

## Analytical Toolkit and Modeling Innovations

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**November 2025**

Hello everyone, I'm **Susanna Grigoryan**, an economist at the **Central Bank of Armenia** and a **Level One student at the Global Forecasting School**. In this session, we'll explore the analytical toolkit and modeling innovations that form the foundation of FPAS Mark II, internally known as Bark II.

FPAS Mark II represents a major evolution in the monetary policy framework of the Central Bank of Armenia. The transition from FPAS Mark I to Mark II reflects a recognition that modern monetary policy cannot treat the world as linear, predictable, or expectation-invariant. Effective policy requires an analytical architecture capable of mapping nonlinear behavior, endogenous credibility, state dependence, and uncertainty. The analytical toolkit introduced in Bark II addresses these gaps directly and forms the basis for disciplined, risk-aware decision-making under uncertainty.

Under the first-generation framework, FPAS Mark I relied heavily on a deterministic baseline constructed from a linear Quarterly Projection Model. While this approach provided structure and transparency, it created several limitations. The framework could not capture nonlinearities in inflation dynamics. Credibility was assumed constant rather than modeled as a policy outcome. The system provided only a single central path that obscured important asymmetries in risks. And the analytical infrastructure made it difficult to integrate high-frequency indicators, financial conditions, and scenario-based thinking. Bark II was developed to overcome these limitations, building robustness directly into the analytical foundations of policy work.

One of the core enhancements of Bark II is the introduction of nonlinear structures into models of inflation, output, and transmission. The Phillips Curve is modeled as convex, consistent with empirical evidence that inflation responds more strongly when the economy is overheating than when it is below potential. This has major implications for monetary policy: tightening too late can lead to disproportionately large inflation costs, while early and measured action delivers smoother outcomes. These nonlinearities also

allow policymakers to analyze how shocks differ depending on the state of the economy—an essential requirement for small open economies facing volatile external conditions.

A defining feature of FPAS Mark II is its treatment of credibility not as an input but as an evolving stock. Credibility is shaped by past policy decisions, communication, and the institution's ability to manage uncertainty. The Bark II manual emphasizes that expectations adjust in response to the perceived competence and consistency of the central bank. Modeling credibility as a dynamic variable allows policymakers to understand how policy mistakes can widen inflation expectations and how consistent behavior can anchor them. This deepens the link between policy decisions and long-term macroeconomic stability.

FPAS Mark II introduces a family of models designed to complement one another. The EndoCred Model captures endogenous credibility, asymmetric loss functions, nonlinear Phillips Curve dynamics, and state-dependent responses. MPmod is a tractable semi-structural model used for real-time policy simulations. FCmod is designed to analyze financial-cycle behavior, balance sheets, and credit risks. And the Linear-QPM is maintained for continuity and decomposition work where linear structures remain useful. By using a suite of models rather than a single workhorse, the system avoids over-reliance on the limitations of any one specification. Each model answers different questions, and together they provide a multidimensional view of the economy.

Bark II also introduces analytical dashboards that integrate information from models, markets, and short-term indicators. These dashboards allow policymakers to visualize how risks evolve within and across policy rounds. They include heat maps of inflation pressures, scenario-probability trees, financial-condition indexes, and high-frequency tracking of demand, supply, labor markets, credit, and external indicators. Dashboards reinforce the shift from point forecasts to risk distributions, enabling the Board to observe how uncertainty shifts in real time.

Another major innovation in Bark II is the adoption of improved measures of underlying inflation. The Near-Term Sticky Price Index, or NTSPI, isolates the slow-moving component of inflation that responds to persistent economic forces rather than volatile items. The NTSPI provides a clearer signal about medium-term price pressures and helps distinguish between temporary shocks and genuine changes in inflation trends. This measure strengthens the link between data interpretation and policy judgment.

FPAS Mark II does not treat judgment as an alternative to modeling. Instead, it places structured judgment at the center of the analytical workflow. Judgment is expressed

through scenario design, shock interpretation, credibility assessments, and the weighting of model results. The system encourages staff to articulate how and why judgment modifies model outcomes, ensuring transparency while preserving expert insight. This elevates the quality of policy briefings and helps Board members understand the rationale behind decisions.

The analytical toolkit is particularly valuable for small open economies like Armenia, where shocks originate from global markets, geopolitical events, commodity prices, and external financial conditions. Nonlinearity, endogenous credibility, and dashboard-based monitoring allow policymakers to avoid mistakes that arise from relying solely on linear projections or deterministic scenarios. FPAS Mark II equips the institution to navigate a world defined by uncertainty, asymmetry, and persistent external shocks.

The analytical toolkit and modeling innovations of FPAS Mark II transform the central bank into a modern, risk-aware, forward-looking institution. By integrating nonlinear dynamics, endogenous credibility, scenario analysis, and improved measurement tools, the framework provides policymakers with the structure and flexibility needed to make disciplined, least-regrets decisions. Bark II is not merely an updated model—it is a comprehensive analytical ecosystem designed to support policy judgment under uncertainty.

Thank you for watching, and I would like to acknowledge **Douglas Laxton, Mher Galstyan, Vahe Avagyan, Jared Laxton, Asya Kostanyan, and Sophio Mkervalidze** for their guidance and support in producing this video.

**See you there.**

## Literature & Further Reading

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