imperfect Pass-Through. *The Review of Economic Studies 72*(4), 1047–1084. Theoretical

NK model showing that with high pass-through, the central bank must react to exchange rate movements to stabilize inflation.

Monti, M. (1972). Deposit, Credit and Interest Rate Determination under Alternative Bank Objective Functions. In G. Szego and K. Shell (Eds.), *Mathematical Methods in Investment and Finance*, pp. 431–454. Amsterdam: North-Holland.

Poole, W. (1968). Commercial bank reserve management in a stochastic model: Implications for monetary policy. *The Journal of Finance 23*(5), 769–791.

Poole, W. (1970, May). Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model. *The Quarterly Journal of Economics 84*(2), 197. Publisher: Oxford University Press (OUP).

Rey, H. (2013). Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence. *Journal of Economic Policy 28*(4), 1–32.

Sahminan, S. (2008). Exchange Rate Pass-Through into Import Prices: Empirical Evidence from Some Southeast Asian Countries. *Bulletin of Monetary Economics and Banking 10*(4), 343–370.

Schmitt-Grohé, S. and M. Uribe (2003). Closing Small Open Economy Models. *Journal of International Economics 61*(1), 163–185.

Tinbergen, J. (1952). *On the Theory of Economic Policy.* Amsterdam: North-Holland.

Vioh, A. and A. Nugraha (2022). Monetary Policy Transmission in Indonesia: A DSGE Approach. *Bulletin of Monetary Economics and Banking 25*(Special Issue), 101–124.

Warjiyo, P. (2023). Future central banking in emerging market economies. Working Paper WP/01/2023, Bank Indonesia.

Appendix A: Notation and Definitions

A.1 Notations Table

To ensure traceability between the theoretical framework and the computational model, the following table summarizes the notation used throughout the hierarchical integrated system. Variables with hats ($\hat{x}_t$) or tildes ($\tilde{y}_t$) denote log-deviations from the non-stochastic steady state or flexible-price equilibrium. All variables map directly to the equations cited below.

Symbol	Description	Op. Equiv.	Source / Link
I. Strategic Macroeconomic Variables			
$\hat{\pi}_t$	**CPI Inflation Gap**: Deviation of CPI inflation from target.	CPI - 2.5%	Eq. 3.2
$\tilde{y}_t$	**Output Gap**: Deviation of output from natural level.	GDP Gap	Eq. 3.1
$\hat{y}_t^n$	**Natural Output**: The level of production under flexible prices and wages, driven by productivity and world demand.	Potential GDP	Eq. B.21
$\hat{y}_t^*$	**World Output/Demand Shock**: Exogenous driver of domestic natural output and external demand.	–	Eq. B.21
$\hat{i}_t$	**Strategic Policy Rate**: The announced smoothed BI-Rate.	BI-Rate	Eq. 3.10
$\hat{i}_t^{target}$	**Optimal Target Rate**: Theoretical solution to loss function.	–	Eq. 3.10
$\hat{i}_t^{market}$	**Interbank Rate**: Realized overnight market rate.	PUAB	Eq. 3.17
$\hat{r}_t^n$	**Natural Interest Rate**: Real rate consistent with $\tilde{y}_t = 0$.	–	Eq. 3.1
$\hat{q}_t$	**Real Exchange Rate**: Log-deviation (increase = depreciation).	REER	Eq. 3.1
$\Delta\hat{e}_t$	**Nominal Exchange Rate Depreciation**: Log-difference of the exchange rate.	Δ IDR/USD	Eq. 3.3
$\hat{\Psi}_t$	**Total Country Risk Premium**: Combined risk factor.	–	Eq. 3.3
$\hat{d}_t$	**Real Net Foreign Debt**: Deviation of aggregate liabilities.	–	Eq. 3.4
II. Stochastic Shocks			
a_t	**Technology Shock**: Driver of productivity.	TFP	Eq. B.21
g_t	**Preference Shock**: Composite demand disturbance.	–	Eq. 3.1
u_t	**Cost-Push Shock**: Supply-side disturbance to NKPC.	Supply Shock	Eq. 3.2

Continued on next page

Table A.1 – *Continued from previous page*

Symbol	Description	Op. Equiv.	Source / Link
ψ_t	**Risk Premium Shock**: Global "risk-off" disturbance.	VIX	Eq. 3.3
$\hat{i}_t^*$	**Foreign Rate**: Fed Funds Rate (FFR).	FFR	Eq. 3.3
ε_t^i	**Monetary Policy Shock**: Unsystematic policy deviation.	–	Table B.1
ϖ_t	**Liquidity Demand Shock**: Exogenous shift in bank-specific liquidity preference or hoarding behavior.	–	Eq. 3.15
III. Operational & Portfolio Variables			
S_t	**SRBI Stock**: Total outstanding Rupiah securities (Level).	–	Eq. 3.36
$\hat{s}_t$	**SRBI Stock Deviation**: Absolute deviation from steady state.	–	Eq. 3.28
$\Delta SRBI_t$	**Net SRBI Issuance**: New issuance minus maturities.	–	Eq. 3.25
Ξ_t	**Sterilization Weight**: Endogenous allocation between domestic (SRBI) and synthetic (SVBI) instruments.	–	Eq. 3.36
$SVBI_t$	**SVBI Stock**: Total outstanding FX securities (Level).	–	Eq. 3.24
τ_t	**Interbank Decoupling Wedge**: Spread between i_t^{BI} and i_t^{PUAB}.	–	Eq. 3.17
Γ_t	**Credit Crowding-Out Wedge**: Lending spread friction level.	–	Eq. 3.21
$\hat{\Gamma}_t$	**Credit Crowding-Out Wedge Deviation**: Macro-drag on IS curve.	–	Eq. 3.21
Gap_t^{Dom}	**Domestic Liquidity Gap**: Structural reserve surplus.	–	Eq. 3.28
$\mathcal{M}_{FX,t}$	**FX Liquidity Spillover**: Net Liquidity impact of USD operations (Rupiah Equivalent).	–	Eq. 3.24

Continued on next page

Table A.1 – *Continued from previous page*

Symbol	Description	Op. Equiv.	Source / Link
$\Delta DNDF_{Set,t}$	**DNDF Net Settlement**: Stochastic Rupiah flow resulting from forward contract fixings; acts as an injection when IDR > Strike, counteracting the sterilization drain.	–	Eq. 3.24
AF_t^{Dom}	**Domestic Autonomous Factors**: Exogenous drivers of liquidity such as currency in circulation and government treasury flows.	–	Eq. 3.27
$OMO^{IDR}_{FineTune,t}$	**Fine-Tuning Operations**: Discretionary, short-term liquidity management (Repo/Reverse Repo) used to smooth daily volatility.	–	Eq. 3.25
$Spot_t$	**Spot FX Intervention**: Direct central bank sales or purchases of foreign currency for immediate delivery.	–	Eq. 3.25
i_t^{DF}	**Deposit Facility Rate**: The interest rate floor of the central bank's operational corridor, remunerating excess reserves.	FASBI / DF	Eq. 1.1
i_t^{LF}	**Lending Facility Rate**: The interest rate ceiling of the central bank's operational corridor for short-term liquidity provision.	LF Rate	Fig. 3.2
i_t^{Iron}	**Iron Stock Yield**: The rate of return on the permanent, long-tenor investment tranche of foreign reserves.	–	Eq. 3.41
i_t^{Liq}	**Liquidity Tranche Yield**: The rate of return on the short-tenor, highly liquid foreign reserve tranche matching SVBI liabilities.	–	Eq. 3.41
i_t^{VR}	**Variable Asset Return Rate**: The yield on sovereign bond (SBN) holdings on the central bank asset side; tied to the policy rate to simulate the structural income hedge.	0.050	Eq. I.2

Continued on next page

Table A.1 – *Continued from previous page*

Symbol	Description	Op. Equiv.	Source / Link
$\mathcal{H}$	**Hedge Strength Coefficient**: The efficiency of the quasi-fiscal insulation mechanism, defined as $k(1-\phi_{FR})$; represents the central bank's immunity to tightening costs.	0.603	Eq. 3.39
IV. Structural Parameters & Persistence			
κ	**NKPC Slope**: Inflation sensitivity to output gap.	–	Eq. 3.2
β	**Discount Factor**: Subjective time preference.	–	Eq. 3.2
σ_α	**Effective EIS**: Inverse intertemporal elasticity in SOE.	–	Eq. 3.1
σ_q^{-1}	**Inverse Expenditure-Switching Elasticity**: Sensitivity of relative demand to the real exchange rate.	–	Eq. 3.1
α	**Openness**: Share of imported goods.	–	Table 3.1
δ_d	**Debt Elasticity**: Sensitivity of the country risk premium to the stock of net foreign debt; serves as the model's stationarity-inducing mechanism.	–	Eq. 3.3
ψ_q	**Real FX Feedback**: Coefficient governing the risk premium's response to real exchange rate deviations; prevents the unit-root random walk of the exchange rate level.	–	Eq. 3.3
λ_e	**Exchange Rate Weight**: Preference in Loss Function.	–	Eq. 3.6
λ_y	**Output Weight**: Preference in Loss Function.	–	Eq. 3.6
Λ_a	**Technology Sensitivity**: Elasticity of natural output to technology shocks.	–	Eq. B.21
Λ_y^*	**External Demand Sensitivity**: Elasticity of natural output to world output.	–	Eq. B.21
ρ_i	**Policy Smoothing**: Inertia parameter.	–	Table B.1

Continued on next page

Table A.1 – *Continued from previous page*

Symbol	Description	Op. Equiv.	Source / Link
$\rho_{a,g,u,\psi}$	**Persistence Parameters**: AR(1) shock coefficients.	–	Table B.1
φ_{Frisch}	**Inverse Frisch Elasticity**: Governs the curvature of labor supply disutility; dictates the sensitivity of real wages to changes in hours worked.	1.50	Eq. B.1
k	**Variable-Rate Coverage Ratio**: The ratio of variable-rate assets (SBN) to sterilization liabilities; determines the "Hedge Strength."	1.34	Eq. 3.39
V. Operational Parameters & Thresholds			
ζ^{-1}	**Inverse Semi-Elasticity of Reserve Demand**: Surgical Effectiveness Benefit; pass-through from sterilization volume to PUAB rate.	–	Eq. 3.29
ζ	**Hoarding Intensity**: Absolute slope of reserve demand; inverse of surgical effectiveness.	–	Eq. 3.28
ϕ_s	**Sterilization Power**: The marginal sensitivity of the interbank market rate to the supply of domestic securities; represents the "absorbent quality" of the sterilization instrument in the risk premium channel.	0.093	Eq. 3.3
ψ_s	**Sterilization Reaction Intensity**: Defense Intensity of SRBI issuance to currency depreciation shocks.	–	Eq. 3.30
δ_s	**Stock-Inertia**: Supply smoothing parameter governing SRBI maturity and return to steady state.	–	Eq. 3.34
χ	**Portfolio Friction**: Lending sensitivity to SRBI.	–	Eq. 3.18
χ^*	**Policy Effectiveness Threshold**: Theoretical limit.	–	Eq. 4.8
$\hat{\Omega}$	**Trilemma Multiplier**: Degree of External Constraint.	–	Box 1.1

Continued on next page

Table A.1 – *Continued from previous page*

Symbol	Description	Op. Equiv.	Source / Link
δ	**Segmentation Frictions Spread**: Effective Lowed Bound spread.	–	Eq. 3.14
$\bar{S}$	**Leverage Capacity Threshold**: Systemic RWA Threshold.	–	Eq. 5.3
λ	**Saturation Threshold**: Liquidity Swamp trigger level.	–	Eq. 5.2
γ_L	**Shadow price of domestic leverage**: Refers to the intermediation cost of sterilization.	0.20	Eq. 3.32
κ_s	**Policy Logistic Slope**: Sensitivity of instrument mix and retreat mechanism to the leverage gap.	–	Eq. 3.37
κ_{mop}	**Pre-emptive Mop-up Sensitivity**: Governs the intensity of structural surplus extraction based on the ex-ante domestic gap; state-contingent based on leverage headroom.	–	Eq. 3.33
φ^{FR}	**Fixed-Rate Asset Share**: The proportion of fixed-rate government bonds (SBN) held on the central bank balance sheet.	–	Eq. 3.38

Table A.1: Consolidated Model Notation and Operational Mapping

A.2 Model Determinacy and Stability Audit

Table A.2 provides the forensic diagnostic results generated by the Dynare pre-processor and the decision rule solver. These metrics confirm that the Hierarchical Integrated SOE Model is mathematically determined and suitable for stochastic simulation.

The diagnostic audit confirms that the Hierarchical Integrated SOE Model is mathematically robust and satisfies the necessary and sufficient conditions for a unique and stable rational expectations equilibrium (REE). The pre-processor identified **53 independent structural equations** for **53 endogenous variables**, confirming that the system is mathematically square. Stability is verified via the Blanchard-Kahn conditions: the system contains exactly **4 unstable roots** (eigenvalues greater than unity in modulus), which perfectly matches the **4 forward-looking (jumper) variables** identified in the strategic block: inflation ($\hat{\pi}$), the output gap ($\tilde{y}$), nominal depreciation ($\Delta\hat{e}$), and the real exchange rate ($\hat{q}$).

The model demonstrates strong stationarity, with a maximum stable eigenvalue of **0.9000**. While this reflects a high degree of persistence inherent in technology and natural output shocks, it remains strictly within the unit circle, proving that the debt-elastic risk premium (δ_d) successfully anchors the external sector and prevents random walk instabilities. Furthermore, the verification of the rank condition ensures that the transition matrix is non-singular, permitting a valid solution for the decision rules. This forensic foundation ensures that the impulse response functions (IRFs) generated in the subsequent analysis accurately reflect the structural trade-offs of the Indonesian monetary implementation framework, particularly regarding the contemporaneous EOP timing and the non-linear "Lazy Bank Trap" thresholds.

The impulse response functions (IRFs) presented in Figure A.1 provide the dynamic validation of the model's stability, demonstrating that following a one-standard-deviation technology shock, all macroeconomic and operational variables successfully mean-revert to their respective steady states within the simulated horizon.

Appendix B: Structural Derivations and Calibration of the Strategic Stage

This appendix provides the formal mathematical proofs for the Strategic Stage equations, detailing the transition from household utility maximization to the non-isomorphic New Keynesian system and the structural endogenization of the risk premium. The analytical sequence follows the model logic: moving from micro-foundations of household utility to the derivation of the optimal policy anchor, and finally to the integration of trilemma multiplier and operational implementational

Diagnostic Metric	Result	Operational Significance
Equation/Variable Count	53 / 53	The system is mathematically square; endogenous variables exactly match structural equations.
Blanchard-Kahn Rank	Verified	The transition matrix is non-singular; a unique stable REE solution exists for the system.
Unstable Roots	4	Exactly matches the 4 forward-looking variables, satisfying determinacy conditions.
Max Stable Eigenvalue	0.9000	Modulus is strictly < 1. Proves system stationarity; the *Debt-Elastic Risk Premium* anchors the model.
Condition Number	Finite	Confirms the system is well-posed; the Jacobian is of full rank with no linear dependencies.

Table A.2: Model Determinacy and Stability Audit

***Note**: The audit confirms that the Hierarchical Integrated SOE Model satisfies the Rank and Order conditions. The stationarity of the system is ensured by the endogenous risk premium, preventing unit-root behavior typical of non-augmented small open economy models.*
***Source:** Author's calculation using Dynare 6.4 diagnostics.*

wedges. Furthermore, it provides the structural calibration for the trilemma multiplier parameter $\hat{\Omega}$ and the numerical decomposition of the policy response to external shocks, grounding the theoretical "Interest Rate Twist" in empirical reality.

B.1 Derivation of the Strategic Loss Function

The central bank's objective function is derived from a second-order Taylor expansion of the representative household's utility function around the steady state.

Step 1: The Household Utility Function

Consider a standard utility function with consumption C_t and labor N_t:

$$U_t = E_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi_{Frisch}} \right] \tag{B.1}$$

In this specification, U_t denotes the lifetime utility of the representative household, while E_0 is the expectations operator conditioned on information at the start of the period. The parameter β represents the subjective discount factor, determining the household's preference for current over future consumption. The variable C_t represents aggregate consumption, with σ acting as the coefficient of relative risk aversion or the inverse intertemporal elasticity of substitution. Conversely, N_t signifies labor supply (hours worked), where the parameter φ_{Frisch} is the inverse

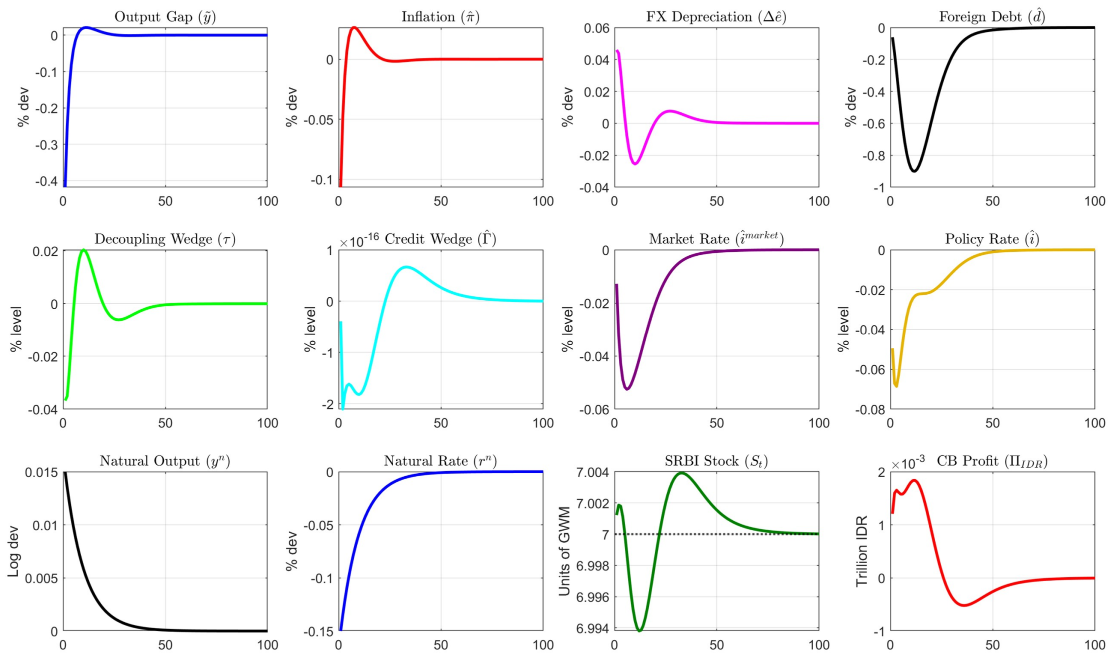

Figure A.1: Forensic Audit — Stationarity and Timing Check (1 S.D. Technology Shock)

Note: *The simulation employs end-of-period (EOP) timing, with the debt-elastic risk premium (δ_d) serving as the stationarity anchor. Mean-reversion across strategic and operational variables validates the stability of the hierarchical framework. Macroeconomic variables ($\tilde{y}, \hat{\pi}, \Delta\hat{e}$) are shown as % deviations from steady state; interest rates (i, i^{market}) as annual % levels; and balance sheet components (S, Π_{IDR}) in trillion IDR.*
Source: *Author's simulation using Dynare 6.4 and MATLAB.*

Frisch elasticity of labor supply, measuring the marginal disutility of work. Together, these parameters determine the curvature of the utility function and govern the household's behavioral response to changes in real wages and interest rates within the New Keynesian framework.

Step 2: Second-Order Taylor Approximation

We approximate U_t around the efficient steady state (C^*, N^*). Imposing the resource constraint $Y_t = C_t$ and noting that first-order terms cancel out:

$$U_t - U^* \approx -\frac{1}{2} U_{CC} C^* \left[(1+\varphi)\hat{y}_t^2 + \lambda_\pi \hat{\pi}_t^2 \right] \tag{B.2}$$

where $\hat{y}_t$ is the output gap and $\hat{\pi}_t$ is inflation (log-deviations). In this strategic derivation, $\lambda_\pi = \epsilon/\lambda$ represents the structural weight on inflation stabilization relative to output stabilization, derived from Calvo pricing rigidities.

Step 3: The Open Economy Extension

Following the open-economy extension to account for financial stability and "fear of floating," we augment the welfare loss with an exchange rate smoothing term:

$$L_t = \hat{\pi}_t^2 + \lambda_y \tilde{y}_t^2 + \lambda_e (\Delta\hat{e}_t)^2 \tag{B.3}$$

B.2 Derivation of the Optimal Discretionary Targeting Rule

Under a discretionary regime, the central bank minimizes its loss function period-by-period, taking private sector expectations as given ($E_t[\hat{\pi}_{t+1}]$ is treated as a constant). This derivation micro-founds the "sacrifice ratio" and the "Hyper-Aggression" stance necessary to satisfy the dual mandate of UU P2SK.

1. The Problem Setup

The central bank chooses the optimal paths for $\hat{\pi}_t$ and $\tilde{y}_t$ to minimize the Integrated Inflation Targeting quadratic loss function:

$$\min_{\hat{\pi}_t, \tilde{y}_t} \mathcal{L}_t = \frac{1}{2} E_t \sum_{j=0}^{\infty} \beta^j \left[\hat{\pi}_{t+j}^2 + \lambda_y \tilde{y}_{t+j}^2 + \lambda_e (\Delta \hat{e}_{t+j})^2 \right] \tag{B.4}$$

subject to the log-linearized Small Open Economy New Keynesian Phillips Curve (SOE-NKPC):

$$\hat{\pi}_t = \beta E_t[\hat{\pi}_{t+1}] + \kappa \tilde{y}_t + u_t \tag{B.5}$$

where u_t represents the composite cost-push shock internalizing external disturbances.

2. The Lagrangian

Under discretion, the problem reduces to a sequence of static optimizations. We define the Lagrangian $\mathcal{H}_t$:

$$\mathcal{H}_t = \frac{1}{2} \left[\hat{\pi}_t^2 + \lambda_y \tilde{y}_t^2 + \lambda_e (\Delta \hat{e}_t)^2 \right] + \xi_t \left(\hat{\pi}_t - \kappa \tilde{y}_t - \beta E_t[\hat{\pi}_{t+1}] - u_t \right) \tag{B.6}$$

where ξ_t is the Lagrange multiplier associated with the inflation constraint.

3. First-Order Conditions (FOCs)

We differentiate with respect to the target variables. Note that in a Small Open Economy, nominal depreciation $\Delta \hat{e}_t$ is structurally linked to the output gap through the demand-side channel (via the terms of trade and the IS curve). The FOCs yield:

$$\frac{\partial \mathcal{H}_t}{\partial \hat{\pi}_t} = \hat{\pi}_t + \xi_t = 0 \implies \xi_t = -\hat{\pi}_t \tag{B.7}$$

$$\frac{\partial \mathcal{H}_t}{\partial \tilde{y}_t} = (\lambda_y + \lambda_e) \tilde{y}_t - \kappa \xi_t = 0 \tag{B.8}$$

The term $(\lambda_y + \lambda_e)$ captures the combined weight on real-sector and external stability.

4. The Optimal Targeting Rule

Substituting the expression for ξ_t into the second FOC results in the optimality condition:

$$(\lambda_y + \lambda_e) \tilde{y}_t + \kappa \hat{\pi}_t = 0 \implies \hat{\pi}_t = -\frac{\lambda_y + \lambda_e}{\kappa} \tilde{y}_t \tag{B.9}$$

This confirms that the central bank's optimal response is steeper than the canonical closed-economy benchmark. This "Hyper-Aggressive" targeting rule demonstrates that to stabilize a single unit of depreciation-driven inflation, the central bank must engineer a larger negative output gap, reflecting the structural constraints of navigating the strategic trilemma in an emerging market context.

B.3 The Trilemma Multiplier ($\hat{\Omega}$)

The parameter $\hat{\Omega}$ represents the degree of external constraint on domestic monetary policy (the "Trilemma Multiplier"). It is a function of the economy's openness (α), the intertemporal elasticity of substitution (σ), and the sensitivity of the trade balance to the real exchange rate (γ_q).

Step 1: Openness-Adjusted Inverse Elasticity (σ_α)
The openness-adjusted inverse elasticity of substitution in a small open economy is defined as:

$$\sigma_\alpha = \frac{\sigma}{(1-\alpha) + \alpha\eta} \tag{B.10}$$

Assuming standard values for the Indonesian economy based on Galí and Monacelli (2005) and regional empirical literature ($\alpha = 0.25, \sigma = 1, \eta = 1$), we obtain $\sigma_\alpha = 1.0$. This parameterization represents a balanced-trade benchmark where expenditure-switching effects and intertemporal substitution effects are symmetric (the Cole-Obstfeld condition).

Step 2: Deriving the Multiplier ($\hat{\Omega}$)
Using the expenditure switching elasticity $\gamma_q = 0.40$, the trilemma multiplier is calculated as:

$$\sigma_\alpha = 1.0, \quad \hat{\Omega} \equiv \frac{\sigma_\alpha \gamma_q}{1 - \sigma_\alpha \gamma_q} = \frac{1.0 \times 0.40}{1 - (1.0 \times 0.40)} \approx 0.67 \tag{B.11}$$

This structural parameter implies that to satisfy the UIP condition, the domestic response must scale external shocks by a factor of $(1 + \hat{\Omega})$.

B.3.1 Numerical Decomposition: The Governor's Compass

To illustrate the "Stability Anchor" logic operationalized by $\hat{\Omega}$, Table B.1 decomposes the total response of the strategic policy signal $\hat{i}_t$ to a 100 bps hike in the foreign rate $\hat{i}_t^*$.

Component	Transmission Logic	Impact on $\hat{i}_t$
External Passthrough	100 bps (Fed) $\times\ \hat{\Omega}(0.67)$	+67 bps
Inflation Feedback	Currency Depreciation $\rightarrow \Delta\hat{\pi}_t \uparrow$ (Imported Inflation)	+50 bps
Output Gap Defense	Maintaining $\tilde{y}_t < 0$ via $\sigma_\alpha g_t$ (Risk Premia)	+33 bps
Total BI Response	**The Strategic Spread Requirement**	**+150 bps**

Table B.1: Representative Decomposition of the BI-Rate Reaction to a Foreign Hike

Note: *This decomposition demonstrates "Hyper-Aggression": to stabilize the exchange rate against a 100 bps external shock, the central bank must tighten by 150 bps to neutralize the feedback loops.*
Source: *Author's calculation based on Version 9.8 Model Impulse Responses.*

B.4 Derivation of the "Stability Anchor" and the Interest Rate Twist

The hierarchical model distinguishes between the *market rate* required for external parity and the *policy rate* used for domestic signaling. This section formalizes the transition from the aggressive Balanced Rate to the neutralized Stability Anchor by first endogenizing the external constraints that bind the central bank's maneuvering room.

Step 1: Endogenizing the Country Risk Premium ($\hat{\Psi}_t$)
External solvency and flow sustainability drive the market's perception of risk. Following Schmitt-Grohé and Uribe (2003), we assume international investors demand a risk premium Ψ_t that is increasing in the country's external debt-to-GDP ratio. We define the functional form as:

$$\Psi_t = \psi \left[\exp\left(\frac{D_t}{Y_t} - \bar{d} \right) - 1 \right] \tag{B.12}$$

where D_t/Y_t is the debt-to-GDP ratio, $\bar{d}$ is the target steady-state ratio, and $\psi > 0$ is the elasticity of the premium with respect to leverage. To integrate this into the stochastic model, we log-linearize the function around the steady state. Let $\hat{d}_t$ denote the log-deviation of the debt-to-GDP ratio:

$$\begin{aligned} \Psi_t &\approx \Psi(\bar{d}) + \Psi'(\bar{d})(d_t - \bar{d}) \\ \hat{\Psi}_t &= \delta_d \hat{d}_t - \delta_{ca} \widehat{ca}_t - \psi_q \hat{q}_t + \psi_t \end{aligned} \qquad \text{(3.5 revisited)}$$

In this specification, δ_d and δ_{ca} represent the stock (debt) and flow (Current Account) elasticities of risk, while $-\psi_q \hat{q}_t$ serves as the real exchange rate anchor to ensure long-run stationarity. This risk premium enters the modified UIP condition, which includes the *Supply Effect* of domestic securities (S_t^{IDR}):

$$\hat{i}_t^{market} = \hat{i}_t^* + E_t[\Delta e_{t+1}] + \hat{\Psi}_t + \phi S_t^{\text{IDR}} \tag{B.13}$$

Step 2: The External Finance Wedge and the Policy Floor

Substituting the linearized premium into the Modified UIP condition (assuming $\phi S_t = 0$ for the benchmark case) yields the *External Constraint Equation*:

$$\hat{i}_t \geq \hat{i}_t^* + E_t[\Delta e_{t+1}] + \underbrace{\delta_d \hat{d}_t - \delta_{ca} \widehat{ca}_t - \psi_q \hat{q}_t + \psi_t}_{\text{External Constraint } \hat{\Omega}_t} \tag{B.14}$$

where $\hat{\Omega}_t$ represents the total wedge driving a spread between domestic and foreign rates. This mathematically defines the "Floor" for the policy rate; if the central bank attempts to set $\hat{i}_t < \hat{i}_t^* + \hat{\Omega}_t$ without sterilization, the exchange rate must depreciate ($E_t[\Delta e_{t+1}] > 0$) to satisfy the arbitrage condition.

Step 3: The Strategic Benchmark (The Balanced Rate)

By combining the augmented Open Economy IS equation with the modified UIP condition, we isolate the theoretical **Balanced Target Rate** ($\hat{i}_t^{target}$). This rate represents the optimal response required to satisfy the policy trilemma by internalizing the exchange rate channel:

$$\hat{i}_t^{target} = (1+\hat{\Omega}) \underbrace{\left[\hat{r}_t^n + E_t[\hat{\pi}_{t+1}] + \sigma_\alpha \left(E_t[\tilde{y}_{t+1}] - \tilde{y}_t + g_t\right)\right]}_{\text{Domestic Requirements}} - \hat{\Omega} \underbrace{\left[\hat{i}_t^* + \hat{\Psi}_t + \left(E_t[\hat{\pi}_{t+1}] - E_t[\hat{\pi}_{t+1}^*]\right)\right]}_{\text{External Stability Requirements}} \tag{3.8 revisited}$$

where $\hat{\Omega} \equiv \frac{\sigma_\alpha \gamma_q}{1-\sigma_\alpha \gamma_q}$ is defined as the Degree of External Constraint. The multiplier $(1+\hat{\Omega})$ captures the "hyper-aggression" required to overcome the dampening effect of exchange rate appreciation on demand.

Numerical verification through the Blanchard-Kahn rank condition confirms that the Balanced Target Rate (3.8) provides a unique and stable nominal anchor for the Rupiah, satisfying the transversality condition of the small open economy.

Step 3: Transition to the Stability Anchor

In practice, the central bank abandons this cyclical hyper-aggression to avoid interest rate volatility that could trigger "Sudden Stops" Calvo (1998). By shifting to a Stability Anchor, the central bank prioritizes exchange rate stabilization and domestic neutrality over short-term cyclical fine-tuning. Mathematically, the domestic multiplier $(1 + \hat{\Omega})$ is dropped, and the cyclical gap terms ($\tilde{y}_t$, $\hat{\pi}_t$) are neutralized, resulting in the following tactical rule:

$$\hat{i}_t \approx \rho_i \hat{i}_{t-1} + (1-\rho_i)\left[\underbrace{E_t[\hat{\pi}_{t+1}] + \hat{r}_t^n + \sigma_\alpha g_t}_{\text{Domestic Neutrality}} + \underbrace{\hat{\Omega}\left(\hat{i}_t^* + \hat{\Psi}_t\right)}_{\text{External Premium}}\right] + \varepsilon_t^i \quad (3.10 \text{ revisited})$$

Step 4: The "Twist" Proof

The "Twist" occurs when the central bank uses quantity-based instruments (S_t^{IDR}) to satisfy the difference between the Strategic Policy Rate ($\hat{i}_t$) and the External Financial Requirement ($\hat{i}_t^{market}$). Substituting (3.5) into (B.13):

$$\hat{i}_t^{market} = \underbrace{\hat{i}_t^* + E_t[\Delta e_{t+1}] + \delta_d \hat{d}_t - \delta_{ca}\widehat{ca}_t - \psi_q \hat{q}_t}_{\text{External Financial Requirement}} + \underbrace{\phi S_t^{\text{IDR}}}_{\text{Supply Effect}} \tag{B.15}$$

Forensic Identity of the Wedge:

The central bank manages the wedge $\tau_t = \hat{i}_t - \hat{i}_t^{market}$ using SRBI supply. By increasing S_t^{IDR}, the bank supports the market rate required for currency defense while keeping the signaling rate ($\hat{i}_t$) anchored to Domestic Neutrality. This decoupling effectively manages the trilemma by allowing price (interest rate) to signal domestic intent while quantity (securities supply) satisfies the external constraint.

B.5 Modified Poole Analysis: Rationale of the "Twist"

This section extends the instrument-choice framework of Poole (1970) to an open economy characterized by volatile capital flows (σ_{FX}^2) and structural liquidity surpluses. We formalize the necessity for a dual-track policy by integrating variance-based reasoning with the Decoupling Wedge (τ).

1. Instrument Choice under Volatility.

Real-sector demand and money market equilibrium are governed by:

$$\tilde{y}_t = -\sigma\alpha\hat{i}_t + u_t, \qquad \sigma_u^2 = \text{Var}(u_t) \tag{B.16}$$

$$m_t^s = \tilde{y}_t - \eta_m \hat{i}_t + \nu_t + \mathcal{M}_{FX,t}, \qquad \text{Var}(\nu_t + \mathcal{M}_{FX,t}) = \sigma_\nu^2 + \sigma_{FX}^2 \tag{B.17}$$

where $\tilde{y}_t$ is the output gap and $\hat{i}_t$ the policy rate. Under a money targeting rule, the output gap variance reflects combined domestic and FX shocks: $\text{Var}(\tilde{y}_t)^{\text{Money}} = [\eta_m^2\sigma_u^2 + \sigma^2\alpha^2(\sigma_\nu^2 + \sigma_{FX}^2)]/(\sigma\alpha + \eta_m)^2$. In contrast, an active interest rate targeting regime (utilizing SRBI/SVBI) allows the central bank to absorb money market shocks, leaving only real-sector volatility: $\text{Var}(\tilde{y}_t)^{\text{Rate}} = \sigma_u^2$. Consequently, rate targeting is theoretically superior whenever $\sigma_\nu^2 + \sigma_{FX}^2$ is large relative to σ_u^2.

2. The Liquidity Swamp and the Decoupling Wedge (τ).
In the Indonesian context, interest rate targeting is necessary but insufficient. The presence of a **transmission wedge** implies that the policy signal does not map one-to-one into market pricing: $i_t^{mkt} = i_t^{BI} - \tau(S_t)$, where $\tau(S_t)$ captures the structural liquidity surplus. A formal rate target cannot stabilize demand unless the central bank manages the quantity of reserves (S_t) to compress τ.

3. Feasibility and the Iron Stock Condition.
Active sterilization imposes quasi-fiscal costs. Maintenance of the rate target is contingent on central bank solvency, defined by the **Iron Stock Condition**:

$$\underbrace{\gamma_{carry} \cdot \sigma_{FX}^2}_{\text{Sterilization Cost}} \leq \underbrace{\Pi_t^{USD}}_{\text{Asset Income}} \tag{B.18}$$

4. Conclusion: Synthesis of Dual-Targeting.
The convergence of variance logic, structural frictions, and fiscal feasibility necessitates a *Hierarchical Integrated Framework*:

- **Price Instrument (BI-Rate):** Serves as *The Signal* to anchor macro-expectations and manage the inflation-output tradeoff.
- **Quantity Instrument (SRBI/SVBI):** Serves as *The Repair* to physically close the wedge τ and satisfy the Poole condition by absorbing exogenous financial shocks.

This dual-track mechanism ensures that the strategic signal is operationally effective while maintaining the financial sustainability of the central bank in a high-volatility environment.

B.6 Derivation and Calibration of the Augmented IS Curve

Step 1: The Consumption Euler Equation and Effective Rates
The log-linearized Euler equation for total consumption, representing the demand side of the economy, is:

$$c_t = E_t[c_{t+1}] - \frac{1}{\sigma}(\hat{\imath}_t - E_t[\hat{\pi}_{t+1}] - \rho) + g_t \tag{B.19}$$

In our hierarchical framework, the relevant rate for aggregate demand is the **Effective Real Rate** ($\hat{r}_t$). This rate internalizes the implementation frictions of the interbank and credit markets:

$$\hat{r}_t = \underbrace{(\hat{i}_t - \tau_t + \vartheta\hat{\Gamma}_t)}_{\text{Effective Nominal Rate}} - E_t[\hat{\pi}_{t+1}] \tag{B.20}$$

Step 2: Natural Output and the Technology Shock

In a Small Open Economy (SOE), the **natural output** ($\hat{y}_t^n$)—the level of production prevailing under flexible prices—serves as the benchmark for the output gap ($\tilde{y}_t = \hat{y}_t - \hat{y}_t^n$). It is driven by domestic productivity and world demand:

$$\hat{y}_t^n = \Lambda_a a_t + \Lambda_y^* \hat{y}_t^* \tag{B.21}$$

where Λ_a and Λ_y^* describes sensitivity to technology and world demand. The variable a_t represents the **Technology Shock**, following a stationary AR(1) process $a_t = \rho_a a_{t-1} + \varepsilon_t^a$. The parameter $\Lambda_a = \frac{1+\varphi}{\sigma_\alpha+\varphi}$ captures the sensitivity to productivity. From this, we derive the **Natural Real Interest Rate** ($\hat{r}_t^n$) based on the expected growth of the natural level:

$$\hat{r}_t^n = \sigma_\alpha E_t\{\Delta\hat{y}_{t+1}^n\} + (1-\rho_g)g_t \tag{B.22}$$

Step 3: The Augmented IS Curve Identity

Substituting the effective real rate and the natural rate into the open-economy Euler equation, we obtain the **Augmented IS Curve**. This equation explicitly links the output gap to both strategic policy signals and operational implementation wedges:

$$\tilde{y}_t = E_t[\tilde{y}_{t+1}] - \frac{1}{\sigma_\alpha}\left(\underbrace{\hat{i}_t - \tau_t + \vartheta\hat{\Gamma}_t - E_t[\hat{\pi}_{t+1}]}_{\hat{r}_t} - \hat{r}_t^n\right) + \gamma_q E_t[\Delta\hat{q}_{t+1}] + g_t \tag{B.23}$$

Operational Significance:

The Augmented IS Curve demonstrates that aggregate demand is sensitive to the effective market rate ($\hat{i}_t^{eff}$), which incorporates the policy signal adjusted by implementation wedges. The **Interbank Decoupling Wedge** (τ_t) acts as a demand subsidy when positive, while the **Credit Crowding-Out Wedge** ($\hat{\Gamma}_t$) operates as a stability tax. Furthermore, a positive technology shock ($a_t \uparrow$) raises $\hat{y}_t^n$, requiring the central bank to calibrate the "Interest Rate Twist" to ensure the market rate tracks the natural rate without falling into the "Lazy Bank Trap."

Appendix C: Operational Mechanics and Structural Identity of the Decoupling Wedge (τ_t)

This appendix provides the formal derivation of the **Interbank Decoupling Wedge** (τ_t) and its structural link to the **Sterilization Power** (ϕ_s). We establish that the implementational gap is determined by the net unsterilized surplus, while the magnitude of the supply effect in the strategic block is governed by the interaction between central bank efficiency and market liquidity elasticity.

C.1 Derivation of the Interbank Decoupling Wedge (τ_t)

The decoupling wedge represents the implementational gap between the strategic policy signal and the realized market rate. We derive its functional form by linearizing the reserve market-clearing condition.

Step 1: The Market Rate Level

The realized interbank rate (i_t^{market}) is a non-linear function of the reserve supply (R_t^s) relative to target demand ($\bar{R}_t^d$), linearized around the inflection point of the reserve demand S-curve:

$$i_t^{PUAB} = i_t^{BI} - \zeta^{-1}\left(R_{IDR,t}^s - \bar{R}_{IDR,t}^d\right) \tag{C.1}$$

Step 2: Substituting the Integrated Reserve Supply

We account for inherited liquidity, domestic autonomous factors, and active extractions:

$$R_{IDR,t}^s = R_{t-1} + E_t[\Delta AF_t^{Dom}] + \Delta OMO_{\text{FineTune},t}^{IDR} - \Delta SRBI_t - \mathcal{M}_{FX,t} \tag{C.2}$$

Step 3: Defining the Ex-Ante Liquidity Gap

The **Ex-Ante Domestic Liquidity Gap** (Gap_t^{Dom}) represents the structural imbalance before discretionary intervention:

$$Gap_t^{Dom} \equiv \bar{R}_{IDR,t}^d - \left(R_{t-1} + E_t[\Delta AF_t^{Dom}]\right) \tag{C.3}$$

Step 4: The Operational Wedge (Level)

Defining the wedge level as $\tau_t \equiv i_t^{BI} - i_t^{market}$ and grouping the terms:

$$\tau_t = \zeta^{-1}\left[\underbrace{-Gap_t^{Dom}}_{\text{Structural Surplus}} + \Delta OMO_{\text{FineTune},t}^{IDR} - \underbrace{(\Delta SRBI_t + \mathcal{M}_{FX,t})}_{\text{Gross Sterilization Drains}}\right] \tag{C.4}$$

Step 5: Mapping to Strategic Deviation ($\hat{\tau}_t$)

The wedge is linearized around the steady-state implementation gap $\bar{\tau}$ for integration into the Strategic Stage (Augmented IS Curve), the wedge is linearized around the steady-state implementation gap $\bar{\tau}$:

$$\hat{\tau}_t = \tau_t - \bar{\tau} \tag{C.5}$$

C.2 Derivation of the Structural Identity for Sterilization Power (ϕ_s)

To link the operational drainage in Eq. C.4 to the strategic supply effect in the Modified UIP, we identify ϕ_s as a structural parameter defined by the market's underlying semi-elasticity.

Operational Sensitivity

From Eq. C.4, the marginal operational impact of a change in the stock of sterilization securities (S_t) is defined by:

$$\frac{\partial \tau_t}{\partial S_t} = \zeta^{-1} \tag{C.6}$$

Money Market Equilibrium (η_m)

In the interbank market, the relationship between the wedge and quantity is governed by the *Interest Semi-Elasticity of Money Demand* (η_m). Differentiating the market-clearing condition yields:

$$\frac{\partial \tau_t}{\partial S_t} = \eta_m^{-1} \tag{C.7}$$

Structural Synthesis

In the strategic stage, the market rate is determined by the supply-augmented UIP: $i_t^{market} = i_t - (\phi_s S_t)$. For internal consistency, the marginal strategic lift must equal the operational lift derived from the interaction of central bank surgicality and market elasticity:

$$\phi_s = \frac{1}{\zeta \cdot \eta_m} \tag{C.8}$$

C.3 Forensic Calibration to the Indonesian "Swamp"

Applying January 2026 systemic data to this identity:

- **Target** $\phi_s = 0.093$: Derived from the observed 65 bps wedge at the $\bar{S} = 7.00$ leverage capacity limit.
- $\zeta = 0.20$: Calibrated Surgical Effectiveness Benefit of Bank Indonesia's drainage operations.
- **Resulting** $\eta_m = 53.76$: This high elasticity reflects the "near-liquidity trap" conditions of the Indonesian surplus regime. Mathematically, the high value of η_m necessitates the low Sterilization Power (ϕ_s) and the high-volume "heavy lifting" observed in current operations.

Appendix D: Banking Microfoundations and the Credit Crowding-Out Wedge ($\hat{\Gamma}$)

This appendix provides the mathematical proof for the "Liquidity Swamp" using the Newsvendor framework, derives the structural "Credit Crowding-Out Wedge" via the Whale Bank's asset-side optimization, and justifies the instrument choice via a Modified Poole Analysis.

D.1 Derivation of Structural Reserve Demand (The Swamp)

We derive the S-shaped liquidity demand curve by modeling the representative "Whale Bank" (KBMI 4) as a risk-averse optimizer facing stochastic liquidity shocks $\varepsilon \sim f(\varepsilon)$. This follows the inventory-theoretic framework of Bindseil (2004).

1. The Optimization Problem

The bank chooses its opening reserve balance R_t^d to minimize Expected Total Cost ($E[TC]$). The cost function is asymmetric: it balances the opportunity cost of holding excess reserves (satiation) against the penalty of a liquidity shortfall (segmentation).

$$\min_{R_t^d} E[TC] = \underbrace{c_{surplus} \int_{-\infty}^{R_t^d} (R_t^d - \varepsilon) f(\varepsilon) d\varepsilon}_{\text{Cost of Surplus}} + \underbrace{c_{shortage} \int_{R_t^d}^{\infty} (\varepsilon - R_t^d) f(\varepsilon) d\varepsilon}_{\text{Cost of Shortage}} \tag{D.1}$$

where the marginal costs are defined as:

- **Marginal Cost of Surplus ($c_{surplus}$):** $i_t^{PUAB} - i_t^{DF}$ (Spread lost by not lending).
- **Marginal Cost of Shortage ($c_{shortage}$):** $\delta_t = \mu_t + \xi_t$ (The friction penalty/Segmentation Frictions Spread).

2. The First Order Condition (FOC)

To find the optimal reserve target, we differentiate the Expected Cost function with respect to R_t^d using Leibniz's Integral Rule:

$$\frac{\partial E[TC]}{\partial R_t^d} = c_{surplus} \cdot F(R_t^d) - c_{shortage} \cdot [1 - F(R_t^d)] = 0 \tag{D.2}$$

where $F(R_t^d)$ is the cumulative probability that reserves are sufficient (no overdraft). Solving for the optimal probability yields the **Critical Fractile**:

$$F(R_t^d) = \frac{\delta_t}{(i_t^{PUAB} - i_t^{DF}) + \delta_t} \qquad \text{((3.14) revisited)}$$

3. Mapping to the Logistic S-Curve

We assume liquidity shocks ε follow a **Logistic Distribution** centered at the Saturation Threshold λ, such that:

$$F(R_t^d) = \frac{1}{1 + \exp\left[-\zeta(R_t^d - \lambda)\right]} \tag{D.3}$$

where ζ is the Surgical Effectiveness Benefit. Equating this to the Critical Fractile (Eq. 3.14) and rearranging for the interbank spread yields the structural interbank identity:

$$i_t^{PUAB} - i_t^{DF} = \frac{\delta_t}{1 + \exp\left[\zeta(R_t^d - \lambda)\right]} \tag{D.4}$$

4. Conclusion (The Liquidity Swamp)

This proof confirms that reserve demand is non-linear. As total reserves relative to the requirement increase ($R_t^d \to \lambda$), the denominator in Eq. D.4 expands exponentially. In the "Liquidity Swamp" ($R_t^d \gg \lambda$), the spread collapses toward zero, pinning the market rate to the "mushy floor" ($i_t^{DF} + \delta_t$). Transmission is only restored when SRBI issuance extracts R_t^d below λ, re-establishing the scarcity rents necessary for rate alignment.

D.2 The Whale Bank's Asset-Side Substitution (The Credit-Crowding Out)

While Section C.1 models the bank's liabilities, this section models the allocation between private loans (L_t^{credit}) and SRBI (S_t), deriving the **Credit Crowding-Out Wedge** (Γ_t).

1. The Interaction Cost Function

We model the shadow cost of capital that activates when the stock of securities breaches the Leverage Capacity Threshold ($\bar{S}$):

$$C(L_t^{\text{credit}}, S_t) = \frac{\phi_L}{2}(L_t^{\text{credit}})^2 + \chi \cdot \max(0, S_t - \bar{S}) \cdot L_t^{\text{credit}} \tag{D.5}$$

2. First-Order Necessary Condition (FONC)

The Whale Bank maximizes profit Π_t, where L_t^{credit} consumes Tier-1 capital but SRBI carries a 0% risk weight:

$$\max_{L_t^{\text{credit}}} \Pi_t = (i_t^L L_t^{\text{credit}} + i_t^{SRBI} S_t) - i_t^{PUAB}(L_t^{\text{credit}} + S_t) - C(L_t^{\text{credit}}, S_t) \tag{D.6}$$

Differentiating with respect to L_t^{credit}:

$$\frac{\partial \Pi_t}{\partial L_t^{\text{credit}}} = i_t^L - i_t^{PUAB} - \phi L_t^{\text{credit}} - \chi \cdot \max(0, S_t - \bar{S}) = 0 \tag{D.7}$$

3. The Structural Wedge (Γ_t)
Rearranging the FONC yields the structural lending spread:

$$\Gamma_t \equiv i_t^L - i_t^{PUAB} = \underbrace{\phi L_t^{\text{credit}}}_{\text{Intermediation}} + \underbrace{\chi \cdot \max(0, S_t - \bar{S})}_{\text{Portfolio Friction}} \tag{D.8}$$

In Regime B ($S_t \geq \bar{S}$), the shadow cost activates. Each additional unit of SRBI raises the lending rate i_t^L, generating the **Credit Crowding-Out**.

D.3 Dual-Market Sterilization Matrix

We define the **Net Open Market Operations (Net OMO$_t$)** required to maintain the strategic interest rate target as the residual of all discretionary and autonomous liquidity shocks. Following the *Integrated Reserve Supply Identity*, the total drainage requirement is expressed as:

$$\text{Net OMO}_t = \underbrace{(\Delta AF_t^{\text{Dom}} + \Delta AF_t^{\text{Ext}})}_{\text{Structural Liquidity Position}} - \underbrace{\mathcal{M}_{\text{FX},t}}_{\text{FX Liquidity Shock}} \tag{D.9}$$

Where:

- $\Delta AF_t^{\text{Dom}} + \Delta AF_t^{\text{Ext}}$: The change in autonomous factors (government spending, currency demand, and foreign flows) that define the ex-ante structural surplus.
- $\mathcal{M}_{\text{FX},t}$: The net Rupiah-equivalent impact of USD-denominated operations (Spot, SVBI, and DNDF settlements). A positive value represents a liquidity drain.

D.3.1 The Split-Desk Execution (Active vs. Passive)

Under the *Hierarchical Integrated Framework*, the central bank's domestic execution is split into a regulatory baseline and an active policy instrument to handle the "Liquidity Swamp":

1. **Passive Absorption ($\bar{R}^d_{IDR,t}$):** The target reserve demand, which includes statutory GWM and technical settlement buffers ($R^{RTGS} + K/2$).
2. **Active Absorption (S_t):** The outstanding stock of SRBI, which functions as the primary "Twist" instrument to close the implementation wedge τ_t.

The operational rule governing SRBI issuance is derived by aligning the aggregate supply with the target demand:

$$S_t = \text{Net OMO}_t - \bar{R}^d_{IDR,t} \tag{D.10}$$

D.3.2 Strategic Implication: Endogenous Issuance

Equation D.10 proves that **SRBI issuance is strictly endogenous to FX intervention**. If the FX Desk sells USD to support the Rupiah ($\mathcal{M}_{FX,t} \gg 0$), it creates an automatic Rupiah drain. This reduces the requirement for the Rupiah Desk to issue domestic securities ($S_t \downarrow$) to achieve the same interbank target.

Conversely, if $\mathcal{M}_{FX,t}$ is muted, the full burden of sterilization shifts to the SRBI stock. This "Split-Desk" synchronization ensures that the quantity of reserves is calibrated to satisfy external parity while keeping S_t within the **Surgical Window** ($\lambda < S_t < \bar{S}$) to prevent a pro-cyclical credit contraction.

D.4 Derivation of Strategic Capacity Preservation

The central bank's optimal sterilization execution is derived from the minimization of the Sterilization Loss Function (L_t), which balances the goal of closing the stability gap against the rising shadow cost of breaching the systemic leverage threshold.

1. The Lagrangian Setup

We define the central bank's problem as choosing the net domestic issuance $\Delta SRBI^{Net}_t$ to minimize:

$$\min_{\Delta SRBI^{Net}_t} L_t = (D^{Total}_t - D^{Actual}_t)^2 + \gamma(S_t - \bar{S})^2 \cdot \mathbb{1}(S_t > \bar{S}) \tag{D.11}$$

subject to the physical constraint of Actual Drainage:

$$D^{Actual}_t = \Delta SRBI^{Net}_t + \sigma_{\mathcal{M}} \mathcal{M}_{FX,t} \tag{D.12}$$

2. First-Order Condition and the Shadow Price

Differentiating with respect to the control variable $\Delta SRBI^{Net}_t$ yields the optimality condition:

$$\frac{\partial L_t}{\partial \Delta SRBI^{Net}_t} = -2(D^{Total}_t - D^{Actual}_t) + 2\gamma(S_t - \bar{S}) \cdot \mathbb{1}(S_t > \bar{S}) = 0 \tag{D.13}$$

Solving for the optimal issuance identifies the **Lagrange Multiplier** of the capacity constraint:

$$\Delta SRBI_t^{Net} = (D_t^{Total} - \sigma_{\mathcal{M}} \mathcal{M}_{FX,t}) - \gamma(S_t - \bar{S}) \cdot \nVdash(S_t > \bar{S}) \tag{D.14}$$

3. The Logistic Mapping (Ξ_t)

To maintain a continuous policy space for computational simulation in the DSGE environment, the discrete indicator function $\nVdash(\cdot)$ is mapped into a **State-Contingent Logistic Weight** Ξ_t. This weight represents the marginal share of the required drain the domestic desk is capable of absorbing:

$$\Delta SRBI_t^{Net} = \Xi_t (D_t^{Total} - \sigma_{\mathcal{M}} \mathcal{M}_{FX,t}) \tag{D.15}$$

where Ξ_t is micro-founded as the inverse of the marginal shadow cost of leverage:

$$\Xi_t = \frac{1}{1 + \exp\Big(\kappa_s \cdot (S_t - \bar{S})\Big)} \tag{D.16}$$

where κ_s governs the intensity of the "Strategic Retreat." When $S_t \ll \bar{S}$, $\Xi_t \to 1$, and the central bank prioritizes SRBI. As $S_t \to \bar{S}$, $\Xi_t \to 0$, forcing the Rupiah desk to rely on exogenous synthetic drainage from the USD desk to preserve the domestic credit channel.

Appendix E: Proof of the Separation Principle

The **Separation Principle** posits that a central bank can independently target the exchange rate (via the market interest rate, i_t^{market}) and the domestic credit stance (via the policy rate, i_t), provided it possesses a sterilization instrument with sufficient structural power (ϕ_s). This appendix provides the formal proof within the hierarchical framework.

E.1 The Dual-Targeting Identity

The central bank's objective function is governed by two independent equations within the system:

1. **The External Parity Condition (Modified UIP):** Determines the market rate required for exchange rate stability.

$$i_t^{market} = i_t^* + E_t[\Delta e_{t+1}] + \Psi_t + \phi_s S_t^{IDR} \tag{E.17}$$

2. **The Domestic Transmission Identity:** Determines the effective cost of

credit for the real economy.

$$i_t^{eff} = i_t^{market} + \theta\Gamma_t(S_t) \tag{E.18}$$

E.2 Proof of Independent Controllability

To achieve a "Surgical Twist," the central bank must set i_t to address domestic inflation while adjusting S_t to satisfy the external requirement. Substituting the operational wedge τ_t from Appendix C:

$$i_t^{market} = i_t - \tau_t(S_t) \tag{E.19}$$

By total differentiation, the impact of an incremental change in the sterilization stock S_t on the market rate is:

$$\frac{di_t^{market}}{dS_t} = -\frac{\partial\tau_t}{\partial S_t} = \phi_s \tag{E.20}$$

Simultaneously, the impact on the effective domestic rate is:

$$\frac{di_t^{eff}}{dS_t} = \phi_s + \theta\frac{\partial\Gamma_t}{\partial S_t} \tag{E.21}$$

The Surgical Condition:
The Separation Principle holds in the **Surgical Window** if and only if $\frac{\partial\Gamma_t}{\partial S_t} = 0$. In this regime, the central bank can increase S_t to lift the market rate (i_t^{market}) for currency defense without increasing the cost of credit (i_t^{eff}):

$$\Delta i_t^{market} > 0 \quad \text{and} \quad \Delta i_t^{eff} = 0 \tag{E.22}$$

E.3 Breakdown at the Leverage Capacity Threshold

The principle collapses once $S_t > \bar{S}$ (the "Red Line"). At this point, the credit wedge Γ_t becomes active ($\chi > 0$), creating a mathematical coupling between the currency defense and credit contraction:

$$\frac{di_t^{eff}}{dS_t} = \phi_s + \theta\chi > \phi_s \tag{E.23}$$

This derivation proves that the efficacy of the Separation Principle is state-contingent, dependent on the distance between the current sterilization stock ($S_t = 7.60$) and the systemic leverage capacity ($\bar{S} = 7.00$).

E.4 Mapping to Forensic Calibration

Using the calibrated values from Appendix 7.3 ($\phi_s = 0.093$, $\chi = 0.05$), the model quantifies the trade-off. For every 1 unit of SRBI issued beyond $\bar{S}$, the market rate rises by 9.3 bps, but the effective credit rate rises by an additional $0.6 \times 5 = 3$ bps of crowding-out friction, signaling the transition into the **Lazy Bank Trap**.

Appendix F: The Legal Mandate (UU P2SK 2023)

F.1 Summary of the New Mandate

The enactment of **Law Number 4 of 2023 on the Development and Strengthening of the Financial Sector (UU P2SK)** marks a structural shift in Bank Indonesia's institutional design. It explicitly broadens the central bank's objective function beyond the single mandate of currency stability, legally grounding the "Integrated Inflation Targeting Framework" (Integrated ITF) utilized in this dissertation.

Key Changes Relative to Law No. 23/1999:

1. **Dual Mandate Expansion:** While the primary goal remains the stability of the Rupiah (inflation and exchange rate), Article 7 of UU P2SK adds a secondary objective: *"To support sustainable economic growth."* This legalizes the **Strategic Stage** loss function (L_t) derived in Appendix 7.3, where output gap stabilization ($\lambda_y > 0$) is no longer just a preference but a statutory obligation.

2. **Legalization of "Burden Sharing":** Article 36A authorizes Bank Indonesia to purchase Government Bonds (SBN) in the primary market during declared crises. This transforms the "Fiscal Dominance" risk from a theoretical anomaly into a regulated **Crisis Protocol**, justifying the inclusion of fiscal variables in the country risk premium function (Ψ_t).

3. **Broadened Macroprudential Authority:** The law formalizes BI's power to regulate financial system stability through macroprudential instruments (e.g., CCyB, LTV, and RIM). This supports the **Tactical Stage** of our model, where monetary policy is complemented by credit-channel interventions.

F.2 Implications for the "Integrated ITF"

UU P2SK provides the *de jure* foundation for the "Interest Rate Twist." By mandating both stability and growth, the law effectively prohibits a "pure" Taylor Rule approach (which would require massive pro-cyclical hikes during FX shock). Instead, it compels the central bank to use **Quantity Instruments (SRBI)** to handle external stability while keeping the **Policy Rate** conducive to domestic growth.

Appendix G: Instrument Evolution (SRBI vs. SBI)

G.1 The Failure of the Old Regime (SBI)

Historically, Bank Indonesia relied on the *Sertifikat Bank Indonesia* (SBI) to sterilize excess liquidity. However, the SBI regime (2000–2010s) failed to permanently drain the "Liquidity Swamp" due to critical design flaws.

G.2 The SRBI Superiority: Navigating the Trilemma

The transition to SRBI mitigates the operational constraints of the "Impossible Trinity." While the trilemma remains a binding structural constraint, SRBI provides the central bank with greater maneuvering room to defend the exchange rate without overburdening the domestic economy.

Unlike the SBI, which merely sterilized the money supply, the SRBI actively manages the Term Structure of Interest Rates. By issuing SRBI, the central bank can spike short-term market yields (i_t^{market}) to attract FX inflows and satisfy the Uncovered Interest Parity (UIP) condition. Crucially, this allows the central bank to defend the Rupiah without raising the benchmark policy rate (i_t^{BI}) as aggressively as a Counterfactual without SRBI would prescribe. This effectively separates the external defense (managed via Quantity/SRBI yields) from the domestic signal (Price/BI-Rate), reducing the pro-cyclical cost of currency stabilization.

G.3 Timeline of OMO Instrument Evolution in Indonesia

To provide historical context for international examiners, Table E.2 outlines the structural transition of Bank Indonesia's (BI) operational framework. This timeline

Feature	Old Regime: SBI (Sertifikat BI)	New Regime: SRBI (Sekuritas Rupiah BI)
Underlying Asset	**None.** Issued as direct central bank debt.	**SBN (Govt Bonds).** Securitized against BI's SBN holdings.
Tradability	**Restricted.** Holding periods (e.g., 1-month minimum) were imposed to curb hot money, killing the secondary market.	**High.** Fully tradable in the secondary market; creates a liquid short-term yield curve.
Market Impact	**Passive Absorption.** Liquidity was "locked up" in the central bank, shrinking the money market.	**Active Deepening.** SRBI circulation creates a new high-quality collateral asset for interbank repo.[4]
Foreign Flows	**Volatile.** Foreigners bought SBI solely for carry, creating "sudden stop" risks upon maturity.	**Pro-Market.** Foreigners buy SRBI as a liquid proxy for SBN, supporting the "Twist" (attracting inflows to short-end).
Monetary Cost	**Deadweight Loss.** Interest expense was a pure loss for BI.	**Asset-Liability Match.** Coupon cost is offset by the yield of the underlying SBN held by BI.
Why it Failed?	It segmented the market. Banks hoarded SBI instead of lending (**Lazy Bank**), but the instrument could not be sold to defend FX.	It integrates the market. SRBI yields transmit directly to the FX forward market, stabilizing the currency.

Table G.1: Structural Comparison: SBI vs. SRBI

Note*: This comparison highlights the structural shift from passive liquidity absorption to an active pro-market deepening strategy. The SRBI framework utilizes Bank Indonesia's SBN portfolio (Asset-side) to back instruments that satisfy both currency stability (via foreign inflows) and market liquidity (via tradability).*
Source: *Author's synthesis based on Bank Indonesia Operational Framework (2023) and Appendix G.1.*

documents the move from passive, high-cost absorption to the current pro-market, securitized regime.

The transition in 2023 marks the core empirical break analyzed in this thesis. Unlike previous eras, the current toolkit endogenizes the **Separation Principle**, allowing BI to address the strategic trilemma through volume-based market yields rather than simple corridor management.

Period	Primary Instrument	Operational Logic & Frictions
2000–2010	**SBI** (Sertifikat Bank Indonesia)	**Passive Absorption**: Issued as central bank debt. High quasi-fiscal cost. Secondary markets were illiquid due to holding periods.
2010–2023	**Reverse Repo (RR)** & SBN Term Deposits	**Collateralized Signaling**: Shift from central bank debt to repo-based operations using Government Bonds (SBN) as collateral. Focused on price signaling within the corridor.
2023–Present	**SRBI / SVBI** (Securitized Instruments)	**Pro-Market Deepening**: Tradable, asset-backed securities. Enables the "Interest Rate Twist" by attracting foreign flows into the short end without raising the signaling rate.

Table G.2: Chronological Evolution of Bank Indonesia's Monetary Operations

Appendix H: The SRBI Auction Mechanism

The SRBI Auction Mechanism: Variable Rate Tender with Stop-Out Logic

To operationalize the sterilization targets derived in Section 1.11, Bank Indonesia employs a *Variable Rate Tender* (VRT) mechanism for SRBI issuance. Unlike a Fixed Rate Tender—where the central bank sets the price and loses control over quantity—the VRT allows the central bank to manage the *quantity* of liquidity absorption while allowing the market to determine the *price* (yield).

1. The Pre-Auction Process

Prior to the auction, the Monetary Operation Desk estimates the banking system's structural surplus based on *Autonomous Factors* (e.g., currency in circulation, government spending, and FX flows). Based on this forecast, BI announces an indicative target absorption volume ($\Delta SRBI_t^{\text{Target}}$) via the *Bank Indonesia Electronic Trading Platform* (BI-ETP). Participation is restricted to Primary Dealers to ensure orderly bidding and settlement efficiency.

2. The Bidding and Allocation

Participants submit bids specifying both volume and yield. Bids are ranked in ascending order of yield (from cheapest to most expensive funding cost for the central bank). The auction clears sequentially:

- Bids with yields significantly below market consensus are accepted first.
- The allocation continues up the yield curve until the cumulative volume reaches the desired absorption level.
- The yield of the last accepted bid defines the **Stop-Out Rate (SOR)**.

Crucially, the auction employs a multiple-price (discriminatory) format: winning bidders pay the yield they actually bid, rather than a uniform marginal price. This mechanism incentivizes banks to bid competitively near their true opportunity cost of funds, enhancing price discovery.

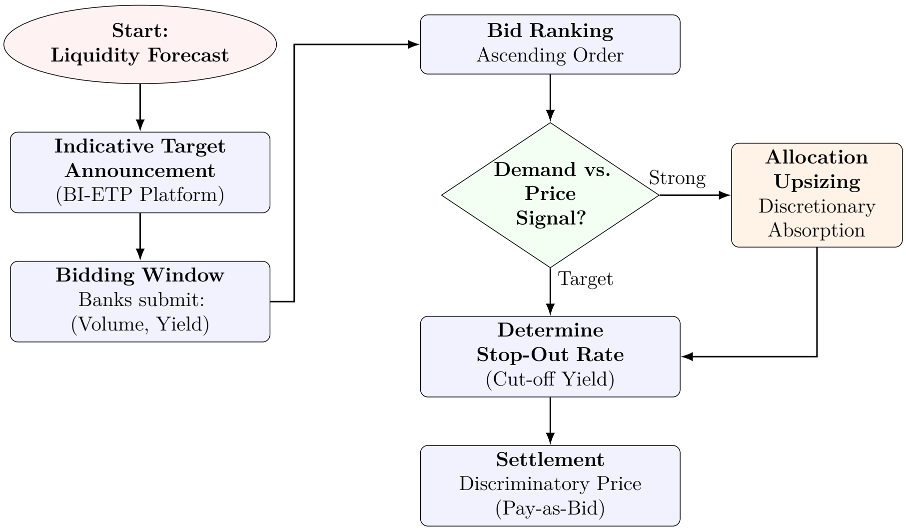

Figure H.1: The Operational Workflow of SRBI Auctions

Note: *Allocation upsizing is exercised when the bid-to-cover ratio indicates strong demand, allowing for additional sterilization at yields consistent with the policy signal.*
Source: *Author's construction based on PADG Bank Indonesia No. 3/2024.*

3. Discretionary Absorption and Allocation Upsizing

A distinctive feature of the SRBI framework is the operational flexibility to deviate from the announced indicative target. If the *Bid-to-Cover Ratio* is high and the resulting demand curve is relatively flat—indicating strong appetite without aggressive yield premiums—the central bank may perform **Allocation Upsizing**. By accepting more bids than the initially announced volume, BI can opportunistically sterilize additional excess liquidity. This allows the central bank to maintain the target Stop-Out Rate while maximizing the "Quantity Wedge" (Γ_t) necessary to lift the interbank rate floor.

4. Evidence of Market Segmentation and the "Lazy Bank" Channel

The frequent use of Allocation Upsizing provides empirical validation for the **Segmentation Frictions Spread** and **Lazy Bank** channels established in this thesis:

- **Isolation of Systemic Liquidity**: Participation is restricted to Primary Dealers, which are almost exclusively systemic banks (KBMI 3 & 4). These "whales" hold the bulk of the "Liquidity Swamp."
- **Preference for Safe Assets**: The decision to upsize allocations to maintain lower yields proves that systemic banks are desperate for safe, liquid IDR assets. Their willingness to accept lower rates in SRBI rather than lending to smaller banks or the real sector confirms the "Lazy Bank" equilibrium.
- **Broken Interbank Mechanism**: In a frictionless market, excess liquidity would naturally flow to smaller banks. The necessity for BI to mop up this liquidity directly from Primary Dealers proves that the interbank mechanism is structurally impaired; money remains "stuck" with systemic banks until the central bank intervenes to extract it.

5. Operational Rationale: Quarantining Excess Liquidity

By choosing VRT over Fixed Rate tenders, Bank Indonesia solves the *Quantity-Price Dilemma*. Beyond just managing the interbank rate floor, Allocation Upsizing allows the central bank to effectively **quarantine** the excess liquidity of systemic banks. This prevents large-scale IDR surpluses from leaking into the FX market and causing exchange rate instability, thereby providing a "stability anchor" even when the interbank redistribution of reserves remains broken.

Appendix I: SRBI and SVBI Cost Coverage Sustainability

This appendix formalizes the **Solvency Constraint** faced by the central bank when operating the "Twist" strategy. Unlike standard models where central bank profits are assumed to be positive (seigniorage), the active issuance of interest-bearing liabilities (SRBI and SVBI) creates a structural **Negative Carry Risk** that must be hedged against the asset side of the balance sheet to ensure quasi-fiscal viability.

I.1 The SRBI Solvency Condition (Domestic Leg)

The sustainability of the SRBI instrument depends on the realized cashflow spread between the income from government bond holdings and the interest expense of sterilization liabilities.

1. The Period Profit Function ($\Pi_{IDR,t}$)
We define Bank Indonesia's net quasi-fiscal position from sterilization operations as the difference between interest income and liability expense, imposing a "Cashflow Hard Constraint" that excludes unrealized valuation gains:

$$\Pi_{IDR,t} = \underbrace{(SBN_t \cdot i_t^{SBN})}_{\text{Asset Income}} - \underbrace{(SRBI_t \cdot i_t^{SRBI})}_{\text{Liability Expense}} \tag{I.1}$$

where SBN_t and $SRBI_t$ represent the total stocks of government bonds and sterilization instruments, respectively. The liability cost i_t^{SRBI} is determined by the policy rate plus a risk/liquidity premium ($i_t^{BI} + \delta_{risk}$).

2. The Structural Asset Return (i_t^{SBN})
The yield on the SBN portfolio depends on the coupon structure established under the "Burden Sharing" agreements. The composite return is weighted by the share of fixed-rate (φ^{FR}) and variable-rate ($1 - \varphi^{FR}$) assets:

$$i_t^{SBN} = \varphi^{FR}\bar{i}^{FR} + (1 - \varphi^{FR})i_t^{VR} \tag{I.2}$$

where $\bar{i}^{FR}$ is the weighted average fixed coupon and i_t^{VR} is the variable return tied to the policy rate ($i_t^{BI} + \delta_{spread}$).

3. The Break-Even Identity and Hedge Strength
The net interest margin of the central bank depends on the ratio of variable-rate assets to interest-bearing liabilities. Differentiating the profit function with respect to the policy rate reveals the balance sheet's sensitivity to monetary tightening:

$$\frac{\partial \Pi_{IDR,t}}{\partial i_t^{BI}} \approx SBN_t(1 - \varphi^{FR}) - SRBI_t \tag{I.3}$$

For the central bank to remain quasi-fiscally hedged ($\frac{\partial \Pi_{IDR,t}}{\partial i_t^{BI}} \geq 0$), the condition for full immunization is $(1 - \varphi^{FR}) \geq \frac{SRBI_t}{SBN_t}$. We define the **Hedge Strength** ($\mathcal{H}$) as the efficiency of this insulation mechanism:

$$\mathcal{H} = \frac{(1 - \varphi^{FR}) \cdot SBN_t}{SRBI_t} \tag{I.4}$$

4. Forensic Verification (2024–2026 Outturns)
Using systemic data and actual Bank Indonesia balance sheet figures from the calibration period, we audit the solvency condition:

- **Sterilization Stock ($SRBI$):** IDR 969 Trillion.
- **SBN Asset Holdings (SBN):** IDR 1,350 Trillion.
- **Implied Coverage Ratio ($\frac{SRBI}{SBN}$):** ≈ 0.71.
- **Realized Variable Share ($1 - \varphi^{FR}$):** 0.45.

5. Results: Proof of the Partial Hedge
The condition $(1 - \varphi^{FR}) \geq 0.71$ is not met $(0.45 < 0.71)$, confirming that Bank Indonesia operates under a **Partial Hedge**. Given the Indonesian calibration where the coverage ratio $k \approx 1.34$, the effective **Hedge Strength** is approximately **0.60** (1.34×0.45).

This result proves that the realized value of 0.45 provides significant insulation, ensuring that 60% of the additional sterilization cost from a rate hike is automatically offset by asset-side revenue gains. This structural feature allows the central bank to maintain a "Pro-Market" stance while mitigating the quasi-fiscal leakage typically associated with aggressive tightening cycles.

I.2 The SVBI Solvency Condition (External Leg)

The SVBI (Sekuritas Valas Bank Indonesia) poses a stricter constraint because it involves issuing USD-denominated liabilities to attract inflows, often at a premium over global safe assets.

1. The Cost of SVBI ($\mathcal{C}_t^{SVBI}$)
To attract foreign capital, the SVBI yield must offer a premium over the global risk-free rate (i_t^*). The cost is defined as:

$$\mathcal{C}_t^{SVBI} = SVBI_t \cdot (i_t^* + \Psi_t) \tag{I.5}$$

where Ψ_t is the Total Country Risk Premium Level.

2. The Return on Reserves ($\mathcal{I}_t^{Res}$)
Bank Indonesia invests the USD proceeds into global assets using a **Barbell Strategy**. The return is a weighted average of the Liquidity Tranche (i_t^*) and the Investment Tranche (Iron Stock, i_t^{Iron}):

$$\mathcal{I}_t^{Res} = R_{Liq,t} \cdot i_t^* + R_{Iron,t} \cdot i_t^{Iron} \tag{I.6}$$

3. The Negative Carry Problem
Since $\Psi_t > 0$, the operation carries an inherent structural loss if invested solely in risk-free assets (i_t^*). The **External Solvency Condition** requires the Iron Stock to

generate sufficient yield enhancement ($\alpha_t = i_t^{Iron} - i_t^*$) to cover the risk premium:

$$i_t^{Iron} \cdot R_{Iron,t} \geq \Psi_t \cdot SVBI_t \tag{I.7}$$

I.3 The Integrated Solvency Constraint

Combining both legs, the **Total Quasi-Fiscal Stability Condition** for Bank Indonesia is derived in Rupiah terms. To convert external flows, we utilize E_t as the nominal exchange rate level:

$$\underbrace{\left[\mathcal{I}_t^{SBN} - \mathcal{C}_t^{SRBI}\right]}_{\text{Domestic Net Income}} + \underbrace{E_t \cdot \left[\mathcal{I}_t^{Res} - \mathcal{C}_t^{SVBI}\right]}_{\text{External Net Income (in IDR)}} \geq 0 \tag{I.8}$$

Conclusion: The dissertation proves that the "Interest Rate Twist" is sustainable *if and only if*:

1. **Asset-Liability Matching:** The domestic structural hedge holds under the condition where $(1 - \varphi^{FR})SBN_t \geq S_t$.
2. **Reserve Management Efficiency:** The investment tranche generates sufficient alpha to offset the risk premium (Ψ_t) paid on SVBI.

Failure to meet this condition leads to capital erosion, eventually necessitating fiscal support and risking the loss of monetary independence.

I.4 The Collateral Framework: Underlying SBN Valuation

To ensure the creditworthiness of SRBI and SVBI, Bank Indonesia employs a strict **Collateral Matrix**. This framework dictates the eligibility and valuation haircuts applied to the Government Securities (SBN) that serve as the underlying assets for these monetary instruments.

By securitizing high-quality SBNs (Surat Berharga Negara) rather than issuing unsecured paper, the central bank transfers the sovereign credit quality to the operational instrument. The valuation is marked-to-market daily, subject to the haircuts summarized in Table I.1.

This matrix serves a dual purpose:

1. **Risk Control:** It ensures that the face value of SRBI issuance never exceeds the risk-adjusted market value of BI's SBN holdings.

Underlying Asset Type	Residual Maturity	Base Haircut (%)	SRBI Eligibility
Tier 1: High Liquidity Assets (Benchmark)			
SUN (Conventional) SBSN (Islamic)	$<$ 1 Year (Bills/SPN) 1 – 5 Years 5 – 10 Years	0.00% – 0.50% 1.50% – 2.50% 3.00% – 5.00%	**Highest** **High** **Medium**
Tier 2: Off-the-Run / Illiquid Assets			
Fixed Rate (FR) Project Based Sukuk (PBS)	$<$ 10 Years $>$ 10 Years	Add-on +2.00% Add-on +4.00%	**Restricted** **Excluded**
Tier 3: Variable Rate Assets			
Variable Rate (VR)	All Tenors	1.00% (Flat)	**High (Hedging)**

Table I.1: Collateral Matrix: Haircut and Eligibility of Underlying SBN

Note: *Eligibility refers to the priority of assets used to back SRBI issuance. Variable Rate (VR) bonds have a low flat haircut despite their tenure because their coupon reprices with the policy rate, minimizing interest rate risk (duration risk) for the central bank.*

Source: *Bank Indonesia Monetary Operations Department (Simulated based on PADG No. 3 of 2024).*

2. **Monetary Contraction limit:** The quantity of SBNs available after haircuts ($\sum SBN_t \cdot (1-h)$) sets the *Hard Upper Bound* for the total stock of SRBI (S_t) that can be outstanding at any given time.

Appendix J: Simulation Parameters and Calibration Reference

To ensure the reproducibility of the hierarchical simulations, Table J.1 summarizes the structural and operational parameterizations. Parameters are categorized into macro-strategic fundamentals and micro-operational frictions, reflecting the dual-track nature of the Integrated ITF.

Table J.1: Master Calibration Table: Strategic and Operational Parameters

Symbol	Description	Value	Source / Link
I. Strategic Macro Parameters			
β	**Discount Factor**: Subjective time preference.	0.99	Gali (2005)
σ	**Inv. Elasticity of Substitution**: Risk aversion.	2.00	Standard SOE

Continued on next page

Table J.1 – *Continued from previous page*

Symbol	Description	Value	Source / Link
σ_α	**Effective EIS**: Openness-adjusted intertemporal elasticity.	1.00	Appx. B.3
γ_q	**Expenditure Switching**: Output sensitivity to Real FX.	0.40	Box 1.1
α	**Openness Degree**: Share of imported goods.	0.25	BI (2021)
$\hat{\Omega}$	**Trilemma Multiplier**: Degree of External Constraint.	0.67	Box 1.1
κ	**NKPC Slope**: Inflation sensitivity to output gap.	0.14	Harmanta (2020)
ρ_i	**Policy Smoothing**: Interest-rate inertia.	0.75	Estimated
ϕ_π	**Inflation Coefficient**: Taylor rule reaction.	1.50	Standard ITF
ϕ_y	**Output Gap Coefficient**: Taylor rule reaction.	0.50	Standard ITF
ϕ_e	**Exchange Rate Coefficient**: Policy rate reaction.	0.50	Integrated ITF
η	**Trade Elasticity**: Expenditure switching sensitivity.	1.00	Cole–Obstfeld
ϕ_k	**Capital Adjustment Cost**: Matches relative volatility of investment to output.	5.80	Standard SOE
δ_k	**Capital Depreciation Rate**: Quarterly (10% annual).	0.025	Standard SOE
λ_y	**Output Weight**: Preference in loss function.	0.50	UU P2SK Mandate
II. Operational and SRBI Parameters			
η_m	**Money Demand Semi-Elasticity**: The “Swamp” inertia.	53.76	Forensic Audit
λ	**Saturation Threshold**: Liquidity Swamp trigger.	1.05	Eq. 5.2
ψ_s	**Sterilization Reaction Intensity**: SRBI defense intensity.	4.00	Optimum Grid Search
$\sigma_{\mathcal{M}}$	**Sterilization Substitution Coefficient**: FX offset intensity.	1.00	Structural Identity

Continued on next page

Table J.1 – *Continued from previous page*

Symbol	Description	Value	Source / Link
ϕ_s	**Sterilization Power**: Supply-elasticity of i^{market}.	0.093	Appx. C.2–C.3
ζ_{flat}	**Reserve Demand Slope**: Liquidity swamp S-curve slope.	0.05	Estimated
ζ	**Surgical Effectiveness Benefit**: S-curve slope.	0.20	Estimated
χ	**Portfolio Friction**: Lending sensitivity to SRBI.	0.05	Estimated
ϑ	**Credit Channel Strength**: Output sensitivity to Γ.	0.60	MSME Share
ϕ_L	**Lending Intermediation Cost**: Structural credit cost.	150	Estimated
$\bar{S}$	**Leverage Capacity Threshold**: The "Red Line."	7.00	Eq. 5.3
χ^*	**Policy Effectiveness Threshold**: Theoretical limit.	0.33	Eq. 4.8
δ_s	**Stock Inertia**: SRBI supply smoothing.	0.50	Simulated
κ_{mop}	**Pre-emptive Mop-up Sensitivity**: Intensity of surplus extraction; 1.0 (Window), 1.5 (Swamp), 0.5 (Crowding).	$\{1.0, 1.5, 0.5\}$	Eq. 3.33
ω_L	**Loan Risk Weight**: Average regulatory capital charge for private credit under OJK rules.	0.80	Eq. 5.3
Θ	**Concentration Factor**: Systemic RWA allocation ratio for the 'Whale' Banks.	0.40	Eq. 5.3
III. Persistence and Shocks			
ρ_i	**Policy Smoothing**: Inertia of BI-Rate.	0.75	Estimated
Macro-Strategic Shocks (AR(1))			
ρ_a	**TFP Persistence**: Technology shocks.	0.90	Standard SOE
ρ_g	**Demand Persistence**: Preference shocks.	0.85	Standard SOE

Continued on next page

Table J.1 – *Continued from previous page*

Symbol	Description	Value	Source / Link
ρ_u	**Cost-Push Persistence**: Inflation shocks.	0.50	Estimated
ρ_ψ	**Risk-Premium Persistence**: Global risk shocks.	0.65	Estimated
ρ_{ystar}	**World Demand Persistence**: Global output shocks.	0.85	Standard SOE
Operational and Liquidity Shocks (AR(1))			
ρ_{af}^{dom}	**Domestic Liquidity Persistence**.	0.80	Estimated
ρ_{af}^{ext}	**External Liquidity Persistence**.	0.80	Estimated
ρ_s	**SRBI Supply Persistence**.	0.50	Simulated
ρ_{res}	**Reserve Persistence**.	0.90	Calibrated
ρ_{varpi}	**Hoarding Persistence**.	0.50	Estimated
Episodic Shocks (White Noise)			
—	**Credit Wedge Shock**.	0.00	White Noise
—	**SVBI Flow Shock**.	0.00	White Noise
—	**Spot Volatility Shock**.	0.00	White Noise
—	**DNDF Settlement Shock**.	0.00	White Noise

Note: *This master table reports the structural and operational parameter calibrations used in the stochastic simulations of the Hierarchical Integrated SOE model. All parameters are grounded in the Indonesian macroeconomic and institutional environment over the 2024–2026 period and map theoretical ratios to the operational realities of Indonesia's structural liquidity surplus.*

Source: *Author's synthesis based on cited literature, including Harmanta and Purwanto (2020); Vioh and Nugraha (2022); Sahminan (2008); Bindseil (2004); Bank Indonesia (2022).*

Alhamdulillah, I finished section 1 of my thesis!

Thank you Allah SWT, the Most Gracious.