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Original Article

Critical Damping in Monetary Policy Communication: A Communication Resonance Approach to Expectation Management

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Abstract: *This paper develops the Communication Resonance Model, a novel framework that applies concepts from engineering and control theory to monetary policy communication. Contrary to the conventional assumption that greater transparency always improves policy effectiveness, the model argues that communication can either stabilize or destabilize market expectations depending on the degree of damping embedded within the expectation formation process. Expectations are modeled as a second-order dynamic system subject to communication shocks. Simulations identify three regimes: underdamped systems generate volatility and expectation overshooting, overdamped systems create dependence on central bank guidance and weaken price discovery, while critically damped systems achieve the fastest convergence toward equilibrium without instability. The analysis further demonstrates the existence of an optimal communication intensity that minimizes market volatility. The findings suggest that effective communication requires optimization rather than maximization of transparency and provide a new interpretation of central bank independence as a stabilizing damping mechanism.*

Keywords: *Communication Resonance, Critical Damping, Monetary Policy Communication, Central Bank Credibility, Expectation Dynamics.*

I. INTRODUCTION

Central bank communication has become one of the most important instruments of modern monetary policy. Since the adoption of inflation targeting and the rise of forward guidance, central banks have increasingly relied on communication to influence expectations, shape market behavior, and enhance policy effectiveness. The prevailing view is that more transparency leads to better monetary performance, benefiting from lower uncertainty, increased credibility, and anchoring of expectations (Blinder et al., 2008; Woodford, 2005) in both academic literature and policy practice.

But recent episodes of financial instability suggest that the connection between communication and market stability is far from simple. The Federal Reserve's Taper Tantrum of 2013, the inflation shock from 2021–2023 and existing tensions at UK gilt markets in 2022 evidenced how even small changes to central bank language can produce outsized responses across financial markets.

Practitioners have noted that bond yields, exchange rates and asset prices often respond not only to the information in policy announcements but also to how investors believe and whether it may be right or wrong that other market participants will interpret these actions. This is exactly what you would expect from rational expectations models and strategic interaction with the financial markets. However, when market participants place increasing weight on higher-order expectations that is, expectations about others' expectations even relatively small changes in central bank language may generate disproportionately large market responses. These episodes raise an important question: under what conditions can monetary policy communication amplify rather than stabilize market dynamics? Existing theories generally treat communication as an information problem. Transparency is expected to improve outcomes because it reduces informational asymmetries between policymakers and private agents. While this perspective has generated important insights, it largely assumes that additional communication either improves outcomes or exhibits diminishing marginal benefits. Much less attention has been paid to the possibility that communication may interact with expectation formation in ways that amplify market volatility.

This paper argues that monetary policy communication should be understood as a dynamic information transmission system rather than a static disclosure mechanism. Using ideas from engineering and control theory, the paper builds a Communication Resonance Model that interprets market expectations as a damped dynamic system reacting to communication shocks. Within this framework, communication has the potential to stabilize expectations through uncertainty-reduction but may also lead to oscillations in result of interference produced by signals and feedback mechanisms grounded in financial markets.

II. LITERATURE REVIEW

Modern monetary policy focuses more on the management of expectations than control of monetary aggregates. The rationale for this approach is based on the theory of rational expectations, which posits that economic agents incorporate all available information into their economic choices (Muth 1961; Lucas 1972). This template was then extended by Kydland and Prescott (1977) and Barro and Gordon (1983) to show that discretionary monetary policy is time-inconsistent with inflationary bias unless complemented with credible commitment. These contributions laid the intellectual foundations of CBI, which arose as a means to improve policy credibility and stabilization expectations.

There is extensive empirical literature in favor of independent monetary institutions. More autonomy for CBI meant lower inflation and better macroeconomic performance (Cukierman et al. 1992; Alesina & Summers, 1993). Hence, credibility became the focus of monetary policy, which is at least as good a messenger and better controls aspirations (Cukierman 1992; Blinder 2000).

Communication has largely become a key policy tool, as monetary policy depends more and more on expectation channels. Using communication, central banks can provide a greater degree of transparency and decrease uncertainty as well as strengthen the transmission mechanism behind monetary policy implementation (Bernanke2004; Woodford 2005). Surveys of the literature generally find that communication improves policy effectiveness through better public comprehension of policy goals and reaction functions (e.g., Blinder et al. 2008). Financial markets react not only to policy measures but also to (new) information about future paths of monetary policy actions and, as a consequence, respond very strongly to forward guidance statements.

More recent research has underscored that the influence of central bank communication is tied not only to policymakers sending aspirational messages, but also how markets and media interpret those signals. Banerjee et al. 2015) and Gardner et al.(2018) argue that the relationship between media coverage of FOMC announcements and financial market responses is bidirectional, as certain types of FOMC announcements are more likely to lead to media coverage show that central-bank communications can shape equity prices as strongly as the policy actions themselves.

In a similar vein, Gómez-Cram and Grotteria (2022) show the important role of verbal communication for price discovery in real time, whilst Schmanski et al. (2025) show meaningful discrepancies can develop between Federal Reserve communication and the narratives captured in financial media headlines. Together these strands of literature imply that communication effectiveness is determined not only by the substance of policy messages, but also varied and interactive conceptions related to market interpretation transitive effects information signaling credibility all ground Communication Resonance Model which claims communications are therefore amplified dampened or stabilized depending on a level uncertainty creates both anxiety other over-dependence the proposition underlying credible signalling processes with challenges reciprocal relationship signals between policies perceived environmental perceptions. The Communication Resonance Model extends the monetary-policy information-effect literature (Nakamura and Steinsson, 2018; Bauer and Swanson, 2020).

But the idea that more communication automatically results in better outcomes has been increasingly challenged. The availability of public information may crowd out private information and decrease informational efficiency (Morris and Shin, 2002), while communication can create unintended coordination effects among market participants (Amato et al., 2002). Forward guidance also records diminishing returns to communication and the danger of too much market reliance on Central Bank signals (Campbell et al., 2012).

Different theories of expectation formation suggest that communication responses may be, in principle, nonlinear. Adaptive learning models focus on continuous adjustment of beliefs rather than immediate optimality (Evans and Honkapohja, 2001). Behavioral approaches emphasize the role of stories, sentiment, and investor psychology in expectations about economic events (Shiller 2000) while complexity economics emphasizes feedback controls, emergence, and non-linear interactions between adaptive systems on longer time scales (Arthur1999; Beinhocker 2006). While these views yield important insights, they are frequently not easily formalized into a framework that can be employed to analyze the dual effects of communication in either stabilizing or destabilizing expectations.

However, recent evidence indicates that the success of communicative efforts is dependent on context and can be highly state-dependent. Monetary policy uncertainty plays a prominent role in determining inflation expectations (Arce-Alfaro et al., 2023), and communication of uncertainty affects household expectation formation (Kostyshyna and Petersen, 2023). Diverse expectations and disagreement among economic agents tend to impair the transmission of monetary policy (Dong et al, 2025), while the impact of policy communication depends critically on whether uncertainty is high or low in normal situations (Garga et al., 2025). While communication is still essential for shaping inflation expectations (Istrefi, 2025), financial markets continue to be particularly sensitive to central bank signals (Bauer, 2026). However, bounded rationality might constrain the information processors in a way that this kind of process cannot be efficient (Kim and Lee, 2024).

In sum, the literature implies that central bank communication is state-dependent and conditioned by a factor of uncertainty, expectation dispersion, and the informational environment. Although more traditional theories treat communication simply as a way to boost transparency and credibility, episodes such as the 2013 Taper Tantrum (see e.g. This study addresses this gap by presenting the Communication Resonance Model to model expectations as a dynamic system that is susceptible to communication shocks. Based on control theory, the model of forecasts argues that communication can stabilize or destabilize expectations depending on how damped the formation process is and thus, monetary policy communications aim to optimize transparency rather than maximize it.

III. METHODOLOGY

A) Framework

Before presenting the formal model, it is useful to clarify how the framework maps into the monetary policy context. The underlying mathematical structure is a standard damped dynamic system, widely used in physics, engineering, and control theory to analyze how complex systems adjust toward equilibrium over time while being influenced by both stabilizing and amplifying forces.

As illustrated in Figure 1, communication enters the expectation-formation process as a shock; credibility, independence, and communication quality act as damping mechanisms; and market uncertainty acts as an amplification mechanism. The resulting changes in expectations are observed through inflation expectations and broader financial-market reactions.

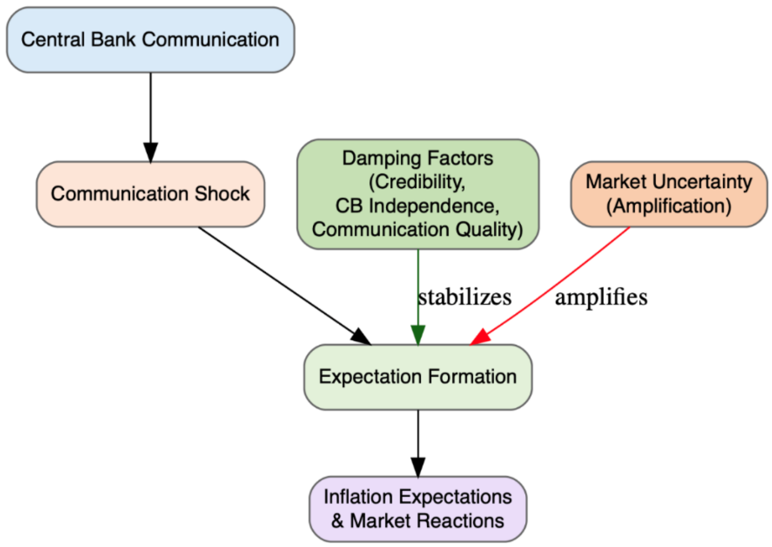

Figure 1. Mapping the Communication Resonance Model into Monetary Policy Communication

Note: The figure illustrates the correspondence between the theoretical components of the Communication Resonance Model and their economic interpretation. Central bank communication enters the expectation-formation process as a communication shock. Credibility, central bank independence, and communication quality operate as damping mechanisms that stabilize expectations, while market uncertainty weakens damping and amplifies market responses. The resulting expectation adjustments are observed through inflation expectations and abnormal financial market reactions.

B) Model

Following Evans and Honkapohja (2001), expectations are assumed to evolve through adaptive learning rather than instantaneous rational adjustment. Market participants continuously revise beliefs in response to new information while simultaneously responding to their expectations regarding how other market participants will react. Consequently, expectation formation is characterized by recursive feedback effects that extend beyond simple first-order updating.

Let E_t denote market expectations and S_t denote a communication signal issued by the central bank. Expectations are updated according to:

$$E_t - E_{t-1} = \alpha(S_t - E_{t-1}) \qquad (1)$$

Where α represents the speed at which agents incorporate new information into their expectations. As expectations are repeatedly revised and agents react strategically to the anticipated responses of others, higher-order feedback mechanisms emerge. In continuous time, these recursive adjustment processes can be represented by the following second-order dynamic system:

$$\frac{d^2E(t)}{dt^2} + c\frac{dE(t)}{dt} + kE(t) = S(t) \qquad (2)$$

Where $E(t)$ denotes market expectations and $S(t)$ represents the communication signal generated by the central bank. The parameter $k > 0$ captures the strength of the nominal anchor that pulls expectations toward equilibrium. The parameter $c > 0$ represents the damping effect embedded within the expectation formation process and is generated by institutional credibility, central bank independence, and the quality of monetary policy communication.

The first derivative, $dE(t)/dt$, measures the speed at which expectations adjust to new information. The second derivative, $d^2E(t)/dt^2$, captures changes in the rate of adjustment and reflects the amplification or attenuation of expectation revisions generated by recursive market feedback. Consequently, the model treats expectation formation as a dynamic process in which communication influences not only the level of expectations but also the speed and stability of their adjustment over time.

To clarify the economic interpretation of the damping parameter, let:

$$c = f(c_{cred}, c_{ind}, c_{comm}), \qquad (3)$$

Where c_{cred} represents policy credibility, c_{ind} represents central bank independence, and c_{comm} represents communication quality. The functional form is left unspecified to allow for potentially nonlinear and interactive effects among these determinants. It is assumed that all first-order partial derivatives are positive.

Policy credibility anchors expectations by strengthening confidence in the central bank's commitment to its objectives. Central bank independence reduces policy uncertainty by insulating monetary policy from short-term political pressures, while communication quality enhances the transmission and interpretation of policy signals. Together, these factors reduce the sensitivity of expectations to communication shocks and weaken the amplification of market reactions through feedback mechanisms. Consequently, higher levels of credibility, independence, and communication quality increase the damping parameter c, thereby contributing to greater stability of inflation expectations. Furthermore, the unspecified functional form permits complementarities among these factors. For example, improvements in communication quality may be more effective when the central bank enjoys a high degree of credibility and independence, implying that the stabilizing effect on expectations may be stronger than the sum of the individual effects.

Equation (2) provides a parsimonious representation of how communication shocks propagate through a complex adaptive system of interacting market participants. Rather than viewing communication as a static disclosure mechanism, the framework conceptualizes monetary policy communication as a dynamic stabilization process whose effectiveness depends on the degree of damping embedded within the expectation formation system.

The homogeneous form of Equation (2) is:

$$\frac{d^2E(t)}{dt^2} + c\frac{dE(t)}{dt} + kE(t) = 0 \qquad (4)$$

Which yields the characteristic equation:

$$r^2 + cr + k = 0 \qquad (5)$$

With roots

$$r = \frac{-c \pm \sqrt{c^2 - 4k}}{2}$$

The dynamic behavior of expectations depends critically on the relationship between the damping coefficient and the anchoring force.

C) Underdamped Regime

When

$$c^2 < 4k$$

the roots are complex, and the solution becomes.

$$E(t) = e^{-ct/2}[A\cos(\omega t) + B\sin(\omega t)] \qquad (6)$$

Where

$$\omega = \sqrt{k - \frac{c^2}{4}}$$

This regime represents insufficient damping. Expectations oscillate around equilibrium and repeatedly overshoot and undershoot their long-run value following a communication shock. Economically, the underdamped case captures episodes in which communication interacts with feedback mechanisms and herd behavior, generating amplified market responses. Investors react not only to the original signal but also to their expectations regarding how other market participants will interpret the signal. Consequently, relatively small policy communications can generate disproportionately large market movements.

D) Critically Damped Regime

When

$$c^2 = 4k$$

the system reaches the condition of critical damping, and the solution becomes

$$E(t) = (A + Bt)e^{-ct/2} \qquad (7)$$

Critical damping corresponds to the repeated-root case $c^2 = 4k$, which forms the boundary between underdamped and overdamped dynamics. Relative to overdamped systems, perturbations decay more rapidly asymptotically, while oscillatory behavior is eliminated. Within the context of monetary policy communication, this condition corresponds to an optimal balance between transparency and market autonomy. Communication remains sufficiently informative to anchor expectations, yet does not become so extensive that markets become dependent upon central bank guidance.

E) Overdamped Regime

When

$$c^2 > 4k$$

the roots become real and distinct, and the solution becomes

$$E(t) = Ae^{r_1 t} + Be^{r_2 t} \qquad (8)$$

Where

$$r_{1,2} = \frac{-c \pm \sqrt{c^2 - 4k}}{2}$$

This regime represents excessive communication and guidance. Expectations converge monotonically toward equilibrium but do so more slowly than under critical damping. Although volatility is reduced, market participants become increasingly dependent on central bank signals, weakening independent information processing and price discovery. Stability is achieved, but at the cost of reduced market responsiveness and diminished informational efficiency.

F) Numerical Evaluation of Closed-Form Solutions

To evaluate the implications of the model, the communication shock is represented as a unit impulse occurring at $t = 0$. The nominal anchor parameter is normalized to:

$$k = 1$$

Three alternative values of the damping coefficient are selected to represent the communication regimes described above:

$$c = 0.5$$

for the underdamped regime

$$c = 2.0$$

for the critically damped regime, and

$$c = 3.5$$

for the overdamped regime.

The system is simulated over a horizon of thirty periods using numerical ordinary differential equation techniques. Initial conditions are standardized across all simulations to isolate the effect of alternative damping parameters. The resulting trajectories of expectations are compared with respect to convergence speed, oscillatory behavior, and persistence.

G) Communication Signal Strength and Market Volatility

To illustrate the trade-off between insufficient and excessive communication, volatility is modeled using a simple reduced-form specification. The first component captures uncertainty arising from limited communication, while the second captures dependency costs associated with excessive reliance on central bank guidance. The functional form is not intended as a structural model but as a parsimonious representation of the nonlinear trade-off predicted by the Communication Resonance framework.

The model predicts that the relationship between communication signal strength and market volatility is nonlinear. Let communication signal strength be represented by C. Signal strength reflects the informational content and perceived policy significance of central bank communication. Volatility is defined as:

$$V(C) = \frac{a}{C} + bC \qquad (9)$$

Where $a > 0$ captures uncertainty arising from weak or uninformative communication signals, while $b > 0$ captures amplification and dependency effects associated with excessively strong communication signals.

The volatility-minimizing communication signal strength is obtained from the first-order condition.

$$\frac{dV(C)}{dC} = -\frac{a}{C^2} + b = 0 \qquad (10)$$

Solving Equation (10) yields

$$C^* = \sqrt{\frac{a}{b}}$$

Which represents the optimal communication signal strength. Equation (11) implies that both insufficient and excessive communication increase volatility, while an interior optimum exists that minimizes instability. This result provides a theoretical analogue to the concept of critical damping and serves as the basis for the simulation presented in Figure 2.

Figures 1 and 2 are intended to illustrate the theoretical properties of the Communication Resonance Model, not to forecast actual market outcomes. Because the model is mathematically equivalent to a second-order damped dynamic system, well-established results from the mathematics and physics literature can be applied. In particular, underdamped systems exhibit oscillatory adjustment, critically damped systems return to equilibrium in the fastest non-oscillatory convergence toward equilibrium without oscillation, and overdamped systems converge more slowly but monotonically. Figure 1 demonstrates how these alternative damping regimes affect the dynamic adjustment of expectations following a communication shock, while Figure 2 identifies the communication signal strength that minimizes volatility. Together, these simulations provide a conceptual framework linking monetary policy communication, expectation formation, market stability, and central bank credibility within a unified dynamic systems perspective.

IV. RESULTS AND DISCUSSION

A) Dynamic Responses of Expectations Across Communication Regimes

The simulations reveal substantial differences in the behavior of expectations across alternative communication regimes. Figure 1 presents the dynamic response of market expectations following an identical monetary policy communication shock under three levels of damping: underdamped, critically damped, and overdamped.

Figure 2 demonstrates that the dynamic behavior of market expectations depends critically on the degree of damping embedded within the communication framework. Although all three regimes eventually converge toward equilibrium, the speed, stability, and efficiency of adjustment differ substantially across communication environments.

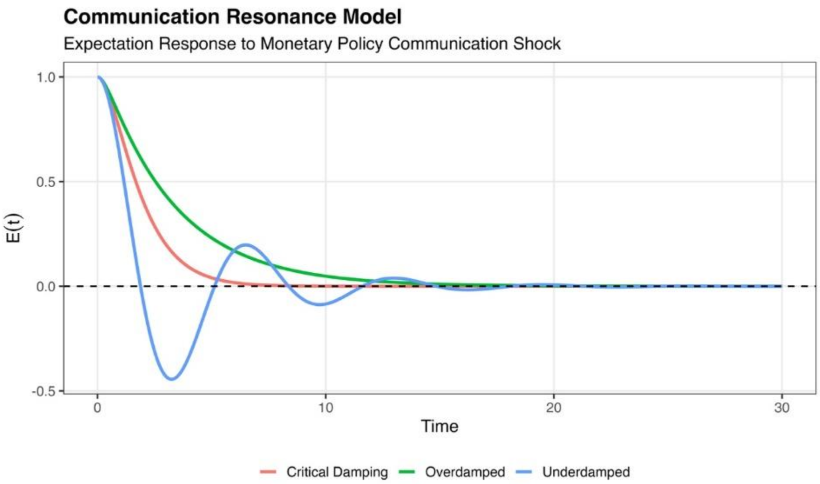

Figure 2. Dynamic Response of Expectations Under Alternative Communication Regimes

Note: The figure illustrates the simulated adjustment of market expectations following an identical communication shock under underdamped, critically damped, and overdamped conditions. The results demonstrate how alternative levels of damping affect convergence speed, oscillation, and stability.

More importantly, the model assume that the relationship between communication and market stability is nonlinear. This follows directly from the assumed volatility function in Equation (9), which incorporates both uncertainty costs arising from insufficient communication and dependency costs associated with excessive communication. While insufficient damping generates excessive volatility and expectation overshooting, excessive damping reduces volatility at the cost of slower adjustment and diminished market responsiveness. The critically damped regime emerges as the most efficient communication environment because it minimizes both instability and persistence.

Under the underdamped regime ($c = 0.5$), expectations exhibit pronounced oscillatory behavior around equilibrium. The communication shock generates repeated cycles of overshooting and undershooting before convergence eventually occurs. In economic terms, this regime reflects an environment in which market participants place excessive weight on short-term policy signals and on the anticipated reactions of other investors. Expectations become self-reinforcing, creating feedback loops that amplify volatility beyond the informational content of the original communication. Such dynamics resemble episodes including the Federal Reserve's 2013 Taper Tantrum, during which relatively modest changes in policy communication generated disproportionately large adjustments in bond yields, capital flows, and risk premia. If the Communication Resonance Model provides a useful description of financial markets, communication shocks occurring in weakly anchored expectation environments should be associated with amplified market responses. Observable manifestations may include overshooting, heightened sensitivity to policy signals, and subsequent revisions in bond yields, inflation expectations, risk premia, and capital flows following central bank communications.

If the Communication Resonance Model provides a useful description of financial markets, communication shocks occurring in weakly anchored expectation environments should be associated with amplified market responses. Such amplification may be reflected in larger revisions in bond yields, inflation expectations, risk premia, and other financial variables following central bank communications. The empirical analysis therefore examines whether market responses to communication vary systematically with observable measures of uncertainty, an implication that follows directly from the Communication Resonance framework.

This interpretation offers a potential framework for understanding episodes such as the Federal Reserve's 2013 Taper Tantrum. In the language of the model, such events may reflect a low-damping environment in which communication shocks generate amplified adjustments in expectations and asset prices. The empirical analysis developed in this paper examines one observable implication of this mechanism by testing whether the impact of hawkish FOMC communication becomes stronger under conditions of elevated uncertainty. Evidence that communication effects are amplified when market uncertainty is high is consistent with the model's central proposition that the transmission of policy communication is state-dependent rather than uniform across market environments.

From a theoretical perspective, the underdamped regime illustrates the phenomenon of communication resonance. Just as systems amplify signals near their natural frequency, financial markets may amplify central bank communication when expectations are weakly anchored and feedback mechanisms are strong. The simulation therefore suggests that insufficient institutional damping can transform communication from a stabilizing instrument into a source of instability. In this context, central banks would probably be creating too much news that enhances volatility and overshooting in the financial markets, while making uncertainty about future actions even worse.

In comparison, the critically damped regime (c=2.0) converges to equilibrium fastest without oscillation. If expectations approach their long-run equilibrium level faster than they would in an underdamped or overdamped regime, it does so without oscillatory behavior: adjusting smoothly and efficiently. This is similar to the engineering concept of critical damping, where a system finds an ideal trade-off between speed and stability. In the monetary policy context, critical dampening is communication using a framework that effectively anchors expectations without taking away from an appropriate market interpretation of information. Expectations are steady but now it is the economic fundamentals that investors assess not just speculation on central bank minutes. Therefore, the critically damped regime is analogous to a benchmark communication strategy given by model. Instead of pursuing maximal transparency, policymakers should pursue optimal transparency. Communication needs to give enough detail on the policy targets, reaction functions and longer-run goals but not too much guidance that governs market behavior. Under this framework, communication becomes a stabilizing mechanism that improves monetary policy transmission without undermining market efficiency.

The overdamped regime ($c = 3.5$) generates a markedly different outcome. Expectations converge monotonically toward equilibrium, and oscillations disappear entirely. The adjustment path approaches equilibrium more slowly than under critical damping. Although oscillations are eliminated, the system exhibits greater persistence and requires a longer period for deviations from equilibrium to become negligible. At the same time, market participants rely increasingly on central bank communication when forming expectations, reducing the role of independent assessments of economic conditions. As a result, market volatility is reduced, but responsiveness declines substantially.

This outcome has important implications for the evolution of modern central banking. In the past 20 years, we have experienced more central banks' using forward guidance, economic projections by releasing persons such as dot plots and high-frequency communication with public. Although these innovations have increased transparency, they also might have fostered excessive reliance on official signals. An example of this can be seen in financial markets that spend more and more attention on deciphering the minutiae released by central banks as opposed to economic realities inherent at any given time. This means price discovery becomes even more inefficient and market discipline disappears.

Overall, the simulations suggest that there is an inherent nonlinearity between the communication signal strength and market stability. An increase in communication improves stability by strengthening the anchoring of expectations at first. Beyond a certain threshold, however, additional communication generates diminishing returns and may reduce market responsiveness. Consequently, the effectiveness of monetary policy communication depends not on the quantity of communication but on its ability to generate an appropriate level of damping within the expectation formation process.

B) Optimal Communication Signal Strength and Market Volatility

Figure 3 examines the relationship between communication signal strength and market volatility given by Equation (9).

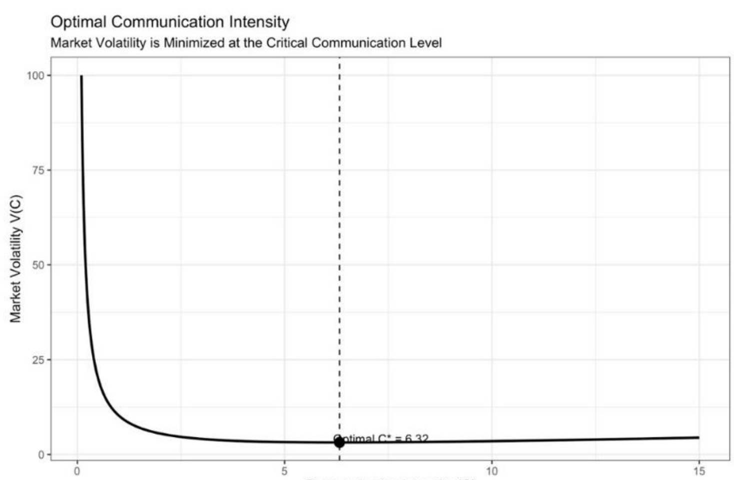

Figure 3. Optimal Communication Signal Strength and Market Volatility

Note: The figure illustrates the nonlinear relationship between communication signal strength and market volatility implied by Equation (12). The minimum point identifies the communication signal strength that minimizes volatility and corresponds to the condition of optimal communication.

The model produces a U-shaped relationship between communication signal strength and volatility. Low communication results in high volatility, as investors do not know whether future policy changes are possible and what the central bank's reaction function will be. With a stronger communication signal, expectations are better anchored and volatility is lower. This part of the curve is consistent with much traditional transparency literature positing that communication enhances credibility and reduces uncertainty.

Nonetheless, the advantages of communication seem to have bounds. Once a certain point is surpassed, more communication begins to exacerbate the volatility. Market participants are becoming more reliant on forward guidance; thus, they focus even more on different ways to interpret small changes in central bank language. Thus, minor modifications in wording, tone, or prospects can evoke exaggerated market responses. Communication itself becomes part of the uncertainty rather than a tool to remove it.

The minimum point of the volatility curve occurs at $C^* = \sqrt{\frac{a}{b}}$, which represents the optimal communication signal strength. At this point, the marginal benefit of additional information exactly offsets the marginal cost associated with market dependency. The existence of an interior optimum challenges the conventional assumption that greater transparency necessarily improves monetary policy outcomes.

From a policy perspective, the result suggests that communication should be evaluated according to its stabilizing properties rather than its volume. The objective of communication is not to maximize information disclosure but to minimize volatility while preserving the market's capacity for independent information processing. This provides a theoretical justification for limiting excessive forward guidance and reducing communication practices that encourage markets to interpret central bank forecasts as commitments.

C) Economic Implications and Communication Strategy

The model implies several important implications for the design of monetary policy communication.

First, transmit policy frameworks instead of exact forecasts. Instead of detailed projections of future interest rates, markets are better served by knowing how policymakers react to inflation, employment, financial conditions, and productivity developments. Revealing a reaction function allows private agents to independently digest economic data and lessens the reliance on official forecasts.

Secondly, central bank communication should seek to build long-run credibility, not constantly manage short-run expectations. Explicit inflation targets, institutional independence and a clear monetary policy mandate reinforce the nominal anchor represented by parameter (k). The stronger the anchor, however, the lower is the chance that short-lived economic or political shocks destabilise expectations.

Third, the model offers a new framework in which to think about central bank independence. Traditional theories justify independence as a mechanism for solving the time-inconsistency problem and preventing politically motivated inflation. The Communication Resonance Model suggests an additional role. Because central bank independence also effectively dampens the reaction of expectations to political noise and transient uncertainty, Independence dampens communication-based volatility and reduces the chances of resonance by enhancing confidence in a long-run policy framework.

Fourth, the findings indicate that over-reliance on forward guidance might inadvertently lure financial markets into an overdamped equilibrium. Such communication lowers short-run uncertainty, but in doing so it also weakens market discipline and provides previously independent incentives to acquire information. Investors throw off their economic fundamentals and focus more and more on interpreting central bank speak. This reliance can erode the efficiency of financial markets over time and raise exposure to miscommunication.

Consistency with critical damping would call for a three-pronged communication strategy. First, policymakers should be clear about goals. Second, they should describe the analytical framework and reaction function that underpins policy decisions. Third, they should avoid excessive commitments regarding future policy paths. Such an approach anchors expectations while preserving the market's role in information aggregation and price discovery.

D) Interpretation

Figures 2 and 3 together provide the central theoretical contribution of the Communication Resonance Model. Figure 2 identifies the dynamic mechanisms through which communication influences expectations by introducing the concepts of resonance, damping, and critical stability. As shown in Figure 3, communication signal strength has a concave-up portion where more transparency is beneficial, but additionally large strengths can be counterproductive.

In conclusion, these results indicate that real transparency of monetary policy communication is optimal, but this must be coupled with overall market autonomy. Too little communication leaves expectations open to uncertainty and speculation, while too much leads to dependency or inefficiency in access. In this sense, the ideal regime of communication is precisely that corresponding to the condition of critical damping: expectations are anchored while markets continue playing their fundamental roles as information aggregators and price discovery mechanisms.

More broadly, the model implies that the future challenge for central banks is not to communicate more, but to communicate more effectively. The objective of communication policy should be the stabilization of expectations rather than the maximization of transparency. By integrating concepts from engineering and control theory, and monetary economics, the Communication Resonance Model provides a new framework for understanding how communication influences market behavior and offers a theoretical foundation for future empirical research on central bank communication, financial stability, and expectation formation.

V. CONCLUSION

This paper explores a key question in contemporary monetary policy: When does central bank communication stabilise financial markets and when can it propagate volatility? Although the existing literature has mostly focused on cases where transparency is shown to improve monetary policy effectiveness, there are also recent episodes such as the 2013 Taper Tantrum and inflation shock building up in the post-pandemic period or the United Kingdom gilt crisis of Autumn 2022, which revealed disproportionate market responses that communication can generate. To try to solve this problem, the paper formulated a working Communication Resonance model -a dynamic framework for expectation formation around monetary policy communication models with some concepts borrowed from engineering and control theory.

At its core, the model argues that communication is not an inert disclosure mechanism; rather, it exists within a system of dynamic and interacting expectations. By modeling expectations as a second-order damped system subject to communication shocks, the analysis demonstrates that the effects of communication depend critically on the degree of damping embedded within the expectation formation process. Three communication regimes emerge. In underdamped systems, communication shocks generate oscillations, expectation overshooting, and amplified market volatility. In overdamped systems, communication suppresses volatility but creates excessive dependence on central bank guidance and weakens market-based information processing. Between these extremes lies the critically damped regime, which achieves the fastest convergence toward equilibrium without instability and therefore represents the most efficient communication environment.

In addition, the model finds that a nonlinear relationship exists between communication intensity and market volatility. Communication improves stability at first by lowering uncertainty, anchoring expectations. Yet above a certain threshold, more communication becomes progressively less effective in terms of the market response and can also lead to greater volatility since we have entered an age when financial operators tend to pay ever closer attention to hints from the central bank. This runs counter to the assumption that increasing transparency will always be beneficial for policy outcomes. The analysis hence argues that the goal of communication policy should be to optimize rather than maximize transparency.

The paper also provides a novel perspective on central bank independence. Besides the classic function of controlling time inconsistency, independence serves as a stabilizing damping factor by making expectations less sensitive to communication shocks and noise in short-term politics. Under this framework, the resilience of expectation formation processes is jointly determined by credibility, independence, and communication quality and thus explains when communications stabilize versus destabilize markets. On a broader horizon, the literature benefits from communication resonator blending elements of monetary economics, expectation formation processes (that include cognitive dissonance) under complex systems engineering principles. The framework is capable of providing a unified explanation for why the same communication signals can create sharply contrasting market outcomes in different institutional and uncertainty contexts. In addition, it provides a theoretical framework to explain state-based communication effects that have been reported in recent empirical research.

There are multiple options for future studies. More importantly, though, is to test the model itself against empirical data. Future work may want to explore more specific measures of uncertainty regarding the conditional expectation dispersion, central bank credibility, or institutional independence in influencing financial-market responses and who is responsive, and how much, though it should be noted that this exercise would not take into account all factors involved in these actions. Event-study methods, data at high frequency in the market, and measures of textual intensity are possibly some useful tools for testing predictions emerging from this model. Future work may also apply the framework to heterogeneous-agent settings or cross-country comparisons, and/or communication strategies during financial distress.

This study highlights a more general principle: that the effectiveness of monetary policy communication is not driven by how much central banks talk about their future conduct, but rather whether and how communications mesh with the institutional/informational environment in which expectations are set. As monetary policy increasingly operates through expectations channels, the challenge facing central banks is not to communicate more, but to communicate in ways that achieve critical stability. Effective communication is therefore best understood not as the maximization of transparency, but as the optimization of expectation management.

Conflict of Interest and Funding Disclosure

The author declares that there are no conflicts of interest regarding the publication of this research. The author received no external funding, sponsorship, or financial support for the conduct of this study. The research was conducted independently, and the author has no financial or personal relationships that could have influenced the work reported in this paper.

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