

Study on Forecasting and Nowcasting Macroeconomic Indicators

Inception Report

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Prepared for PT. SARANA MULTIGRIYA FINANSIAL (PERSERO)

August 2025

Recap & Milestone Delivery

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- **Milestone Achieved:** We are pleased to deliver the formal **Inception Report** today, Friday, August 29th.
- **Purpose of the Report:** This document serves as the official, mutually agreed-upon blueprint for the project, detailing:
 - The precise project scope (the 7 key indicators).
 - Our comprehensive analytical methodology.
 - The full list of key deliverables and the project timeline.

The Scale of the Analytical Task Ahead

- Our core philosophy is not to assume a single best model, but to force them to compete in a rigorous "horse race."
- This requires a massive-scale computational effort to find the optimal solution for each indicator.
- **The Analytical Calculation:**
 - We are targeting **7 main outcome variables** (GDP, Bond Yield, BI Rate, etc.).
 - We will deploy a toolkit of over **10 distinct modeling families** (from DFM and BVAR to LSTM and Random Forest).
 - Each model family can have up to **20+ iterations** based on hyperparameter tuning and feature engineering.

Total Potential Models to Test

7 Outcomes × 10+ Model Families × 20+ Iterations = **Over 1,400+ model configurations** will be built, tested, and validated.

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 - Developing the baseline econometric models (e.g., DFM, BVAR) to serve as robust benchmarks.
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- **Communication & Reporting:**
 - You will receive a **weekly progress report** via email summarizing key findings, backtesting results, and next steps.
 - We will continue our close collaboration through regular technical working sessions as needed.

Building a Proactive Analytical Asset for SMF's Decision-Making

Core Project Objective

To equip PT. SMF with a robust and automated forecasting system, shifting the organization's strategic posture from **reactive to proactive**.

- **Why?** SMF's business is highly sensitive to economic shifts. The ability to anticipate these changes is a crucial competitive advantage.
- **What?** A scope focused on the **seven key macroeconomic indicators** (GDP, SUN Yield, BI Rate, etc.) that are critical to SMF's operations.
- **How?** A **hybrid, evidence-based methodology**, combining the structure of econometric models with the predictive power of machine learning, validated through rigorous backtesting.
- **Deliverables:** Not just a tool, but a **lasting analytical asset**—including the complete and transparent code repository to build internal capacity.

Agenda

- 1 Introduction: Context and Objectives
- 2 Project Scope & Coverage
- 3 Analytical Methodology
- 4 Key Deliverables
- 5 Project Timeline & Milestones
- 6 Conclusion

Why This Project is a Strategic Necessity

SMF's business model is highly sensitive to macroeconomic dynamics through two primary channels:

1. Cost of Funds

SMF's bond issuance costs are highly influenced by the yield of Government Bonds (SUN).

2. Investment Returns

Income from fund placements (e.g., deposits) is directly correlated with the BI Policy Rate.

This dual exposure creates significant financial and operational risk.

The Urgent Need

A reliable, data-driven forecasting tool is essential for managing market risk, optimizing the timing of bond issuance, and creating a more responsive early warning system.

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- ➌ **Enhance Internal Capacity:** To increase the economic analysis capabilities of the internal teams at PT. SMF.
- ➍ **Facilitate Monitoring:** To simplify the process of monitoring economic conditions and evaluating policy impacts.

A Precise Focus on the Variables with the Greatest Impact on SMF

All modeling efforts will be concentrated on seven key variables for the Indonesian economy.

Primary Indicators (High-Frequency):

- 1 Economic Growth (GDP)
- 2 10-Year Government Bond Yield
- 3 BI Rate
- 4 Deposit Rate (Average)
- 5 Inflation Rate (CPI)
- 6 Exchange Rate (USD/IDR)

Additional Indicator (Low-Frequency):

- 7 Percentage of Informal Workers

Note

Specifically requested by the MRK Division for internal risk modeling needs.

A Collaborative Partnership for Success

PT. SMF (The Client)

- **Economic Research Division:**
Project Owner Subject Matter Expert
- **MRK Division:**
Critical End-User for Risk Modeling
- **Strategic Planning Division:**
Project Management Oversight

PT. Manlindo Surya Chandra (The Implementer)

- The technical partner responsible for the end-to-end design, development, and implementation of the forecasting system.

3.1 Foundational Philosophy: A Hybrid, Evidence-Based Approach

Key Finding (from 100+ studies)

No single model consistently outperforms all others. The most accurate and robust forecasting systems are **hybrid**.

Traditional Econometric Models

- **Strengths:** Based on economic theory, providing structure and interpretability.
- **Examples:** DFM, BVAR, MIDAS.
- **Role:** The robust baseline.

Modern Machine Learning (ML)

- **Strengths:** Superior predictive accuracy, captures non-linearities, robust during structural breaks.
- **Examples:** LSTM, Random Forest.
- **Role:** The high-performance challenger.

Final Strategy: Use **ensembling** to combine the "wisdom of the crowd" from top-performing models to produce a more stable and accurate final forecast.

A Comprehensive Data Infrastructure as the System's Foundation

- 1 **Data Collection:** Gather a comprehensive set of predictor variables from official sources (CEIC), covering all components of GDP (C, I, G, X-M).

Key Feature: Multi-Frequency Approach

Data is collected at its highest native frequency (e.g., daily) and systematically aggregated. This provides a richer information set for all models.

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- 3 **Feature Engineering:** Create new predictive variables (e.g., lags, moving averages) to improve model performance.

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Applying the Right Tool for the Right Job

A versatile toolkit of state-of-the-art models will be deployed in a competitive framework.

Econometric Workhorses

- **DFM:** Central bank standard for nowcasting GDP.
- **BVAR:** Models feedback loops between variables.
- **MIDAS:** Formally handles mixed-frequency data.
- **GARCH/TVP:** Standard for modeling volatility (e.g., USD/IDR).

Machine Learning Powerhouses

- **LSTM:** Deep learning for complex, non-linear patterns.
- **Random Forest:** Robust ensemble, strong during high volatility.
- **Elastic Net:** Powerful for variable selection (e.g., for the BI Rate).

Forcing Models to Compete for Reliability

We will not select models based on theory alone; we will prove their performance.

- ➊ **Historical Simulation ("Backcasting"):** Simulate a historical forecasting exercise. Example: using data up to 2015, predict 2016 outcomes, and compare with reality. This process is repeated for many periods.

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- ➌ **Graphical Analysis:** Plot actual historical data against forecasts from different models for an intuitive visual assessment.
- ➍ **Model Selection:** The results of this competitive validation will determine the "champion" models and the weights used in the final ensemble forecast.

Building a Complete, Operational, and Sustainable Capability

- **A Validated Macroeconomic Forecasting System:**

- An end-to-end system with a robust **Python backend** (for modeling) and a user-friendly **Excel frontend** (for interaction).
- Built on a **modular coding framework** for easy future adaptation and scalability.

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- **The Complete Model and Script Repository:**

- **Full Transparency:** Delivery of ALL code, including production scripts, testing scripts, and even developmental "scraps".
- **Strategic Goal:** To facilitate internal learning, reverse engineering, and build independent capacity within PT. SMF.

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- **Regular Nowcast, Forecast, and Backtesting Reports:**

- Standardized reports presenting the latest forecasts, confidence intervals, and clear visual validation of model performance.

Ensuring the System Can and Will Be Used

Interactive Visualization System (Excel Frontend)

A user-friendly dashboard in Excel will serve as the primary user interface. Features include at-a-glance summaries, drill-down capabilities, and simple controls to run updates without touching code.

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Training and Knowledge Transfer

A formal training program for various user groups:

- **User Training:** A hands-on session on operating the Excel dashboard and interpreting outputs.
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Comprehensive Documentation

- **Model Risk Documentation:** Formal documents detailing the theory, assumptions, and risks of each model to support internal governance.
- **Technical and User Manuals:** A complete guide to the system architecture and step-by-step user guides.

Project Timeline: A Phased Approach (12 Weeks)

Phase 1: Foundation Data Pipeline (Weeks 1-3)

Goal: Establish the project's technical bedrock and finalize the implementation plan.

- **Activities:** Kick-Off, Data Sourcing, Data Pipeline Automation.
- **Key Milestone:** Inception Report Approval (Meeting 3).

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Phase 2: Baseline Model Development (Weeks 4-6)

Goal: Build and rigorously evaluate the core econometric models.

- **Activities:** Implement DFM, BVAR, etc.; Develop backtesting framework.
- **Key Milestone:** Present Baseline Backtesting Results (Meeting 4).

Project Timeline: A Phased Approach (Continued)

Phase 3: Advanced Model Integration (Weeks 7-9)

Goal: Run competitive validation and begin system development.

- **Activities:** Run "horse race" (Econometric vs. ML); Finalize model selection; Develop Excel dashboard prototype.
- **Key Milestone: Final Model Selection (Meeting 5) & Prototype Demo (Meeting 6).**

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Phase 4: Deployment, Training Handover (Weeks 10-12)

Goal: Operationalize the system and conduct comprehensive knowledge transfer.

- **Activities:** Finalize system, complete documentation, conduct User Technical Training.
- **Key Milestone: Final Handover Project Closure (Meeting 7).**

Conclusion: Building a Lasting Asset for Strategic Decisions

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- The evidence-based, hybrid framework ensures the highest possible degree of **accuracy and robustness**.
- The commitment to a modular system, a complete code repository, and comprehensive training is designed to foster **analytical independence** within PT. SMF.
- **The Ultimate Goal:** To equip PT. SMF with a lasting analytical asset that empowers more informed, data-driven decisions, strengthening its strategic role in Indonesia's financial ecosystem.

Thank You Questions & Discussion