Central Bank Credibility and Exchange Rate Determination with Financial Intermediaries

by

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Abstract

Financial intermediaries play a key role in determining exchange rates by adjusting international risk-sharing in response to volatility. This thesis seeks to answer how imperfect central bank credibility impacts this equilibrium risk-sharing and, by extension, the real economy. I build a two-country model with financial intermediaries by introducing a credibility-driven jump-diffusion process for the carry trade return. I solve for the optimal portfolio choice of intermediaries, showing that it features a novel credibility-driven hedging term. Using this result, the model predicts that equilibrium deviations from uncovered interest parity and changes to the Backus–Smith residual are partially driven by shocks to credibility. I test this hypothesis in the US–South Korea setting and find that credibility shocks contribute significantly to both of these measures, appearing empirically on both the financial and real side of the economy. Finally, I investigate the dynamic effects of credibility shocks in general equilibrium, showing that negative shocks have persistent deleterious macroeconomic effects by reducing consumer spending, driving increases in inflation and exchange rate depreciation, and raising borrowing costs.

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1 Introduction

Financial intermediaries sit at the heart of exchange rate determination. Indeed, fundamental economic forces like comparative advantage and productivity growth determine the behavior of exchange rates in the long run. But supply and demand in short-term currency markets are the immediate sources from which foreign exchange fluctuations arise in practice. Despite this fact, mainstream macroeconomic models have long avoided explicitly describing the agents in this market. Itskhoki and Mukhin (2025) take a first step, adding risk-averse arbitrageurs whose position sizes are endogenously influenced by exchange rate volatility. This behavior helps explain why the volatility of macroeconomic aggregates like consumption and investment are barely affected by changes in the exchange rate regime—often referred to as the Mussa (1986) puzzle. But these arbitrageurs are myopic, failing to consider the risk that the exchange-rate regime is altered. In other words, arbitrageurs in existing models believe that central banks are perfectly credible.

The experience of many emerging-market economies says otherwise. In practice, pegged regimes often end in speculative attacks, in which investors pressure the central bank to abandon past commitments. Even in floating regimes, the monetary risk of abrupt foreign exchange intervention and the fiscal risk of inflation-driven technical sovereign default can shape the exchange rate though investors' expectations. Understanding these events requires a model of exchange rate determination in which arbitrageurs face uncertainty about central bank behavior.

This thesis investigates how the financial system influences exchange rates when central bank credibility is imperfect. To accomplish this, I construct a model of an international economy in which central bank policy carries commitment risk. I then use this model to study the dynamic portfolio choice of intermediaries, deriving implications

for observable financial and real macroeconomic variables. I take these theoretical results to the data, testing them empirically in the US–South Korea setting. Finally, I study the dynamic effects of shocks to credibility in general equilibrium, showing that negative credibility shocks produce persistent detrimental economic effects .

How should arbitrageurs react to the risk of central bank policy deviations? Without loss of generality, consider a domestic country with a greater interest rate than some foreign country, where policy deviation entails domestic currency depreciation. That is, deviation reduces demand for domestic assets. Suppose that arbitrageurs engage in a carry trade, in which they short the low-interest country's bonds and buy those of the high-interest country, profiting from the difference. Here, domestic depreciation causes arbitrageurs' liabilities to become more expensive. Therefore, intermediaries' long position should decrease in the domestic central bank's deviation risk.

To test this claim rigorously, I develop a two-country model based on Itskhoki and Mukhin (2025) that incorporates credibility. This state-of-the-art dynamic stochastic general equilibrium (DSGE) model features home bias in consumption, capital adjustment costs, and monopolistically competitive firms. Asset markets are segmented, so risk-averse arbitrageurs and noise traders—rather than households—are the sole participants in international risk-sharing. I capture the risk of policy deviation by modeling the return on the carry trade as a jump-diffusion stochastic process. In normal times, the return follows a standard geometric Brownian motion. Whenever the domestic central bank abandons its commitment, the economy enters an excited state and the return experiences a discontinuous jump. I join these two states with a continuous-time Markov chain that parameterizes the deviation rate. By allowing for skew and discontinuity, this model aligns with empirical evidence on carry trade returns and crash risk (Brunnermeier, Nagel, and Pedersen 2008).

I solve for the optimum portfolio choice of the intermediaries using stochastic calculus, following Campbell and Viceira (2002) and Honda (1997) by approximating the discrete-time portfolio choice with a continuous-time diffusion process when time increments are small. The optimal portfolio consists of a standard factor proportional to the risk-adjusted carry-trade return and a novel hedging term that corresponds to credibility risk. If arbitrageurs fail to trust the domestic central bank, this hedging causes them to reduce their long position in domestic bonds, relative to the perfect-credibility benchmark. With the policy function in hand, I analyze how changes to credibility—i.e., to the rate and size of credibility shocks—impact the size of intermediaries' positions, and how these pricing dynamics influence aggregate risk-sharing between the two countries in partial equilibrium.

I derive several testable hypotheses from this model. On the financial side, I find that deviations from uncovered interest parity (UIP)—a measure of the return arbitrageurs can earn from engaging in unhedged carry trades—are linearly related to the risk of central bank policy deviations. This result follows naturally from the fact that credibility shocks reduce the expected return on the carry trade. I also connect credibility risk to the real side of the economy, showing that changes to the Backus–Smith residual—a relationship between relative consumption growth rates and the real exchange rate—have the same relationship with credibility shocks. Indeed, arbitrageurs unwind their carry trades in response to heightened credibility risk, causing international risk-sharing to fall and uncoupling relative consumption growth rates.

To substantiate the model, I test these hypotheses empirically in the US–South Korea setting. I gather data on macroeconomic aggregates from the Organization for Economic Cooperation and Development (OECD), International Monetary Fund (IMF), and US and South Korean governments. To measure domestic central bank credibility, I use a dataset of high-frequency shocks to investors' expectations of South Korean

monetary policy from Ahn, Kim, and Lee (2021), treating the largest-magnitude shock in the past year as a proxy for popular sentiment about credibility. For robustness, I also use South Korean economic policy uncertainty (EPU) indices from Cho and Kim (2023), who measure exchange rate policy uncertainty using a text-based analysis of South Korean newspapers. I find that UIP deviations grow significantly in association with both large recent contractionary monetary shocks, as well as heightened exchange rate policy uncertainty. On the real side, I find no relationship between high-frequency monetary shocks and Backus–Smith residuals, but I do find that these residuals grow with the exchange rate EPU index—the discrepancy likely resulting from the low frequency of observations. These results provide strong support for the inclusion of credibility risk in models of exchange rate determination.

After establishing empirical support for the model, I investigate how credibility shocks affect the broader economy—beyond the balance sheets of arbitrageurs. To do this, I solve the model in general equilibrium. I begin by specifying the model as a directed acyclic graph (DAG), which automates variable substitution when solving the nonlinear system of equilibrium conditions. This format allows me to apply the sequence-space Jacobian method of Auclert, Bardóczy, Rognlie, and Straub (2021) to calculate the impulse responses of sequences of aggregates (e.g., consumption, investment, and the exchange rate) to transient credibility shocks around a steady state.

I find that negative shocks to domestic central bank credibility have persistent deleterious effects on the domestic real economy in general equilibrium. These shocks reduce consumer spending, drive increases in inflation and exchange rate depreciation, and raise borrowing costs. These impacts often last for two or more years. Credibility shocks do temporarily improve the competitiveness of domestic firms—raising output—through exchange rate depreciation, but much of this rise comes from increases in the use of intermediate inputs, rather than capital or labor. These results provide strong

evidence that shocks to central bank credibility are salient both for exchange rate determination and the behavior of the real economy.

Related Literature. This research contributes to three distinct literatures: First, by studying the optimal portfolio choice of constrained intermediaries, I follow the past work on limits to arbitrage pioneered by Shleifer and Vishny (1997), who establish that arbitrage is typically capital-intensive and risky. In the open-economy models of Alvarez, Atkeson, and Kehoe (2009), Gabaix and Maggiori (2015), and Itskhoki and Mukhin (2023, 2025), intermediaries are limited respectively by fixed costs, balance sheet constraints, and risk-aversion. My novel contribution is to model rates as a jump-diffusion process, generating an incentive to hedge against discontinuous price jumps that limits arbitrage by intermediaries.

Second, my work connects to a rich literature on central bank credibility. Seminally, Barro and Gordon (1983) and Rogoff (1985) show that welfare-minded central banks will not achieve socially-optimal policy outcomes without rules that ensure commitment or over-weight inflation. Indeed, Carriere-Swallow, Gruss, Magud, and Valencia (2021) show empirically that countries with more credible central banks demonstrate reduced exchange rate pass-through to consumer prices. I provide a theoretical framework that clarifies this observation. In particular, I show that negative shocks to credibility produce persistent exchange-rate depreciation and declines in consumer spending. This therefore adds a novel dimension to the economic benefits of traditional rules-based credibility.

Finally, my work is the first—to my knowledge—to apply the sequence-space Jacobian method of Auclert, Bardóczy, Rognlie, and Straub (2021) in an open-economy setting. This use requires novel implementation methods to handle the joint determination of, e.g., price levels and interest rates in each country. Therefore, my work opens the

door to future research with international macroeconomic models—particularly, those featuring the heterogeneous agents that were the original use-case of the method—in the sequence-space.

The thesis proceeds as follows. Section 2 introduces the model of exchange rate determination with imperfect central bank credibility and derives the optimal portfolio choice of arbitrageurs. In Section 3, I present testable hypotheses and empirically evaluate them. In Section 4, I solve the model in the sequence space and examine general-equilibrium dynamics of the exchange rate and real economy in response to credibility shocks. Section 5 concludes and examines future directions for this research.

2 A Model of Credibility in Exchange Rate Determination

To begin understanding the role of central bank credibility in exchange rate determination, I build an international real business cycle (IRBC) model based on Itskhoki and Mukhin (2025). This two-country model features home bias in consumption, costly capital adjustment, and monopolistically competitive firms. A Taylor rule is used to conduct monetary policy, targeting both the output gap and exchange rate stabilization with country-specific weights. Asset markets are segmented and households cannot trade bonds internationally; arbitrageurs and noise traders perform international risk-sharing instead. This segmentation allows the risk premium to vary endogenously with the exchange rate regime and thereby influence exchange rates. For clarity of presentation, prices and wages are flexible; Itskhoki and Mukhin (2025) show that price stickiness is unimportant in arbitrageur-driven models of exchange rate determination.

I depart from existing models by introducing a Markov deviation process for central bank credibility, which induces a jump-diffusion for the real return on arbitrageurs' trades. I show in Proposition 1 that these jumps cause arbitrageurs to perform credibility-

driven hedging, which influences the extent of their international risk-sharing. Through this channel, I show that central bank credibility influences the exchange rate and the real economy. Namely, in Proposition 2 I link credibility to uncovered interest parity (UIP) deviations and in Proposition 3 to Backus–Smith residuals.

2.1 Foundations

The setting is as follows: There are two countries, a "home" country and a "foreign" country. I denote foreign-country variables with an asterisk; for example, P_t and P_t^* are the respective price levels in the home and foreign countries at time t. For concreteness, and to connect this discussion with the later empirical analysis, I will interchangeably refer to the home country as South Korea and the foreign country as the United States. This is merely an aesthetic choice, and does not limit the generality of the model. Each country has its own currency, in terms of which its variables are expressed; for the US, the dollar, and for South Korea, the won. The domestic exchange rate at time t is represented by $\mathcal{E}_t$, the price of one dollar in won; similarly, $\mathcal{E}_t^*$ is the price of one won in dollars. Therefore, the domestic real exchange rate at time t is

$$\mathcal{Q}_t = P_t^* \mathcal{E}_t / P_t, \tag{1}$$

and likewise for the US. Unless otherwise specified, a lowercase variable refers to the natural logarithm of its uppercase counterpart; for example, $q_t = \log \mathcal{Q}_t$.

Households. There are symmetric representative households in each country; I present the domestic case for concreteness. The home household maximizes their discounted expected future utility, which takes a constant relative risk aversion form in consumption

C_t and labor L_t:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\sigma}}{1-\sigma} - \frac{L_t^{1+\frac{1}{\nu}}}{1+\frac{1}{\nu}} \right), \tag{2}$$

where β is the discount rate, σ is the inverse elasticity of intertemporal substitution, and ν is the Frisch elasticity of labor supply. This maximization takes place subject to the flow budget constraint

$$P_t C_t + P_t I_t + \frac{B_{t+1}}{R_t} \leq W_t L_t + r_t^K K_t + B_t + \Pi_t, \tag{3}$$

where P_t is the price index, I_t is investment into the gross capital stock K_t, B_{t+1} is the household's holdings of bonds that will pay out 1 unit of home currency in period $t+1$, R_t is the domestic interest rate (so that the price of one bond is $1/R_t$), W_t is the wage for domestic workers, r_t^K is the rental rate of capital, and Π_t is the profits of domestic firms, which are remitted to households. Intuitively, the left-hand side of (3) represents the costs of the household—their consumption, direct investment, and bond purchases—and the right side represents their income—their wages, capital rental returns, bond payouts, and firm profits.

Capital depreciates at a rate δ and is subject to quadratic adjustment costs. The law of motion is

$$K_{t+1} = (1-\delta)K_t + I_t - \frac{\kappa}{2} \frac{(\Delta K_{t+1})^2}{K_t}, \tag{4}$$

where κ controls the size of the adjustment costs. Therefore, tomorrow's capital stock is the sum of the existing capital stock after depreciation and the household's current investment, minus a quadratic function of the change in capital. Introducing adjustment costs in this manner aligns the model with empirical evidence on capital impulse response functions and unifies the neoclassical and Tobin's q theories of investment

(Hayashi 1982). Moreover, such adjustment costs are a standard feature of modern DSGE models (Christiano, Eichenbaum, and Evans 2005).

To solve the household's optimization problem, substitute the capital law of motion (4) into the budget constraint (3) and construct the Lagrangian

$$E_t \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\sigma}}{1-\sigma} - \frac{L^{1+\frac{1}{\nu}}}{1+\frac{1}{\nu}} - \lambda_t \left(P_t C_t + P_t \left(K_{t+1} - (1-\delta) K_t + \frac{\kappa}{2} \frac{(\Delta K_{t+1})^2}{K_t} \right) + \frac{B_{t+1}}{R_t} \right. \right. \tag{5}$$
$$\left. \left. - W_t L_t - r_t^K K_t - B_t - \Pi_t \right) \right].$$

Solving for the first-order conditions yields three equilibrium conditions: First, I have that, for all t,

$$\frac{L_t^{\frac{1}{\nu}}}{W_t} = \frac{C_t^{-\sigma}}{P_t}. \tag{6}$$

In other words, the marginal utility of additional spending on consumption must equal the marginal cost of that for labor. Second, for all t, I have the Euler equation

$$\frac{C_t^{-\sigma}}{P_t} = \beta R_t E_t \left[\frac{C_{t+1}^{-\sigma}}{P_{t+1}} \right]. \tag{7}$$

This reflects that the marginal utility of consumption spending today must equal the marginal utility of investing it in bonds, earning interest reflected by rate R_t, and consuming it tomorrow with discount β. In this sense, (7) pins down intertemporal consumption dynamics. Third, I have, for all t,

$$1 + \kappa \frac{\Delta K_{t+1}}{K_t} = \beta E_t \left[\left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} \left(\frac{r_{t+1}^K}{P_{t+1}} + (1-\delta) + \kappa \frac{\Delta K_{t+2}}{K_{t+1}} + \frac{\kappa}{2} \left(\frac{\Delta K_{t+2}}{K_{t+1}} \right)^2 \right) \right]. \tag{8}$$

Due to the presence of the capital adjustment costs, this equation is more difficult to intuitively interpret. However, just as (7) trades off the marginal utility of spending on

consumption today versus spending on consumption tomorrow via saving in bonds, (8) does so when the saving is done via investment in the capital stock.

The above equations characterize the home household's overall consumption. I now consider their consumption of specific good varieties. Both the home and foreign countries produce continuums of goods indexed by $i \in [0,1]$. The home-country price of each domestic good at time t is given by $P_{Ht}(i)$ and the foreign-country price of these domestic goods is $P^*_{Ht}(i)$. Likewise, the price of each foreign good in the home country is $P_{Ft}(i)$ and $P^*_{Ft}(i)$ in the foreign country. Consumption of each good, in each country, is denoted similarly by $C_{Ht}(i)$, $C^*_{Ht}(i)$, $C_{Ft}(i)$, and $C^*_{Ft}(i)$. The aggregate consumption levels are naturally defined

$$C_{Ht} = \int_0^1 C_{Ht}(i)di, \tag{9}$$

and likewise for the other consumption variables. The price levels are denoted similarly, and are implicitly defined so that they accurately reflect the price of aggregate consumption from a particular origin; for example,

$$P_{Ht}C_{Ht} = \int_0^1 P_{Ht}(i)C_{Ht}(i)di, \tag{10}$$

implicitly defines P_{Ht}.

The home household decides to allocate their overall consumption expenditures, $P_tC_t = P_{Ht}C_{Ht} + P_{Ft}C_{Ft}$, between domestic and foreign goods. They do so by maximizing the constant elasticity of substitution (CES) aggregator for these goods,

$$C_t = \left[\int_0^1 \left((1-\gamma)^{\frac{1}{\theta}} e^{\frac{-\gamma}{\theta}\xi_t} C_{Ht}(i)^{\frac{\theta-1}{\theta}} + \gamma^{\frac{1}{\theta}} e^{\frac{1-\gamma}{\theta}\xi_t} C_{Ft}(i)^{\frac{\theta-1}{\theta}}\right)\right]^{\frac{\theta}{\theta-1}}, \tag{11}$$

where $\gamma \in [0,1/2)$ parameterizes the openness of the economy, θ determines the constant elasticity of substitution, and ξ_t is a taste shock for foreign goods. The standard

Dixit and Stiglitz (1977) CES aggregator captures the empirical fact that consumers prefer a well-diversified portfolio of goods to large quantities of a particular variety. Moreover, the parameter γ captures openness by increasing the desirability (namely, the contribution to aggregate consumption) of foreign goods. It is important to note that openness here captures not only households' direct preference for domestic goods, but also trade costs and the presence of non-tradable goods (Obstfeld and Rogoff 2000). Finally, the shock ξ_t, which represents time-varying changes in the relative desirability of domestic and foreign goods, is includes as the source of empirically-plausible volatility in net exports (Pavlova and Rigobon 2007).

The solution to the CES maximization problem yields the demand schedules

$$C_{Ht}(i) = (1-\gamma)e^{-\gamma\xi_t}\left(\frac{P_{Ht}(i)}{P_t}\right)^{-\theta} C_t \quad \text{and} \quad C_{Ft}(i) = \gamma e^{(1-\gamma)\xi_t}\left(\frac{P_{Ft}(i)}{P_t}\right)^{-\theta} C_t. \tag{12}$$

As one would expect, the consumption of a domestic good variety is decreasing in the openness of the economy and the domestic price of the good, while it is increasing in overall consumption. I use these demand functions with (11) to derive the implied overall domestic price index

$$P_t = \left[\int_0^1 \left((1-\gamma)e^{-\gamma\xi_t} P_{Ht}(i)^{1-\theta} + \gamma e^{(1-\gamma)\xi_t} P_{Ft}(i)^{1-\theta}\right) di\right]^{\frac{1}{1-\theta}}. \tag{13}$$

Such an index has the pleasant consequence that if I create, say, the import price index using the form

$$P_{Ft} = \left[\int_0^1 P_{Ft}(i)^{1-\theta}\, di\right]^{\frac{1}{1-\theta}}, \tag{14}$$

then I have the desired result that the import price index accurately reflects the price of aggregate consumption from abroad, and moreover is proportional to the overall

expenditures $P_t C_t$:

$$P_{Ft} C_{Ft} = \int_0^1 P_{Ft}(i) C_{Ft}(i) = \gamma e^{(1-\gamma)\xi_t} \left(\frac{P_{Ft}}{P_t} \right)^{1-\theta} P_t C_t. \tag{15}$$

As a final note, I can use this framework to express the net exports of the domestic country by $NX_t = \mathcal{E}_t P^*_{Ht} C^*_{Ht} - P_{Ft} C_{Ft}$. Moreover, using (15) and its foreign-country counterpart, I have the closed-form

$$NX_t = \mathcal{E}_t P^*_{Ht} C^*_{Ht} - P_{Ft} C_{Ft} = P_{Ft} C_{Ft} \left[e^{(1-\gamma)(\xi^*_t - \xi_t)} \frac{\mathcal{E}_t (P^*_{Ht})^{1-\theta} (P^*_t)^{\theta} C^*_t}{P^{1-\theta}_{Ft} P^{\theta}_t C_t} - 1 \right]. \tag{16}$$

As expected, domestic net exports increase in the aggregate consumption of the foreign country and decrease in that of the home country.

Firms. In each country, there is a continuum of identical firms indexed by $i \in [0,1]$ that produces each respective good variety. The domestic firm i produces its variety using the Cobb–Douglass technology

$$Y_t(i) = \left(e^{a_t} K^{\vartheta}_t L^{1-\vartheta}_t \right)^{1-\phi} X^{\phi}_t \tag{17}$$

with capital K_t, labor L_t, and intermediate inputs X_t. The parameter ϑ represents the elasticity of value-added with respect to capital, and ϕ the elasticity of output with respect to intermediate goods. The value-added productivity is parameterized by a_t.

The continuum of firms competitively use domestic labor and capital. Therefore, the domestic wage and rental rates are characterized in equilibrium simply by the marginal products

$$W_t = (1-\phi)(1-\vartheta) \frac{Y_t}{L_t} \quad \text{and} \quad r^K_t = (1-\phi)\vartheta \frac{Y_t}{K_t}. \tag{18}$$

This is because—in the case of the wage—the firms would optimally use more labor if their marginal product of labor exceeded the wage, and vice versa if the marginal product were less than the wage. Similar logic holds for the rental rate. However, both because the price-setting of each firm impacts the cost of intermediate inputs, and the firm is not the sole consumer of (components of) these inputs, I analyze each firm's profit maximization problem to characterize price-setting.

To begin, I assume that the bundle of intermediate goods is identical to that of final goods, and therefore commands the price P_t. I then solve the standard Cobb–Douglass cost minimization problem to find that the marginal cost of producing output for any domestic firm is

$$MC_t = \frac{1}{\varpi}\left(e^{-a_t}\left(r_t^K\right)^{\vartheta} W_t^{1-\vartheta}\right)^{1-\phi} P_t^{\phi} \quad \text{where} \quad \varpi = \phi^{\phi}\left[(1-\phi)\vartheta^{\vartheta}(1-\vartheta)^{1-\vartheta}\right]^{1-\phi}. \tag{19}$$

Given this marginal cost, firm i maximizes its lifetime profits from producing their variety for the domestic and foreign markets, with outputs $Y_{Ht}(i)$ and $Y_{Ht}^*(i)$ respectively. Namely, they maximize

$$E_0 \sum_{t=0}^{\infty} M_t \Pi_t(i) \quad \text{where} \quad \Pi_t(i) = (P_{Ht}(i) - MC_t)\, Y_{Ht}(i) + \left(P_{Ht}^*(i)\mathcal{E}_t - MC_t\right) Y_{Ht}^*(i), \tag{20}$$

and the stochastic discount factor is $M_t = \beta^t C_t^{-\sigma}/P_t$, following from the domestic household's ownership of the firm. I solve this optimization problem to find that all goods will be priced identically as

$$P_{Ht}(i) = P_{Ht} = \frac{\theta}{\theta-1} MC_t \quad \text{and} \quad P_{Ht}^*(i) = P_{Ht}^* = \frac{\theta}{\theta-1}\frac{MC_t}{\mathcal{E}_t}. \tag{21}$$

These markups arise from the fact that each firm competes monopolistically with the corresponding foreign firm.

Monetary Policy. Monetary policy in each country is implemented by a Taylor rule. For the home country, I have the equation

$$i_t = \rho_m i_{t-1} + (1-\rho_m)\left[\phi_\pi \pi_t + \phi_e(e_t - \overline{e})\right] + \sigma_m \varepsilon_t^m, \tag{22}$$

where $i_t = \log R_t$ is the log nominal interest rate, $\pi_t = \Delta \log P_t$ is inflation, and $\sigma_m \varepsilon_t^m$ parameterizes the monetary policy shock. The parameter ρ_m controls the persistence of the rule while ϕ_π and ϕ_e control the relative weight on stabilizing inflation and the exchange rate, respectively. The rule adjusts the interest rate upwards whenever inflation rises above 0% or the exchange rate depreciates beyond a target $\overline{e}$. Generally, I treat the foreign country (the US) as solely valuing inflation reduction (i.e., $\phi_e = 0$), while the home country has a value of ϕ_e corresponding to their exchange rate regime.

Market Clearing. Implicit in the model as stated, the labor supply of domestic (foreign) households must equal that demanded by domestic (foreign) firms. Moreover, the capital supplied by households in the form of investment must satisfy the capital demand of firms within each market. Clearly, also, firms must split their production as $Y_t(i) = Y_{Ht}(i) + Y_{Ht}^*(i)$ and likewise for foreign firms. Since households will optimally exhaust their available resources, there must be goods clearing in each market:

$$Y_{Ht} = C_{Ht} + X_{Ht} + I_{Ht} = (1-\gamma)\frac{\theta}{\theta-1}(C_t + X_t + I_t) \tag{23}$$

$$Y_{Ht}^* = C_{Ht}^* + X_{Ht}^* + I_{Ht}^* = \gamma \frac{\theta}{\theta-1}\left(C_t^* + X_t^* + I_t^*\right). \tag{24}$$

and analogously for foreign-consumed goods. To obtain the country budget constraints, combine firm profits (20) with the budget constraint (3) to find that

$$\frac{B_{t+1}}{R_t} = N X_t, \tag{25}$$

where net exports are defined in (16). Finally, I discuss asset market clearing below.

Financial Sector. I follow Itskhoki and Mukhin (2025) in assuming that home and foreign households cannot purchase each other's national bonds directly. That is, asset markets are segmented. This is admittedly a strong assumption, but it is broadly consistent with empirical evidence. For example, Bacchetta, Tièche, and van Wincoop (2023) find that households rebalance their portfolios infrequently, and with high frictional costs. This implies that most households find the information-gathering required to actively invest internationally too costly to participate, reflecting effective market segmentation.

Home households' total holdings of South Korean bonds at time t is B_{t+1} bonds, and these bonds each pay out one won in period $t+1$. Therefore, their period-t price is $1/R_t$, where R_t is the South Korean interest rate. US bonds and holdings are similarly defined. Since households cannot trade internationally in assets, I introduce two institutions that can: noise traders and arbitrageurs.

There exists a measure n of identical noise traders that—for concreteness—are based in the US and remit profits to US households. Noise traders take zero-capital positions in domestic and foreign bonds. That is, if they take a total position of N_{t+1}/R_t won in South Korean bonds, then they match this with an offsetting position of $N^*_{t+1}/R^*_t = -\mathcal{E}^*_t N_{t+1}/R_t$ dollars in US bonds. Note that one of these positions will necessarily be non-positive. Noise traders' portfolio choices are driven by an exogenous liquidity currency demand that is unrelated to macroeconomic fundamentals—hence the "noise" in their name. Formally, their real position in US bonds is modeled by the AR(1) process

$$\frac{N^*_{t+1}}{P^*_t} = \psi_t \quad \text{where} \quad \psi_t = \rho_\psi \psi_{t-1} + \sigma_\psi \varepsilon^\psi_t. \tag{26}$$

The offsetting South Korean bond position is simply $N_{t+1}/P_t = -\mathcal{E}_t \psi_t$. This ψ_t is called the "financial shock," where $\rho_\psi \in [0,1]$ represents its persistence, $\sigma_\psi \geq 0$ its volatility, and $\varepsilon_t^\psi \sim N(0,1)$.

On the other hand, arbitrageurs are professional intermediaries who seek to profit from spreads in the interest rates between the two countries. There is a mass m of identical intermediaries, and I assume that they are based in the US. They also adopt a zero-capital carry trade strategy, with each intermediary's time-t position in US bonds being d_{t+1}^*/R_t^* dollars, with an offsetting position of $d_{t+1}/R_t = -\mathcal{E}_t d_{t+1}^*/R_t^*$ won in South Korean bonds. The next-period return on this carry trade is given by $\tilde{R}_{t+1}^* \coloneqq R_t^* - R_t \mathcal{E}_t/\mathcal{E}_{t+1}$ for each dollar invested in US bonds (and each $\mathcal{E}_t$ won shorted to offset). I will discuss the portfolio choice of these intermediaries below.

Arbitrageurs in the Itskhoki and Mukhin (2025) model solely care about their expected return on the carry trade. Naturally, the utility of this expected return is a function of the relative interest rates , as well as the expected change in the exchange rate and its volatility. However, the model treats the exchange rate regime and actions of the central bank as exogenous and known, and fails to incorporate uncertainty about these actions. In the real world—and especially in the case of emerging markets—arbitrageurs would incorporate such risks into their expectations. Capturing this behavior in this setting requires augmenting the carry-trade return process with sharp price changes that reflect announcements of shifting central bank policy. We pursue such an augmentation in the next section.

2.2 Credibility and Portfolio Choice

I depart from existing work and the setting of Itskhoki and Mukhin (2025) to introduce central bank credibility into the model. Intuitively, I suppose that the domestic central

bank deviates from its committed policy at some rate, with lower rates reflecting greater credibility. These deviations produce discontinuous jumps in carry trade returns that arbitrageurs must optimally hedge against as they decide their portfolio and thus the amount of international risk-sharing. This hedging bond demand is a central feature of the model.

Formally, I define two states $\mathcal{S} = \{1, 2\}$. The first represents a normal period in which the domestic central bank behaves as expected; the second represents a departure from its prior commitments and the associated market uncertainty in the aftermath. The economy must be in exactly one of these states at any point in time. In the limit—as discrete time intervals become vanishingly small—I model the transitions between these states with a continuous-time Markov-chain S with a 2×2 Q-matrix $(q_{i,j})$. The entries of this matrix determine the state transitions: The economy will stay in state $s = 1$ for a length of time determined by an exponential random variable with rate $q_{1,2}$, then transition to state $s = 2$. Likewise, $q_{2,1}$ determines the process for transitioning out of state $s = 2$ and into state $s = 1$. In this model, larger rates $q_{1,2}$, correspond to less credible domestic central banks that frequently abandon commitments. In practice, I expect the rate $q_{2,1}$ to be large—representing a swift return from uncertainty—although this assumption is not strictly needed for the later results.

The state s formally impacts the economy through the return on the carry trade. Whenever the state shifts from s to $-s$ (the notation $-s$ refers to the state that is not s), the return process—which is modeled below as a diffusion—experiences a jump of size $\eta(s,-s)$, where $\eta : \mathcal{S} \times \mathcal{S} \to \mathbb{R}$ has $\eta(s,s) = 0$ for all $s \in \mathcal{S}$. Note that $\eta(s,-s)$ can be positive or negative, giving it the flexibility to reflect appreciation risk in the case when

the domestic country is the low-interest one. As I will show below, these jumps create an incentive for intermediaries to hedge against credibility-induced shocks.[1]

With this framework in hand, I state the portfolio choice problem of the arbitrageurs. Each arbitrageur has wealth w dollars and seeks to maximize their next-period wealth, over which they have log utility. Since the carry trade is zero-capital, this problem simply becomes

$$\max_{d^*_{t+1}(s)} E_t \log\left(\frac{\tilde{R}^*_{t+1}}{P^*_{t+1}}\frac{d^*_{t+1}(s)}{R^*_t}\right), \tag{27}$$

for whichever state $s \in \mathcal{S}$ the economy occupies at time t. Note that the choice of log utility means that arbitrageurs are risk-averse, and thus require a risk premium to perform international risk-sharing. I now solve the portfolio problem for intermediaries.

Proposition 1. *The optimal portfolio choice of an intermediary in state $s \in \{1,2\}$ is*

$$\frac{d^*_{t+1}(s)}{P^*_t} = -\frac{i_t - i^*_t - E_t\Delta e_{t+1} + \frac{1}{2}\sigma^2_e + \sigma_{e\pi^*} - 2q_{s,-s}\eta(s,-s)}{\sigma^2_e}, \tag{28}$$

where $i_t - i^*_t = \log(R_t/R^*_t)$ is the difference in log interest rates, $E_t\Delta e_{t+1} = E_t(\log\mathcal{E}_{t+1} - \log\mathcal{E}_t)$ is the expected change in log exchange rates, $\sigma^2_e = \mathrm{Var}_t(\Delta e_{t+1})$ is the volatility of these changes, and $\sigma_{e\pi^*} = \mathrm{Cov}_t(\Delta e_{t+1}, \Delta p^*_{t+1})$ is the covariance between changes in log exchange rates and log foreign inflation.

Proof. The first part of the proof follows Itskhoki and Mukhin (2025), who in turn uses the method of Campbell and Viceira (2002) to find the optimal portfolio. I begin by rewriting the next-period return using simple algebraic manipulation as

$$\frac{\tilde{R}^*_{t+1}}{P^*_{t+1}}\frac{d_{t+1}(s)^*}{R^*_t} = \left(1 - e^{x^*_{t+1}}\right)e^{-\pi^*_{t+1}}\frac{d^*_{t+1}(s)}{P^*_t},$$

1. In fact, this framework also allows the state s to determine the carry trade return means and variances. This feature may be useful when studying a shift from a pegged regime with very low return volatility to a floating regime with high volatility. For clarity of presentation, I assume here that these means and variances do not change across states.

where the log carry trade return x^*_{t+1} and the log foreign inflation rate π^*_{t+1} are defined

$$x^*_{t+1} = i_t - i^*_t - \Delta e_{t+1} = \log(R_t/R^*_t) - \Delta \log \mathcal{E}_{t+1} \quad \text{and} \quad \pi^*_{t+1} = \Delta \log P^*_{t+1}.$$

Campbell and Viceira (2002) show that, when time intervals are sufficiently small, (x^*_{t+1}, π^*_{t+1}) can be approximated by the increments of a diffusion process $(\mathcal{X}^*_t, \mathcal{P}^*_t)$ given by the stochastic differential equation

$$\begin{pmatrix} \mathrm{d}\mathcal{X}^*_t \\ \mathrm{d}\mathcal{P}^*_t \end{pmatrix} = \mu_t \mathrm{d}t + \sigma \mathrm{d}\mathcal{W}_t,$$

where $\mathcal{W}_t$ is a two-dimensional Brownian motion and

$$\mu_t = E_t \begin{pmatrix} x^*_{t+1} \\ \pi^*_{t+1} \end{pmatrix} = \begin{pmatrix} i_t - i^*_t - E_t \Delta e_{t+1} \\ E_t \pi^*_{t+1} \end{pmatrix} \quad \text{and} \quad \sigma^2 = \mathrm{Var}_t \begin{pmatrix} x^*_{t+1} \\ \pi^*_{t+1} \end{pmatrix} = \begin{pmatrix} \sigma^2_e & -\sigma_{e\pi^*} \\ -\sigma_{e\pi^*} & \sigma^2_{\pi^*} \end{pmatrix}.$$

The respective variances are $\sigma^2_e = \mathrm{Var}_t(\Delta e_{t+1})$, $\sigma^2_{\pi^*} = \mathrm{Var}_t(\Delta p^*_{t+1})$, and $\sigma_{e\pi^*} = \mathrm{Cov}_t(\Delta e_{t+1}, \Delta p^*_{t+1})$. I now use Ito's lemma to express the carry trade return as the process

$$\begin{aligned} \left(1 - e^{\mathrm{d}\mathcal{X}^*_t}\right) e^{-\mathrm{d}\mathcal{P}^*_t} \frac{1}{P^*_t} &= \left(-\mathrm{d}\mathcal{X}^*_t - \frac{1}{2}\left(\mathrm{d}\mathcal{X}^*_t\right)^2\right)\left(1 - \mathrm{d}\mathcal{P}^*_t + \frac{1}{2}\left(\mathrm{d}\mathcal{P}^*_t\right)^2\right)\frac{1}{P^*_t} \\ &= \left(-\mathrm{d}\mathcal{X}^*_t - \frac{1}{2}\left(\mathrm{d}\mathcal{X}^*_t\right)^2 + \mathrm{d}\mathcal{X}^*_t \mathrm{d}\mathcal{P}^*_t\right)\frac{1}{P^*_t} \\ &= -\left(\left(\mu_{1,t} + \frac{1}{2}\sigma^2_e + \sigma_{e\pi^*}\right)\mathrm{d}t + \sigma_e \mathrm{d}\mathcal{W}_{1,t}\right)\frac{1}{P^*_t}, \end{aligned}$$

where I make use of the "box algebra" facts that $(\mathrm{d}\mathcal{X}^*_t)^2 = \sigma^2_e \mathrm{d}t$ and $\mathrm{d}\mathcal{X}^*_t \mathrm{d}\mathcal{P}^*_t = -\sigma_{e\pi^*}\mathrm{d}t$, and that the higher-order terms vanish. This naturally leads to a definition of the carry

trade return process as $\mu' \mathrm{d}t + \sigma' \mathrm{d}\mathcal{W}_{1,t}$, where

$$\mu' \coloneqq -\frac{\mu_{1,t} + \frac{1}{2}\sigma_e^2 + \sigma_{e\pi^*}}{P_t^*} \quad \text{and} \quad \sigma' \coloneqq -\frac{\sigma_e}{P_t^*}.$$

Recall that the state $s \in \mathcal{S}$ of the economy impacts the carry trade return by transforming it into a jump diffusion process. Note that from here onward, the proof no longer follows Itskhoki and Mukhin (2025). The jump diffusion rate process is defined

$$\mathrm{d}\mathcal{R}_t^* \coloneqq \mu' \mathrm{d}t + \sigma' \mathrm{d}\mathcal{W}_{1,t} + \frac{\eta(S_{t-}, S_t)}{P_t^*} \mathrm{d}\mathcal{N}_t, \tag{29}$$

where $\mathcal{N}$ is the counting process of the credibility-state Markov chain S, the function $\eta : \mathcal{S} \times \mathcal{S} \to \mathbb{R}$ describes the size and direction of the jumps (with $\eta(s,s) = 0$), and S_{t-} is the left limit of S at t. Given that the return process is a standard jump diffusion, I now apply the result of Honda (1997, 68) to find that

$$\frac{d_{t+1}^*(s)}{P_t^*} = -\frac{i_t - i_t^* - E_t \Delta e_{t+1} + \frac{1}{2}\sigma_e^2 + \sigma_{e\pi^*} - 2q_{s,-s}\eta(s,-s)}{\sigma_e^2},$$

for $s \in \mathcal{S}$. This gives the desired portfolio allocation and completes the proof. □

Taking a moment to observe this portfolio choice confirms intuition. Indeed, the intermediaries' dollar bond position decreases in the South Korean won interest rate, as carry-trade returns become more lucrative. The dollar position also increases in the expected change in log exchange rate, since such an increase would represent a depreciation of won assets.

The novel part of this proposition is the credibility hedging term $2q_{s,-s}\eta(s,-s)$. To understand its presence, consider the rate process in (29). A change in the state from s to $-s$ produces an $\eta(s,-s)$-sized jump in the return on the carry trade; namely, the

return on a carry trade position with one dollar long on US bonds. Assuming that $\eta(1,2)$ is positive, as I do for the rest of the paper, then a South Korean central bank deviation from commitment represents a positive shock to the return on being long US bonds or, equivalently, a negative shock to the return on being long South Korean bonds. Because these jumps create a risk of being unexpectedly compensated above the level of the standard diffusion for being long US bonds, the positive term $2q_{s,-s}\eta(s,-s)$ is added to the Itskhoki and Mukhin (2025) US bond portfolio choice to increase the position and reflect this otherwise-ignored upside risk. Likewise, this term translates to the arbitrageur hedging *away* from being long South Korean bonds due to downside jump risk.

Given the tacit (but not generally necessary) assumption that the domestic (South Korean) interest rate is greater than the foreign (US) interest rate, an arbitrageur hedging away from being long South Korean bonds means that their absolute position size decreases, since they will almost always (barring severe exchange rate volatility) be long the high-interest country's bonds. Because asset markets are segmented and noise traders do not consider credibility, this means that the overall amount of international risk-sharing decreases in the credibility risk. It is a general microeconomic result that moving further away from complete asset markets makes economic allocation less efficient. Indeed, I expect credibility hedging to impact real macroeconomic dynamics through this allocative channel.

2.3 Equilibrium Conditions

Now that the arbitrageurs' portfolio has been found, I return to the broader financial sector to derive equilibrium conditions. Without loss of generality, I assume that bonds

are in zero net supply, yielding the market-clearing equations

$$B_{t+1} + N_{t+1} + D_{t+1} = 0 \quad \text{and} \quad B^*_{t+1} + N^*_{t+1} + D^*_{t+1} = 0, \tag{30}$$

where $D_{t+1} = m d_{t+1}$ is the aggregate position of the intermediaries. I combine this condition with the optimal portfolio choice to characterize equilibrium deviations from uncovered interest parity (UIP). UIP is satisfied when there is no arbitrage opportunity by participating in the carry trade described above; in other words, the carry trade return is zero. Thus, a deviation from UIP can simply be measured by the return on the carry trade. I give the result below.

Proposition 2. *In the state $s \in \mathcal{S}$, deviations from uncovered interest parity are given by*

$$i_t - i^*_t - E_t \Delta e_{t+1} = \frac{\sigma_e^2}{m} n \psi_t - \frac{\sigma_e^2}{m} \frac{R^*_t}{R_t} \frac{1}{\mathcal{E}_t} \frac{B_{t+1}}{P^*_t} - \sigma_{e\pi^*} - \frac{1}{2} + 2 q_{s,-s} \eta(s,-s), \tag{31}$$

where the first term on the right-hand side represents the impact of financial shocks, the next reflects the excess bond demand using the interest spread, the third is the exchange-rate–inflation covariance, and the final represents credibility-induced hedging effects.

Proof. Combining the arbitrageur portfolio choice (28), noise trader position (26), and the market clearing condition (30) yields

$$B^*_{t+1} + P^*_t n \psi_t - m P^*_t \frac{i_t - i^*_t - E_t \Delta e_{t+1} + \frac{1}{2}\sigma_e^2 + \sigma_{e\pi^*} - 2 q_{s,-s} \eta(s,-s)}{\sigma_e^2} = 0.$$

Rearranging gives that

$$i_t - i^*_t - E_t \Delta e_{t+1} = \frac{\sigma_e^2}{m} n \psi_t - \frac{\sigma_e^2}{m} \frac{B^*_{t+1}}{P^*_t} - \sigma_{e\pi^*} - \frac{1}{2} + 2 q_{s,-s} \eta(s,-s).$$

Finally, the fact that both noise traders and arbitrageurs take zero-capital positions shows that US and South Korean households must also take aggregate zero-capital positions to ensure market clearing in (30). That is, $B_{t+1}/R_t = -\mathcal{E}_t B^*_{t+1}/R^*_t$. With the last equation, this gives

$$i_t - i^*_t - E_t \Delta e_{t+1} = \frac{\sigma_e^2}{m} n \psi_t - \frac{\sigma_e^2}{m} \frac{R^*_t}{R_t} \frac{1}{\mathcal{E}_t} \frac{B_{t+1}}{P^*_t} - \sigma_{e\pi^*} - \frac{1}{2} + 2q_{s,-s}\eta(s,-s),$$

as claimed. □

I also connect these hedging terms with the real side of the economy using the expected Backus–Smith residual. With (7) above, the log-linearized South Korean Euler equation is $i_t = E_t(\sigma \Delta c_{t+1} + \Delta p_{t+1})$, where σ is the inverse elasticity of intertemporal substitution, and likewise for US households. So, the UIP deviations can be written as

$$i_t - i^*_t - E_t \Delta e_{t+1} = E_t\left(\sigma\left(\Delta c_{t+1} - \Delta c^*_{t+1}\right) - \Delta q_{t+1}\right) = E_t \Delta z_{t+1}, \tag{32}$$

where $z_t \coloneqq \sigma(c_t - c^*_t) - q_t$ is the Backus–Smith residual (Backus and Smith 1993). Chnages to be Backus–Smith residual represent a linear relationship between relative consumption growth rates and percentage changes in the real exchange rate, each corresponding to the real side of the international economy. Combining (32) with Proposition 2 immediately shows the following proposition.

Proposition 3. *In state $s \in \{1,2\}$, changes to the expected Backus–Smith residual are*

$$E_t\left(\sigma\left(\Delta c_{t+1} - \Delta c^*_{t+1}\right) - \Delta q_{t+1}\right) = \frac{\sigma_e^2}{m} n \psi_t - \frac{\sigma_e^2}{m} \frac{R^*_t}{R_t} \frac{1}{\mathcal{E}_t} \frac{B_{t+1}}{P^*_t} - \sigma_{e\pi^*} - \frac{1}{2} + 2q_{s,-s}\eta(s,-s). \tag{33}$$

3 Reduced-form Evidence

In the previous section, I proved that hedging behavior and its macroeconomic consequences follow from shocks to central bank credibility in a theoretical model. I now ask whether this channel is economically salient in practice.

To begin, notice that several testable hypotheses immediately arise from the theory above. Proposition 2 suggests that equilibrium deviations from the log-linearized uncovered interest parity (UIP) condition are linearly related to the rate and size of credibility shocks to the carry trade return. Proposition 3 implies that the expected Backus–Smith residual is likewise linearly related to these terms. Although the rate and size of these credibility shocks are not separately identified in the linear relationship, the presence of the hedging factor can be evidenced with a simple linear regression of the UIP or Backus–Smith deviations against measures of excess bond demand and central bank credibility. I do not claim that such an association would be causal—only that a linear relationship between credibility and these macroeconomic measures must arise empirically if the model in Section 2 captures a real-world economic phenomenon.

3.1 Data and Variable Construction

To test Propositions 2 and 3, I respectively use monthly and quarterly data for the US and South Korean economies between roughly 2010 and 2022, depending on the regression. I use the US as the "foreign" country since it is the predominant home of international arbitrageurs and has strong central bank credibility, allowing the impact of home-country shocks to be better isolated. I choose South Korea as the "home" country because it both has non-trivial central bank credibility concerns and is sufficiently developed to provide high-quality economic and financial data.

I obtain each country's monthly short-term (three-month) interest rates (corresponding to R_t and R_t^*) from the Organization for Economic Cooperation and Development (OECD), while I get the monthly and quarterly end-of-period dollar–won exchange rate ($\mathcal{E}_t$) from the International Monetary Fund (IMF). I source monthly US price level data (P_t^*) as the monthly consumer price index from the Bureau of Labor Statistics, and quarterly South Korean and US percentage changes in consumer prices ($\Delta \log P_t$ and $\Delta \log P_t^*$) from the IMF. I also obtain the monthly value of outstanding South Korean government bonds B_{t+1} (in million won) from the South Korean Ministry of Economy and Finance. I finally get quarterly data on real consumption growth (Δc_{t+1} and Δc_{t+1}^*) from the OECD. A detailed description of each of these data sources is provided in Appendix A.

To calculate the UIP deviation in month t, I assume rational expectations to find the *ex post* deviations

$$i_t - i_t^* - E_t \Delta e_{t+3} = \log(R_t) - \log(R_t^*) - \log(\mathcal{E}_{t+3}) + \log(\mathcal{E}_t), \tag{34}$$

where I use $t+3$ instead of $t+1$ as the lead since i_t and i_t^* are three-month rates. I also estimate the exchange rate variance σ_e^2 at each time t to be the sample variance of Δe_{t+3} for the 6 prior months, including the current one. The covariance $\sigma_{e\pi^*}$ is calculated analogously using lags of the log US price level.

I also calculate the Backus–Smith residual *ex post* at the quarterly level, due to less frequent data reporting on consumption. In quarter t, the formula is

$$E_t\left(\sigma\left(\Delta c_{t+1} - \Delta c_{t+1}^*\right) - \Delta q_{t+1}\right) = 2\left(\Delta c_{t+1} - \Delta c_{t+1}^*\right) - (\Delta \log P_{t+1}^* + \Delta e_{t+1} - \Delta \log P_{t+1}), \tag{35}$$

where I use the parameter value $\sigma = 2$ for the inverse elasticity of intertemporal substitution, in line with Itskhoki and Mukhin (2025).

Since the noise traders in the model face short-term exogenous liquidity shocks with mean zero, there is a strong argument for simply omitting them in these month- and quarter-level empirical analyses. Indeed, for some later specifications, I do. However, I would also like to allow for the reasonable possibility that noise traders are acting on market sentiment when they choose their positions. Therefore, as a proxy for the noise-trader position, I use the excess bond premium from the GZ spread developed by Gilchrist and Zakrajšek (2012), which Favara, Gilchrist, Lewis, and Zakrajšek (2016) make available on a continuously-updated monthly basis. This measure represents US investor sentiment and risk-appetite, with lower premia indicating more exuberence, and it is constructed by removing the portions of credit spreads that are directly attributable to default risk.

I obtain measures for South Korean central bank credibility shocks from Ahn, Kim, and Lee (2021). The data were provided by the authors through June 2021 upon request. They use high-frequency data on 3-year South Korean Treasury bond futures to calculate the market's degree of surprise in the 30-minute window surrounding South Korean monetary policy announcements. This short window ensures that any significant change in futures prices is likely solely related to the policy announcement, and therefore represents an exogenous shock that I may use to proxy for exogenous changes in credibility. Ahn, Kim, and Lee (2021) use the method of Jarociński and Karadi (2020) to decompose this surprise into two orthogonal factors, one representing a pure shock to monetary policy, the other measuring the central bank information effect—a phenomenon in which central bank disclosures about the current state of the economy change market participants' expectations. I adapt these shocks to the credibility context under the assumption that the normal-state hedging term $2q_{1,2}\eta(1,2)$ is proportional

to the maximum-magnitude shock within the 12 months prior.[2] Intuitively, I assume that if agents recently experienced large unexpected shocks from the central bank, they will be more wary of them happening again—eroding credibility. Using the 12-month window captures the recent shocks that are front-of-mind for agents as they form their expectations. I refer to these lagged magnitude-based credibility measures simply as the monetary policy (MP) credibility shock and the central bank information (CBI) credibility shock in month t.

For robustness, I also consider another measure of South Korean central bank credibility. Cho and Kim (2023) perform a text-based analysis of 13 South Korean newspapers to construct an economic policy uncertainty (EPU) index that reflects the amount of social discourse about expected or recent policy changes between January 1990 and February 2025. This overall index is further decomposed into foreign exchange, monetary, fiscal, and trade policy uncertainty indices. The first sub-index is most important for my work, since it should respond to changes in central bank credibility related to the exchange rate, the main channel through which credibility hedging is expected to operate. This index reflects mentions of terms like "foreign exchange policy," "currency manipulation," and "exchange rate reserves," along with general terms like "uncertainty" and "concern" in these newspapers within a given month. I rescale each index to average 1 over the entire period of observations.

3.2 UIP Deviations

In this section, I present the empirical strategy and results for UIP deviations. I form the full-specification regression model using Proposition 2, making two notable changes:

2. I use the normal-state term here since my economic data are monthly averages. Under the assumption that the economy is almost always in the normal state, the monthly average is always near the normal state.

First, due to the fact that the covariance terms $\sigma_{e\pi^*}$ are minuscule in practice and have no meaningful bearing on the regression results, I omit them in this presentation. Second, I normalize $m = n = 1$ as the masses of noise traders and arbitrageurs for concreteness. With this complete, the model is the linear regression

$$\begin{aligned}\text{UIP Deviation}_t = \beta_0 + \beta_1 &\text{Excess Bond Demand}_t + \beta_2 \text{GZ Excess Bond Premium}_t \\ &+ \beta_3 \text{MP Credibility Shock}_t + \beta_4 \text{CBI Credibility Shock}_t + \varepsilon_t, \end{aligned} \tag{36}$$

where I calculate the *ex post* UIP deviation and excess bond demand variables as

$$\text{UIP Deviation}_t = i_t - i_t^* - \Delta e_{t+3} \tag{37}$$

$$\text{Excess Bond Demand}_t = -\sigma_e^2 \frac{R_t^*}{R_t} \frac{1}{\mathcal{E}_t} \frac{B_{t+1}}{P_t^*}. \tag{38}$$

The other variables are included as defined in Section 3.1. The data consist of 101 monthly observations between January 2013 and June 2021, with April 2020 excluded due to a Covid-related gap in US interest rate data from the OECD.

It is important to note that a month-level regression is sub-optimal for testing Proposition 2. That result was proved under the assumption that discrete time periods are small—permitting a continuous-time approximation. Moreover, currency markets are some of the deepest and most liquid in the world. In practice, the arbitrage opportunities encapsulated by UIP deviations can appear quickly and disappear just as fast. Despite these limitations, I expect that credibility hedging will contribute to UIP deviations consistently over time, since credibility deviations are relatively infrequent events (that is, the economy is normally in state $S_t = 1$). If this is true, then credibility hedging should still appear in a month-level regression. Indeed, my results below suggest that this is the case.

Table 1 presents the results using the Ahn, Kim, and Lee (2021) measure of central bank credibility. The first column is a specification with only the excess bond demand

Table 1. MP Credibility Shocks and Deviations from Uncovered Interest Parity

	UIP Deviation			
	(1)	(2)	(3)	(4)
Excess Bond Demand	0.702***	0.701***	0.500***	0.505***
	(0.079)	(0.078)	(0.082)	(0.083)
GZ Excess Bond Premium		−0.434		−0.146
		(0.278)		(0.284)
MP Credibility Shock			0.089***	0.090***
			(0.026)	(0.027)
CBI Credibility Shock			−0.056*	−0.048
			(0.030)	(0.033)
Constant	2.057***	2.018***	1.629***	1.631***
	(0.131)	(0.133)	(0.146)	(0.147)
R^2	0.445	0.458	0.560	0.560
N	101	101	101	101

Notes. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

variable on the right-hand side. It indicates that a unit increase in the excess bond demand will significantly increase UIP deviations by 70% on average. Given the significance of this result, and the R^2 value of 0.445, the excess bond demand is highly associated with the equilibrium UIP deviations. This is a natural (or, perhaps, mechanical) result, given that the excess bond demand directly includes the interest rate ratio, which features directly in the UIP residual on the left-hand side. Column 2 adds the GZ excess bond premium to the specification, which leaves the coefficient on excess bond demand largely untouched and is insignificant itself. Note that this specification is the one predicted by the Itskhoki and Mukhin (2025) model without credibility shocks if noise traders considered market sentiment. There is no evidence of this noise-trader behavior at the monthly frequency.

Column 3 of Table 1 introduces the credibility shocks without the GZ excess bond premium present. The estimates show that the coefficient on the monetary policy credibility shock is highly significant, and indicate that if the greatest-magnitude monetary policy shock over the last year were 1 basis point more contractionary, then the value of the UIP deviation would increase by 9.1%. The coefficient on the central bank information shock is only slightly significant. Moreover, in Column 4, I add the GZ excess bond premium variable again, finding largely unchanged coefficients for excess bond demand and the MP credibility shock, but with no significance for the GZ bond premium or the CBI credibility shock.

The results using the EPU-based measures of central bank credibility are given in Table 2. The first two columns are identical to those in Table 1, but the third adds the

Table 2. EPU Credibility Shocks and Deviations from Uncovered Interest Parity

	UIP Deviation			
	(1)	(2)	(3)	(4)
Excess Bond Demand	0.702***	0.701***	0.567***	0.571***
	(0.079)	(0.078)	(0.075)	(0.072)
GZ Excess Bond Premium		−0.434		−0.819***
		(0.278)		(0.259)
Exchange Rate Uncertainty			0.967***	1.015***
			(0.257)	(0.247)
Monetary Uncertainty			−0.166	0.258
			(0.273)	(0.291)
Fiscal Uncertainty			−0.422	−0.569*
			(0.318)	(0.308)
Trade Uncertainty			−0.638***	−0.656***
			(0.107)	(0.102)
Constant	2.057***	2.018***	2.463***	2.084***
	(0.131)	(0.133)	(0.350)	(0.356)
R^2	0.445	0.458	0.639	0.673
N	101	101	101	101

Notes. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

category-specific EPU indices without the GZ excess bond premium. These results indicate that an increase in the exchange-rate uncertainty index of 1 (the average value also being 1) would increase the UIP residual by 96.7% with high statistical significance. This result is consistent with the Ahn, Kim, and Lee (2021) measures, and lends strong support to the results of Proposition 2. The other category-specific indices are insignificant, with the exception of trade, where a 1-point increase will significantly reduce UIP deviations by 63.8%. The results are largely unchanged when the GZ premium is added, as shown in Column 4.

Overall, the results in Tables 1 and 2 show that credibility shocks—as defined in Section 3.1—are economically salient for the determination of equilibrium UIP deviations. This finding is robust to using alternative measures of credibility, with the EPU-based indices from Cho and Kim (2023) showing additionally that exchange-rate-related credibility is the most important component of uncertainty for determining these deviations. Moreover, for both sets of indices, the addition of credibility measures explains 10.2 and 21.5 percentage points more, respectively, of the total data variability than the baseline model of Itskhoki and Mukhin (2025). Therefore, these results provide strong evidence for the appearance of credibility-hedging terms in Proposition 2 and therefore their inclusion in the Section 2 model.

3.3 Backus–Smith Residuals

I now turn to testing Proposition 3, which establishes a similar linear relationship between excess bond demand, credibility shocks, and the Backus–Smith residual. In contrast to UIP deviations—which are fundamentally financial—the Backus–Smith residual is squarely on the real side of the economy, involving the real exchange rate and relative real consumption growth rates. Therefore, empirical evidence for Proposition 3

not only supports the model specified in Section 2, but also suggests that credibility hedging is salient for real macroeconomic dynamics.

My regression model is the same as (36), except the left-hand side is the Backus–Smith residual, rather than the UIP deviation. Additionally, this regression is at the quarter level from 2010 Q1 to 2022 Q4, since consumption growth data is only available at this frequency. I calculate the *ex post* Backus–Smith residual as

$$\text{Backus–Smith Residual}_t = 2\left(\Delta c_{t+1} - \Delta c^*_{t+1}\right) - (\Delta \log P^*_{t+1} + \Delta e_{t+1} - \Delta \log P_{t+1}), \quad (39)$$

following (35). For the Ahn, Kim, and Lee (2021) credibility shocks, I take the maximum-magnitude shock over the last four quarters, including the current quarter. Since the shock series ends before the bond demand series does, the regressions that use these shocks end in 2022 Q1, rather than 2022 Q4. For all the other variables in (36), I simply take the end-of-period value from the monthly series.

It is important to note that this regression only has 40 quarterly observations (37 when using the Ahn, Kim, and Lee (2021) shocks), so statistical power is more difficult to achieve than the monthly UIP case. Moreover, the Backus–Smith residual—involving country-level consumption—is much more "aggregate" than UIP deviations. Therefore, I expect any results to be less prominent for these tests than those in the previous section, even if credibility hedging is present.

Table 3 gives the results for the Ahn, Kim, and Lee (2021) credibility shocks. In all the columns, no coefficients are statistically significant except for the GZ excess bond premium, which suggests—in both cases—that a 1 percentage point increase in the premium is associated with a 6.1% rise in the Backus–Smith residual. This may be due to noise trader sentiment, but is likely connected with the fact that a greater GZ premium is associated with lower exuberence in the US economy, and therefore US recession

Table 3. MP Credibility Shocks and Backus–Smith Residuals

	Backus–Smith Residual			
	(1)	(2)	(3)	(4)
Excess Bond Demand	−0.001	−0.001	0.005	0.005
	(0.002)	(0.002)	(0.010)	(0.010)
GZ Excess Bond Premium		0.061**		0.061**
		(0.026)		(0.027)
MP Credibility Shock			0.002	0.001
			(0.003)	(0.003)
CBI Credibility Shock			0.004	0.002
			(0.004)	(0.002)
Constant	−0.012	−0.006	−0.001	−0.003
	(0.011)	(0.011)	(0.018)	(0.017)
R^2	0.010	0.137	0.045	0.174
N	40	40	37	37

Notes. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

status, which increases the Backus–Smith residual by reducing US consumption growth. It is also notable that none of the excess bond demand coefficients are significant, a stark contrast with the UIP results above. As previously mentioned, I expect that this difference arises from the fact that relative interest rates have a direct mechanical relationship with UIP deviations, while the Backus–Smith residual is sufficiently aggregated that carry trades *per se* are not driving variation in practice. This is not necessarily an argument against the role of credibility shocks in the Backus–Smith residual, though, since these shocks would likely impact all international intermediation in the real world.

Indeed, Table 4 tells a different story. When using the EPU indices to proxy for credibility, I find strong evidence that exchange rate uncertainty is associated with elevated Backus–Smith residuals. In Column 3, a 1-point increase in the index is associated with a significant 6.8% increase in the Backus–Smith residual. When the GZ excess bond premium is included in Column 4, this becomes a significant 6.4% increase. The other category-specific EPU indices are not significant. The EPU exchange rate index is a

Table 4. EPU Credibility Shocks and Backus–Smith Residuals

	Backus–Smith Residual			
	(1)	(2)	(3)	(4)
Excess Bond Demand	−0.001	−0.001	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
GZ Excess Bond Premium		0.061**		0.052*
		(0.026)		(0.026)
Exchange Rate Uncertainty			0.068**	0.064**
			(0.031)	(0.029)
Monetary Uncertainty			−0.024	−0.033
			(0.031)	(0.030)
Fiscal Uncertainty			0.003	0.008
			(0.039)	(0.038)
Trade Uncertainty			−0.009	−0.014
			(0.015)	(0.014)
Constant	−0.012	−0.006	−0.026	−0.011
	(0.011)	(0.011)	(0.041)	(0.040)
R^2	0.010	0.137	0.209	0.292
N	40	40	40	40

Notes. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

more targeted measure of foreign-exchange credibility than the Ahn, Kim, and Lee (2021) shocks, which likely explains the discrepancy between these results.

Both in the case of UIP deviations and Backus–Smith residuals, I have found evidence that credibility shocks are measurably associated with the behavior of the real-world economy in the US–South Korea setting. The UIP results support Proposition 2 and therefore validate my incorporation of credibility into the model in Section 2. In addition to appearing on the financial side of the economy, the Backus–Smith results show that—when using the EPU index—foreign-exchange-driven credibility shocks are associated with changes in the real side of the economy, evidencing Proposition 3 and suggesting that credibility shocks may play a salient role in macroeconomic dynamics.

4 General Equilibrium Dynamics

In the previous section, I presented suggestive evidence that credibility shocks play a salient role in exchange rate determination. However, understanding the effect of these shocks on the real economy—say, domestic consumption and investment—requires studying the dynamics of the model from Section 2 in general equilibrium. To do this, I use the sequence-space Jacobian (SSJ) method of Auclert, Bardóczy, Rognlie, and Straub (2021), which allows me to numerically compute the first-order response of economic aggregates (like consumption) to transitory shocks to credibility around a steady-state. In this section, I will summarize the SSJ method, explain its use in solving the model, and present the calculated impulse response functions.

4.1 The Sequence-space Jacobian Method

The sequence-space Jacobian method of Auclert, Bardóczy, Rognlie, and Straub (2021) is based fundamentally on the observation that one can write most macroeconomic models (including the one in Section 2) as a system of nonlinear equations

$$\mathbf{F}(\mathbf{X},\mathbf{Z}) = 0, \tag{40}$$

where $\mathbf{X}$ is an infinite-dimensional matrix (namely, a linear operator) containing the path of all the endogenous variables (e.g., the consumption sequence $\mathbf{C} = \{C_t\}_{t\geq 0}$) for all periods $t \in \{1,2,\ldots\}$, and $\mathbf{Z}$ contains the paths of the exogenous shocks (e.g., the productivity shock series $\mathbf{a} = \{a_t\}_{t\geq 0}$) for all t.

To fix ideas, I present the case of a simple deterministic real business cycle (RBC) model with aggregate labor supply fixed at unity. In the interest of space, and due to the general similarities with the model in Section 2, I describe briefly only the equations

that characterize equilibrium in the model. The Euler equation for the household is $C_t^{-\sigma} = \beta(1+r_{t+1})C_{t+1}^{-\sigma}$ and holds the same intertemporal substitution interpretation as (7) above. Capital evolves according to the standard Solow–Swan law of motion $K_{t+1} = (1-\delta)K_t + I_t$. There is a representative firm with Cobb–Douglass technology $Y_t = e^{a_t}K_t^{\alpha}$, where $\alpha \in [0,1]$ parameterizes the capital share of production, a_t is an exogenous shock that determines productivity, the labor term is suppressed because $L_t = 1$ is fixed for all t. The equilibrium wage and interest rate are pinned down in the standard way by the marginal product of capital and labor: $w_t = (1-\alpha)e^{a_t}K_t^{\alpha}$ and $r_t = \alpha e^{a_t}K_t^{\alpha-1} - \delta$. Finally, I impose clearing in the market for goods by $Y_t = C_t + I_t$.

I can write this RBC model in the form of (40) above by first recognizing the set of endogenous variables $X_t = (C_t, I_t, K_t, Y_t, r_t, w_t)$ and the exogenous variable $Z_t = a_t$ for all $t \geq 0$. Then, our system of nonlinear equations that characterizes equilibrium is

$$F_t(\mathbf{X},\mathbf{Z}) := \begin{pmatrix} C_t^{-\sigma} - \beta(1+r_{t+1})C_{t+1}^{-\sigma} \\ K_{t+1} - (1-\delta)K_t - I_t \\ Y_t - e^{a_t}K_t^{\alpha} \\ w_t - (1-\alpha)e^{a_t}K_t^{\alpha} \\ r_t + \delta - \alpha e^{a_t}K_t^{\alpha-1} \\ Y_t - C_t - I_t \end{pmatrix} = 0, \tag{41}$$

for all $t \geq 0$, and I stack each F_t into the matrix $\mathbf{F}$ in the natural way.

I return, for now, to the general case. To generate the desired impulse response functions, one would like to compute the impact of some shocks to $\mathbf{Z}$ on the endogenous variables in $\mathbf{X}$. In order to tractably handle such computations, one typically begins by truncating the time horizon to, say, $T = 300$, and assumes that $\mathbf{F}$ is invertible about some steady-state $(\mathbf{X}^{ss}, \mathbf{Z}^{ss})$. Using this representation, one can then use the implicit

function theorem to find that the effect of some path of exogenous shocks $d\mathbf{Z}$ on the change in the endogenous variables $d\mathbf{X}$ is

$$d\mathbf{X} = -\mathbf{F}_{\mathbf{X}}^{-1}\mathbf{F}_{\mathbf{Z}}d\mathbf{Z} = \mathbf{G}d\mathbf{Z}, \tag{42}$$

where $\mathbf{F}_{\mathbf{X}}$ and $\mathbf{F}_{\mathbf{Z}}$ are Jacobians—matrices of derivatives—at the steady state, and $\mathbf{G} \coloneqq -\mathbf{F}_{\mathbf{X}}^{-1}\mathbf{F}_{\mathbf{Z}}$ is a linear map from shocks $d\mathbf{Z}$ to aggregates $d\mathbf{X}$.

It is important to remember that (42) only holds exactly for infinitesimal shocks $d\mathbf{Z}$ around the steady state $(\mathbf{X}^{ss}, \mathbf{Z}^{ss})$. This first-order approximation is therefore suitable for sufficiently small shocks, but does not capture nonlinear dynamics like endogenous transitions between steady states; I will return to this issue in Section 5 below.

Having established (42), the challenge lies in calculating the Jacobians $\mathbf{F}_{\mathbf{X}}$ and $\mathbf{F}_{\mathbf{Z}}$. Auclert, Bardóczy, Rognlie, and Straub (2021) develop sophisticated methods for doing so in the particularly complex case of heterogeneous-agent models. But even with the representative-agent model in Section 2, these matrices can be high-dimensional and computationally taxing with standard numerical differentiation techniques.

A first step towards improving efficiency is explicitly solving for some variables in the system $\mathbf{F}(\mathbf{X}, \mathbf{Z}) = 0$ to reduce the number of endogenous variables. I begin by separating $\mathbf{F}$ into $\mathbf{F}^{(1)}$ and $\mathbf{F}^{(2)}$, where $\mathbf{F}^{(2)}(\mathbf{X}, \mathbf{Z}) = 0$ can be solved in closed-form to yield $\mathbf{X}$ as a function of a matrix of fewer unknowns $\mathbf{U}$, given by $\mathbf{X} = \mathbf{M}(\mathbf{U}, \mathbf{Z})$. Then, I can rewrite the system in (40) as the composition

$$\mathbf{H}(\mathbf{U}, \mathbf{Z}) \coloneqq \mathbf{F}^{(1)}(\mathbf{M}(\mathbf{U}, \mathbf{Z}), \mathbf{Z}) = 0. \tag{43}$$

This separated form is helpful because it permits an application of the implicit function theorem that yields the formulae

$$d\mathbf{U} = -\mathbf{H}_{\mathbf{U}}^{-1}\mathbf{H}_{\mathbf{Z}}d\mathbf{Z} \tag{44}$$

$$d\mathbf{X} = \mathbf{M}_{\mathbf{U}}d\mathbf{U} + \mathbf{M}_{\mathbf{Z}}d\mathbf{Z} = \mathbf{G}d\mathbf{Z}. \tag{45}$$

Since $\mathbf{U}$ is a proper subset of the endogenous variables in $\mathbf{X}$, these Jacobians are much smaller than the original $\mathbf{F}_{\mathbf{X}}$ and $\mathbf{F}_{\mathbf{Z}}$, and therefore much easier to compute.

In the simple case of the RBC model, I can separate $\mathbf{F}$ in this way by defining

$$F_t^{(1)}(\mathbf{X},\mathbf{Z}) = C_t^{-\sigma} - \beta(1+r_{t+1})C_{t+1}^{-\sigma} \tag{46}$$

to be the household Euler equation, and $F_t^{(2)}(\mathbf{X},\mathbf{Z})$ as the remaining equations in (41), for all $t \geq 0$. Then, I can solve $\mathbf{F}^{(2)}(\mathbf{X},\mathbf{Z}) = 0$ as a function of $\mathbf{U} = \{K_t\}_{t\geq 0}$ and $\mathbf{Z} = \{a_t\}_{t\geq 0}$ as

$$M_t(\mathbf{U},\mathbf{Z}) = X_t = \begin{pmatrix} C_t \\ I_t \\ K_t \\ Y_t \\ r_t \\ w_t \end{pmatrix} = \begin{pmatrix} e^{a_t}K_t^{\alpha} + (1-\delta)K_t - K_{t+1} \\ K_{t+1} - (1-\delta)K_t \\ K_t \\ e^{a_t}K_t^{\alpha} \\ \alpha e^{a_t}K_t^{\alpha-1} - \delta \\ (1-\alpha)e^{a_t}K_t^{\alpha} \end{pmatrix}, \tag{47}$$

for all t, where I stack each $M_t(\mathbf{U},\mathbf{Z})$ into the matrix $\mathbf{M}(\mathbf{U},\mathbf{Z})$. In this setting, clearly, $\mathbf{H}(\mathbf{U},\mathbf{Z}) \coloneqq \mathbf{F}^{(1)}(\mathbf{M}(\mathbf{U},\mathbf{Z}),\mathbf{Z}) = 0$ characterizes the model equilibrium only in terms of the unknowns $\mathbf{U} = \{K_t\}_{t\geq 0}$, a considerable simplification from the full endogenous state $\mathbf{X}$.

Since $\mathbf{M}(\mathbf{U},\mathbf{Z})$ is purely a function of the sequences $\{K_t\}_{t\geq 0}$ and $\{a_t\}_{t\geq 0}$, computing its Jacobians $\mathbf{M}_{\mathbf{U}}$ and $\mathbf{M}_{\mathbf{Z}}$ is straightforward. Similarly, $\mathbf{H}_{\mathbf{Z}}$ can be computed directly

since $\{a_t\}_{t\geq 0}$ is exogenous. Moreover, the final Jacobian $\mathbf{H_U}$ can be computed more easily using $\mathbf{M}(\mathbf{U},\mathbf{Z})$: Consider calculating the element $[\mathbf{H_U}]_{t,s}$ using the chain rule by

$$[\mathbf{H_U}]_{t,s} = \frac{\partial F_t^{(1)}}{\partial C_s}\frac{\partial C_s}{\partial K_s} + \frac{\partial F_t^{(1)}}{\partial r_{s+1}}\frac{\partial r_{s+1}}{\partial K_s} + \frac{\partial F_t^{(1)}}{\partial C_{s+1}}\frac{\partial C_{s+1}}{\partial K_s}. \tag{48}$$

For each of the three terms in the sum, notice that the first multiplicative term may be obtained directly from $F_t^{(1)}$, and the second corresponds to a derivative of some dimension of (47) for some time (that is, an element of the Jacobian $\mathbf{M_U}$).

This "separation" method can be extended further in the general case. To improve both efficiency and interpretability, Auclert, Bardóczy, Rognlie, and Straub (2021) develop a method in which the model's equilibrium equations are separated into logically-organized "blocks" (e.g., one block might contain all the equations associated with a country's firms) which pass variables to one another according to a directed acyclic graph (DAG). The inputs of the DAG are the unknowns $\mathbf{U}$ and shocks $\mathbf{Z}$, the outputs are the remaining equilibrium conditions $\mathbf{F}^{(1)}$ that have not been substituted out (of which there must be as many as unknowns for the system to be identified), and the nodes represent further separations $\mathbf{F}^{(n)}$. In order to compute $\mathbf{H_U}$, the chain rule is applied using automatic differentiation for each unknown along the DAG, starting from an output equilibrium condition and tracing it back to the unknown input. Essentially, the DAG is just an organized way to depict the function composition encapsulated by (44) above, making the chain rule easier to implement.

A DAG for the RBC model is depicted in Figure 1.[3] To connect this DAG with a separation of $\mathbf{F}$, work backwards. The terminal node of the graph, (or, the "target")

3. DAG representations are not unique. Indeed, the RBC model could be represented by a trivial DAG with only one "firm and household" block, which corresponds to (47) above. It could also be represented by another trivial DAG with each equation in $\mathbf{F}$ corresponding to its own block. An advantage of this flexibility is that one can choose to arrange the DAG in a logical manner, grouping together economically-related equations.

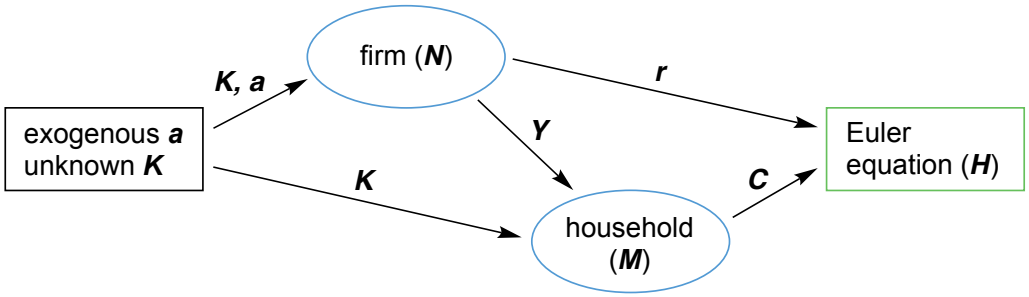

Figure 1. Directed Acyclic Graph (DAG) Representation of the RBC Model

is associated with the function $\mathbf{F}^{(1)}(\mathbf{X},\mathbf{Z})$ containing the household Euler equation, as defined in (46) above. The household block is associated with the separation $\mathbf{F}^{(2)}(\mathbf{X},\mathbf{Z})$ that contains the law of motion of capital and the goods market clearing condition. The firm block associated with another separation $\mathbf{F}^{(3)}(\mathbf{X},\mathbf{Z})$ that contains the production technology and the wage and rental rate equations.

In the first separation above, I created the subset $\mathbf{U}$ of endogenous variables $\mathbf{X}$ to reduce dimensionality. Here, since I have three separations, I create an intermediate subset $\mathbf{V}$ that contains the unknowns in $\mathbf{U}$ but not all the endogenous variables in $\mathbf{X}$. Intuitively, $\mathbf{V}$ represents the variables that may be obtained from $\mathbf{U}$ using only the firm-related equations. In the RBC case, I have that $U_t = K_t$ and $V_t = (K_t, Y_t, r_t, w_t)$ for all $t \geq 0$. Now, in the spirit of (47) above, I solve $\mathbf{F}^{(3)}(\mathbf{X},\mathbf{Z}) = 0$ to obtain $\mathbf{V} = \mathbf{N}(\mathbf{U},\mathbf{Z})$ as

$$N_t(\mathbf{U},\mathbf{Z}) = V_t = \begin{pmatrix} K_t \\ Y_t \\ r_t \\ w_t \end{pmatrix} = \begin{pmatrix} K_t \\ e^{a_t} K_t^{\alpha} \\ \alpha e^{a_t} K_t^{\alpha-1} - \delta \\ (1-\alpha) e^{a_t} K_t^{\alpha} \end{pmatrix}. \tag{49}$$

The fact that $\mathbf{N}$ is a function of $\mathbf{U}$ and $\mathbf{Z}$ is captured by the arrow annotated with the sequences $\mathbf{K}$ and $\mathbf{a}$ in Figure 1 above. Next, I use the post-firm endogenous variables $\mathbf{V}$

to solve $\mathbf{F}^{(2)}(\mathbf{X},\mathbf{Z})=0$ and obtain the full set of endogenous variables $\mathbf{X}=\mathbf{M}(\mathbf{V},\mathbf{Z})$ as

$$M_t(\mathbf{V},\mathbf{Z})=X_t=\begin{pmatrix} C_t \\ I_t \\ K_t \\ Y_t \\ r_t \\ w_t \end{pmatrix}=\begin{pmatrix} Y_t+(1-\delta)K_t-K_{t+1} \\ K_{t+1}-(1-\delta)K_t \\ K_t \\ Y_t \\ r_t \\ w_t \end{pmatrix}. \tag{50}$$

The novel dimensions of $\mathbf{M}$ are a function of $\mathbf{K}$, from the unknowns $\mathbf{U}$, and $\mathbf{Y}$, from the firm block; hence, the arrows from the respective sources in Figure 1. Finally, with these two substitutions, equilibrium is characterized by the system

$$\mathbf{H}(\mathbf{U},\mathbf{Z}) \coloneqq \mathbf{F}^{(1)}(\mathbf{M}(\mathbf{N}(\mathbf{U},\mathbf{Z}),\mathbf{Z}),\mathbf{Z})=0. \tag{51}$$

In the DAG in Figure 1, the Euler equation is labeled with $\mathbf{H}$ because, along the DAG, it is solely a function of the unknown $\mathbf{K}$ and exogenous variable $\mathbf{a}$. Just as in the first substitution, the function composition that defines $\mathbf{H}$ facilitates easy application of the chain rule to compute $\mathbf{H_U}$ using the Jacobians $\mathbf{M_V}$ and $\mathbf{N_U}$. The key advantage of this DAG approach is that it allows for variable substitution in an intuitive and easily-implementable manner.

To conclude the general case, after numerically computing $\mathbf{H_U}$, $\mathbf{H_Z}$, $\mathbf{M_U}$, and $\mathbf{M_Z}$ using the DAG method, one needs only specify the shock path $d\mathbf{Z}$ to then compute the response of aggregate sequences $d\mathbf{X}$ using the linear map $\mathbf{G}$ from (42). After constructing a DAG for the model from Section 2, I calculate such impulse responses in the next section.

4.2 Modeling in the Sequence-space

In line with the method described above, the first step in using the SSJ method to solve the model in Section 2 is specifying a suitable DAG representation.

Before I do this, though, I make several small modifications to the model to simplify computations. Most significantly, I remove persistence in the Taylor rule in (22), instead introducing a natural rate of interest R^n:

$$i_t = i_t^n + \phi_\pi \pi_t + \sigma_m \varepsilon_t^m, \tag{52}$$

where $i_t^n = \log R_t^n$. The foreign Taylor rule is simplified analogously. This helps calculate the steady state of the model because it decouples current interest rates from all the previous values of the sequence. This does change the persistence of, say, interest rates in the model, but will not affect the broader shape of the dynamics explained below. Moreover, notice that the modified Taylor rule in (52) lacks the weight on exchange rate stabilization that was originally present in (22). This is another simplifying assumption, because it allows me to isolate the case in which both countries operate using floating exchange rate regimes. Therefore, none of the dynamics below are a result of foreign exchange regime differences—only shocks to credibility hedging.

Another modification is the exclusion of noise traders. In the model in Section 2, noise traders exist to generate empirically plausible variation in carry trade returns. Because the SSJ method focuses on dynamics around a steady state, this variation is superfluous. Therefore, I do not include noise traders in the DAG, and I modify the asset market clearing conditions from (30) to $D_t + B_t = 0$ and $D_t^* + B_t^* = 0$ accordingly.

I finally modify the credibility hedging term $2q_{s,-s}\eta(s,-s)$ in the portfolio choice equation (28) to a standard shock term η_t, and assume that the mass of arbitrageurs is

$m = 1$, so that

$$\frac{D^*_{t+1}}{P^*_t} = -\frac{i_t - i^*_t - E_t \Delta e_{t+1} - \eta_t}{\sigma^2_e}. \tag{53}$$

Underlying this choice is the assumption that the economy is usually in the normal state $S_t = 1$ with $2q_{1,2}\eta(1,2)$ as the steady-state hedging term. Then, a transition to $S_t = 2$ (and then quickly back to $S_t = 1$) can be proxied by a transitory shock to the single parameter η_t. I also excise the numerator variance and covariance terms, as I did in Section 3 since there is no exchange rate nor price level volatility in a steady state equilibrium.

I now turn to describing the DAG for the Section 2 model. There are 10 unknowns: the capital stocks K and K^*, the labor supplies L and L^*, the intermediate good supplies X and X^*, the natural rates of interest R^n and R^{n*}, the exchange rate $\mathcal{E}$, and the domestic price level P. Note that I fix the foreign price level to be $P^*_t = 1$ for all t as the numeraire. I target as outputs the foreign and domestic consumption Euler equations, capital Euler equations, country budget constraints, price conditions, and goods market clearing. Asset market clearing is implicit. Each country has a firm, household, and Taylor rule block, and an arbitrageur block contains the relevant portfolio choice. An extensive description of the equations in each DAG block is given in Appendix B.2.

I calibrate the model following Itskhoki and Mukhin (2025) where applicable, with the parameter values given in Table 5. Note that I choose the steady-state credibility hedging term to be $\eta = 0.001$, corresponding to a 10 basis point premium for being long on domestic bonds. This represents the case in which domestic steady-state credibility is not perfect, but also not severely impaired—corresponding to the South Korean case.

With the DAG specified, I use a Julia-ported version of the software provided in Auclert, Bardóczy, Rognlie, and Straub (2021) to proceed with the analysis. Detailed notes on this software and the model's implementation are provided in Appendix B.1. With this software, I first use a nonlinear equation solver along the DAG to compute a

Table 5. Calibrated Parameters and Steady-state Shock Values for the SSJ Method

Variable	Description	Value
Parameters:		
β	discount factor	0.99
σ	inverse elasticity of intertemporal substitution	2.0
ν	Frisch elasticity of labor supply	1.0
γ	openness of the economy	0.035
ϕ	intermediate share of production	0.5
ϑ	capital share of production	0.3
δ	depreciation rate	0.02
θ	home–foreign good elasticity of substitution	1.5
ρ_m	persistence of interest rates	0.95
ϕ_m	reaction to inflation	2.15
σ_m	Taylor rule shock sensitivity	0.0
σ_e	exchange rate volatility	1.0
κ	capital adjustment parameter	10.0
Steady-state Shocks:		
a	home productivity shock	0.0
a^*	foreign productivity shock	0.0
ξ	home taste shock	0.0
ξ^*	foreign taste shock	0.0
ε^m	home Taylor rule shock	0.0
ε^{m*}	foreign Taylor rule shock	0.0
η	credibility shock	0.001

steady-state of the model. Then, around this steady-state, I automatically differentiate along the DAG to obtain the Jacobians described in Section 4.1 above and calculate the linear impulse map **G**.

4.3 Impulse Responses to Credibility Shocks

Having obtained the linear map **G** about a steady state, I now return to the original question that motivated this section: How do credibility shocks affect macroeconomic dynamics in equilibrium? We consider three possible shocks: $d\eta_t^n$ for $n \in \{1,2,3\}$ and

$t \in \{0, 1, \ldots, 300\}$ is defined to be a deterministic $AR(1)$ process $d\eta_t^n = \rho\, d\eta_{t-1}^n$ where the persistence is $\rho = 0.8$ and the size of the shocks are $d\eta_0^1 = 0.0001$, $d\eta_0^2 = 0.0002$, and $d\eta_0^3 = 0.0003$. Since the steady-state level of η is 0.001, these three processes represent negative domestic central back credibility shocks of 10%, 20%, and 30% above the steady state. I plot these three shocks in the first panel of Figure 2.

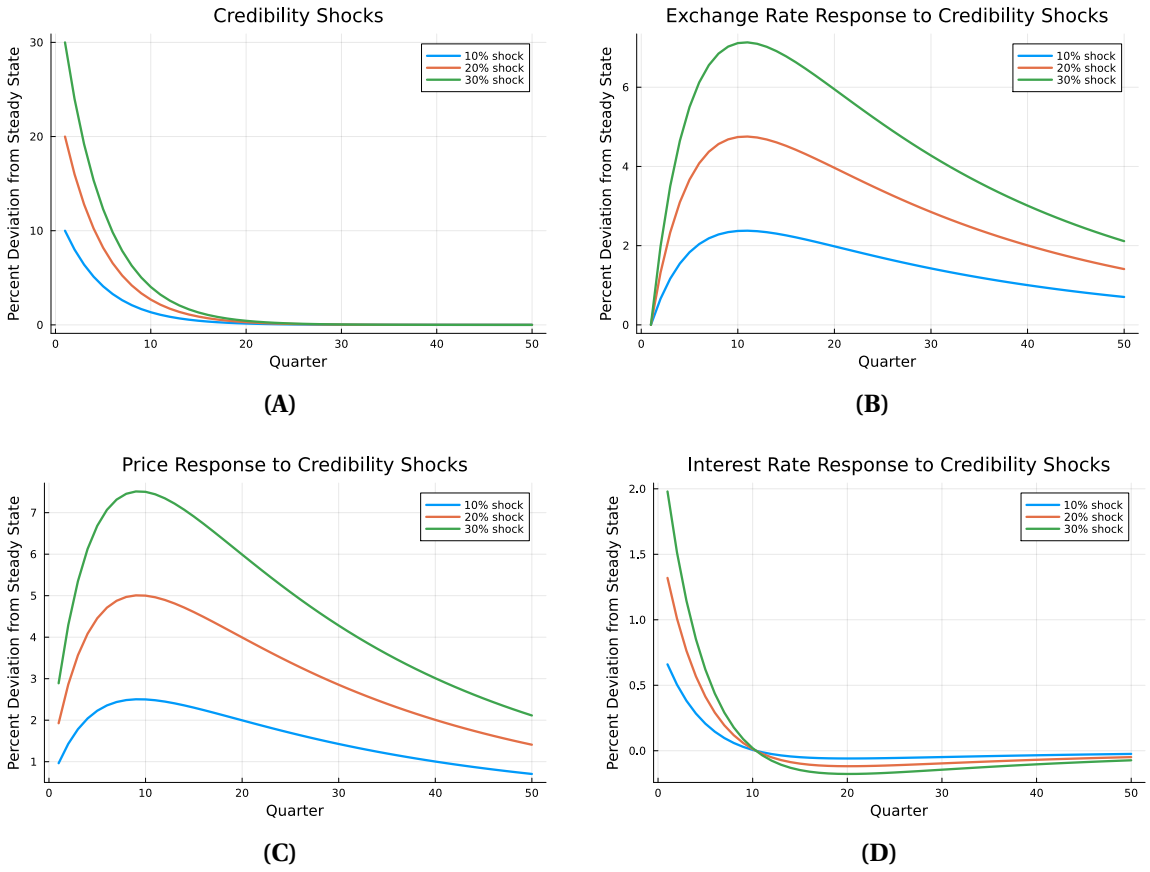

Figure 2. Impulse Responses to Credibility Shocks: Shocks and Prices

I now follow (42) to calculate $d\mathbf{X} = \mathbf{G} d\mathbf{Z}^n$, where $d\mathbf{Z}^n$ includes $d\eta^n$, to obtain the impulse response functions (IRFs) for all the endogenous variables. I present the IRF for the exchange rate $\mathcal{E}_t$, representing the number of domestic currency units per unit of foreign currency, in the second panel of Figure 2. Credibility shocks induce large and persistent depreciations of the domestic currency, with peaks ranging from about 2%

to 7%, and with significant impacts lasting years. This is an expected result: Credibility shocks cause arbitrageurs to unwind long domestic bond positions, reducing domestic currency demand and thus the value of the currency. In turn, the third panel of Figure 2 shows the IRF for the domestic price level. Inflation rises in response to credibility shocks, with the domestic price level increasing by about 2% to 7% over two years, depending on the size of the shock. Indeed, as the exchange rate depreciates, the price level adjusts to help maintain domestic economic competitiveness. Finally, the last panel of Figure 2 shows the IRF for domestic interest rates, which immediately rise between about 0.5% and 2%, depending on the shock, then return to equilibrium within two years. Naturally, as arbitrageurs flee domestic bonds in response to credibility shocks, this raises domestic real borrowing costs.

Figure 3 shows the impulse response functions for domestic firm-related aggregates. The first panel shows that domestic output increases substantially over the following two to three years, with peaks between about 1% and 3%. As the exchange rate depreciates, domestic goods become relatively cheaper for foreign consumers, leading to a jump in output from domestic firms. This recalls the standard motivation for government-driven currency depreciation: improving national competitiveness. This increase in output does not come from capital or labor, though, as the second and third panels of Figure 3 show. The capital stock immediately declines by between 3% and 12.5%, reflecting heightened borrowing costs, and the labor supply declines by between 0.5% and 2% over the next two years, as consumers scale back spending (which I will show below). Instead, the gap is made up with intermediate inputs—shown in the fourth panel of Figure 3—which grow between 3% and 11% over the next two years as domestic inflation cheapens these intermediate goods.

Finally, Figure 4 shows the impulse response functions for domestic and foreign spending and investment. In the first panel, I show that domestic consumption imme-

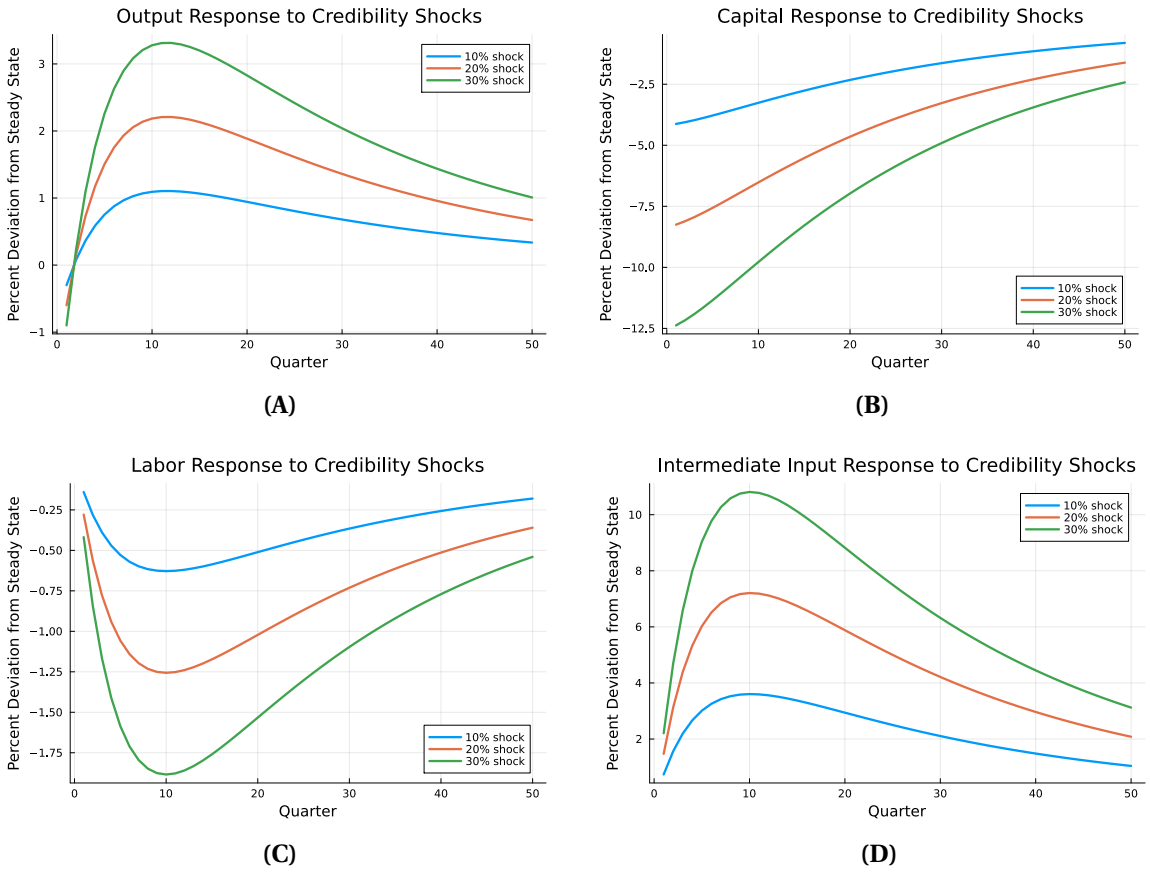

Figure 3. Impulse Responses to Credibility Shocks: Domestic Firms

diately decreases by between 0.5% and 1.5%, depending on the shock, with significant persistence for two years. As the exchange rate depreciates, foreign goods become more expensive and—since consumers prefer a diversified consumption of home and foreign goods—they scale back their consumption. Interestingly, the second panel of Figure 4 shows that foreign consumption also decreases, albeit at most by 0.035%. Indeed, foreign consumers are hurt by the decline in international risk-sharing induced by the credibility shock. Also, despite domestic goods being cheaper due to depreciation, much of this benefit is undone by domestic inflation. Both of these channels, though, are tempered by the low openness of each economy to trade. In the third panel of Figure 4, we see that domestic investment rises substantially by between 2% and 6%

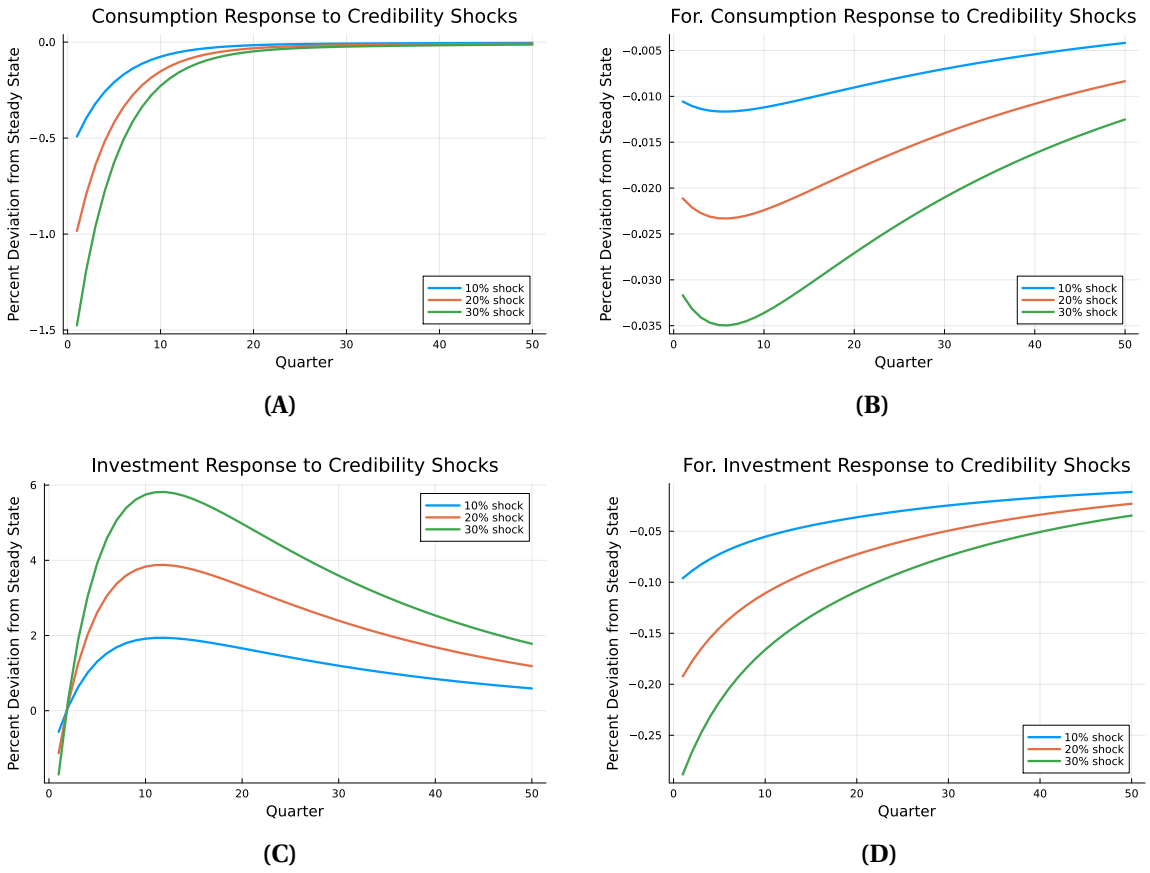

Figure 4. Impulse Responses to Credibility Shocks: Consumption and Investment

over two years, reflecting increased borrowing costs and curtailed spending. Likewise, the fourth panel shows that foreign investment decreases marginally, by between 0.1% and 0.25%, as foreign households are hit by reduced asset market completeness.

In summary, I have shown that negative shocks to domestic central bank credibility have persistent deleterious effects on the domestic real economy in general equilibrium. These shocks reduce consumer spending, drive increases in inflation and exchange rate depreciation, and raise borrowing costs. They do temporarily improve the competitiveness of domestic firms—raising output—but much of this rise comes from increases in the use of intermediate inputs. Therefore, the Section 2 model provides a clear

picture of the importance of domestic central bank credibility both in exchange rate determination and macroeconomic dynamics.

5 Conclusion

In this thesis, I have shown that central bank credibility plays a significant theoretical and empirical role in exchange rate determination and macroeconomic dynamics.

In Section 2, I developed an open-economy model that features credibility risk through a novel jump-diffusion process for the carry trade return. I proved that arbitrageurs take this credibility risk into account when deciding their portfolio, hedging against the risk of domestic depreciation with reduced long positions in domestic bonds. I then showed that this hedging behavior translates into measurable relationships with uncovered interest parity (UIP) deviations and changes to Backus–Smith residuals, respectively on the financial and real sides of the economy.

I examined these relationships empirically in Section 3, considering the case of the United States and South Korea. Using two different measures of credibility risk—one derived from high-frequency market reactions to South Korean central bank announcements, the other from text-based analysis of South Korean newspaper articles—I showed that UIP deviations rise significantly with recent contractionary credibility shocks, specifically those pertaining to foreign exchange policy. I also showed that credibility shocks propagate to the real side of the economy, finding that Backus–Smith residuals show significant increases when South Korean newspapers mention exchange-rate policy uncertainty more often. These empirical findings strongly support the inclusion of credibility shocks in the model, and lend credence to its policy implications.

Finally, I explored the macroeconomic consequences of credibility shocks in general equilibrium in Section 4. Applying the sequence-space Jacobian method of Auclert,

Bardóczy, Rognlie, and Straub (2021) to the Section 2 model, I calculated the impulse response functions for aggregate sequences in response to transitory shocks to credibility. I showed that negative credibility shocks have harmful and persistent macroeconomic effects. In particular, these shocks reduce consumer spending, drive increases in inflation and exchange rate depreciation, and raise borrowing costs.

These results highlight the importance of arbitrageurs and other intermediaries in exchange-rate and macroeconomic dynamics when central bank credibility is imperfect. Indeed, they suggest that countries with less credible central banks are punished by arbitrageurs and suffer economically as a result. Naturally, a policy implication of this finding is that central banks would be wise to improve their credibility—this is not surprising. Interestingly, though, the fact that this channel occurs through financial intermediaries suggests that macro-prudential regulation may serve as an effective tool for shaping exchange rates and absorbing macroeconomic volatility. Capital controls could be effective policy instruments for the same reason. More work is needed to weigh the costs and benefits of these policies when trying to control arbitrageur hedging.

There are several other future directions for this research: First, the sequence-space Jacobian method used in Section 4 is limited in that the impulse response functions are linear approximations of the true nonlinear responses around the steady state. This has the important consequence that the economy is guaranteed to return to the original steady state when faced with credibility shocks. In practice, though, large shocks could endogenously force the economy to transition between different steady-state equilibria. To capture these dynamics, one could use the deep-learning-based global solution method of Azinovic, Gaegauf, and Scheidegger (2022) to solve for functional rational expectations equilibria of the model that permit nonlinear transitions. Using these solutions, one could show that sufficiently large shocks to domestic central bank credibility cause the economy to transition between equilibria, with paths that depend on the

specific shock and economic conditions. This result would suggest that the presence of financial intermediaries can create a "credibility trap," within which the intermediary-mediated exchange rate stabilization proposed in Itskhoki and Mukhin (2025) fails to hold. This notably aligns with the experience of emerging-market economies with poor credibility, whose exchange-rate regime has more direct bearing on real macroeconomic volatility than in the advanced economies that the Mussa (1986) puzzle concerns.

One could also use the model in Section 2 to investigate how credibility impacts the optimal exchange rate regime. Since I find that intermediary risk-sharing decreases in credibility risk, I hypothesize that the optimality of a peg will also decrease in this risk. To answer this question, one could combine the model with two central banks that each solve a modified Ramsey problem of optimizing social welfare under commitment. This would depart from a traditional Ramsey problem, since the central banks can control their deviation rate up to some country-specific floor—representing credibility factors that are outside the bank's control, like a lack of independence. One could then find the general equilibrium solution of a log-linear approximation around the steady state in the state-space, and use it to analyze the welfare dynamics of credibility and find the optimal exchange rate policy. This result could be contrasted with the perfect-credibility policy of Itskhoki and Mukhin (2023).

Finally, one could estimate the quantitative impact of credibility on risk-sharing and optimal policy. The results in Sections 2 and 4 suggest that financially sophisticated countries with weak central banks will be able to reduce both exchange rate and output volatility by improving credibility. One could test this claim by estimating the model in the US–South Korea setting using Bayesian methods, following Herbst and Schorfheide (2016). In addition to standard macroeconomic aggregates, one could use data on foreign exchange options—a type of financial derivative that can be used to insure against large movements in the exchange rate—to discipline the equilibrium rate of

deviation. Specifically, one could follow Brunnermeier, Nagel, and Pedersen (2008) by using risk reversals to quantify skew. These results would allow the measurement of each central bank's credibility, and thus the policy trade-off that each suffers as a result of imperfect commitment.

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Appendices

A Data Sources

In this appendix, I give specific sources for the macroeconomic data series I use in Section 3. The shocks from Ahn, Kim, and Lee (2021) were obtained by request from the authors. The South Korean EPU indices from Cho and Kim (2023) are available—and frequently updated—at "https://www.policyuncertainty.com/korea_chokim.html." Finally, the updated Gilchrist and Zakrajšek (2012) excess bond premium is available at "https://doi.org/10.17016/2380-7172.1836."

Consumption Growth. Data for US and South Korean real consumption growth was obtained from the OECD Quarterly National Accounts. The table ID was "T0102", and I used observations tagged with "Final consumption expenditure" for "Households and non-profit institutions serving households (NPISH)." The transformation was "Growth rate, period on period."

Consumer Prices. The monthly US consumer price index was obtained from the Bureau of Labor Statistics, by way of FRED. The FRED code was "CPIAUCSL." Quarterly percent changes in consumer prices were obtained from the IMF's "CPI" table. The expenditure category was "All items" and the transformation was "Period average, Period-over-period percent change."

South Korean Bond Supply. The monthly supply of South Korean government bonds was obtained from the South Korean Ministry of Economy and Finance. The table was "Outstanding Vol. by Bond Line" at "https://ktb.moef.go.kr/eng/avDyTrVol.do" under the "Gov't" heading.

Exchange Rates. The end-of-period quarterly and monthly dollar–won exchange rate was obtained from the IMF's "ER" table. The indicator was "Domestic currency per US dollar" and the transformation was "End-of-period."

Interest Rates. Data for monthly US and South Korean short-term interest rates were obtained from the OECD's "Key short-term economic indicators" table. The measure was "Short-term interest rates" with code "IR3TIB."

B Sequence-space Jacobian Technical Details

B.1 Implementation

All computations in Section 4 that use the Sequence-space Jacobian (SSJ) method of Auclert, Bardóczy, Rognlie, and Straub (2021) were implemented using the "SSJ.jl" Julia package that I developed as an intern at the Federal Reserve Bank of New York with Elena Elbarmi (elbarmi@uchicago.edu), Nikhil Kumar (kumarnik@sas.upenn.edu), and Elizabeth Wright (elwright@mit.edu). This package is a one-to-one Julia port of the "sequence-jacobian" Python package that Auclert, Bardóczy, Rognlie, and Straub (2021) provide with their paper. Our Julia package is not currently publicly available (although it is entirely non-confidential), but a version of the program is included in this paper's replication package.

In brief, SSJ.jl requires a user to specify a directed acyclic graph (DAG) representation of a model via individual blocks, which are implemented as Julia functions. The program can then assemble and arrange the DAG automatically. With the DAG in hand, the program can calculate steady states of the model using a built-in nonlinear equation solver, then form the impulse linear map $\mathbf{G}$ from (42) using automatic differentiation along the DAG. Then, one can generate impulse responses by simply specifying a shock

sequence and multiplying it by **G**. For specific implementation details, I encourage the reader to refer to the package in the replication files itself, or the documentation of Auclert, Bardóczy, Rognlie, and Straub (2021) that accompanies their Python package.

B.2 DAG Representation

In this appendix, I describe in detail the blocks associated with the directed acyclic graph (DAG) representation of the model in Section 2 that I use to form the impulse responses given in Section 4. As I explain in Appendix B.1, it suffices to only specify these blocks, since the program used for computation automatically arranges the DAG in the correct order, with the correct connections. Additionally, the DAG for the Section 2 model is too complicated to easily graphically depict, so this choice simplifies the presentation. That said, the order in which I present the blocks is a topological sorting of the DAG—from which the DAG order itself naturally follows.

It is also important to note that, in practice, I specify the model largely using the logarithms of state variables to force quantities like the capital stock and consumption to be positive—this helps the nonlinear equation solver when computing the steady state. Here, I do not present these log transformations for the sake of simplicity; the underlying model and DAG structure is identical in either case. Additionally, in cases when there are analogous domestic and foreign blocks, I present only the domestic block here for conciseness.

Unknown and Exogenous Variables. The set of 10 unknowns for the DAG is the gross capital stocks K and K^*, the labor supplies L and L^*, the intermediate good supplies X and X^*, the natural rates of interest R^n and R^{n*}, the exchange rate $\mathcal{E}$, and the domestic price level P. The exogenous variables are given in Table 5.

Taylor Rule. This block takes as inputs the natural rate of interest R^n and price level P, and outputs the interest rate R. The Taylor rule used to calculate the interest rate is a simplified version of (22) with no persistence and a sole focus on monetary policy, given in (52) above. The foreign Taylor rule block is analogous.

Arbitrageurs. This block takes as inputs the domestic and foreign interest rates R and R^*, the exchange rate $\mathcal{E}$, and the foreign price level P^*. It outputs the portfolio choices D and D^*. It calculates these positions using the SSJ-modified portfolio choice (53) that arises from Proposition 1.

Firms. This block takes as inputs the gross capital stock K, the labor supply L, the supply of intermediate inputs X, the exchange rate $\mathcal{E}$, and the price level P. It outputs the output Y, the rental rate R^K, the wage W, the domestic good price levels P_H and P_H^*, the profit Π, and the marginal cost MC. The block calculates output using the technology in (17). It calculates the rental rate and wage using (18). It calculates the marginal cost using (19). The price levels are calculated using (21). Profits are derived from (20) using the price levels as

$$\Pi_t = \frac{MC_t}{\theta - 1} Y_t. \tag{54}$$

The foreign firm block is analogous.

Households. This block takes as inputs the gross capital stock K, the labor supply L, the rental rate R^K, the wage W, the firm profits Π, the price level P, the domestic home good price P_H, the domestic foreign good price P_F, and the interest rate R. It outputs the consumption C, the investment I, and the consumption of home and foreign goods C_H and C_F. The block calculates consumption using the equilibrium condition (6). It calculates investment using the law of motion (4). It calculates the consumption of

home and foreign goods using the demand schedules in (12). The foreign household block is analogous.

Market Clearing. The market clearing block takes as inputs the full set of endogenous variables that I have computed above. Its outputs reflect goods market clearing, the consumption and capital Euler equations, the country budget constraint, and the price index condition. Asset market clearing is implicit, since I use the fact that bonds are in zero net supply from (30) and noise traders are absent to find that $B_t = -D_t$. The block calculates goods market clearing by combining the condition $Y_t = Y_{Ht} + Y^*_{Ht}$ with the conditions (23) and (24). It calculates the consumption Euler equation using (7) and the capital Euler equation using (8). The country budget constraint is obtained using (25). Finally, the price index condition is from (13), divided by the price level P to help with convergence. The foreign market clearing block is analogous.