Shaded Supply and Demand: A Structural Model of Conditional Market Reactivity*

Chaeyeon Renée Eunice Xon
School of Economics
Yonsei University
Seoul, Republic of Korea
eunixon@yonsei.ac.kr

Abstract—**Classical supply and demand theory assumes continuous and immediate adjustment to price changes. This paper introduces Shaded Supply and Demand (Shaded-SD), a structural refinement that preserves the classical model while explaining observed market inertia. We propose that agents' reactivity is conditional: supply and demand functions are "activated" only when price movements exceed a latent threshold, θ. This minimal extension, where quantity responses are gated by the condition $|\Delta p| > \theta$, provides a unified structural explanation for phenomena like sticky prices, Giffen behavior, and supply inertia without altering the underlying preference or cost functions. By embedding responsiveness into a latent activation structure rather than treating it as a fixed assumption, Shaded-SD offers a tractable framework that bridges the gap between classical equilibrium logic and observed market behavior.**

Index Terms—**Supply and Demand, Structural Activation, Sticky Prices, Giffen Goods, Conditional Reactivity, Choice Architecture**

I. Introduction: When the Curves Fall Silent

The supply and demand framework is the foundational language of microeconomics, built on the assumption that agents adjust smoothly and continuously to price signals. However, empirical observations frequently reveal "silent" markets where prices shift but quantities do not, such as in cases of price stickiness or supply inertia. Rather than attributing these anomalies to external frictions or irrationality, this paper proposes a structural interpretation: the classical curves are correct, but their expression is conditional.

II. The Shaded Supply and Demand (Shaded-SD) Model

We extend the classical model by introducing a minimal, structure-preserving refinement based on the principles of the Shaded Rational Agent. The core idea is that market participants do not react to every price change, but only to those that are significant enough to cross a latent activation threshold.

A. Conditional Reactivity

We preserve the standard functional forms of demand, $D(p)$, and supply, $S(p)$, but introduce a binary activation gate based on a price-change threshold, θ. The market response is activated only when the magnitude of a price change, $|\Delta p|$, exceeds this threshold.

$$Q_d(p) = \mathbb{I}_{|\Delta p| > \theta_d} \cdot D(p) \tag{1}$$

$$Q_s(p) = \mathbb{I}_{|\Delta p| > \theta_s} \cdot S(p) \tag{2}$$

where $\mathbb{I}$ is an indicator function. This formulation does not alter the underlying logic of the supply and demand curves; it simply defines the conditions under which they become behaviorally manifest. The space where $|\Delta p| \leq \theta$ is an **inaction zone**, where the market is structurally silent.

III. Reinterpreting Market Anomalies

The Shaded-SD framework provides a unified structural explanation for several well-documented market phenomena.

- **Sticky Prices:** Price stickiness is reinterpreted as a situation where underlying shocks cause price changes that are sub-threshold ($|\Delta p| \leq \theta$). In this zone, quantities do not adjust, giving the appearance of price rigidity, even without explicit menu costs.
- **Giffen Behavior:** The counterintuitive case of demand increasing with price can be modeled as a non-linear activation pattern. A price increase might push a certain segment of constrained consumers across their activation threshold θ_d, leading to a localized, upward-sloping demand response that was previously silent.
- **Supply Inertia:** Prolonged periods of supply inaction, despite favorable price movements, can be seen as a market where the supply-side activation threshold, θ_s, is high. The potential supply exists, but it remains dormant until a sufficiently large price signal triggers its activation.

IV. Structural and Policy Implications

This reinterpretation has significant implications for policy and empirical analysis.

- **Policy Asymmetry:** The effectiveness of a policy (e.g., a tax or subsidy) depends on whether the

induced price change is large enough to cross the population's activation thresholds. A small, broad-based incentive might fail, while a larger, targeted one succeeds.

- **Rigidity as a Measurable Structure:** Market rigidity is no longer an unobservable friction but a testable structural parameter, θ. By analyzing price and quantity data, it becomes possible to estimate the distribution of these thresholds across markets or agents, offering a new diagnostic tool for hidden rigidities.

V. Conclusion: The Activation of Markets

The Shaded-SD model does not replace the classical supply and demand framework but provides a structural envelope that defines its operative boundaries. It preserves the core logic of equilibrium while formalizing the conditions for market reactivity. By doing so, it reinterprets observed inaction not as a failure of the theory, but as a predictable feature of an untriggered state. The curves were always correct; the question was whether they were active.

References

[1] L. Ball and N. G. Mankiw, "Asymmetric price adjustment and economic fluctuations," *Economic Journal*, vol. 104, no. 423, pp. 247–261, 1994.

[2] R. Chetty, "Bounds on elasticities with optimization frictions: A synthesis of micro and macro evidence on labor supply," *Econometrica*, vol. 80, no. 3, pp. 969–1018, 2012.

[3] X. Gabaix, "A sparsity-based model of bounded rationality," *Quarterly Journal of Economics*, vol. 129, no. 4, pp. 1661–1710, 2014.

[4] M. Golosov and R. E. Lucas, "Menu costs and Phillips curves," *Journal of Political Economy*, vol. 115, no. 2, pp. 171–199, 2007.

[5] H. A. Simon, "A behavioral model of rational choice," *Quarterly Journal of Economics*, vol. 69, no. 1, pp. 99–118, 1955.

[6] M. Woodford, *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton, NJ: Princeton University Press, 2003.