Optimal Sovereign Debt Structure: Evidence and Theory*

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Abstract

We document that emerging market sovereigns have increased leverage while shifting toward local-currency borrowing, alongside a pronounced shortening of maturities. In contrast, advanced economies exhibit neither trend and fund almost exclusively in local currency. We rationalize these patterns with a model in which a sovereign without commitment jointly chooses debt currency and maturity, trading off inflation distortions, rollover risk, and currency mismatch. Higher local-currency leverage, weaker institutions, and greater foreign participation in local-currency markets tilt sovereigns toward shorter maturities, heightening exposure to rollover crises. When commitment frictions are severe, sovereigns rely on foreign-currency debt instead. Using novel granular bond-level data and plausibly exogenous capital flow shocks, we find strong empirical support.

KEYWORDS: sovereign debt, maturity structure, rollover risk.
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1. Introduction

Historically, emerging-market sovereign debt has been issued predominantly in foreign currency (FC), such as the U.S. dollar. In recent years, however, an increasing share has been denominated in local currency (LC) (Du and Schreger, 2022; Onen, Shin, and Peter, 2023; Bertaut, Bruno, and Shin, 2025). While this development mitigates traditional currency mismatch, which Eichengreen and Hausmann (1999) famously termed the *original sin*, it raises a number of fundamental questions about sovereign debt choices in emerging economies. What drives the choice between FC and LC debt? How do currency denomination and maturity interact? And what new risks arise when sovereigns borrow in their own currency?

This paper addresses these questions. We first document a set of stylized facts on the evolution of sovereign debt structure in emerging markets (EMs) and advanced economies (AEs). To this end, we construct a novel, granular dataset of sovereign bond issuances from 2013 to 2024, spanning 23 EMs and nine AEs, comprising more than 9,000 local-currency bonds and covering, on average, more than 80% of each country's total government debt. Using detailed information on issuance amounts, coupon frequencies, and maturity dates, we build each country's sovereign debt maturity structure. We show that sovereign leverage in EMs has expanded, driven almost entirely by LC issuance, with the average general government debt-to-GDP surging from 27.6% to 45.6% over our sample period. In contrast, AEs exhibit no comparable trend. Their average general government debt-to-GDP ratio stood at 57.5% in 2013 and 57.4% in 2024—essentially unchanged over the sample period (see Figure 1).

We next document that, while AEs display an increase in the average maturity of LC bonds followed by relative stability, EMs have experienced a pronounced shortening of LC maturities, from 9.06 years in 2013 to 6.98 years in 2024, a decline of 22.96%. Finally, we observe that several EMs have experienced rising exposure to rollover risk: average LC bond maturities have declined, coinciding with an increase in the fraction of bonds maturing within one year. For example, in Chile, the average LC bond maturity fell from 12.74 years in 2013 to 9.88 years in 2024, while the share of bonds maturing within one year rose from 0.62% to 3.38%. By contrast, rollover-risk exposure in AEs is substantially smaller and has remained largely stable.

To interpret these patterns, we develop a model in which a sovereign lacking commitment jointly chooses the currency denomination and maturity of its debt. At the core of the model is a trilemma. LC debt avoids exchange-rate risk but creates an ex-post incentive to dilute nominal liabilities through inflation. FC debt eliminates this

inflation problem but exposes the sovereign to default risk when the domestic currency depreciates. Maturity choice provides a third margin: issuing short-term debt disciplines inflation, by forcing the sovereign to return to the market frequently, but introduces exposure to self-fulfilling rollover crises. The sovereign's optimal debt structure therefore reflects a trade-off between inflation distortions, rollover risk, and currency mismatch.

The key insight of the model is that maturity can act as an endogenous commitment device. When institutional credibility is weak or when a large share of LC debt is held by foreign investors, the sovereign has strong ex-post incentives to inflate. In such environments, long-term LC debt becomes difficult to sustain because investors anticipate future dilution. Short-term LC debt partially mitigates this problem by limiting the horizon over which inflation can dilute the debt claims, thereby reducing the equilibrium distortion. However, this comes at the cost of exposing the sovereign to refinancing risk at an interim date. As a result, highly leveraged and low-credibility sovereigns are endogenously pushed toward short maturities.

This mechanism generates a funding pecking order. Sovereigns with strong institutions optimally issue long-term LC debt, as inflation incentives are weak. Sovereigns with weaker institutions or higher leverage sustain LC debt only at shorter maturities, which discipline inflation at the cost of rollover exposure. For sovereigns with sufficiently severe commitment frictions, even short maturities cannot restore credibility at acceptable cost, and FC debt is optimal as a hard commitment device. The model therefore provides the first unified framework linking institutional quality, leverage, currency denomination, and maturity structure.

The model delivers several sharp theoretical predictions. First, higher LC leverage, weaker institutions, and greater foreign participation in LC debt all compress LC maturities, thereby increasing exposure to rollover crises. Second, sovereigns with higher inflation rates tend to have greater exposure to rollover risk, and this exposure is associated with wider CDS spreads. Third, increases in rollover risk—such as those induced by capital-flow shocks—amplify real and financial effects in countries with high exposure to rollover risk, with these effects concentrated at the short end of the yield curve. Fourth, AEs with strong institutions issue predominantly long-term LC debt and are consequently insulated from these dynamics.

The intuition behind these predictions is as follows. Higher LC leverage, weaker institutions, and greater foreign ownership each strengthen the sovereign's ex-post incentive to dilute LC debt through inflation, forcing it to shorten maturities as a commitment device at the cost of greater refinancing vulnerability. Because frequent refinancing exposes the sovereign to interim market conditions, the sovereigns least

able to commit to low inflation are precisely those that must refinance most often, and investors price this vulnerability in wider spreads even absent external shocks. When large amounts of debt come due in the near term, a capital-flow shock forces the sovereign to refinance a greater fraction of outstanding debt under adverse conditions, amplifying borrowing costs and financial stress at short maturities where the refinancing constraint binds. Finally, strong institutional credibility allows the sovereign to commit credibly to low inflation on long-term debt, eliminating the need to shorten maturities and thereby avoiding rollover risk altogether.

Bringing the predictions of the model to the data, we first investigate the baseline determinants of sovereign debt composition. To measure institutional quality, we use the first principal component of the six World Bank Worldwide Governance Indicators, a comprehensive, standardized measure of a sovereign's institutional commitment. We find that an improvement in institutional quality is associated with a statistically significant increase in both the LC debt-to-GDP ratio and average LC maturities. These results are consistent with the funding pecking order established in our model: sovereigns with weaker institutions sustain LC debt only at shorter maturities—if at all—and rely more heavily on FC debt as the harder commitment device.

We next test the prediction that a higher fraction of LC debt held by foreign investors exacerbates dilution risk, thereby pushing the sovereign toward shorter maturities. We show that both foreign and domestic LC debt ownership are negatively associated with average LC maturities: as the government expands its debt, the temptation to dilute rises with the amount at stake, and the sovereign shortens maturities as a commitment device. More importantly, however, the coefficient on foreign ownership is substantially more negative than the coefficient on domestic ownership (nearly three times as large in magnitude). This asymmetry suggests that while EMs successfully transitioned toward LC borrowing, heavy foreign participation transformed traditional currency mismatch into shorter maturities and greater exposure to rollover risk.

We next examine model implications regarding exposure to rollover risk directly. We show that higher LC leverage, weaker institutional quality, and greater foreign ownership are associated with higher exposure to rollover risk, proxied by the amount of bonds maturing within one year relative to GDP. We also find that sovereigns with higher inflation rates carry more debt coming due in the near term, and that a one standard deviation increase in this exposure is associated with approximately 7.6% wider CDS spreads. Thus, even in the absence of external market stress, investors price the commitment problem embedded in a sovereign's maturity structure.

We then turn to shocks to rollover risk themselves. Because rollover risk rises when part of the investor base withdraws, we use capital outflows from LC sovereign bond markets as a proxy for such shocks, measured by the flows implied by the rebalancings (FIR) of the J.P. Morgan Government Bond Index–EMs (GBI-EM) Global Diversified benchmark. The index caps country weights at 10%, so its mechanical monthly rebalancings shift foreign holdings across countries for reasons unrelated to fundamentals.[1] We find that a one standard deviation increase in FIR leads to a 2.87% exchange rate appreciation over a quarter, rising to 3.62% in countries with high rollover-risk exposure—an amplification of about 26%—and that CDS spreads decline more than twice as much in these countries. The effects are also much stronger at the short end of the yield curve: short-term bond yields fall by 0.62 percentage points on average, with an additional decline of 0.17 percentage points—an amplification of 28%—in countries with a high fraction of bonds maturing within one year, whereas long-term yields show no statistically significant response, and five-year CDS spreads decline significantly while ten-year spreads do not. This concentration at short maturities is consistent with the shocks operating through an increase in rollover risk.

Finally, AE maturity profiles have remained stable or even lengthened over our sample period, and we find little evidence that rollover-risk exposure amplifies the response of AE CDS spreads to external shocks. These results are also consistent with our theory: sovereigns with highly credible institutions face only a weak temptation to dilute, sustain long-term LC debt, and are therefore insulated from rollover-risk amplification.

The rest of the paper proceeds as follows. Section 2 reviews the literature. Section 3 describes the data and presents stylized facts. Section 4 introduces the model. Section 5 reports the empirical results. Section 6 concludes. Details on data construction, variable definitions, and robustness tests are provided in the Appendices.

2. Related Literature

This paper relates to several strands of literature. The first applies a corporate finance perspective to sovereign finance. Specifically, Bolton (2016) and Bolton and Huang (2018) model fiat currency as sovereign equity, demonstrating that a nation's optimal capital structure is determined by trading off the dilution costs of inflation against the deadweight costs of sovereign default on FC debt. Our model extends

[1] In the Appendix, we also use fluctuations in the Broad Dollar Index (BDI) and high-frequency U.S. monetary policy shocks to capture outflow shocks and find similar results.

the sovereign's capital structure decision beyond the currency composition of its liabilities to formally incorporate their maturity structure.

We contribute to the foundational macroeconomic literature on the time inconsistency of sovereign debt and the endogenous determination of maturity structures. A long-standing theoretical literature highlights the sovereign's ex-post temptation to dilute the real value of nominal, LC debt via inflation, and the necessity of compressing maturities to maintain credibility as debt burdens rise (Calvo, 1988; Missale and Blanchard, 1994). Subsequent work demonstrates that issuing short-term debt can act as an endogenous commitment device to discipline the sovereign and mitigate this dilution risk (Jeanne, 2009; Arellano and Ramanarayanan, 2012; Broner, Lorenzoni, and Schmukler, 2013; Aguiar and Amador, 2014). We provide the first unified framework that simultaneously endogenizes sovereign debt currency and maturity choices in the presence of inflation moral hazard, rollover risk, and exchange rate risk. We also demonstrate how this joint optimal choice depends critically on structural drivers such as LC leverage, institutional quality, and vulnerability to self-fulfilling rollover crises.

We relate to the literature analyzing the currency composition of sovereign debt in EMs. Seminal contributions by Eichengreen and Hausmann (1999) and Eichengreen, Hausmann, and Panizza (2005) introduced the concept of *original sin*, referring to EMs' historical inability to issue bonds denominated in their domestic currencies. Tirole (2003) revisits the *original sin* debate, demonstrating how dual-agency frictions lead to inefficient reliance on FC borrowing and maturity mismatches. A growing body of recent work reassesses this phenomenon using new granular datasets (Aizenman et al., 2021; Eichengreen, Hausmann, and Panizza, 2023; Onen, Shin, and Peter, 2023; Zheng, 2023; Belz and Breckenfelder, 2025). These papers demonstrate that domestic-currency bond issuance relies heavily on specific macroeconomic variables, institutional characteristics, and the risk-bearing capacity of non-bank financial intermediaries. More related to our work, Bertaut, Bruno, and Shin (2025) show that the shift to LC borrowing exposes foreign investors to duration risk, generating fragility in portfolio flows. Our framework complements their analysis by formalizing how commitment constraints endogenously compress maturities and create rollover vulnerability on the sovereign side. In particular, we analyze the maturity structure of LC sovereign bonds and its dynamics compared to FC denominated sovereign bonds. Our empirical analysis highlights how rollover risk in LC debt influences sovereign bond yields, default risk, and exchange rates—an aspect largely overlooked in prior studies focused solely on currency composition.

Our work also draws on a literature on cross-border capital flows and financial asset valuations. Within this field, a number of studies have explored how benchmark indices

affect mutual fund portfolio allocations across countries (Shleifer, 1986; Kaul, Mehrotra, and Morck, 2000; Greenwood, 2005; Vayanos and Woolley, 2013; Claessens and Yafeh, 2013; Raddatz, Schmukler, and Williams, 2017; Pandolfi and Williams, 2019; Beltran and He, 2024). While these studies emphasize the role of benchmark-induced capital flows, our focus is on the maturity structure of sovereign debt and its interaction with these shocks. We provide novel empirical evidence that many EMs experience significant changes in their debt maturity structures over time, with substantial cross-country heterogeneity. Our analysis finds that the impact of exogenous capital flows on exchange rates, CDS spreads, and bond yields is significantly amplified for countries with a large share of bonds maturing. We also show that short-maturity bonds are more sensitive to these capital flow shocks, underscoring the short-run vulnerabilities associated with rollover risk.

Our analysis is linked to the literature on sovereign risk and sovereign debt markets (Du and Schreger, 2016; Bianchi, Hatchondo, and Martinez, 2018; Du and Schreger, 2022; Cole, Neuhann, and Ordonez, 2024; Barbosa-Alves, Bianchi, and Sosa-Padilla, 2024; Bianchi and Sosa-Padilla, 2024; Moretti et al., 2024), to theoretical work on sovereign bond pricing and self-fulfilling crises (Cole and Kehoe, 2000; Rebelo, Wang, and Yang, 2022; Jiang et al., 2024), as well as to the literature on the resolution of severe banking and financial crises in emerging and transition economies (Enoch, Gulde, and Hardy, 2002). While much of this research focuses on pricing sovereign risk or rare default events, our theoretical framework yields explicit predictions regarding the asset pricing implications of self-fulfilling rollover crises. We empirically validate these predictions using novel granular bond-level data from 23 emerging economies, providing the first evidence that rollover risk in LC debt contributes to depreciating exchange rates, increasing sovereign CDS spreads, and increasing bond yields. We also show that weaker institutional quality drives a reliance on shorter maturities, leaving these countries disproportionately vulnerable to rollover risk.

Finally, our study connects to the literature on corporate debt rollover risk (Almeida et al., 2011; Carvalho, 2015; Kalemli-Ozcan, Laeven, and Moreno, 2015; Valenzuela, 2016; Choi, Hackbarth, and Zechner, 2018; Cortes and Rocha, 2021; Choi, Hackbarth, and Zechner, 2021; Jungherr et al., 2022; Oliveira, Rafi, and Simon, 2024). For instance, Choi, Hackbarth, and Zechner (2018) show that maturity dispersion reflects firm characteristics and affects exposure to refinancing risk, which in turn shapes capital structure decisions. We focus on sovereign debt, emphasizing how debt maturity profiles influence countries' exposure to external shocks.

3. Data and Stylized Facts

We construct a granular, comprehensive dataset on EM and AE sovereign bonds from several sources. We first describe the data and sample construction, then present a set of novel stylized facts on the leverage, currency composition, and maturity structure of sovereign debt in our sample.

3.1 Data Sources and Sample Construction

Bond-Level Data. Our primary data source is Refinitiv Eikon, which provides security-level information on sovereign bonds, including issuance amounts, coupon rates, coupon payment frequencies, issuance dates, and maturity dates. We collect data on both LC and FC government bonds for 23 EMs in the GBI-EM: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Dominican Republic, Egypt, Hungary, Indonesia, Malaysia, Mexico, Nigeria, Peru, Philippines, Poland, Romania, Russia, Serbia, South Africa, Thailand, Turkey, and Uruguay. We exclude bonds with missing issuance amounts or coupon rates, leaving 7,243 LC sovereign bond issuances. As shown in Table B.2 in the Appendix, this bond-level dataset is highly comprehensive, covering on average 84% of each country's total government debt. For AEs, we impose the same bond coverage standard, retaining only the nine countries whose bond-level data cover more than 80% of total government debt: Australia, Austria, Denmark, France, Italy, Korea, Spain, Sweden, and Switzerland. This filter yields a smaller but comparably comprehensive sample of 1,843 LC AE bond issuances.

Debt-to-GDP Ratio Data. We draw on the BIS for central and general government debt securities by currency[2] and the World Bank for GDP in U.S. dollars. We collect both LC and FC debt for 18 EMs—Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hungary, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, and Turkey—and 23 AEs—Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Hong Kong SAR, Ireland, Israel, Italy, Japan, Korea, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States—over the period 2013–2024. Because Fact 1 below draws on debt-to-GDP data, it covers all 23 AEs listed above; the nine-country restriction

[2]Specifically, the BIS series "Central and general government debt securities, by currency — Long-term, all markets, amounts outstanding in billions of US dollars."

enters only in the bond-level analysis.[3] From these series we also construct the share of LC debt, Share LC, defined as LC general government debt securities divided by the sum of LC and FC general government debt securities.

Maturity Structure and Exposure to Rollover Risk. Using the bond-level data, we construct two key variables for each country and period. First, average bond maturity is the average of years to maturity across a country's outstanding bonds, weighted by amounts outstanding. For example, if in a given year, country A has two bonds with outstanding amounts of 1,000 and 500 and maturities of 5 years and 10 years, respectively, the average maturity for that country would be ((1,000 * 5) + (500 * 10))/1500 = 6.67 years. We compute this measure separately for LC and FC bonds, as well as across all bonds combined. Second, our measure of rollover-risk exposure, $FBM_{c,t}$, is the total value of bonds maturing within one year, normalized by GDP. Appendix B.3 details the variable construction.

Additional Data. We complement the bond-level data with macroeconomic variables (debt-to-GDP ratios from the BIS and CEIC, GDP growth from the IMF, inflation from the World Bank), institutional quality indices (World Bank Worldwide Governance Indicators), financial-market data (exchange rates from Compustat, sovereign CDS spreads from Bloomberg and Markit, bond yields from Bloomberg), debt ownership shares from Arslanalp and Tsuda (2014), the Broad Dollar Index from FRED, U.S. monetary policy shocks from Bauer and Swanson (2023), and capital flow measures constructed from JP Morgan GBI-EM index rebalancings.[4] Table B.1 in the Appendix provides a complete list of all variables, their sources, frequencies, and sample ranges. These variables and their roles in the empirical analysis are described in detail in Section 5 and the Appendix.

3.2 Stylized Facts

An initial examination of the dataset reveals several novel and robust regularities, which we summarize as four stylized facts motivating the theoretical and empirical analysis below.

Fact 1: EMs have become more leveraged over time. Over our sample period from 2013 to 2024, the aggregate sovereign debt burden of emerging market economies has

[3] Dominican Republic, Egypt, Nigeria, Serbia, and Uruguay are included in the GBI-EM, but are not in the BIS data.

[4] Our main analysis uses U.S. dollar-denominated CDS spreads due to their broader coverage. Our results are robust to using local currency CDS spreads.

expanded significantly. In 2013, the average general government debt-to-GDP ratio across our sample stood at 27.6%. By 2024, this figure had surged to 45.6%, representing an increase of 18 percentage points in just over a decade. Panel A of Figure 1 plots this pronounced and sustained upward trajectory. In contrast, AEs exhibit no comparable trend. Their average general government debt-to-GDP ratio stood at 57.5% in 2013 and 57.4% in 2024—essentially unchanged over the sample period.[5] Apart from a temporary spike to 68.7% in 2020 amid the COVID-19 pandemic, leverage in AEs remained broadly flat (Panel D of Figure 1). As a result, the gap between the two groups narrowed sharply, from roughly 30 percentage points in 2013 to about 12 percentage points in 2024. This contrast underscores that the rise in sovereign leverage is a distinctly EM phenomenon rather than a reflection of global financial conditions.[6]

Consistent with existing literature documenting emerging markets' shift from foreign- to local-currency borrowing (Bertaut, Bruno, and Shin, 2025; Onen, Shin, and Peter, 2023; Du and Schreger, 2022; Eichengreen, Hausmann, and Panizza, 2023), LC debt is the dominant source of sovereign financing in our sample. In our data, the EM average LC debt-to-GDP ratio rises from 21.9% in 2013 to 37.5% in 2024, while FC debt increases only marginally, from 5.7% to 8.0% (Panels B and C of Figure 1); in AEs the LC share remains close to 100% throughout (Panels E and F). The leverage expansion in Fact 1 is thus driven almost entirely by LC debt, which sets up the central tension of the paper: how the currency shift interacts with the maturity structure we document next.

Fact 2: LC debt maturities have shortened over time for EMs, but not for AEs. We next examine how LC debt maturities, computed as in Section 3.1, have evolved over time. Figure 2 shows that, while AEs display an increase in the average maturity of LC bonds followed by relative stability, EMs have experienced a pronounced shortening of LC maturities: from 9.06 years in 2013 to 6.98 years in 2024, a decline of 22.96%. By contrast, FC maturities have remained broadly stable, edging up from 9.16 years in 2013 to 10.41 years by 2024, so that the FC-LC maturity gap widened substantially. Average sovereign bond maturities (across both LC and FC bonds) also declined, from 9.64 years in 2013 to 8.48 years by 2024.

Fact 3: Shorter LC maturities in EMs are associated with higher LC leverage. Facts 1 and 2 indicate that while emerging market sovereigns successfully expanded their capacity to borrow in LC, this transition coincided with a sustained reduction of their debt

[5] Figures E.2 and E.3 in Appendix E report the country-level time series.

[6] To compute the average debt-to-GDP ratio, we calculate the simple cross-sectional average across all countries. Figure E.1 in Appendix E shows similar findings when using the GDP-weighted average.

maturity profiles. Over our sample period, as the LC debt-to-GDP ratio surged, the average maturity of these obligations systematically declined. Figure 3 plots the evolution of average LC bond maturity alongside the LC debt-to-GDP ratio, illustrating this stark negative correlation. This dynamic points to a structural vulnerability: to induce investors to absorb a large supply of new LC debt, sovereigns have increasingly issued in shorter maturities. Overcoming *original sin* thus carries a new cost, namely exposure to rollover risk.

Fact 4: Exposure to rollover risk varies substantially across countries and time. We next investigate exposure to rollover risk directly using $FBM_{c,t}$, the amount of bonds maturing within one year normalized by GDP, as defined in Section 3.1. Note that a shorter average debt maturity at issuance does not mechanically translate to a higher fraction of bonds maturing within one year. For example, a country could refinance bonds before they mature, so that a shorter average issuance maturity need not raise the share of bonds maturing within one year. Figures 4 and 5 report country-level time-series averages over the 2013–2024 period for emerging market and advanced economy countries, respectively. Appendix F documents the time-series dynamics for each country.

Both figures reveal substantial cross-country and within-country variation in the fraction of bonds maturing within one year over 2013–2024. In Chile, for instance, the fraction rose from 0.62% in 2013 to 3.38% in 2024, a large within-country change. Cross-country variation is also pronounced: in 2024, the fraction was 3.38% in Chile versus 8.55% in Brazil. Such variation suggests that differences in maturity structures are likely to shape countries' vulnerability to adverse shocks.

Combining the above with Fact 2, we observe that rollover-risk exposure in AEs is substantially smaller and largely stable, whereas several EMs have experienced rising exposure: average maturities have declined alongside a rising fraction of bonds maturing. This pattern is evident in Chile, the Czech Republic, Egypt, Indonesia, Mexico, Peru, the Philippines, and South Africa. For example, in Chile the average LC bond maturity fell from 12.74 years in 2013 to 9.88 years in 2024, while the share of bonds maturing within one year rose from 0.62% to 3.38%. For these countries, shorter maturities and larger near-term repayments together imply greater exposure to refinancing difficulties, particularly during adverse economic conditions such as capital outflows that reduce liquidity.

4. Model

We develop a model of sovereign borrowing in which a government lacking commitment chooses both the maturity (short vs. long) and the currency denomination (local vs.

foreign) of its debt. LC debt is not exposed to exchange rate shocks but gives rise to a time-inconsistency problem: because the sovereign lacks commitment, investors rationally anticipate that LC debt will be diluted through distortionary inflation after issuance.

To mitigate this moral hazard, the sovereign can issue short-term LC debt, which may reduce the convex macroeconomic costs of inflation but exposes the economy to self-fulfilling rollover crises. Alternatively, it can issue FC debt, which serves as a hard commitment device against inflation but introduces default risk via shocks to the real exchange rate.

The optimal debt structure is thus determined by a trilemma between inflation distortions, rollover risk, and currency mismatch. This trade-off depends on the volatility of the real exchange rate and on the strength of inflationary incentives, which are in turn driven by institutional credibility and the share of local-currency debt held by foreign investors.

4.1 Economic Environment

Preferences and Technology. We consider a small open economy (SOE) where the output from capital in place is normalized to zero. There are three time periods $t \in \{0, T/2, T\}$. At time $t = 0$, the sovereign undertakes an investment of size K that yields a deterministic real output at time $t = T$, denoted by y_T. If the sovereign defaults on its debt obligations, the investment is disrupted and output to the sovereign falls to a constrained liquidation value, denoted by $\underline{y} \in (0, y_T)$. The sovereign maximizes expected domestic welfare, defined as expected output net of transfers to foreign creditors, domestic investors' opportunity costs of capital, and macroeconomic deadweight costs.

Financial Environment. The sovereign finances the initial capital K by issuing debt to a pool of competitive risk-neutral domestic and foreign investors, whose common outside option is the real risk-free return r, evaluated by each investor in units of its own consumption good. We assume that some participation of both domestic and foreign investors is required for each issue. Since repayment to domestic investors constitutes a purely internal transfer, inflation reduces the sovereign's real debt burden only through the externally held share of local currency debt denoted by $f \in (0, 1)$.[7]

The real exchange rate, S_0, defined as units of local currency per unit of foreign currency, is normalized to one. The time-T real exchange rate $\tilde{S}_T$ is

[7] All results extend to environments in which the sovereign derives a strictly lower benefit from diluting domestically held debt than externally held debt. If the benefits are equal, the main results continue to hold, except for the comparative statics with respect to the foreign-held share of debt.

stochastic with a continuous cumulative distribution function $F(\cdot)$, and is expected to stay constant, i.e. $\mathbb{E}_t[\tilde{S}_T] = 1$.[8]

Debt Contracts. The sovereign issues debt along two dimensions: maturity and currency denomination. Debt can be issued in LC or FC, and with a short-term (ST) maturity of $T/2$ or a long-term (LT) maturity of T. Thus, there are four distinct funding options: short-term LC debt (STLC) rolled over once at $T/2$, with nominal claim N_1 at time $T/2$ and N_2 at time T; long-term LC debt (LTLC) with maturity T and nominal claim N_L; short-term FC debt (STFC) rolled over once at $T/2$, with nominal foreign-currency claim D_1 at time $T/2$ and D_2 at time T; and long-term FC debt (LTFC) with maturity T and nominal foreign-currency claim D_L.[9]

Inflation. The SOE lacks commitment and can dilute its local-currency (LC) debt through inflation. The dilution of a nominal zero-coupon unit claim issued at time t and maturing at time $t+\tau$ is given by

$$I_{t,t+\tau} = 1 - (1 + \pi_{t,t+\tau})^{-1}.$$

By construction, $I_{t,t+\tau} \in [0,1]$ for $\pi_{t,t+\tau} \in [0,\infty)$.

Generating inflation imposes distortionary real costs on the domestic economy, captured by a penalty function $k(I_{t,t+\tau}, \tau)$ satisfying

$$\frac{\partial k}{\partial I_{t,t+\tau}} > 0, \quad \frac{\partial^2 k}{\partial I_{t,t+\tau}^2} > 0, \quad \text{and} \quad \frac{\partial^2 k}{\partial I_{t,t+\tau}\,\partial \tau} < 0.$$

Thus, the cost of inflation is strictly increasing and convex in total dilution, and a given level of dilution is less costly when spread over a longer horizon. Intuitively, the more the sovereign inflates, the costlier it is for the domestic economy, and these costs accelerate. For instance, moving from 0% to 2% inflation imposes a smaller macroeconomic penalty than moving from 2% to 4%, even though the increment is identical. Similarly, diluting 20% of the debt's real value over eight years is less damaging than over four years, because the required inflation rate per period is lower. If the marginal cost of aggregate inflation declines sufficiently as the horizon lengthens, the sovereign finds it increasingly attractive to erode the real value of long-term debt through gradual inflation. The resulting increase in equilibrium inflation generates

[8] A natural extension is to allow for expected depreciation of the real value of the local currency, i.e. $\mathbb{E}_t[\tilde{S}_T] > 1$. We discuss below how such an extension would alter the composition of marginal investors in the FC debt market.

[9] For tractability, we restrict the sovereign to a single currency–maturity instrument. With mixed portfolios, the inflation incentive scales with the LC share while default risk scales with the FC share, yielding an interior optimum that preserves the comparative statics of Proposition 4.

larger macroeconomic deadweight costs, which investors rationally anticipate and incorporate into the nominal yields they demand on long-term debt. This creates a role for short-term debt as an endogenous commitment device: by forcing the sovereign to return to the market more frequently, it limits the scope for gradual inflation and thereby reduces expected inflation distortions despite exposing the sovereign to rollover risk.

Both properties have theoretical and empirical foundations. New Keynesian welfare analysis delivers a deadweight loss that is convex in the per-period inflation rate rather than in the cumulative price-level change (Rotemberg and Woodford, 1997; Galí, 2015),[10] so that a given dilution is cheaper when spread over a longer horizon. Consistent with convexity, the inflation–growth literature finds output effects that are flat at low inflation and turn sharply negative above threshold rates (Sarel, 1996; Khan and Senhadji, 2001).[11] The convexity also admits an expectations-based interpretation: because inflation expectations tend to de-anchor after large rather than small increases in inflation (Cochrane, 2026), a penalty that is convex in realized dilution captures, in reduced form, costs that operate through inflation expectations.

These properties apply exclusively to local-currency debt as inflation in foreign currency is normalized to zero, reflecting the standard assumption that the sovereign has no monetary instrument to dilute FC liabilities.

We interpret the inflation penalty as a real deadweight loss to domestic output, arising from capital misallocation or disruptions to the domestic financial system. This interpretation is consistent with evidence that inflation impairs financial intermediation and the allocation of capital, with pronounced threshold effects (Huybens and Smith, 1999; Boyd, Levine, and Smith, 2001), and that losses on government bonds held by domestic banks transmit to credit supply and real activity (Gennaioli, Martin, and Rossi, 2014; Bocola, 2016). While the unconstrained penalty can become arbitrarily large under hyperinflation, the sovereign's liability is strictly limited: if the inflation penalty exceeds the loss associated with liquidation, the sovereign will optimally exercise its outside option to default or switch to FC debt, effectively bounding the realized macroeconomic cost.

Default. Default payoffs to lenders are normalized to zero, and the SOE receives a constrained outside option $\underline{y} < y_T$. Default may occur for two reasons. First, it may

[10] A second-order approximation to household welfare yields a per-period loss proportional to the squared inflation rate, arising from the relative-price dispersion generated by staggered price setting. Because the loss depends on the per-period rate rather than the cumulative price-level change, a given cumulative dilution executed over a longer horizon, at a lower per-period rate, is less costly, consistent with $\partial^2 k / \partial I_{t,t+\tau} \, \partial \tau < 0$.

[11] Table H.1 in Appendix H provides empirical support for this assumption. We find that the output penalty is monotonically increasing across inflation bins, consistent with a cost function that is increasing and convex in inflation.

occur due to rollover risk at $T/2$ (STLC). Short-term debt exposes the sovereign to self-fulfilling market freezes. With probability $1-\lambda_r$, lenders roll over the short-term debt claim. With probability λ_r, lenders refuse, confirming a crisis and forcing liquidation (Cole and Kehoe, 2000; Bocola and Dovis, 2019).[12]

Second, default may occur due to the SOE's inability to repay FC debt at T (as we show in Proposition 2, short-term FC debt is never optimal). Specifically, default occurs if a currency depreciation pushes net output below the outside option: $y_T - D\tilde{S}_T < \underline{y}$, where D is the nominal FC claim at maturity. This defines an endogenous default threshold exchange rate $S_T^c \equiv (y_T - \underline{y})/D$. For tractability, we abstract from post-default renegotiation and recovery (Bulow and K. Rogoff, 1989; Yue, 2010); the outside option $\underline{y}$ can thus be interpreted as the sovereign's payoff net of any subsequent restructuring.

4.2 Government Problem

Objective. Let $C \in \{LC, FC\}$ and $M \in \{T/2, T\}$ denote the currency and maturity of sovereign debt. At $t = 0$, the sovereign chooses (C, M) to maximize expected domestic welfare, defined by the expected output, net of payments to lenders and net of default and inflation costs, $V(C, M)$:

$$\max_{C\in\{LC,FC\},\, M\in\{T/2,T\}} V(C, M),$$

subject to two constraints. First, a *participation constraint* requires the marginal investor in each debt market to break even in expectation. Second, an *incentive compatibility constraint* requires that inflation and default policies be chosen optimally after debt issuance, reflecting the sovereign's lack of commitment. Investors price debt in anticipation of the sovereign's ex-post behavior, implying that the debt structure, inflation and default choices, and prices must be mutually consistent in equilibrium.

Foreign investors hold a fraction f of local-currency (LC) debt and are diluted by inflation. Domestic investors hold the remaining share, $(1-f)$, and are also diluted, but these losses constitute purely internal transfers that cancel out in aggregate welfare. Consequently, inflation affects welfare only through (i) the real transfer to foreign investors, $fN(1-I)$, and (ii) the associated macroeconomic deadweight cost, $k(I, \tau)$, where N, I, and $k(I, \tau)$ are used generically to denote the nominal debt claim, aggregate inflation,

[12]Such LC defaults are empirically relevant (Carmen M. Reinhart and Kenneth S. Rogoff, 2011). Russia's August 1998 restructuring of ST ruble-denominated GKO bills followed a failed rollover, and Jamaica restructured its domestic debt in 2010 and 2013. Du and Schreger (2016) document that LC sovereign debt carries sizable credit risk.

and inflation cost associated with the relevant local-currency debt contract. The analysis extends naturally to environments in which the sovereign places a positive, but smaller, weight on the dilution of domestic investors than on the dilution of foreign investors.

Under rational expectations, the real cost of capital to the sovereign is $K(1+r)^{\tau}$, since the binding participation constraint is that of domestic investors, whose required real return is r. A sovereign debt structure equilibrium is therefore defined as follows.

Equilibrium A rational expectations equilibrium consists of a debt choice (C, M), inflation policy I^*, default rule, and pricing schedules (N, D) such that:

1. Given prices, the sovereign chooses (C, M) to maximize $V(C, M)$.
2. For LC debt, inflation is chosen optimally ex post; for FC debt, default occurs if repayment reduces output below $\underline{y}$.
3. The marginal investor prices debt to break even in expectation, incorporating the risk-free rate r and anticipating sovereign policies.
4. Markets clear at issuance $(t = 0)$ and, for short-term debt, at rollover $(t = T/2)$.

To characterize the optimal debt structure, we next derive the sovereign's objective under the feasible currency–maturity combinations. Specifically, we consider long-term local-currency debt, short-term local-currency debt, and long-term foreign-currency debt, as Proposition 2 establishes that issuing short-term foreign-currency debt is never optimal.

4.2.1 Long-Term LC Debt (LTLC)

Under LTLC financing, the sovereign issues a nominal LC claim N_L due at maturity T. Let $I_L \equiv I_{0,T}$ denote the sovereign's aggregate inflation over the full horizon. The sovereign's value is determined by its ex-post inflation choice. The objective consists of three components in real terms: expected output net of domestic investors' opportunity cost of capital, the real transfer to foreign investors, and the deadweight cost of inflation:

$$V(LC, T) = \max_{I_L} \left\{ y_T - (1-f)K(1+r)^T - fN_L(1-I_L) - k(I_L, T) \right\}, \tag{1}$$

subject to the investors' break-even condition

$$N_L(1 - I_L^*) = K(1+r)^T,$$

or

$$N_L = \frac{K(1+r)^T}{1 - I_L^*}. \tag{2}$$

Given break-even condition (2), foreign investors earn an expected real return of at least r in units of their own consumption good: by Jensen's inequality, $\mathbb{E}[1/\tilde{S}_T] \geq 1/\mathbb{E}[\tilde{S}_T] = 1$, with strict inequality whenever the real exchange rate is volatile. Foreign participation therefore imposes no additional restriction on bond prices. Since both domestic and foreign ownership of each bond must be strictly positive by assumption, domestic investors are marginal, and condition (2) holds with equality. The same logic applies to the break-even conditions for short-term LC debt derived below.[13]

The first-order condition

$$\frac{\partial k(I_L^*, T)}{\partial I_L} = f N_L \tag{3}$$

pins down the sovereign's discretionary inflation. Substituting the incentive-compatible inflation rate from equation (3) and the break-even condition (2) into the objective, the domestic opportunity cost and the foreign transfer combine into the full cost of capital $K(1+r)^T$, yielding:

$$V(LC, T) = y_T - K(1+r)^T - k(I_L^*, T). \tag{4}$$

4.2.2 Short-Term LC Debt (STLC)

Under STLC financing, the sovereign issues local-currency debt at $t = 0$ with a total claim N_1 at maturity $T/2$. At the interim date, the debt is refinanced with probability $1 - \lambda_r$ and a rollover crisis occurs with probability λ_r, in which case output falls to $\underline{y}$. Let N_2 denote the total nominal claim held by investors at time T, and let I_1 and I_2 denote the inflation decisions for the first and second halves of the horizon, respectively. The sovereign makes two sequential inflation decisions, each over a horizon of length $T/2$, and the problem is solved by backward induction.

[13] Strictly positive domestic bond ownership is natural for two reasons. First, other things equal, the sovereign prefers domestic ownership of LC debt: repayments to domestic investors are internal transfers and thus create no incentive to dilute the debt through costly inflation. Only because domestic savings are insufficient to absorb the entire issuance — as we assume — must part of the debt be sold to foreign investors. Second, foreign investors' capacity to absorb the sovereign's debt is likely limited, both because financial institutions face regulatory capital requirements on their holdings of foreign sovereign debt, and/or because foreign investors may themselves demand domestic co-investment to align the sovereign's interests with those of its bondholders.

Stage 2. At date $T/2$, conditional on successful rollover, the sovereign takes I_1 as given and chooses I_2 to maximize the continuation payoff:

$$\max_{I_2} \{y_T - fN_2(1-I_1)(1-I_2) - k(I_2, T/2)\}.$$

The first-order condition yields

$$\frac{\partial k(I_2^*, T/2)}{\partial I_2} = fN_2(1-I_1), \tag{5}$$

which implicitly determines

$$I_2^* = I_2^*(I_1).$$

Stage 1. At date 0, the sovereign chooses I_1 to maximize the ex-ante value, embedding the optimal continuation $I_2^*(I_1)$:

$$\begin{aligned} V(LC, T/2) = \max_{I_1} \Big\{ &(1-\lambda_r)\left[y_T - fN_2(1-I_1)(1-I_2^*) - k(I_2^*, T/2)\right] \\ &+ \lambda_r \underline{y} - (1-f)K(1+r)^T - k(I_1, T/2) \Big\}. \end{aligned} \tag{6}$$

Since the Stage 2 optimum depends on I_1, and since the break-even condition for the second bond (shown below) determines the nominal claim when the debt is refinanced at $T/2$, the total derivative with respect to I_1 must account for both the direct effect and the indirect effect through I_2^* and N_2:

$$\frac{dV}{dI_1} = \frac{\partial V}{\partial I_1} + \frac{\partial V}{\partial I_2}\frac{dI_2^*}{dI_1} + \frac{\partial V}{\partial N_2}\frac{dN_2}{dI_1} = 0.$$

Since the continuation problem satisfies its own first-order condition, the envelope theorem implies that the second term is zero. The third term does not vanish, however, because N_2 is set by investors' break-even condition for the second bond:

$$N_2 = \frac{N_1(1+r)^{T/2}}{1-I_2^*}.$$

Hence,

$$(1-\lambda_r)fN_2(1-I_2^*) - \frac{\partial k(I_1, T/2)}{\partial I_1} - (1-\lambda_r)fN_2(1-I_1)\frac{dI_2^*}{dI_1} = 0,$$

where the third term uses $\frac{\partial V}{\partial N_2} = -(1-\lambda_r)f(1-I_1)(1-I_2^*)$ and $\frac{dN_2}{dI_1} = \frac{N_2}{1-I_2^*}\frac{dI_2^*}{dI_1}$.

Using the Stage 2 first-order condition (5) to substitute $fN_2(1-I_1) = \partial k(I_2^*, T/2)/\partial I_2$, we obtain the Stage 1 first-order condition

$$\frac{\partial k(I_1^*, T/2)}{\partial I_1} = (1-\lambda_r)\left[fN_2(1-I_2^*) - \frac{\partial k(I_2^*, T/2)}{\partial I_2}\frac{dI_2^*}{dI_1}\right]. \tag{7}$$

The break-even condition for the first bond is

$$N_1 = \frac{K(1+r)^{T/2}}{(1-\lambda_r)(1-I_1^*)}.$$

Substituting for N_1 yields

$$N_2 = \frac{K(1+r)^T}{(1-\lambda_r)(1-I_1^*)(1-I_2^*)}. \tag{8}$$

Substituting the incentive-compatible inflation rates from equations (5) and (7) and the break-even condition (8) yields:

$$V(LC, T/2) = (1-\lambda_r)y_T + \lambda_r \underline{y} - K(1+r)^T - k(I_1^*, T/2) - (1-\lambda_r)\,k(I_2^*, T/2). \tag{9}$$

4.2.3 Long-Term FC Debt (LTFC)

Under LTFC financing, the sovereign issues a nominal FC claim D_L due at T, which cannot be diluted through domestic inflation. The sovereign's objective is now given by

$$V(FC, T) = \mathbb{E}\left[\max\left(y_T - D_L\tilde{S}_T,\, \underline{y}\right)\right]$$

At maturity, the sovereign observes the realized exchange rate $\tilde{S}_T$ and defaults if repayment would reduce output below the liquidation value:

$$y_T - D_L\tilde{S}_T < \underline{y} \quad \Longrightarrow \quad \tilde{S}_T > S_T^c \equiv \frac{y_T - \underline{y}}{D_L}. \tag{10}$$

The resulting break-even condition for domestic investors is

$$D_L\, F(S_T^c)\, \mathbb{E}[\tilde{S}_T \mid \tilde{S}_T \le S_T^c] = K(1+r)^T, \tag{11}$$

which, together with the default threshold in (10), determines D_L as a fixed point.

Since repayments to domestic bondholders are internal transfers, welfare equals expected output net of the transfer to foreign holders and of domestic investors' opportunity cost of capital. Using the break-even condition (11), these two components sum to the full cost of capital (see Appendix A):

$$V(FC, T) = F(S_T^c)\, y_T + (1 - F(S_T^c))\, \underline{y} - K(1+r)^T. \tag{12}$$

As in the case of LC debt, foreign investors earn an expected real rate greater than or equal to r if the break-even condition holds for domestic investors. Domestic investors value the bond in LC and expect to receive $D_L\, F(S_T^c)\, \mathbb{E}[\tilde{S}_T \mid \tilde{S}_T \leq S_T^c]$ in expectation: because $\mathbb{E}[\tilde{S}_T] = 1$ and the expectation is truncated to solvency states, this is strictly less than the foreign valuation $F(S_T^c)\, D_L$. Intuitively, the FC bond pays off in states in which the foreign currency is cheap in terms of the domestic currency, while the SOE defaults in states in which the foreign currency is valuable. With domestic investors marginal, foreign investors earn rents on their rationed share. Because payments to domestic holders are internal transfers and the expected LC value of the payment per unit of face value is the same across holders, the sovereign's value (12) is independent of the foreign-held share of FC debt.

We highlight two points. First, we retain the default rule (10): default is triggered when total debt service pushes net output below the outside option, and the sovereign cannot selectively default on foreign holders only. Second, if foreign demand instead absorbed the entire issue, foreign investors would be marginal and the sovereign's expected real repayment would fall to $K(1+r)^T\, \mathbb{E}[\tilde{S}_T \mid \tilde{S}_T \leq S_T^c] < K(1+r)^T$: FC debt would then embed a valuable option to repay only when the foreign currency is cheap. We adopt the domestic-marginal case as our benchmark because it prices out this option effect and isolates the commitment role of FC debt.[14]

4.3 Optimal Debt Composition

We now characterize the sovereign's optimal choice of debt maturity and currency. The problem can be naturally decomposed into two steps. First, conditional on the currency denomination, the sovereign chooses the optimal maturity structure. Second, it chooses between LC and FC debt, taking into account the endogenous maturity choice in each market.

[14] If we extend the model to allow for an expected structural depreciation of the local currency ($\mathbb{E}[\tilde{S}_T] > 1$), domestic and foreign investors could be simultaneously marginal, but only under a knife-edge condition: the expected depreciation premium must exactly offset the truncation induced by default.

4.3.1 Maturity Choice within Local-Currency Debt

We begin by analyzing the sovereign's maturity choice conditional on issuing LC debt. The following proposition characterizes the relevant trade-off.

Proposition 1 (LC Maturity Choice)**.** *Conditional on issuing local-currency debt, the sovereign strictly prefers long-term LC debt (LTLC) to short-term LC debt (STLC) if and only if*

$$\lambda_r(y_T - \underline{y}) > k(I_L^*, T) - \left[k(I_1^*, T/2) + (1-\lambda_r)k(I_2^*, T/2)\right]. \tag{13}$$

Equivalently, STLC is strictly preferred if and only if the reverse inequality holds. Equality implies indifference.

Proof. The sovereign prefers LTLC to STLC if and only if $V(LC, T) > V(LC, T/2)$. Substituting (4) and (9) for $V(LC, T)$ and $V(LC, T/2)$, respectively, and noting that the expected repayment term $K(1+r)^T$ cancels because both maturity structures must deliver the same expected real return to investors under competitive pricing, yields

$$\begin{aligned} V(LC, T) - V(LC, T/2) = \lambda_r(y_T - \underline{y}) \\ - \Big[k(I_L^*, T) - k(I_1^*, T/2) - (1-\lambda_r)k(I_2^*, T/2)\Big]. \end{aligned}$$

The result follows immediately. □

To gain intuition, note that the left-hand side of equation (13) captures the expected output loss from a rollover crisis. The right-hand side represents the difference in inflation deadweight costs when the SOE makes a single inflation decision at time $t = 0$ for the entire period up to time T and when it makes two separate decisions: the first decision is made at $t = 0$ for aggregate inflation until $T/2$ and the second is made at time $t = T/2$ for aggregate inflation until T.

Thus, Proposition 1 states that LTLC debt may be dominated by STLC debt, if the latter provides sufficiently more inflation discipline. To see why this can be the case, it is useful to interpret Proposition 1 through the equilibrium inflation cost $C(\tau) \equiv k(I^*(\tau), \tau)$, where $I^*(\tau)$ solves $\frac{\partial k}{\partial I}(I^*(\tau), \tau) = fN$. Recall that a longer horizon lowers the marginal cost of aggregate inflation, i.e. $\frac{\partial^2 k}{\partial I_{t,t+\tau} \partial \tau} < 0$, which induces the sovereign to choose a higher aggregate inflation rate as the time horizon increases. To see this more precisely, we take the first derivative of the equilibrium cost w.r.t. the time horizon, τ

$$\frac{\partial C}{\partial \tau} = \frac{\partial k}{\partial \tau}(I^*(\tau), \tau) - \frac{\frac{\partial k}{\partial I}(I^*(\tau), \tau)\, \frac{\partial^2 k}{\partial I \partial \tau}(I^*(\tau), \tau)}{\frac{\partial^2 k}{\partial I^2}(I^*(\tau), \tau)}.$$

Hence, whether the equilibrium cost of inflation increases with the time horizon depends crucially on the cross-derivative $\frac{\partial^2 k}{\partial I_{t,t+\tau} \partial \tau}$. The more negative this cross-derivative is, the steeper the increase in equilibrium inflation costs with maturity. When this effect is sufficiently strong, the inflation-cost differential on the right-hand side of (13) exceeds the expected rollover loss on the left-hand side, and the inequality is reversed: issuing short-term claims becomes optimal even though it exposes the sovereign to rollover risk.

Intuitively, short maturities discipline inflation because the marginal cost of aggregate inflation is high over short horizons. For example, even if the SOE starts implementing an expansionary monetary policy at time $t = 0$, its effects on inflation may materialize only with a lag. Moreover, influencing the monetary stance of the central bank is difficult in the short run, as institutional changes, such as staffing decisions, take time to implement.

By contrast, as the time horizon increases, it becomes easier for the SOE to affect aggregate inflation. Political pressure on the central bank is more likely to take effect, and even moderate monetary easing accumulates into higher inflation over longer periods. This accumulation effect is stronger in countries with weaker institutional quality (low g), where the central bank's resistance to political pressure is limited, as we formalize in Section 4.4. Accordingly, the marginal cost of inflation declines with the horizon, i.e. $\frac{\partial^2 k}{\partial I_{t,t+\tau} \partial \tau} \ll 0$. A declining marginal cost alone is not sufficient, however: under short-term financing the sovereign makes two inflation decisions rather than one, so cumulative dilution falls only if the decline in marginal costs is sufficiently pronounced. When it is, equilibrium dilution is smaller under two consecutive short-term claims than under a single long-term claim, $(1 - I_1^*)(1 - I_2^*) > 1 - I_L^*$, with correspondingly lower deadweight costs.[15]

In sum, when the horizon sufficiently reduces marginal inflation costs, the resulting increase in equilibrium inflation dominates, making long-term debt more distortionary and rendering short-term debt attractive despite rollover risk.

4.3.2 Maturity Choice within Foreign-Currency Debt

We next consider the sovereign's maturity choice conditional on issuing FC debt. The following proposition formally states the result.

Proposition 2 (FC Maturity Choice)**.** *Long-term foreign-currency debt (LTFC) strictly dominates short-term foreign-currency debt (STFC).*

Proof. See Appendix A. □

[15] In the quadratic specification of Section 4.4, this requires the horizon-scaling parameter to be sufficiently large (approximately $\eta > 1$); condition (23) in Proposition 4 is the formal counterpart for deadweight costs.

To understand Proposition 2, note that under FC debt, domestic inflation cannot dilute liabilities, so shortening maturity provides no commitment benefit. The only effect of issuing STFC is therefore to introduce rollover risk at the interim date $T/2$. To compensate investors for the possibility that the debt cannot be rolled over, the sovereign must promise a higher repayment at $T/2$. Conditional on successful rollover, this larger obligation is refinanced into a higher face value due at T.

This higher refinanced face value increases the sovereign's exposure to exchange-rate risk at maturity. In particular, because default occurs when $y_T - D\tilde{S}_T < \underline{y}$, a larger D lowers the default threshold $S_T^c = (y_T - \underline{y})/D$, expanding the set of states in which default occurs. Hence, even absent a rollover crisis, STFC leads to strictly higher expected default losses at T. Combined with the additional liquidation risk at $T/2$, this implies that STFC is strictly dominated by long-term FC debt.

4.3.3 Currency Choice and the Debt Trilemma

We now characterize the sovereign's optimal choice between LC and FC debt. Combining Propositions 1 and 2, the sovereign compares the optimal LC instrument (either LTLC or STLC) with LTFC.

This choice reflects a fundamental trilemma between (i) inflation distortions, (ii) rollover risk, and (iii) currency mismatch. LC debt avoids currency mismatch but creates a time-inconsistency problem, as the sovereign can dilute nominal claims through inflation. FC debt eliminates this inflation incentive, but exposes the sovereign to default risk triggered by exchange rate depreciations. Shortening maturity mitigates inflation distortions but introduces rollover risk.

The following proposition characterizes the conditions under which FC debt is preferred.

Proposition 3 (Currency Choice)**.** *Foreign-currency debt (LTFC) is preferred to local-currency debt if and only if the macroeconomic cost of inflation exceeds the expected cost of an exchange-rate crisis.*

More formally:

1. *If LTLC is optimal within LC debt, then LTFC is preferred if and only if*

$$k(I_L^*, T) > (1 - F(S_T^c))(y_T - \underline{y}). \tag{14}$$

2. *If STLC is optimal within LC debt, then LTFC is preferred if and only if*

$$k(I_1^*, T/2) + (1 - \lambda_r)k(I_2^*, T/2) > (1 - \lambda_r - F(S_T^c))(y_T - \underline{y}). \tag{15}$$

Proof. See Appendix A. □

Proposition 3 characterizes the sovereign's currency choice as a comparison between two distortion margins: inflation under LC debt and default under FC debt.

Under LC debt, the distortion arises from the sovereign's ex-post incentive to dilute nominal liabilities through inflation. The equilibrium level of inflation, I^*, is pinned down by the first-order condition $\frac{\partial k}{\partial I} = fN$, which equates the marginal cost of inflation with the marginal benefit of dilution, proportional to the foreign-held share f of the total nominal debt claim N. As a result, both I^* and the associated distortionary costs $k(I^*)$ are increasing in f. Intuitively, a higher foreign ownership share raises the sovereign's effective gains from inflation, strengthening its ex-post incentives to inflate and thereby exacerbating the associated macroeconomic distortions.

The marginal cost of inflation, which governs the left-hand side of the first-order condition, reflects institutional credibility. Sovereigns with strong institutions can effectively commit to low inflation by making it very costly to increase inflation, even at moderate inflation levels, thereby mitigating the severity of the inflation distortion.

Under FC debt, by contrast, inflation is no longer a policy instrument, but the sovereign is exposed to default risk driven by exchange rate fluctuations. Default occurs when a sufficiently large real depreciation renders repayment infeasible, which happens with probability $1 - F(S_T^c)$. This probability captures the sovereign's exposure to exchange-rate risk and depends on both the volatility of the real exchange rate and the debt burden. Greater exchange rate uncertainty increases the likelihood of entering default states, raising the expected costs of FC debt.

The sovereign's currency choice therefore reflects a trade-off between endogenous inflation distortions under LC debt—whose severity is governed by f and institutional credibility—and state-contingent default losses under FC debt, whose likelihood is captured by $1 - F(S_T^c)$. LC debt is preferred when inflation distortions are limited, while FC debt becomes optimal when the inflation problem is sufficiently severe relative to the expected costs of default.

The following Lemma provides conditions under which LTLC and LTFC dominate, respectively.

Lemma 1 (Marginal inflation costs and debt denomination)**.** *Let $k(I,\tau)$ be continuously differentiable and strictly convex in I. Consider LC debt with nominal claim N at horizon τ, and recall that discretionary inflation solves*

$$I^* \in \arg\min_I \{fN(1-I) + k(I,\tau)\},$$

so that any interior optimum satisfies

$$\frac{\partial k}{\partial I}(I^*,\tau) = fN.$$

Then:

1. *If*
$$\left.\frac{\partial k}{\partial I}(I,\tau)\right|_{I\downarrow 0} > fN,$$
then the sovereign optimally sets $I^* = 0$. In this case, local-currency long-term debt (LTLC) strictly dominates foreign-currency debt (LTFC).

2. *If*
$$\lim_{I\to 1}\frac{\partial k}{\partial I}(I,\tau) < fN,$$
then no finite interior solution exists, and the sovereign's incentive to inflate remains strictly positive for all I. In this case, the LC equilibrium unravels, and FC debt strictly dominates LC debt.

Proof. See Appendix A. □

4.4 Quantitative Analysis and Calibration

To analyze the sovereign's optimal debt portfolio decisions and generate comparative statics, we map the general theoretical framework to specific functional forms and calibrate the model to standard emerging market debt parameters.

4.4.1 Functional Forms

Cost of Inflation. We assume the macroeconomic welfare penalty of dilution is strictly quadratic in the chosen inflation rate (I) and scaled by the horizon (τ)

and an institutional quality parameter (g):

$$k(I,\tau) = \frac{g}{2}\frac{I^2}{\tau^\eta}$$

Under this specification, each first-order condition equates the marginal cost gI/τ^η to the relevant marginal benefit of dilution, denoted b, so that discretionary inflation and its equilibrium deadweight cost take the form

$$I^* = \frac{b\,\tau^\eta}{g}, \qquad k(I^*,\tau) = \frac{b^2\tau^\eta}{2g}.$$

For long-term LC debt, $b = fN_L$ from (3); for the two short-term claims, b is given by the right-hand sides of (5) and (7), respectively. Because the penalty is quadratic, a higher foreign ownership share (f) or a heavier nominal debt burden quadratically increases the equilibrium macroeconomic distortion.

The horizon-scaling parameter η admits a microfoundation: in Appendix A we show that a constant per-period cost of inflation delivers exactly $\eta = 1$, while adding a cost of *adjusting* inflation—reflecting gradual monetary transmission, or expectations that catch up to the new inflation regime only over time—generates $\eta \in (1,3)$, with the calibrated value $\eta = 1.5$ matching the model-implied horizon exponent at empirically measured adjustment speeds.

Liquidation Value. If the sovereign defaults, retained output falls to a constrained dynamic liquidation value, defined as a proportion $\alpha \in (0,1)$ of the net surplus under solvency:

$$\underline{y} = \alpha\left(y_T - K(1+r)^T\right)$$

Exchange Rate Dynamics. We implement a discrete two-point distribution for the exchange rate shock at T. The real exchange rate enters a severe depreciation state (S_{bad}) with probability p, and a normal state (S_{good}) with probability $1-p$. Because the unconditional expectation must satisfy $\mathbb{E}[\tilde{S}_T] = 1$, the normal state is determined by:

$$S_{good} = \frac{1 - pS_{bad}}{1-p}$$

Under this discrete distribution, the sovereign's value function for long-term FC debt collapses to a closed-form expected payoff:

$$D_L = \frac{K(1+r)^T}{(1-p)\,S_{good}}, \qquad V(FC,T) = (1-p)y_T + p\underline{y} - K(1+r)^T,$$

where the first expression is the domestic break-even condition and the closed form assumes $S_{good} < S_T^c < S_{bad}$, so that default occurs exclusively in the depreciation state.

4.4.2 Analytical Characterization of the Debt Pecking Order

Under the quadratic specification, the first-order condition of each local-currency claim equates gI/τ^η to the claim's marginal dilution benefit b, so that equilibrium inflation and its deadweight cost take the form $I^* = b\,\tau^\eta/g$ and $k(I^*,\tau) = b^2\tau^\eta/(2g)$, which is decreasing in institutional quality g. The relevant benefit bases are $b_L = fN_L$ for long-term LC debt (eq. 3) and, for the two short-term claims, $b_2 = fN_2(1-I_1^*)$ and $b_1 = (1-\lambda_r)\big[fN_2(1-I_2^*) - \frac{\partial k(I_2^*,T/2)}{\partial I_2}\,\frac{dI_2^*}{dI_1}\big]$ from eqs. (5) and (7), respectively.

Substituting into the value functions (4)–(12) yields expressions indexed by g:

$$V(\text{LTLC}) = y_T - K(1+r)^T - \frac{T^\eta b_L^2}{2g}, \tag{16}$$

$$V(\text{STLC}) = y_T - K(1+r)^T - C_r - \frac{(T/2)^\eta \Phi_S}{2g}, \tag{17}$$

$$V(\text{LTFC}) = y_T - K(1+r)^T - C_F, \tag{18}$$

where b_L, b_1, and b_2 are evaluated at the equilibrium claims solving the respective break-even conditions, and

$$\Phi_S \equiv b_1^2 + (1-\lambda_r)\,b_2^2, \tag{19}$$

$$C_r \equiv \lambda_r(y_T - \underline{y}), \tag{20}$$

$$C_F \equiv (1 - F(S_T^c))(y_T - \underline{y}). \tag{21}$$

Here C_r is the expected output loss from a rollover crisis, C_F is the expected cost of currency mismatch under FC debt, and Φ_S is a weighted measure of the inflation exposure under short-term LC debt. Since the FC value function does not depend on g while the LC inflation costs are decreasing in g, the sovereign's optimal debt structure shifts from FC to LC debt as institutional quality improves. The following proposition formalizes this pecking order.

Proposition 4 (Debt Structure and Institutional Quality)**.** *Suppose long-term foreign-currency debt is feasible. Assume*

$$C_F > C_r \tag{22}$$

and

$$2^{\eta} > \frac{C_F \, \Phi_S}{(C_F - C_r)\, b_L^2}. \tag{23}$$

Then there exist thresholds $g_{FC} < g_{LT}$ such that

$$D^*(g) = \begin{cases} LTFC, & g < g_{FC}, \\ STLC, & g_{FC} \le g < g_{LT}, \\ LTLC, & g \ge g_{LT}. \end{cases}$$

Proof. See Appendix A. □

Condition (22) requires that the expected cost of currency mismatch exceeds the expected cost of a rollover crisis, ensuring that FC debt is dominated for sufficiently high institutional quality; given (21) and (20), it reduces to $1 - F(S_T^c) > \lambda_r$, i.e., the currency-crisis probability exceeds the rollover-crisis probability. Condition (23) requires that the horizon-scaling parameter η is large enough for breaking maturity to meaningfully reduce inflation costs; it also guarantees that short-term LC debt becomes competitive before long-term LC debt as g rises, so the STLC region is non-empty. Intuitively, halving the maturity shrinks the horizon component of equilibrium inflation costs per bond by the factor 2^{η}, but the sovereign then plays the dilution game twice, which claws back a factor of two, leaving a net disciplining effect of order $2^{\eta-1}$.[16] Condition (23) requires this effect to be strong enough, relative to the cost ratio $C_F\Phi_S/[(C_F - C_r)b_L^2]$, that, as institutional quality deteriorates, the sovereign prefers to sacrifice maturity before sacrificing currency denomination.

Together, the two conditions deliver a non-degenerate three-region pecking order: as institutional quality deteriorates, the sovereign moves from LTLC (no inflation distortion, no rollover risk) to STLC (reduced inflation distortion via short maturity, but rollover exposure) to LTFC (hard commitment against inflation, but currency

[16] From the policy rule $I^* = b\,\tau^{\eta}/g$, and holding the benefit bases comparable across maturities, cumulative dilution under a single bond of maturity T relative to two consecutive bonds of maturity $T/2$ equals $T^{\eta}/\left[2\,(T/2)^{\eta}\right] = 2^{\eta-1}$. The case $\eta = 1$ corresponds to pure smoothing of a constant per-period loss: the per-bond commitment gain of 2 is exactly offset by rolling over twice, cumulative dilution is identical across maturity structures, and short maturity provides no discipline. In equilibrium, the short-term bases b_1 and b_2 differ from b_L through compounding, the rollover premium, and the strategic repricing term in (7), which is why condition (23) features Φ_S/b_L^2 rather than the clean factor $2^{\eta-1}$.

mismatch risk). The transition threshold is characterized by

$$g_{LT} = \frac{T^{\eta} b_L^2 - (T/2)^{\eta} \Phi_S}{2\, C_r}, \tag{24}$$

where g_{LT} is defined as a fixed point solving the equation, which we solve numerically.[17] The threshold is decreasing in rollover risk λ_r, through two reinforcing channels: a higher λ_r raises the crisis cost C_r in the denominator and, through the rollover premium embedded in the short-term claims, raises Φ_S in the numerator. Higher rollover costs thus shift the transition to LTLC toward lower institutional quality, expanding the LTLC region at the expense of STLC.

4.4.3 Calibration Strategy

The model is calibrated to align with empirical and quantitative studies on sovereign default.

Debt-to-GDP Ratio (K/y_T): We normalize the required capital investment to $K = 2.0$ and set target output at maturity to $y_T = 5.0$. This targets an implied debt-to-GDP ratio of 40%, consistent with our empirical facts.

Output Loss in Default ($\underline{y}$): We set $\alpha = 0.40$, imposing a 60% loss on the net surplus. We assume this severe penalty to ensure that the sovereign has no incentive to strategically default, which is necessary to sustain a viable FC debt equilibrium.[18]

Exchange Rate Dynamics ($\tilde{S}_T$): We parameterize a "crisis state" with a probability of $p = 0.18$. Over our 8-year maturity horizon, this precisely maps to a standard 2.45% annualized crisis probability (Arellano, 2008). In this state, the currency depreciates to $S_{bad} = 1.5$, the classical 50% sudden-stop benchmark for a severe emerging market crash (Frankel and Rose, 1996; Carmen M Reinhart and Kenneth S Rogoff, 2009). To analytically maintain $\mathbb{E}[\tilde{S}_T] = 1.0$, the model forces the normal state to carry a mild cumulative appreciation ($S_{good} \approx 0.89$), consistent with long-run real exchange rate catch-up (the Balassa-Samuelson effect).

Maturity Structure (T): The maturity for long-term debt is set to $T = 8.0$ years, closely matching the 7.95 years average maturity for LC sovereign bonds in our empirical sample. Consequently, short-term debt requires a single rollover midway through the project at $\tau = 4.0$ years.

[17] At the baseline calibration, the numerical solutions are $g_{FC} = 47.22$ and $g_{LT} = 91.84$; see Panel B of Figure 6.

[18] Since default payoffs to lenders are normalized to zero in the model, α captures the sovereign's retained output rather than creditor recovery, and is therefore not directly comparable to empirical sovereign haircuts. Our comparative statics results are robust to the choice of α.

Risk-Free Rate (r): The real risk-free rate is set to $r = 0.04$ (a 4% annualized rate), reflecting standard parameterizations of the lenders' opportunity cost (Arellano, 2008).
Rollover Crisis Probability (λ_r): The baseline probability of a self-fulfilling rollover crisis is anchored at $\lambda_r = 0.05$. This aligns with the mean fraction of bonds maturing in our sample as well as standard default probabilities.
Foreign Ownership Share (f): In the model, the sovereign derives no benefit from diluting domestically held debt. In practice, however, sovereigns retain weaker but non-negligible incentives to dilute domestic bondholders. If diluting domestic bondholders generates a fraction $\alpha_d \in (0, 1)$ of the gain perceived by the sovereign from diluting foreign ones, the effective dilution parameter becomes $f = f_{obs} + (1 - f_{obs})\alpha_d$, where f_{obs} denotes the observed foreign ownership share. We anchor f_{obs} to the sample average ($f_{obs} = 0.195$) and set $\alpha_d = 0.20$, implying that the sovereign perceives roughly one-fifth of the dilution benefit on domestically held debt. This yields $f \approx 0.36$.
Horizon Scaling (η) and Institutional Quality (g): We set $\eta = 1.5$ to ensure that breaking inflation into shorter intervals provides a convex cost advantage. The scaling parameter g is calibrated to $g = 91.84$. This structural value ensures that the expected output costs of a forced liquidation perfectly offset the inflation cost savings due to short-maturity debt, forcing the intersection of the ST and LT expected value curves to occur precisely at our baseline 5% rollover risk threshold.

4.4.4 Model Dynamics and Comparative Statics

Expected Value vs. Rollover Risk (λ_r). Panel A of Figure 6 plots the sovereign's expected value against the probability of a rollover crisis, λ_r. When the risk of a market freeze is entirely absent ($\lambda_r = 0$), STLC debt strictly dominates: with $\eta > 1$, breaking the inflation decision into two shorter horizons substantially reduces the equilibrium deadweight cost of inflation, and the vertical gap between the two curves at $\lambda_r = 0$ measures precisely this discipline gain. The value of the LT strategy is flat in λ_r (a sovereign that never returns to the market cannot suffer a rollover crisis) while the expected value of the ST strategy declines approximately linearly, at a rate given by the expected output loss of a crisis. At $\lambda_r = 0.05$, the expected cost of liquidation exactly offsets the inflation-cost savings; for any rollover risk above this threshold, LTLC debt becomes the strictly optimal choice.

The Currency-Maturity Trilemma (g). Panel B of Figure 6 illustrates the complete currency-maturity trilemma by holding rollover risk constant at $\lambda_r = 0.05$ and varying institutional quality (g). For countries with poor institutional quality ($g < 47.22$), the

sovereign hits its maximum inflation tax capacity at $g \approx 45$; rational lenders demand astronomically high nominal yields, which forces the sovereign to optimally inflate even more to survive, triggering an equilibrium-destroying "inflation death spiral." Because the LC market unravels, the sovereign must issue FC debt to credibly commit to zero inflation. For intermediate institutional quality ($47.22 \leq g < 91.84$), STLC debt is optimal. Over most of this region, the eight-year LC market is infeasible ($g < 88$), since the longer horizon strengthens the dilution temptation. Only near the top of the region does LTLC become feasible, and it remains dominated by the discipline savings of short maturity. Finally, for strong institutional quality ($g \geq 91.84$), the marginal cost of generating inflation is high enough that discretionary inflation, and hence its equilibrium deadweight cost, is negligible even over an eight-year horizon, and the sovereign locks in LTLC debt, completely immunizing itself from rollover risk.

Expected Value vs. Leverage (K). Panel C of Figure 6 plots the net welfare advantage of issuing long-term debt ($\Delta V = V(LC, T) - V(LC, T/2)$) against leverage. We observe a decreasing concave relationship where high debt burdens trigger an increasingly severe macroeconomic penalty. Because the marginal benefit of dilution scales with the outstanding claim, the equilibrium deadweight cost of inflation grows quadratically with leverage and disproportionately for the long-term claim, whose longer horizon amplifies the temptation through the factor T^{η}. This theoretical mechanism formally rationalizes our empirical finding that higher LC leverage is strictly associated with shorter maturities.

Expected Value vs. Horizon Scaling (η). Panel D of Figure 6 demonstrates the model's sensitivity to the horizon scaling parameter (η). When η is close to 1, the penalty function scales almost proportionally with the horizon, so that a single inflation decision over eight years costs approximately the same as two consecutive decisions over four years each: splitting the maturity provides no discipline (see footnote 16), and long-term debt strictly dominates because short-term debt then adds only rollover risk. As η increases, the penalty function becomes highly convex, capturing the reality that long-term LC debt creates strong incentives to inflate, thereby inflicting large damages on the real economy. Short-term debt only emerges as optimal when the convexity of these inflation savings is sufficiently high to offset the expected output loss of the baseline 5% rollover risk penalty.

Foreign Ownership (f). Panel E of Figure 6 demonstrates that as f increases (i.e., as more foreign capital enters the domestic LC market), the sovereign's temptation to inflate rises sharply. Higher foreign participation raises the equilibrium inflation costs of both

short- and long-term instruments but penalizes the long-term claim disproportionately, shrinking the LTLC dominance region and pushing the sovereign into STLC debt. This provides an explanation for our findings that high foreign participation in emerging market LC debt is associated with shorter maturity profiles.

Optimal Inflation Strategy (I^* vs. Leverage). Panel F of Figure 6 plots the optimal inflation policies across varying levels of leverage. For LT debt, the strategy is straightforward ex-post dilution: as leverage increases, rational lenders demand a higher nominal yield, prompting a non-linear acceleration in the implied inflation rate. The ST debt strategy reveals a dynamic problem. When leverage (K) is low, the required real repayment is small, and the forward-looking sovereign behaves as a classical tax-smoother, splitting the inflation burden evenly ($I_1^* \approx I_2^*$) to minimize convex distortions. However, as leverage grows, the sovereign faces a heightened incentive to inflate in the first period to lower the real value of the debt that must be rolled over. This reduced debt burden subsequently lowers the incentive to inflate in the second period, activating the repricing channel in (7), whereby the sovereign systematically abandons tax-smoothing and strategically front-loads the inflation tax ($I_1^* > I_2^*$).

Foreign Investors' Rents. The participation structure of Section 4.1 implies that foreign investors, whose outside option is r in units of their own consumption good, earn strictly positive expected surplus on both LC and FC debt. The calibration quantifies this surplus. On LC debt, the expected FC return exceeds the break-even return by the factor $\mathbb{E}[1/\tilde{S}_T] = 1.041$, a cumulative rent of 4.1% over the eight-year horizon (roughly 50 basis points per year). On FC debt, the expected FC payoff is $K(1+r)^T/\mathbb{E}[\tilde{S}_T \mid \tilde{S}_T \leq S_T^c] = K(1+r)^T/S_{good}$, a cumulative rent of 12.3% (roughly 1.5% per year), three times the LC rent, because the FC bond pays off precisely in the state in which the foreign currency is cheap and defaults in the state in which it is valuable. Foreign investors thus have the strongest incentive to take up FC issues, consistent with the substantially higher foreign ownership shares observed for EM foreign-currency debt (see Figure G.1 in the Appendix).

4.5 Empirical Implications

We now turn to the model's empirical implications. Because the model restricts the sovereign to a single currency–maturity instrument, Proposition 4 characterizes which instrument is optimal rather than a portfolio of debt shares. Its predictions are

nonetheless ordinal: as institutional quality deteriorates, for example, FC debt moves up the funding pecking order relative to both LC instruments, and, within LC debt, short maturity moves up relative to long. To confront the data, where sovereigns typically hold all three instruments simultaneously, we translate this ordering into predictions about debt composition through a marginal-issuance interpretation.

Consider a sovereign with a given stock of LTLC, STLC, and FC debt that must finance an additional stand-alone project—a project bond backed by dedicated cash flows, exactly as in the model. Proposition 4 pins down the currency and maturity of this marginal issue. Because individual issues differ in characteristics the model holds fixed—cash-flow risk, investor base, refinancing conditions—a sovereign in the neighborhood of the thresholds g_{FC} and g_{LT} does not sit exactly at a corner. Following a deterioration in institutional quality, any given issue is instead *more likely* to be denominated in FC, and, conditional on remaining in LC, *more likely* to carry a short maturity. A sovereign's debt stock is the accumulation of many such issuance decisions, so the pecking order of Proposition 4 translates into smooth comparative statics for the share of LC debt in total debt and the average maturity at which LC debt is issued. This aggregation logic can also be formalized directly: with mixed portfolios, the inflation incentive scales with the LC share while default risk scales with the FC share, yielding an interior optimum that preserves the comparative statics of Proposition 4 (see footnote 9). We therefore state the model's implications in terms of shares and average maturities. Because dilution incentives operate through the nominal LC claim, the empirical counterpart of the model's debt burden K is the stock of LC debt relative to GDP (LC leverage).

Implications 1–3 focus on EMs, where the tension among inflation, rollover risk, and currency mismatch generates binding trade-offs in sovereign debt structure. Implication 4 turns to AEs, which—by virtue of their strong institutional quality—reside in the long-term LC region of the trilemma and are not exposed to rollover risk.

Implication 1: *Sovereigns with weaker institutional quality hold a lower share of LC debt. Weaker institutional quality, higher LC leverage, and greater foreign ownership of LC debt each lead the sovereign to issue LC debt at shorter maturities, and consequently to bear greater exposure to rollover risk.*

Each of these characteristics sharpens the sovereign's temptation to dilute LC debt through inflation, so investors are willing to hold only claims that are difficult to dilute. The sovereign therefore shortens the maturity of its LC debt, submitting to frequent repricing as a commitment device. Short maturities, in turn, imply that a large fraction

of the debt stock comes due in the near term, leaving the sovereign dependent on refinancing that can fail—this dependence is what we mean by exposure to rollover risk.

Implication 2: *Sovereigns with higher inflation rates tend to have greater exposure to rollover risk, and this exposure is associated with wider CDS spreads.*

A sovereign borrowing in its own currency can, in principle, redeem any maturing bond by printing, so debt coming due should threaten the price level rather than solvency, leaving CDS spreads unaffected. In our model, however, high inflation and high rollover-risk exposure emerge together in equilibrium: the same weak commitment that surfaces as inflation also pushes the sovereign into short maturities, precisely because short-dated debt makes dilution too costly to be worthwhile. The sovereigns with the most debt coming due in the near term are therefore the least able to print their way out of a failed refinancing, and the risk of a rollover failure is borne as default risk that CDS spreads price.

Implication 3: *An increase in rollover risk affects financial prices more adversely in countries with greater exposure to rollover risk, with effects concentrated at the short end of the term structure.*

Whereas Implication 2 concerns rollover risk exposure, Implication 3 concerns rollover risk itself. When the probability of a refinancing failure (λ_r) rises—for instance, because part of the investor base withdraws—maturing bonds can be rolled over only at lower prices, that is, at larger promised claims to the remaining investors. This added financing cost is borne on exactly the bonds coming due, so the sovereign's debt burden—and with it default and dilution risk—rises most where large amounts of debt come due in the near term, depressing bond prices and widening CDS spreads. The model does not directly deliver a within-country term structure; if rollover risk is the operative channel, however, it loads on near-term default risk, so short-maturity yields and short-dated CDS spreads should respond more than long-dated ones—adding a further piece of evidence for the mechanism.

Implication 4: *Countries with strong institutional quality issue predominantly long-term LC debt and are consequently insulated from rollover-risk amplification.*

For these sovereigns the inflation time-inconsistency problem is mild, so long-term LC debt is sustainable without the discipline of frequent refinancing. With little debt maturing at any interim date, there is no refinancing constraint through which adverse shocks can be amplified, and the mechanism underlying Implication 3 should be absent.

5. Empirical Analysis

In this section, we take the theoretical predictions of our model to the data and test each of the empirical implications established in Section 4.

5.1 Debt Structure, Foreign Ownership, and Rollover Exposure

We test *Implication 1* in three steps. First, we examine how institutional quality shapes the currency composition and maturity of sovereign debt. Second, we investigate the roles of LC leverage and foreign ownership. Third, we show that the resulting short-maturity debt structures expose sovereigns to rollover risk.

5.1.1 Institutional Quality and Sovereign Debt Structure

In Table 2, we examine sovereign debt structure using the following regression:

$$y_{i,t} = \alpha_i + \delta_t + \beta \mathrm{I}_{i,t} + \gamma X_{i,t-1} + \epsilon_{i,t} \tag{25}$$

where the dependent variable $y_{i,t}$ is the average maturity of LC debt, the LC debt-to-GDP ratio, or the share of LC debt (LC debt divided by the sum of LC and FC debt) for country i in year t, and $\mathrm{I}_{i,t}$ is the explanatory variable of interest in each specification. In Columns (1)–(3), the dependent variable is the average maturity of LC debt, the LC debt-to-GDP ratio, and the share of LC debt, respectively. The explanatory variable is institutional quality (IQ). We measure IQ as the first principal component of the six World Bank Worldwide Governance Indicators, a standardized summary of a sovereign's institutional commitment.[19] Control variables $X_{i,t-1}$ include GDP growth, inflation, and inflation volatility (3-year rolling standard deviation). Country fixed effects (α_i) absorb time-invariant sovereign characteristics, and year fixed effects (δ_t) control for global macroeconomic shocks.

The results, presented in Table 2, provide strong empirical support for the first part of *Implication 1*. Column (1) shows that the maturity of LC debt increases with IQ, and the effect is statistically significant. Columns (2) and (3) show that the LC debt-to-GDP ratio and the share of LC debt both increase with IQ. Overall, these results are consistent with the pecking order of Proposition 4: sovereigns with weaker commitment face a stronger temptation to dilute, and accordingly sustain LC debt only at shorter maturities and in smaller quantities, with FC debt serving as the harder commitment device.

[19] The six indicators are control of corruption, government effectiveness, political stability, regulatory quality, rule of law, and voice and accountability. Figure 7 shows their trends over time.

5.1.2 LC Leverage, Foreign Ownership and Debt Maturity

We next test the prediction that higher LC leverage and a higher fraction of LC debt held by foreign investors are associated with shorter debt maturities. We estimate a regression similar to Equation (25), where the dependent variable is the average maturity of LC debt. Our primary explanatory variables of interest are LC leverage (total LC debt), LC debt held by foreign investors, and LC debt held by domestic investors, each as a percentage of GDP, using ownership data from Arslanalp and Tsuda (2014).

The results are reported in Table 3. Column (1) shows that higher LC leverage is associated with significantly shorter LC maturities. We further find that the coefficients on both LC debt held by foreign investors and LC debt held by domestic investors are negative and statistically significant: as the government expands its debt stock, the risk of dilution rises, and the sovereign shortens maturities to keep investors willing to hold its debt. Crucially, however, the coefficient on foreign ownership is approximately three times as large in magnitude as the coefficient on domestic ownership in Column (4). This differential is the distinctive prediction of our model: because diluting foreign-held claims yields a real resource gain while diluting domestically held claims is a purely internal transfer, the sovereign's temptation to inflate scales with the foreign-held share f.

These results provide evidence on the cost of overcoming *original sin*: while EMs successfully transitioned toward LC borrowing, foreign participation replaced traditional currency mismatch with shorter maturities and, as we show next, with greater exposure to rollover risk.

5.1.3 LC Leverage, Institutional Quality, Foreign Ownership, and Exposure to Rollover Risk

Having established that LC leverage, weaker institutional quality, and foreign participation reduce the maturity of LC debt, we now turn to the final piece of *Implication 1* and ask whether changes in these characteristics are associated with higher exposure to rollover risk. We proxy this exposure with $\text{FBM}_{c,t}$, the amount of LC bonds maturing within one year relative to GDP, defined in Section 3 (see Section B.3 in the Appendix for construction details), and regress this measure on LC leverage, IQ, and LC debt held by foreign investors, maintaining the standard macroeconomic controls as well as country and time fixed effects.

Table 4 shows the results. We find that LC leverage, weaker institutional quality, and LC debt held by foreign investors are positively and significantly related to

exposure to rollover risk. This evidence, together with the results in the preceding subsections, is consistent with our predictions in *Implication 1*.

5.2 Inflation, Rollover Risk, and CDS Spreads

We next test *Implication 2*, which links inflation, rollover-risk exposure, and sovereign credit risk. Table 5 presents the results. Column (1) regresses our measure of exposure to rollover risk, $\text{FBM}_{c,t}$, on lagged inflation rates, and Column (2) regresses the log of 5-year sovereign CDS spreads on lagged inflation rates directly. Columns (3) and (4) regress the log of 5-year sovereign CDS spreads on the predetermined maturity structure: following Carvalho (2015), we measure FBM one year earlier, so that the maturity structure is not itself responding to current market conditions. Column (4) adds the analogous FC measure.

Columns (1) and (2) document the inflation associations. High-inflation sovereigns carry significantly greater rollover-risk exposure: a 10 percentage point higher year-over-year inflation rate predicts a 0.5 percentage point higher fraction of bonds maturing within one year, roughly one tenth of the sample mean. When inflation reveals a weak commitment to price stability, investors are more willing to hold claims that reprice frequently, and the sovereign's maturity structure shortens accordingly. Inflation also shows up in sovereign credit markets: the same 10 percentage point difference is associated with approximately 14% wider CDS spreads.

Column (3) shows that exposure to rollover risk is itself priced: a one standard deviation increase in the predetermined fraction of bonds maturing is associated with approximately 7.6% wider CDS spreads. Because our measure of exposure is based on the maturity structure of LC debt—which constitutes a substantially larger share of total sovereign debt than FC debt—Column (4) examines whether FC exposure is priced similarly. The coefficient on LC exposure is nearly three times as large as the coefficient on FC exposure, which is not statistically significant. This asymmetry is consistent with the model: maturing FC debt entails generic refinancing pressure but involves no dilution incentive, so the commitment channel that makes short maturities informative about sovereign credibility operates specifically through LC debt. The weaker role of FC exposure also reflects its much smaller scale: Tables D.1 and D.2 in the Appendix, together with Figure 8, show that FBM_{FC} averages 1.0% of GDP, compared to 4.5% for $\text{FBM}_{c,t}$, and that the average debt maturity in FC is 10.41 years, compared to 7.95 years in LC.

Overall, this pattern is what *Implication 2* predicts and what monetary sovereignty alone would not: sovereigns whose inflation reveals weak commitment have the most

debt coming due in the near term and, being the least able to inflate away a failed refinancing, see that exposure priced as default risk. The inflation–CDS association in Column (2) is consistent with these two links operating jointly.

5.3 Capital Flows and Rollover Risk

Implication 3 concerns an increase in rollover risk itself: negative shocks should affect financial prices most adversely in countries with large amounts of debt coming due in the near term. Testing this prediction requires an observable shock to rollover risk. Because rollover risk rises when part of the investor base withdraws (Section 4.5), we measure such shocks with cross-border capital flows into and out of LC sovereign bond markets. Observed flows are endogenous, however—they respond to inflation, default risk, and the same country conditions that move asset prices—so we rely on plausibly exogenous flow shocks from the literature: flows implied by portfolio rebalancings (FIR), shifts in the Broad Dollar Index (BDI), and U.S. monetary policy shocks (MPS). We focus on FIR in the main text and report BDI and MPS results in Online Appendix I.

FIR exploits the mechanical rebalancings of the GBI-EM Global Diversified index—the largest and most widely tracked LC government bond benchmark for EMs, with $222 billion in benchmarked assets as of December 2021. Because the index caps country weights at 10%, its monthly rebalancings force reallocations of foreign holdings across countries for reasons unrelated to country fundamentals. Following Pandolfi and Williams (2019), we measure FIR as the implied dollar flows generated by these mechanical weight changes, normalized by the size of each country's sovereign bond market, and aggregate them to the quarterly level.[20]

Two economic forces make even these passive reallocations consequential for rollover risk. First, an outflow shock reallocates holdings from relatively inelastic, long-term investors to more price-sensitive arbitrageurs, so that—consistent with evidence on the downward-sloping demand for sovereign debt—even informationless sales depress bond prices and raise yields. Second, higher yields at the point of refinancing tighten the sovereign's interim budget constraint; the increased cost of rolling over debt raises default risk, which can further depress prices. This mutually reinforcing spiral is what the crisis probability λ_r captures in reduced form.

To avoid using a maturity structure determined simultaneously with the flow shocks, we use predetermined bond maturities as in Section 5.2: FBM based on bonds

[20] Rebalancing takes place at the end of each month, so we sum the three monthly shocks within each quarter, following the aggregation of monetary policy shocks around FOMC meetings in Ottonello and Winberry (2020). Appendix C.1 describes the index rules and Appendix C.2 the construction of FIR.

issued at least one year earlier, which excludes short-term bonds issued during the preceding year. We sort countries each year into terciles of this measure, creating the dummy $\text{TopFBM}_{c,t}$, which equals one for countries in the top tercile. We use the dummy rather than the continuous variable because amplification requires enough debt coming due for the refinancing constraint to bind.[21]

5.3.1 Exchange Rates and CDS Spreads

To test whether capital-flow shocks affect financial prices more adversely in countries with greater exposure to rollover risk, we estimate the following regression:

$$\Delta y_{ct} = \theta_t + \theta_c + \beta_1 \text{FIR}_{ct} + \beta_2 \text{TopFBM}_{ct} + \beta_3 \text{FIR}_{ct} \times \text{TopFBM}_{ct} + \gamma' \text{Controls}_{c,t-1} + \epsilon_{ct} \tag{26}$$

where y_{ct} is the log of the exchange rate or the log of the 5-year CDS spread at quarter t for country c. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with FIR. The coefficient β_1 captures the baseline effect of the shocks, and β_3—the main coefficient of interest—their differential effect on countries with high exposure to rollover risk. We expect both to be negative: a capital inflow shock should appreciate the local currency (a drop in the price of the U.S. dollar expressed in local currency units) and compress the country's CDS spread, with both effects amplified by rollover-risk exposure.

Table 6 presents the results. Columns (1) and (3) report the specification without the interaction terms: the FIR coefficient is negative and statistically significant for both outcomes—capital inflows appreciate the exchange rate and compress CDS spreads. The magnitudes are economically significant. In 2016 Q4, for example, Chile's FIR was equal to -0.6947; the estimates imply an exchange rate depreciation of $(-0.6947) \times (-0.0099) = 0.69\%$ and an increase in CDS spreads of $(-0.6947) \times (-0.0154) = 1.07\%$ in response to these plausibly exogenous outflows.

Columns (2) and (4) add the rollover-risk interactions. For exchange rates (Column 2), FIR remains significant, and FIR $\times$ TopFBM is negative and statistically significant: a one standard deviation increase in FIR appreciates the exchange rate by 2.87%, rising to 3.62% for countries in the top tercile of rollover-risk exposure—an amplification of approximately 26%. For CDS spreads (Column 4), the effect is concentrated in high-exposure countries: in response to the same shock, their CDS spreads decline

[21] In the Appendix, we further assess the robustness of our bond maturity measure by constructing the FBM measure using DD2, which captures the amount of bonds maturing in two years.

by 7.6%, more than twice the point estimate for other countries. Consistent with *Implication 3*, the same capital-flow shock thus moves financial prices substantially more where large amounts of debt come due in the near term.

5.3.2 Term Structure Effects

As noted in Section 4.5, the model does not directly deliver a within-country term structure; but if rollover risk is the operative channel, it loads on near-term default risk, and the effects of capital-flow shocks should be concentrated at the short end—in short-maturity bond yields and CDS spreads—while long-dated instruments remain relatively insulated. We therefore read the following results as evidence for the mechanism of *Implication 3* rather than as a test of a formal prediction of the model.

Bond Yields. To examine maturity-specific responses, we estimate specifications analogous to Equation (26) at the bond level, with the change in the yield of bond i in maturity group $m \in \{st, mt, lt\}$ as the outcome variable.[22]

Panel (A) of Table 7 reports the findings. Short-term bond yields are the most sensitive to capital flow shocks: a one-standard-deviation FIR shock reduces short-term bond yields by 0.62 percentage points on average, with an additional decline of 0.17 percentage points in countries in the top tercile of bonds maturing, corresponding to a rollover-risk amplification effect of 28%. By contrast, the average FIR effect on long-term bond yields is statistically insignificant, consistent with the mechanism whereby the refinancing constraint binds at short maturities. In Online Appendix Tables I.3 and I.4, we present consistent results for BDI and monetary policy shocks, with effects concentrated in short- and medium-term maturities.

Credit Default Swaps. We repeat the analysis for sovereign CDS spreads, comparing 5-year and 10-year contracts.[23] Panel (B) of Table 7 reports the effects of FIR shocks on 5- and 10-year CDS spreads. A one-standard-deviation capital flow shock leads to a significant decline in 5-year spreads in countries with high rollover-risk exposure, while the impact on 10-year spreads is statistically insignificant and roughly one-third as large. In Online Appendix Tables I.3 and I.4, BDI and monetary policy shocks

[22] We collect daily yield data for government bonds in the JP Morgan index from Bloomberg. Short-term bonds (st) have maturities of 1–5 years, medium-term bonds (mt) 5–10 years, and long-term bonds (lt) more than 10 years.

[23] We do not use CDS spreads with shorter maturities due to data limitations for many countries in our sample.

show qualitatively similar patterns. Overall, the evidence from both bond yields and CDS spreads strongly supports the mechanism of *Implication 3*.

5.4 Institutional Quality and Advanced Economies

Finally, we test *Implication 4* by examining AEs. In the model, sovereigns with highly credible institutions (high g) face only a weak temptation to dilute; they optimally issue long-term LC debt, with little debt coming due at interim dates and hence no margin for the amplification mechanism of *Implication 3* to operate. AEs should therefore show no rollover-risk amplification of external shocks.

For each AE, we construct $\text{FBM}_{c,t}$ and estimate the effect of exogenous shocks on CDS spreads using specifications analogous to Equation (26). We focus on BDI and MPS shocks; FIR is excluded because the GBI-EM index covers only EMs.

Table 8 presents the results. Panel A shows that the coefficient on $\Delta \log \text{BDI} \times \text{TopFBM}$ is statistically insignificant across all specifications, indicating no amplification of dollar shocks through the rollover-risk channel in AEs. Panel B shows qualitatively similar results for monetary policy shocks: the interaction is marginally significant on the announcement day (at 10%) but dissipates immediately thereafter.

Overall, these findings support *Implication 4*: AEs reside in the high-credibility, long-maturity region of the debt trilemma, where little debt comes due in the near term, leaving capital-flow reversals no rollover exposure to amplify.

6. Conclusion

This paper examines how the currency composition of sovereign debt interacts with its maturity structure, and what this interaction implies for rollover risk in emerging markets. We construct a granular bond-level dataset covering 23 EMs and nine AEs and document that sovereign leverage in EMs has expanded primarily through LC debt, that average LC maturities have declined substantially, and that exposure to rollover risk has risen in several EMs. Motivated by these facts, we develop a model in which sovereigns face a trilemma between inflation distortions, rollover risk, and currency mismatch. Because higher leverage, weaker institutional quality, and greater foreign ownership of LC debt each sharpen the temptation to dilute LC debt through ex-post inflation, sovereigns with these characteristics sit lower in the funding pecking order: they sustain LC debt only at shorter maturities, submitting to frequent repricing as a

commitment device at the cost of exposure to rollover crises, and, where institutional frictions are most severe, rely on FC debt as the harder commitment device.

We next evaluate the model's predictions empirically. Consistent with this pecking order, sovereigns with higher LC leverage, weaker institutional quality, or greater foreign ownership of LC debt issue it at shorter maturities and are more exposed to rollover risk; stronger institutional quality is also associated with a larger stock of LC debt. We further show that sovereigns with higher inflation rates have more debt coming due in the near term, and that this exposure is priced in wider CDS spreads. Using countries' ex-ante maturity structures and plausibly exogenous variation in cross-border capital flows, we find that the effects of capital-flow shocks on exchange rates, CDS spreads, and bond yields are significantly amplified when countries face high rollover-risk exposure. These effects are concentrated at the short end of the term structure, where the refinancing constraint binds. By contrast, AEs with strong institutions issue predominantly long-term LC debt and show little evidence of rollover-risk amplification, suggesting that institutional quality determines a sovereign's position in the debt trilemma.

Our findings underscore that overcoming *original sin* carries a cost of its own: while the shift toward LC debt mitigates traditional currency mismatch, it exposes sovereigns to inflation distortions and rollover risk. The binding constraint for EMs is therefore no longer the ability to borrow in their own currency, but the institutional credibility required to sustain that borrowing at long maturities.

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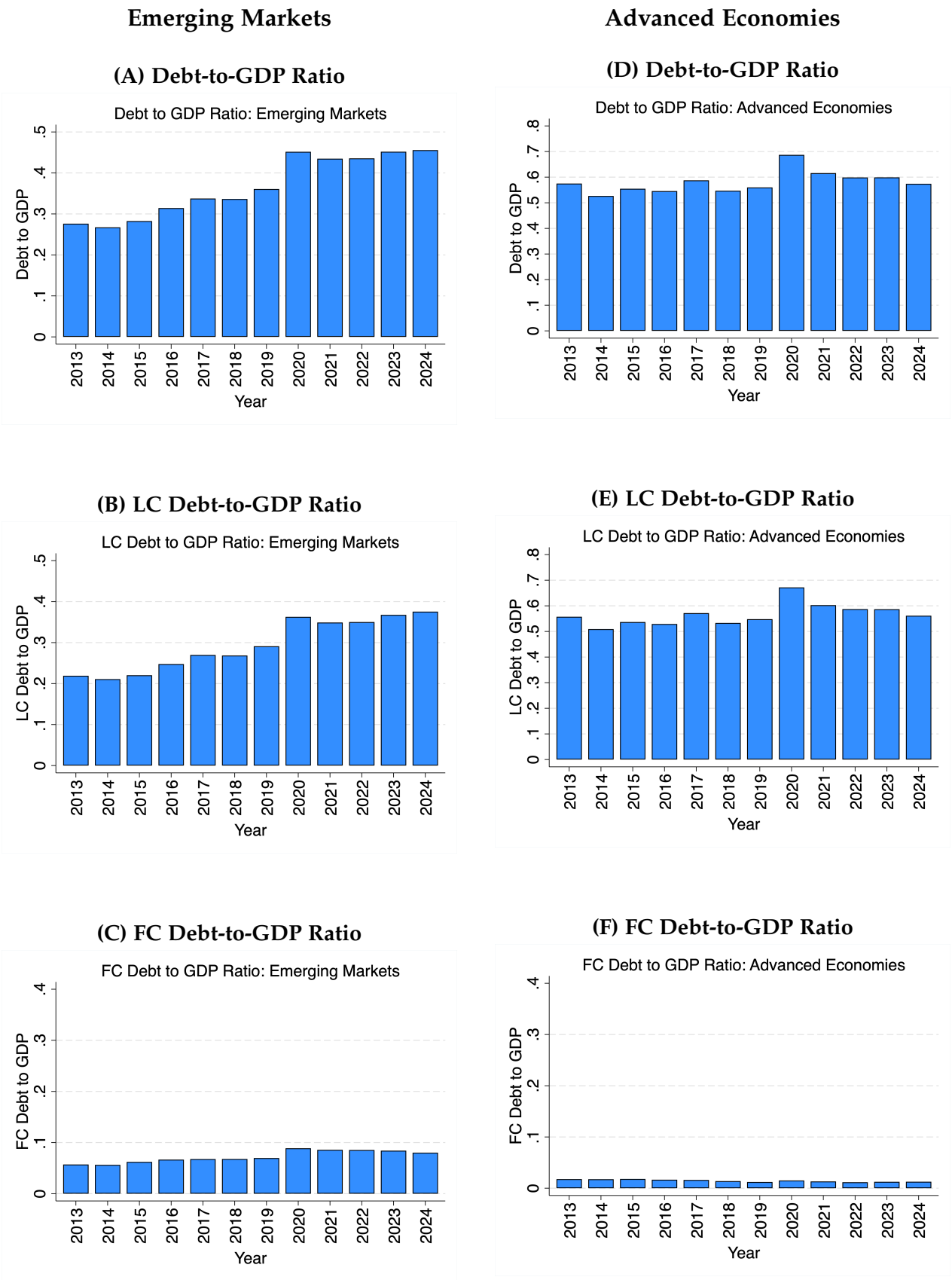
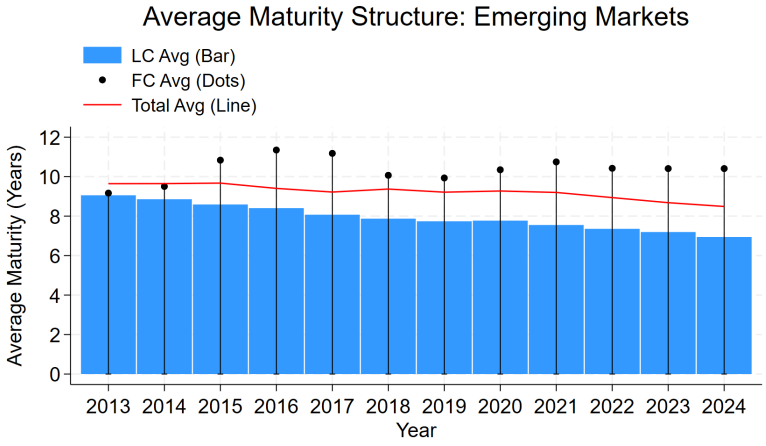
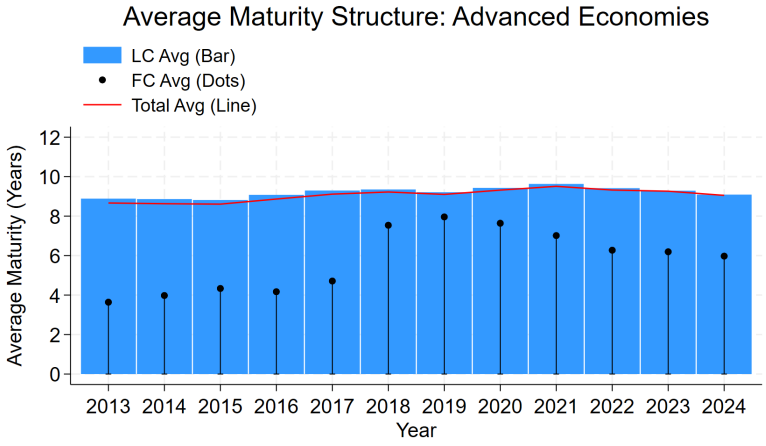


Figure 1. This figure plots the average general government debt-to-GDP ratio (panels A and D), the average LC general government debt-to-GDP ratio (panels B and E), and the average FC general government debt-to-GDP ratio (panels C and F) for the emerging-market economies (panels A–C) and advanced economies (panels D–F) in our sample from 2013 to 2024. To construct each series, we first measure the debt-to-GDP ratio for each country in a given year, and then calculate the simple cross-sectional average across all countries in the group for that year. Data sources: Bank for International Settlements (BIS) and World Bank.

(A) Emerging Economies Average Maturity



(B) Advanced Economies Average Maturity



Panel (C): Average Maturity by country group

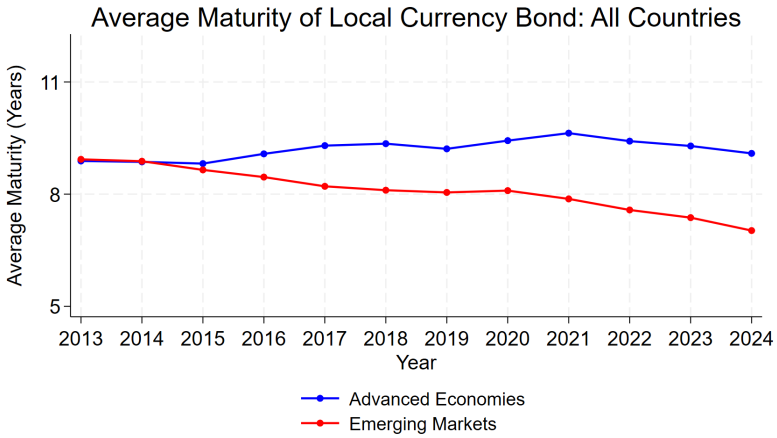


Figure 2. Panel A of this figure reports the LC average bond maturity (blue bars), the FC average bond maturity (black dots), and the total average bond maturity (red line) for all emerging-market countries in our sample from 2013–2024. For each country and year, we compute the weighted average years to maturity of LC and FC debt at the country level. The total average bond maturity is calculated as the weighted average of LC and FC maturities. We then take the simple (unweighted) average across countries in a given year to obtain each data point in the figure. Panel B employs an analogous construction for advanced economies. Panel C plots the average debt maturity for both advanced and emerging economies. Data sources: Refinitiv Eikon.

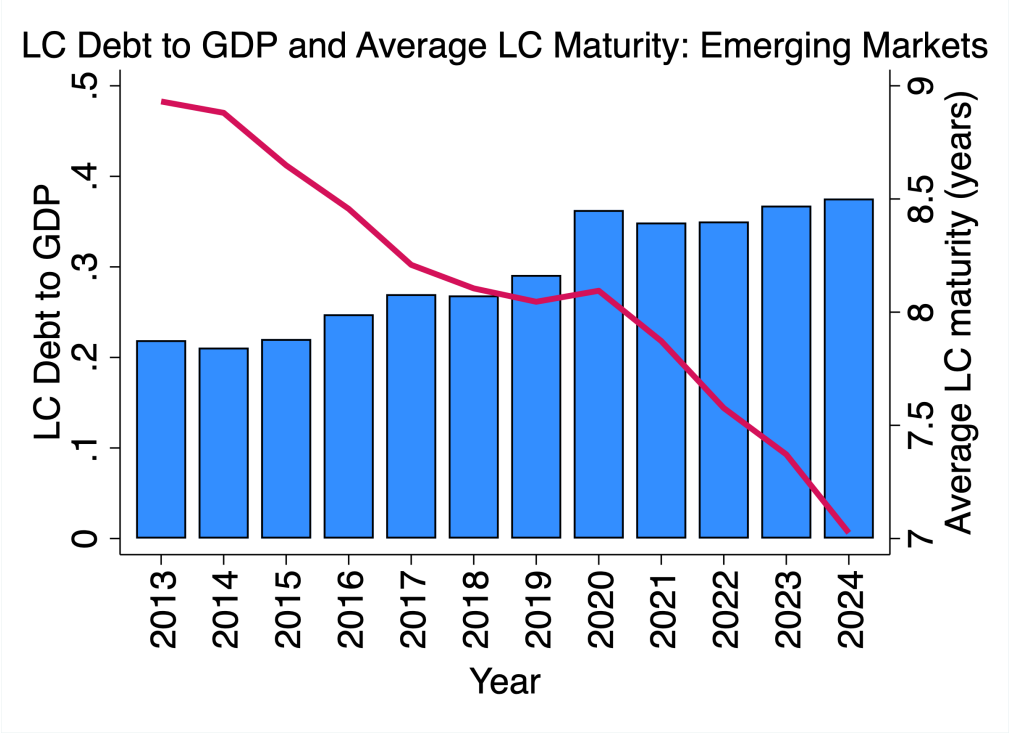
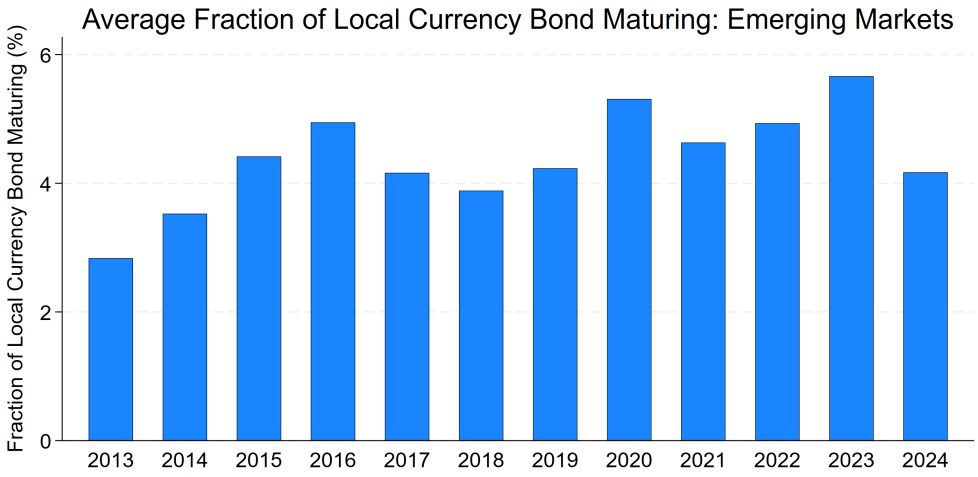


Figure 3. This figure reports the average LC general government debt-to-GDP ratio (left axis) and LC average bond maturity (right axis). To construct the debt-to-GDP ratio, we first measure the ratio for each country in a given year, and then calculate the simple cross-sectional average across all countries in the group for that year. To construct the average LC maturity, for each country and year, we compute the weighted average years to maturity of LC at the country level. We then take the simple (unweighted) average across countries in a given year to obtain each data point in the figure.

(A) Emerging Markets: Fraction of Bond Maturing by year



(B) Emerging Markets: Fraction of Bond Maturing by country

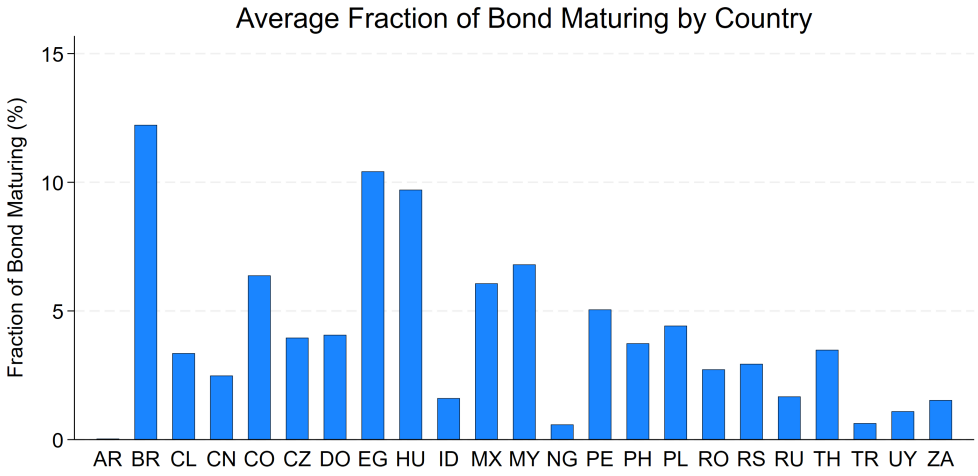
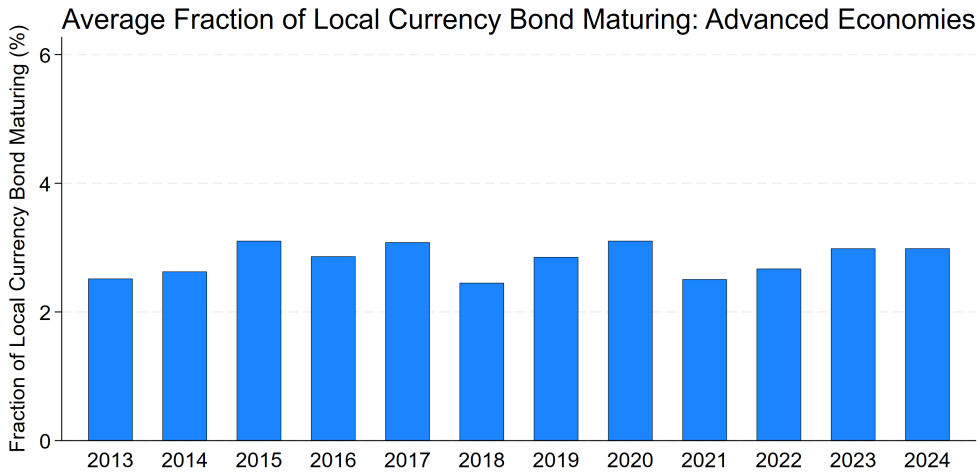


Figure 4. This figure reports the amount of bonds maturing within one year as a percentage of GDP for the emerging market countries in our sample from 2013–2024. The fraction of LC bonds maturing is computed by dividing the value of outstanding bonds maturing within one year by GDP. Panel (A) reports the cross-country average of the fraction of bonds maturing by year. Panel (B) reports the average fraction of bonds maturing by country over 2013–2024. Source: Refinitiv Eikon.

(A) Advanced Economies: Fraction of Bond Maturing by year



(B) Advanced Economies: Fraction of Bond Maturing by country

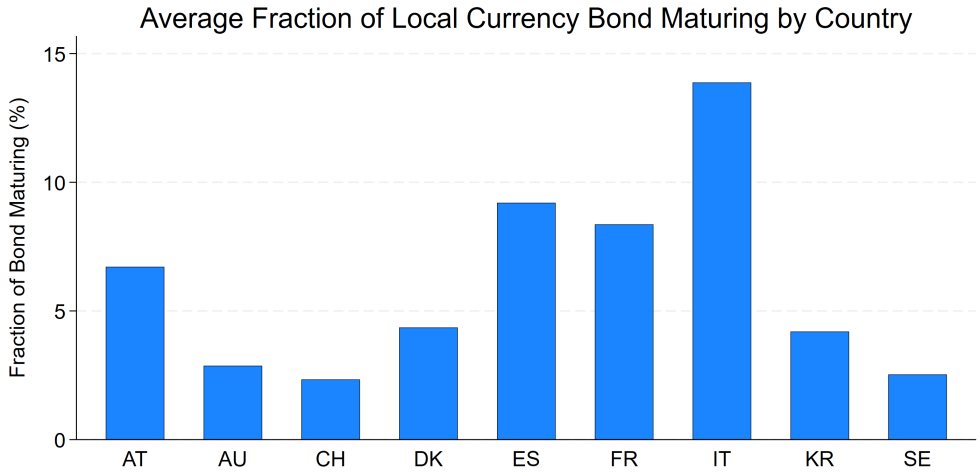


Figure 5. This figure reports the amount of bonds maturing within one year as a percentage of GDP for advanced-economy countries in our sample from 2013–2024. The fraction of LC bonds maturing is computed by dividing the value of outstanding bonds maturing within one year by GDP. Panel (A) reports the cross-country average of the fraction of bonds maturing by year. Panel (B) reports the average fraction of bonds maturing by country over 2013–2024. Source: Refinitiv Eikon.

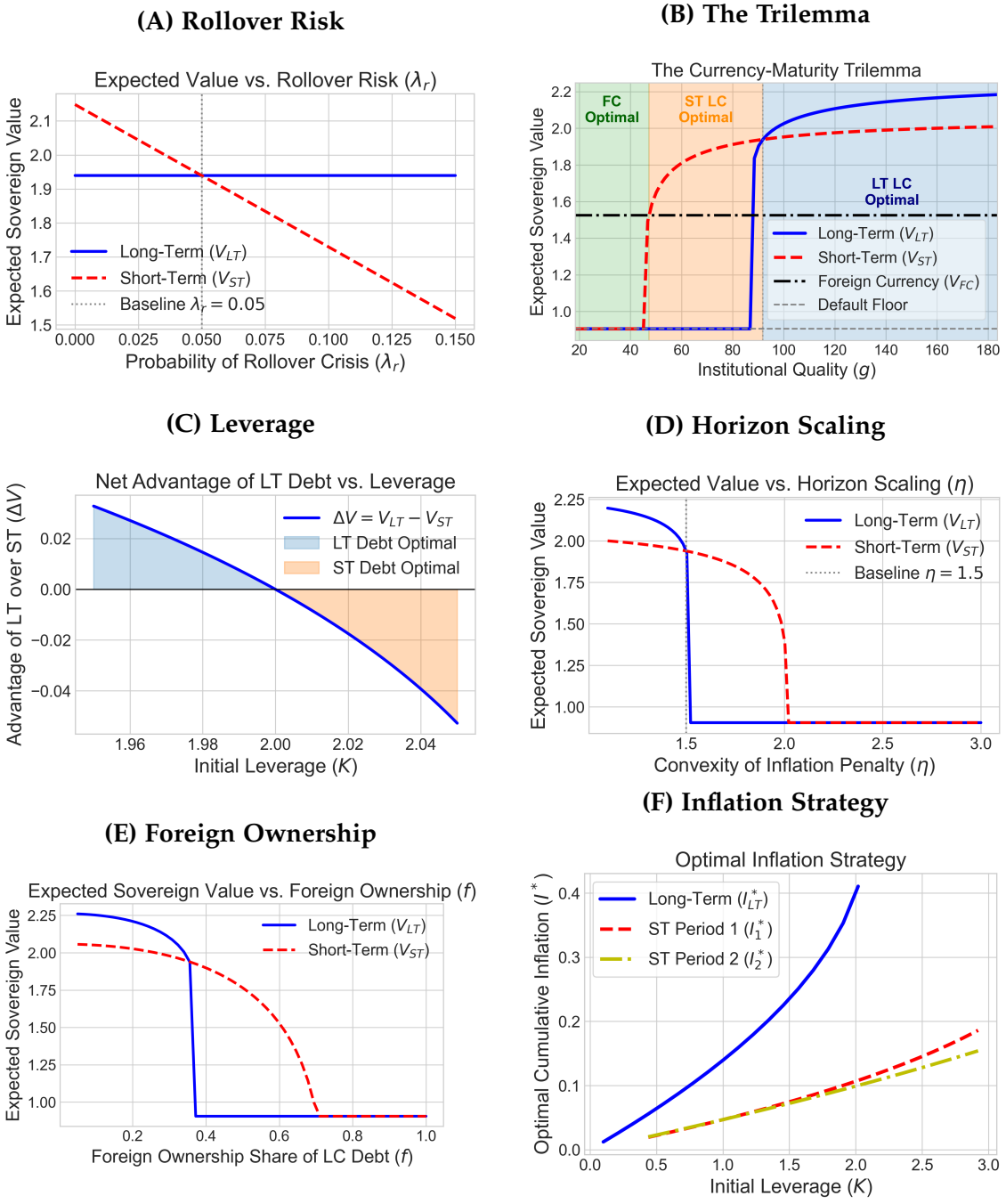


Figure 6. This figure plots the numerical simulations of the sovereign's expected value and optimal policy choices. Panel A illustrates the trade-off between long-term (LT) and short-term (ST) LC debt as the probability of a rollover crisis (λ_r) increases. Panel B maps the currency-maturity trilemma against institutional quality (g); the shaded regions denote the optimal debt policy. The two region boundaries are the thresholds of Proposition 4, solved numerically: $g_{FC} = 47.22$ and $g_{LT} = 91.84$. Panel C shows the net advantage of LT over ST debt (ΔV) as a function of initial leverage (K). Panel D displays the sensitivity of expected sovereign value to the convexity of the inflation penalty (η). Panel E plots the transition from LT to ST debt optimality as the foreign ownership share (f) increases. Panel F plots the sovereign's optimal inflation strategies under ST and LT debt, across varying levels of leverage.

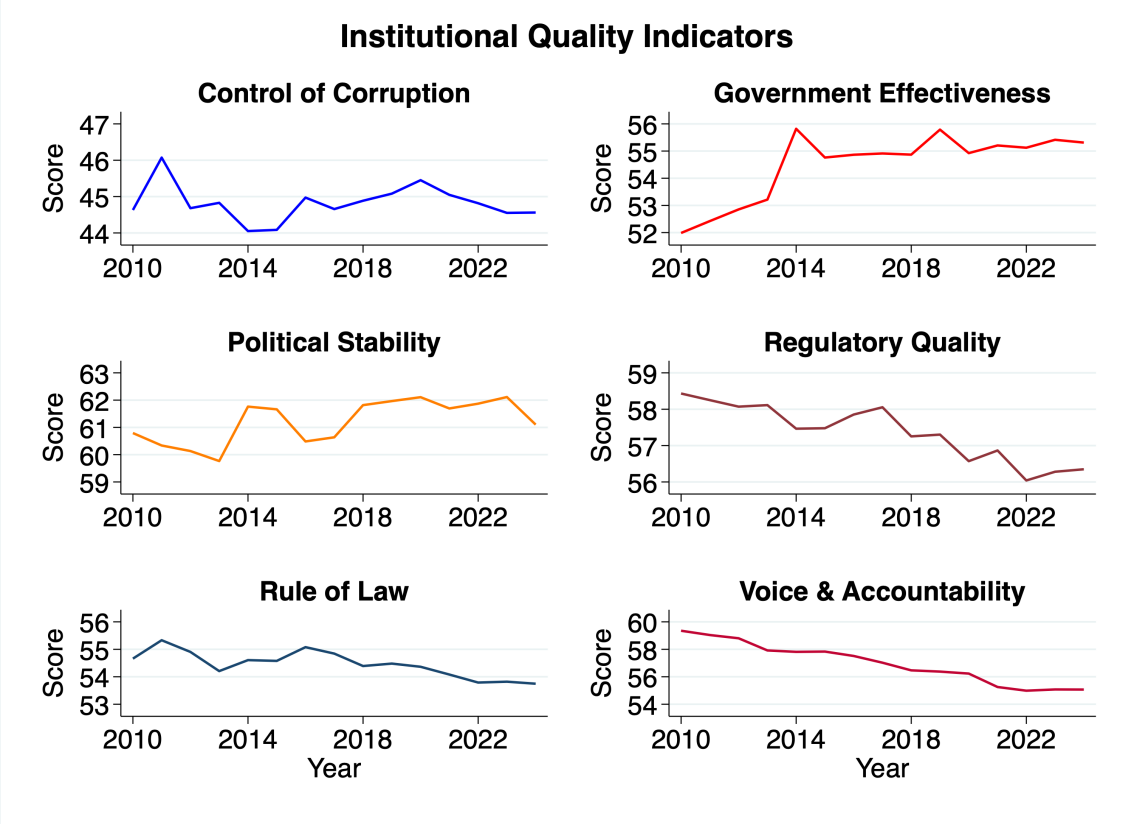


Figure 7. This figure presents institutional quality indices from the World Bank for the 23 countries in our sample. The indices are standardized on a 0–100 scale, with higher values indicating better governance, and cover six dimensions: Control of Corruption, Government Effectiveness, Political Stability, Regulatory Quality, Rule of Law, and Voice and Accountability. The figure plots the evolution of these indicators over time (2010–2024). Source: World Bank.

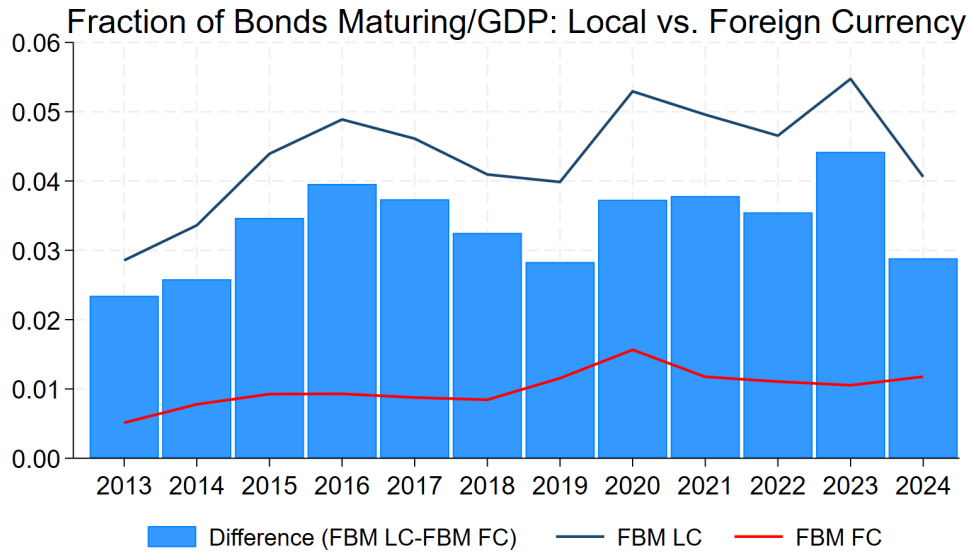


Figure 8. This figure reports the annual average share of bonds maturing within one year, expressed as a percentage of GDP. For each year, we compute the cross-country averages of FBM LC and FBM FC. FBM LC is the fraction of LC bonds maturing within one year (see Equation 32), while FBM FC is the fraction of FC bonds maturing within one year. FBM (LC–FC) is defined as the difference between FBM LC and FBM FC. Source: Refinitiv Eikon.

Table 1. Baseline Calibration Parameters

Parameter	Symbol	Value
Leverage (Implies ∼40% Debt/GDP)	K	2.0
Target Output at Maturity	y_T	5.0
Recovery Rate on Net Surplus	α	0.40
Depreciation Probability	p	0.18
Depreciation Shock (50% Depreciation)	S_{bad}	1.50
Long-Term Maturity (Years)	T	8.0
Risk-Free Rate	r	0.04
Rollover Crisis Probability	λ_r	0.05
Horizon Scaling (Convexity)	η	1.5
Institutional Quality Target	g	91.84
Foreign Ownership Share	f	0.36

This table reports the baseline calibration. Section 4.4 details each choice.

Table 2. Institutional Quality and Sovereign Debt Structure

	Debt Maturity (1)	**LC Debt/GDP** (2)	**Share of LC Debt** (3)
Institutional Quality	1.946***	0.094***	0.146***
	(0.524)	(0.025)	(0.016)
Observations	175	175	171
Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
R-squared	0.9322	0.9260	0.9181

This table reports the estimated coefficients of regressions examining how institutional quality relates to the structure of sovereign debt. In Columns (1)–(3), the dependent variable is the average maturity of local currency debt (Debt Maturity), the local currency debt-to-GDP ratio (LC Debt/GDP), and the share of LC debt, defined as LC debt divided by the sum of LC and FC debt, respectively. The primary variable of interest is a measure of institutional quality constructed from the six World Bank Worldwide Governance Indicators (the standardized first principal component). We control for lagged GDP growth, inflation, and inflation volatility (3-year rolling standard deviation). All specifications include country and year fixed effects. Standard errors are clustered at the time level and are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3. LC Leverage, Foreign Ownership and Debt Maturity

	Debt Maturity (1)	**Debt Maturity** (2)	**Debt Maturity** (3)	**Debt Maturity** (4)
LC Debt/GDP	-7.658***			
	(1.876)			
LC Debt Held FI/GDP		-15.299*		-19.712**
		(7.748)		(7.782)
LC Debt Held DI/GDP			-4.594*	-6.821***
			(2.475)	(1.910)
Observations	163	163	163	163
Controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
R-squared	0.9358	0.9349	0.9338	0.9374

This table reports the estimated coefficients of regressions examining the impact of LC leverage and foreign ownership on debt maturity. The dependent variable across specifications is the average maturity of local currency debt (Debt Maturity). The primary variables of interest are LC Debt/GDP, LC Debt held by FI, and LC Debt held by DI, each as a percentage of GDP. LC Debt held by FI and DI refers to local currency government debt held by foreign and domestic investors, respectively, as reported by Arslanalp and Tsuda (2014). We control for lagged GDP growth, inflation, inflation volatility (3-year rolling standard deviation), and institutional quality. All specifications include country and year fixed effects. Standard errors are clustered at the time level and are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4. LC Leverage, Institutional Quality, Foreign Ownership, and Exposure to Rollover Risk

	Bonds Maturing/GDP (1)	**Bonds Maturing/GDP** (2)	**Bonds Maturing/GDP** (3)
LC Debt/GDP	0.099**		
	(0.0394)		
Institutional Quality		-0.0054**	
		(0.0024)	
LC Debt Held FI/GDP			0.2542**
			(0.0973)
Observations	602	602	609
Controls	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
R-squared	0.2294	0.2069	0.2174

This table reports the estimated coefficients from regressions examining the impact of changes in LC leverage, institutional quality, and local-currency government debt held by foreign investors on exposure to rollover risk. The dependent variable in all specifications is the change in bonds maturing relative to GDP, that is, the fraction of local-currency (LC) government bonds maturing within one year as a share of GDP. The primary variables of interest are changes in LC leverage (LC debt over GDP), changes in lagged institutional quality, measured as the standardized first principal component of the six World Bank Worldwide Governance Indicators, and changes in LC government debt held by foreign investors relative to GDP. Observations are at the country-quarter level. All specifications control for lagged GDP growth, inflation, inflation volatility, and changes in average debt maturity, and include country and time fixed effects. Standard errors are clustered at the time level and are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5. Inflation, Rollover Risk, and CDS Spreads

	Bonds Maturing/GDP	**Credit Default Swaps**		
	(1)	(2)	(3)	(4)
Inflation_{t-1}	0.0502**	1.3220***		
	(0.0157)	(0.3086)		
Lagged FBM			0.0757**	0.0815**
			(0.0289)	(0.0307)
Lagged FBM_FC				0.0262
				(0.0158)
Observations	591	615	639	632
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.88	0.88	0.88	0.91

This table reports the estimated coefficients from regressions of $FBM_{c,t}$ (Bonds Maturing/GDP) on lagged inflation, and of the log of CDS spreads on lagged inflation and on lagged $FBM_{c,t}$. In Column (1), the dependent variable is $FBM_{c,t}$, the fraction of LC bonds maturing within one year over GDP. In Columns (2)–(4), the dependent variable is the log of the 5-year CDS spread. Inflation_{t-1} is the lagged year-over-year inflation rate. Following Carvalho (2015), Lagged FBM and Lagged FBM_FC are the fractions of LC and FC bonds coming due in a given year as predicted from the maturity structure in place in the previous year, and thus reflect only bonds outstanding at that date. Both are standardized. Observations are at the country-quarter level. Controls include lagged total debt over GDP, GDP growth, average LC bond maturity, and interest rates; Column (4) additionally controls for the lagged average maturity of FC debt and the lagged log exchange rate. All specifications include country and time fixed effects. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 6. Capital Flows and Rollover Risk: Flows Implied by the Rebalancing (FIR)

	Exchange Rate	**Exchange Rate**	**Credit Default Swaps**	**Credit Default Swaps**
FIR	-0.0099***	-0.0287**	-0.0154***	-0.0354
	(0.0030)	(0.0121)	(0.0042)	(0.0283)
FIR × TopFBM		-0.0075**		-0.0406***
		(0.0031)		(0.0120)
Observations	733	673	690	639
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.5193	0.5500	0.5614	0.5633

This table reports the estimated coefficients of FIR and FIR× TopFBM on the changes in the log of the exchange rate, and the log of CDS spreads. Observations are at the country-quarter level. The main independent variable is the measure of standardized flows implied by the rebalancings accumulated to the quarterly-level interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. All regressions control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with FIR. Robust standard errors clustered at the country level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Table 7. Flows Implied by the Rebalancing (FIR) and Term Structure Effects

Panel A: Impact on Bond Yields by Maturity

	Bond Yields (1–5Y)	Bond Yields (5–10Y)	Bond Yields (10Y+)
FIR	-0.6218***	-0.2837	-0.0592
	(0.2346)	(0.1806)	(0.0984)
FIR × TopFBM	-0.1745**	0.0429	0.0713**
	(0.0782)	(0.0672)	(0.0331)
Observations	4,547	3,290	2,859
Bond FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
R-squared	0.2604	0.3175	0.5116

Panel B: Impact on CDS Spreads by Maturity

	Credit Default Swaps (5Y)	Credit Default Swaps (10Y)
FIR	-0.0353	0.0271
	(0.0284)	(0.0583)
FIR × TopFBM	-0.0399***	-0.0119
	(0.0119)	(0.0144)
Observations	642	324
Country FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
R-squared	0.5657	0.6158

Panel A of this table reports the estimated coefficients of FIR and $FIR\times$ TopFBM on changes in bond yields across maturity buckets. Observations are at the bond-quarter level. Panel B reports the estimated coefficients of FIR and $FIR\times$ TopFBM on changes in the log of CDS spreads with 5-year and 10-year maturities. The main independent variable is the measure of standardized flows implied by the rebalancings accumulated to the quarterly-level interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. All regressions include controls for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and their interactions with FIR. Robust standard errors, clustered at the bond level for the bond-yield regressions and at the country level for the CDS regressions, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Table 8. Capital Flows, Rollover Risk, and Advanced Economies

Panel A: Broad Dollar Index (BDI)

	Credit Default Swaps	**Credit Default Swaps**
$\Delta \log BDI$	-0.0307**	
	(0.0148)	
$\Delta \log BDI \times$ TopFBM	-0.0172	-0.0159
	(0.0156)	(0.0144)
Observations	416	416
Country FE	Yes	Yes
Time FE	No	Yes
Controls	Yes	Yes
R-squared	0.1659	0.3862

Panel B: Monetary Policy Shocks (MPS)

	Credit Default Swaps			
	[d]	[d+1]	[d+2]	[d+3]
MPS	-0.0254	0.0294	-0.9440	-0.9454
	(0.1275)	(0.2178)	(0.9734)	(0.9731)
$MPS \times TopFBM$	-0.1139*	0.0330	-0.3324	-0.3308
	(0.0672)	(0.1577)	(0.3064)	(0.3074)
Observations	584	584	584	584
Country $\times$ Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.1393	0.1411	0.1294	0.1295

Panel A of this table reports the estimated coefficients of $\Delta \log BDI$ and $\Delta \log BDI \times$ TopFBM on the changes in the log of CDS spreads. Observations are at the country-month level. The main independent variable is the broad dollar index (BDI), which is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. Panel B reports the estimated coefficients of monetary policy shocks (MPS) and their interaction with TopFBM on changes in the log of CDS around the FOMC announcement day (d). The main independent variable is the MPS from Bauer and Swanson (2023), interacted with TopFBM. All regressions include controls for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and their interactions with MPS or $\log \Delta BDI$. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Online Appendix for "Optimal Sovereign Debt Structure: Evidence and Theory" by Jaewon Choi, Sebastiao Oliveira, Jay Rafi and Josef Zechner

A. Formal Theoretical Derivations and Proofs

Derivation of Value Functions

Long-Term LC Debt (LTLC)

At maturity T, the sovereign faces a predetermined nominal LC claim N_L. The sovereign chooses inflation I_L to minimize the total ex-post loss, which consists of the real transfer to foreign investors (holding fraction f) and the macroeconomic penalty $k(I_L, T)$. The unconstrained minimization problem is:

$$\min_{I_L} \mathcal{L} = fN_L(1 - I_L) + k(I_L, T)$$

Taking the First-Order Condition (FOC) with respect to I_L yields:

$$\frac{\partial \mathcal{L}}{\partial I_L} = -fN_L + \frac{\partial k(I_L, T)}{\partial I_L} = 0$$

$$\implies \frac{\partial k(I_L^*, T)}{\partial I_L} = fN_L$$

The sovereign inflates until the marginal macroeconomic cost of inflation exactly equals the marginal benefit of diluting the foreign-held nominal debt. Rational investors anticipate this optimal inflation I_L^*, and the marginal domestic investors price the bond to break even:

$$N_L(1 - I_L^*) = K(1 + r)^T \implies N_L = \frac{K(1 + r)^T}{1 - I_L^*}$$

Substituting the break-even condition, the foreign transfer $fN_L(1 - I^*)$ and the domestic opportunity cost $(1 - f)K(1 + r)^T$ collapse into the single term $K(1 + r)^T$, yielding

$$V(LC, T) = y_T - K(1 + r)^T - k(I_L^*, T). \tag{27}$$

Short-Term LC Debt (STLC)

The STLC problem is solved via backward induction using the sequential claims N_1 and N_2.

Period 2 ($t = T/2$ to T): Assuming the debt is successfully rolled over at $T/2$, the sovereign issues a new nominal claim N_2 to cover the period-1 repayment. At $t = T$, the sovereign solves:

$$\min_{I_2} \left[f N_2 (1 - I_2) + k(I_2, T/2) \right]$$

The Period 2 FOC is therefore: $\frac{\partial k(I_2^*, T/2)}{\partial I_2} = f N_2$. The period 2 break-even constraint requires $N_2(1 - I_2^*) = N_1(1 - I_1^*)(1 + r)^{T/2}$.

Period 1 ($t = 0$ to $T/2$): At $t = 0$, the sovereign issues LC debt with a claim N_1 with maturity $t = T/2$. Once debt has been issued, the sovereign chooses aggregate inflation I_1, knowing that it will dictate the required rollover size N_2. With probability $1 - \lambda_r$, the market rolls over the debt. With probability λ_r, a crisis occurs and the sovereign receives $\underline{y}$ at time T. The sovereign minimizes the expected sequence of costs:

$$\min_{I_1} \mathcal{L} = (1 - \lambda_r) \Big[f N_1 (1 - I_1)(1 + r)^{T/2} + k(I_2^*, T/2) \Big] + k(I_1, T/2)$$

The period 1 FOC equates the marginal cost of period 1 inflation to the expected marginal savings on the period 2 debt burden. Substituting the sequential break-even constraint $N_1(1 - I_1^*) = \frac{K(1+r)^{T/2}}{1-\lambda_r}$ into the full expected payoff function across both periods and states yields:

$$V(LC, T/2) = (1 - \lambda_r) y_T + \lambda_r \underline{y} - K(1 + r)^T - k(I_1^*, T/2) - (1 - \lambda_r) k(I_2^*, T/2).$$

Long-Term FC Debt (LTFC)

The sovereign cannot inflate FC debt and issues a nominal FC claim D_L. At $t = T$, the sovereign observes the exchange rate shock $\tilde{S}_T$. Default occurs if the post-repayment output falls below the liquidation value:

$$y_T - D_L \tilde{S}_T < \underline{y} \implies \tilde{S}_T > \frac{y_T - \underline{y}}{D_L} \equiv S_T^c.$$

Domestic investors are the marginal buyers. In solvency states they receive $D_L \tilde{S}_T$ in local-currency terms, so their break-even condition is

$$D_L \int_0^{S_T^c} s\, dF(s) = K(1+r)^T \implies D_L\, F(S_T^c)\, \mathbb{E}[\tilde{S}_T \mid \tilde{S}_T \leq S_T^c] = K(1+r)^T,$$

which determines D_L jointly with $S_T^c = (y_T - \underline{y})/D_L$.

Let $\phi \in [0,1)$ denote the share of the issue held by foreign investors. The sovereign's welfare equals expected output, net of the transfer to foreign holders and of domestic investors' opportunity cost of capital (repayments to domestic holders are internal transfers):

$$V(FC,T) = \int_0^{S_T^c} y_T\, dF(s) + \int_{S_T^c}^{\infty} \underline{y}\, dF(s) - \phi\, D_L \int_0^{S_T^c} s\, dF(s) - (1-\phi)K(1+r)^T.$$

By the break-even condition, the expected LC value of the payment per unit invested is the same for every holder, so the transfer to foreign holders equals $\phi K(1+r)^T$ and the last two terms sum to $K(1+r)^T$:

$$V(FC,T) = F(S_T^c)\, y_T + (1 - F(S_T^c))\, \underline{y} - K(1+r)^T,$$

independently of ϕ. Foreign investors, who value the bond in FC, receive an expected FC payoff of $\phi\, D_L\, F(S_T^c) = \phi K(1+r)^T / \mathbb{E}[\tilde{S}_T \mid \tilde{S}_T \leq S_T^c] > \phi K(1+r)^T$ and thus earn rents on their rationed share, consistent with the required participation of domestic investors in each issue.

Proof of Proposition 1

The sovereign strictly prefers long-term LC debt (LTLC) over short-term LC debt (STLC) if and only if $V(LC,T) > V(LC,T/2)$. Using the value functions derived above:

$$y_T - K(1+r)^T - k(I_L^*, T) > (1-\lambda_r)y_T + \lambda_r \underline{y} - K(1+r)^T - k(I_1^*, T/2) - (1-\lambda_r)k(I_2^*, T/2)$$

The opportunity cost of capital, $K(1+r)^T$, cancels from both sides. Rearranging:

$$y_T - (1-\lambda_r)y_T - \lambda_r \underline{y} > k(I_L^*, T) - k(I_1^*, T/2) - (1-\lambda_r)k(I_2^*, T/2)$$

$$\lambda_r y_T - \lambda_r \underline{y} > k(I_L^*, T) - k(I_1^*, T/2) - (1-\lambda_r)k(I_2^*, T/2)$$

$$\lambda_r(y_T - \underline{y}) > k(I_L^*, T) - k(I_1^*, T/2) - (1-\lambda_r)k(I_2^*, T/2)$$

Proof of Proposition 2

Let

$$W(D) \equiv \int_0^{(y_T-\underline{y})/D} (y_T - Ds)\, dF(s) + \int_{(y_T-\underline{y})/D}^{\infty} \underline{y}\, dF(s)$$

denote the sovereign's continuation value at date $T/2$ when it enters period T with a foreign-currency face value D due at T. Then W is strictly decreasing in D.

Indeed, writing $S^c(D) \equiv (y_T - \underline{y})/D$, Leibniz' rule gives

$$W'(D) = \int_0^{S^c(D)} (-s)\, dF(s) + \Big(y_T - DS^c(D) - \underline{y}\Big) \frac{dS^c(D)}{dD} F'(S^c(D)).$$

Since $y_T - DS^c(D) = \underline{y}$ by definition of the default threshold, the boundary term is zero, so

$$W'(D) = -\int_0^{S^c(D)} s\, dF(s) < 0.$$

Now compare LTFC and STFC.

For LTFC, let D_L be the date-T face value. Competitive pricing implies

$$D_L \int_0^{S^c(D_L)} s\, dF(s) = K(1+r)^T.$$

For STFC, let D_1 be the face value due at $T/2$. Since rollover succeeds only with probability $1-\lambda_r$, date-0 investors must satisfy

$$(1-\lambda_r)D_1 = K(1+r)^{T/2},$$

hence

$$D_1 = \frac{K(1+r)^{T/2}}{1-\lambda_r}.$$

Conditional on successful rollover at $T/2$, the sovereign refinances D_1 into a new date-T face value D_S satisfying

$$D_S \int_0^{S^c(D_S)} s\, dF(s) = D_1(1+r)^{T/2} = \frac{K(1+r)^T}{1-\lambda_r}.$$

Because $1/(1-\lambda_r) > 1$, the right-hand side is strictly larger than under LTFC, so

$$D_S > D_L.$$

Since W is strictly decreasing in D,

$$W(D_S) < W(D_L).$$

Therefore, even conditional on successful rollover, STFC yields a strictly lower continuation value than LTFC because it increases the time-T exchange-rate default risk.

Unconditionally, STFC is even worse because with probability λ_r the rollover fails at $T/2$ and the sovereign is forced into liquidation, yielding $\underline{y} < W(D_L)$. Hence

$$V(FC, T/2) = (1-\lambda_r)W(D_S) + \lambda_r \underline{y} < W(D_L) = V(FC, T).$$

Thus LTFC strictly dominates STFC.

Proof of Proposition 3

We prove the threshold for part 1 (LTFC vs LTLC). The sovereign strictly prefers LTFC if and only if $V(FC, T) > V(LC, T)$. Substituting the value functions:

$$F(S_T^c)y_T + (1 - F(S_T^c))\underline{y} - K(1+r)^T > y_T - K(1+r)^T - k(I_L^*, T)$$

The cost of capital $K(1+r)^T$ cancels from both sides. Moving the inflation penalty to the left-hand side and factoring the output terms,

$$y_T - F(S_T^c)y_T - (1 - F(S_T^c))\underline{y} = (1 - F(S_T^c))(y_T - \underline{y}),$$

yields the threshold condition for part 1:

$$k(I_L^*, T) > (1 - F(S_T^c))(y_T - \underline{y}).$$

The proof for part 2 follows the exact same algebraic steps, substituting $V(LC, T/2)$ for $V(LC, T)$.

Proof of Lemma 1

Consider the sovereign's ex-post problem under LC debt:

$$\min_{I} \{fN(1-I) + k(I,\tau)\}.$$

Define the objective by

$$\Phi(I) \equiv fN(1-I) + k(I,\tau).$$

Its derivative is

$$\Phi'(I) = -fN + \frac{\partial k}{\partial I}(I,\tau),$$

and, since k is strictly convex in I,

$$\Phi''(I) = \frac{\partial^2 k}{\partial I^2}(I,\tau) > 0.$$

Hence Φ is strictly convex, so the inflation choice is characterized by the sign of $\Phi'(I)$.

For part (1), suppose

$$\frac{\partial k}{\partial I}(I,\tau)\Big|_{I\downarrow 0} > fN.$$

Then

$$\Phi'(0) > 0.$$

By strict convexity, $\Phi'(I)$ is increasing in I, so $\Phi'(I) > 0$ for all $I \geq 0$. Therefore, $\Phi(I)$ is strictly increasing on $[0,\infty)$, implying that the sovereign optimally chooses the corner solution

$$I^* = 0.$$

It follows that LC debt is not diluted and generates no inflation distortion, i.e.

$$k(I^*,\tau) = k(0,\tau) = 0.$$

Under LTLC, the sovereign therefore delivers the promised real repayment without incurring any deadweight loss from inflation. By contrast, LTFC still exposes the sovereign to exchange-rate-driven default risk: comparing (4) and (12),

$V(LC,T) - V(FC,T) = (1 - F(S_T^c))(y_T - \underline{y}) > 0$ whenever the default probability is positive. Hence LTLC strictly dominates LTFC.

For part (2), suppose instead that

$$\lim_{I \to 1} \frac{\partial k}{\partial I}(I,\tau) < fN.$$

Then, for all sufficiently large I,

$$\Phi'(I) = -fN + \frac{\partial k}{\partial I}(I,\tau) < 0.$$

Since $\Phi'(I)$ never reaches zero, there is no finite interior optimum satisfying

$$\frac{\partial k}{\partial I}(I^*,\tau) = fN.$$

Equivalently, the sovereign's marginal gain from inflation strictly exceeds its marginal cost for all feasible inflation levels, so the incentive to inflate never disappears. In this case, the LC debt market cannot sustain a finite rational-expectations equilibrium: investors anticipate unbounded dilution and would require arbitrarily large nominal compensation. Thus the LC equilibrium unravels. Since FC debt rules out inflation by construction and remains feasible whenever repayment in solvency states can be priced competitively, FC debt strictly dominates LC debt.

Proof of Proposition 4

Under the quadratic specification $k(I,\tau) = \frac{g}{2}\frac{I^2}{\tau^\eta}$, the equilibrium value functions are given by equations (16)–(18):

$$\begin{aligned}
V(\text{LTLC}) &= y_T - K(1+r)^T - \frac{T^\eta b_L^2}{2g}, \\
V(\text{STLC}) &= y_T - K(1+r)^T - C_r - \frac{(T/2)^\eta \Phi_S}{2g}, \\
V(\text{LTFC}) &= y_T - K(1+r)^T - C_F,
\end{aligned}$$

where the benefit bases b_L, b_1, and b_2 (and hence Φ_S) are evaluated at the equilibrium claims and inflation rates. Because the bases are themselves equilibrium objects that vary with g, the threshold conditions below define g_{FC} and g_{LT} implicitly, with the displayed expressions understood as evaluated at the equilibrium bases. The FC

value function does not depend on g. Both LC value functions are strictly increasing in g, and for sufficiently low g the LC inflation costs grow without bound, making LC debt either infeasible (the break-even equation for the nominal LC claims has no real solution) or strictly dominated by FC debt.

Step 1: STLC vs. LTFC. Setting $V(\text{STLC}) = V(\text{LTFC})$ yields the threshold characterization

$$g_{FC} = \frac{(T/2)^{\eta}\Phi_S}{2(C_F - C_r)}.$$

Since $C_F > C_r$ by assumption (22), the right-hand side is positive; and since $V(\text{STLC})$ is strictly increasing in g while $V(\text{LTFC})$ does not depend on g, the crossing exists and is unique. For $g < g_{FC}$, $V(\text{LTFC}) > V(\text{STLC})$; for $g \geq g_{FC}$, STLC weakly dominates LTFC.

Step 2: LTLC vs. STLC. Setting $V(\text{LTLC}) = V(\text{STLC})$ yields the threshold characterization

$$g_{LT} = \frac{T^{\eta} b_L^2 - (T/2)^{\eta}\Phi_S}{2\,C_r}.$$

Under assumption (23) the numerator is positive, so the value gap $V(\text{LTLC}) - V(\text{STLC})$ is strictly increasing in g and the crossing is unique. For $g < g_{LT}$, STLC dominates LTLC (conditional on LC debt being optimal); for $g \geq g_{LT}$, LTLC weakly dominates.

Step 3: Non-emptiness of the STLC region. The STLC region $[g_{FC}, g_{LT})$ is non-empty if and only if $g_{FC} < g_{LT}$, which reduces to

$$\frac{(T/2)^{\eta}\Phi_S}{C_F - C_r} < \frac{T^{\eta} b_L^2 - (T/2)^{\eta}\Phi_S}{C_r}.$$

Cross-multiplying and collecting terms:

$$C_r \cdot (T/2)^{\eta}\Phi_S + (C_F - C_r) \cdot (T/2)^{\eta}\Phi_S < (C_F - C_r) \cdot T^{\eta} b_L^2,$$

$$C_F \cdot (T/2)^{\eta}\Phi_S < (C_F - C_r) \cdot T^{\eta} b_L^2.$$

Dividing both sides by $(T/2)^{\eta} b_L^2$ yields

$$\frac{C_F \Phi_S}{b_L^2} < (C_F - C_r) \cdot 2^{\eta},$$

which is equivalent to $2^{\eta} > C_F\Phi_S/[(C_F - C_r)b_L^2]$. This holds by assumption (23).

The same condition also ensures that STLC becomes competitive with FC at a lower threshold than LTLC does (i.e., $g_{FC} < g''_{FC}$, where $g''_{FC} \equiv T^{\eta} b_L^2/(2C_F)$ is the threshold at which $V(\text{LTLC}) = V(\text{LTFC})$), confirming that the three-region ordering is well-defined.

Combining Steps 1–3, the debt-structure pecking order follows: LTFC is optimal for $g < g_{FC}$, STLC for $g_{FC} \leq g < g_{LT}$, and LTLC for $g \geq g_{LT}$. □

A Microfoundation for the Inflation Cost Function

This subsection microfounds the specification $k(I,\tau) = \frac{g}{2} I^2/\tau^{\eta}$ of Section 4.4, and in particular the horizon-scaling parameter η. Index time within the life of a claim by $s \in [0,\tau]$, with $s = 0$ the issuance date, and let π_s denote the per-period inflation rate chosen by the sovereign, so that cumulative dilution over the claim's life is $I = 1 - e^{-\int_0^\tau \pi_s\, ds} \approx \int_0^\tau \pi_s\, ds$ for moderate inflation; we use this approximation throughout. Suppose that generating inflation imposes a flow deadweight loss ℓ_s per unit of time on the domestic economy. The penalty function is then the value of the sovereign's path-choice problem,

$$k(I,\tau) \;=\; \min_{\pi(\cdot)} \int_0^\tau \ell_s\, ds \qquad \text{s.t.} \qquad \int_0^\tau \pi_s\, ds \;=\; I. \tag{28}$$

Benchmark: a constant per-period cost gives exactly $\eta = 1$. Let $\ell_s = \frac{c}{2}\pi_s^2$ with a constant coefficient $c > 0$. By convexity the optimal path is flat, $\pi_s = I/\tau$, so $k(I,\tau) = \frac{c}{2} I^2/\tau$: the specification of Section 4.4 with $g = c$ and $\eta = 1$ exactly. In this case the first-order condition $k_I = c\,(I/\tau) = fN$ pins down the optimal inflation *rate* independently of τ, so equilibrium dilution and deadweight costs are linear in the horizon, and two consecutive claims of maturity $T/2$ replicate a single claim of maturity T: maturity provides no discipline (the pure-smoothing case of footnote 16). The mechanism behind condition (23) therefore requires more than smoothing.

Gradual adjustment delivers $\eta > 1$. Keep the level cost and add a quadratic cost on the *change* in inflation,

$$\ell_s \;=\; \frac{c}{2}\,\pi_s^2 \;+\; \frac{\gamma}{2}\,\dot{\pi}_s^2, \qquad \pi_0 = 0, \tag{29}$$

with π_τ free. The change term captures that moving inflation away from the regime under which the claim was priced is gradual and costly: monetary transmission operates with lags, and, equivalently, if only imperfectly anticipated inflation is costly and expectations catch up to actual inflation at speed λ, so that the surprise component is $\pi_s - \hat{\pi}_s \approx \dot{\pi}_s/\lambda$, then a surprise cost $\frac{c_u}{2}(\pi_s - \hat{\pi}_s)^2$ is exactly the change cost in (29) with $\gamma = c_u/\lambda^2$. Solving

(28) under (29) (the Euler–Lagrange equation is $c\pi_s - \gamma\ddot{\pi}_s = \mu$, with boundary conditions $\pi_0 = 0$ and $\dot{\pi}_\tau = 0$) yields a back-loaded optimal path and a closed form for the penalty:

$$\pi_s^* = \frac{\mu}{c}\left[1 - \frac{\cosh\big(\omega(\tau - s)\big)}{\cosh(\omega\tau)}\right], \qquad k(I,\tau) = \frac{I^2}{2H(\tau)}, \qquad H(\tau) = \frac{1}{c}\left[\tau - \frac{\tanh(\omega\tau)}{\omega}\right], \tag{30}$$

where $\omega \equiv \sqrt{c/\gamma}$ and $\mu = I/H(\tau)$. Because k remains quadratic in I, all closed forms in Section 4.4 go through with τ^η/g replaced by $H(\tau)$; in particular $I^* = fN\,H(\tau)$, and condition (23) becomes $H(T)/H(T/2) > C_F\Phi_S/[(C_F - C_r)b_L^2]$. Two properties characterize the solution. First, the implied per-period cost coefficient, $c_s \equiv 1/H'(s) = c/\tanh^2(\omega s)$, is decreasing in elapsed time: inflation is most expensive when the economy is unadjusted. Second, the effective horizon exponent $\eta_{\text{eff}}(\tau) \equiv d\ln H/d\ln\tau = \omega\tau\tanh^2(\omega\tau)/[\omega\tau - \tanh(\omega\tau)]$ lies in $(1,3)$, declining from 3 at short horizons to 1 at long ones, with the benchmark $\eta = 1$ recovered exactly as $\gamma \to 0$. The exponent relevant for condition (23) is the two-point average $\bar{\eta} = \log_2[H(T)/H(T/2)]$. At adjustment speeds consistent with the observed catch-up of inflation expectations during inflation surges—forecast errors dissipate within roughly two to three years (Blanco, Ottonello, and Ranošová, 2025)—$\omega \approx 0.5$ per year, giving $\eta_{\text{eff}}(4) = 1.79$, $\eta_{\text{eff}}(8) = 1.33$, and $\bar{\eta} = 1.53$: essentially the calibrated $\eta = 1.5$.

The initial condition as a normalization. The condition $\pi_0 = 0$ does not assert literal price stability at issuance; it is the normalization that the claim is priced under the prevailing inflation regime, so that the dilution program starts from zero deviation and zero inflation "preparedness." Nor could the sovereign profitably relax it. Under long maturity, it pays to build preparedness gradually over the claim's life: raising it mid-life lowers the cost of further inflation in later years and thereby allows greater dilution at repayment—the back-loaded path in (30). Under short maturity, by contrast, any preparedness in place at rollover is observed and fully priced by the buyers of the new claim: it generates no transfer on the rolled-over debt, while lowering the marginal cost of inflation over the new claim's life and thereby weakening the sovereign's ability to commit to low cumulative inflation, so that a higher nominal claim is demanded upfront. Inflation preparedness at an issuance date is therefore a curse rather than an asset, and the sovereign has no incentive to pre-build it; each claim's dilution problem effectively restarts from the unadjusted state. This is precisely the sense in which frequent rollover disciplines inflation: it denies the sovereign the low-marginal-cost tail of the adjustment path.

B. Data Construction and Coverage

B.1 Variables Sources

This section provides information on the sources of the variables in our sample. Table B.1 reports the variables used in our analysis, along with their sources, frequencies, and ranges.

B.2 Coverage of Bond-level Data

This section provides information on the data coverage of our sample. Table B.2 shows the country-level distribution of Refinitiv Eikon local and foreign currency bond coverage as a share of total government debt. The coverage spans the period 2013–2024.

Appendix Table B.1. Variable Description

Variable	Definition	Source	Frequency	Range
Local Currency Bond Data	Security-level data on LC sovereign bonds: amount issued, coupon rate and frequency, issuance and maturity dates	Refinitiv Eikon	Issuance Date	2013–2024
Foreign Currency Bond Data	Security-level data on FC sovereign bonds, analogous to LC bond data	Refinitiv Eikon	Issuance Date	2013–2024
Average Bond Maturity (LC, FC)	Amount-weighted average years to maturity of outstanding bonds, computed separately for LC and FC bonds	Authors' calc. from Eikon	Annual/Quarterly	2013–2024
FBM, FBM_FC	Value of bonds (principal plus coupons) maturing within one year over GDP, for LC and FC bonds (Eq. 32)	Authors' calc. from Eikon	Annual/Quarterly	2013–2024
Lagged FBM, Lagged FBM_FC	FBM (FBM_FC) measured one year in advance: bonds maturing within one year as predicted from the maturity structure in place in the previous year, reflecting only bonds outstanding at that date	Authors' calc. from Eikon	Quarterly	2013–2024
FBM_DD2	Value of bonds maturing within two years over GDP (Appendix J)	Authors' calc. from Eikon	Quarterly	2013–2024
TopFBM (TopFBM_DD2)	Indicator equal to one if the country is in the top tercile of Lagged FBM (Lagged FBM_DD2), sorted by year	Authors' calc.	Quarterly	2013–2024
Debt to GDP Ratio	Total government debt over GDP	CEIC	Quarterly	2013–2024
TopDebt	Indicator equal to one if the country is in the top tercile of the debt-to-GDP distribution, sorted by quarter	Authors' calc.	Quarterly	2013–2024
Debt to GDP Ratio	Central and general government debt securities over GDP	BIS	Annual	2013–2024
LC Debt to GDP Ratio	LC-denominated general government debt securities over GDP	BIS	Annual	2013–2024
FC Debt to GDP Ratio	FC-denominated general government debt securities over GDP	BIS	Annual	2013–2024
Share of LC Debt	LC general government debt securities over the sum of LC and FC general government debt securities	Authors' calc. from BIS	Annual	2013–2024
Inflation Rates	Annual CPI inflation rate	World Bank	Annual	2013–2024
CPI	Consumer price index level	IMF	Quarterly	2013–2024
Inflation (YoY)	Year-over-year log change in the CPI, computed at quarterly frequency	Authors' calc. from IMF CPI	Quarterly	2013–2024
Inflation Volatility	3-year rolling standard deviation of inflation	Authors' calc.	Annual	2013–2024
Institutional Quality Indexes	Six Worldwide Governance Indicators; IQ is their first principal component	World Bank	Annual	2013–2024
Exchange Rates	Local currency units per U.S. dollar	Compustat	Daily/Annual	2013–2024
CDS Spreads US Dollar (5Y, 10Y)	USD-denominated sovereign CDS spreads at 5- and 10-year tenors	Bloomberg	Daily	2013–2024
CDS Spreads Local Currency (3Y, 4Y, 5Y)	LC-denominated sovereign CDS spreads at 3-, 4-, and 5-year tenors	Markit	Daily	2013–2024
Bond Prices	Prices of individual sovereign bonds	Bloomberg	Daily	2013–2024
Bond Yields	Yields of individual sovereign bonds in the GBI-EM index	Bloomberg	Daily	2013–2024
Interest Rates (Policy Rates)	Central bank policy rate	IMF	Quarterly	2013–2024
Debt Held by Foreign and Domestic Investors	Government debt held by foreign and domestic investors, by currency, scaled by GDP	Arslanalp and Tsuda (2014)	Quarterly	2004–2024
FIR (Flows Implied by Rebalancing)	Capital flows implied by mechanical GBI-EM index rebalancings, normalized by sovereign bond market size (Appendix C.2)	JP Morgan / Authors' calc.	Monthly	2013–2024
Broad Dollar Index (BDI)	Trade-weighted index of the USD against a broad group of U.S. trading partners	St. Louis FRED	Daily	2013–2024
VIX	CBOE S&P 500 implied volatility index	FRED	Daily	2013–2024
Monetary Policy Shocks	High-frequency interest rate surprises around FOMC announcements	Bauer and Swanson (2023)	Event-based	2013–2024
GDP	Nominal GDP in USD	World Bank	Annual	2013–2024
GDP (Quarterly)	Nominal GDP in USD	Economist Intelligence Unit	Quarterly	2013–2024
GDP Growth	Growth rate of Nominal GDP in USD	Economist Intelligence Unit	Quarterly	2013–2024
Real GDP Growth	Annual real GDP growth	World Bank	Annual	2013–2024
Current Account/GDP	Current account balance over GDP	Economist Intelligence Unit	Annual	2013–2024
Interest/Exports	Government interest due over total exports	Economist Intelligence Unit	Annual	2013–2024
Long-Term Yield	10-year government bond yield	Economist Intelligence Unit	Annual	2013–2024
Debt Growth	Year-over-year change in government debt	Authors' calc.	Annual	2013–2024
Credit Ratings	Sovereign credit rating	Moody's	Monthly	2013–2024

This table reports the variables used in our analysis, their definitions, sources, frequencies, and ranges.

Appendix Table B.2. Refinitiv Eikon Coverage as Share of CEIC Total Debt

Country	Mean	Std. Dev.	Max	Min
Panel A: Emerging Markets				
Argentina	0.9456	0.0611	1.0000	0.7970
Brazil	0.6317	0.2278	0.9993	0.3010
Chile	0.9907	0.0322	1.0000	0.8886
China	0.9478	0.0414	0.9998	0.8595
Colombia	0.9037	0.0607	1.0000	0.7926
Czech Republic	0.9737	0.0373	1.0000	0.9073
Egypt	0.5357	0.1924	0.8574	0.2592
Hungary	0.9186	0.1157	1.0000	0.6220
Indonesia	0.7873	0.0498	0.8764	0.7302
Mexico	0.9693	0.0642	1.0000	0.8324
Malaysia	0.9851	0.0339	1.0000	0.9083
Nigeria	0.3517	0.1455	0.4962	0.1492
Peru	0.9939	0.0145	1.0000	0.9560
Philippines	0.8830	0.0927	0.9791	0.7445
Poland	0.8914	0.1268	1.0000	0.6365
Romania	0.9500	0.1167	1.0000	0.6385
Russia	0.9937	0.0217	1.0000	0.9248
Serbia	0.7770	0.0892	0.8874	0.5766
Thailand	0.9397	0.0623	1.0000	0.8279
Turkey	0.4458	0.1430	0.6784	0.2495
Uruguay	0.6926	0.1094	0.8550	0.5179
South Africa	1.0000	0.0000	1.0000	1.0000
Panel B: Advanced Economies				
Austria	0.8872	0.0825	0.9937	0.7316
Australia	0.9637	0.0594	1.0000	0.8502
Denmark	0.9126	0.0856	1.0000	0.7389
France	0.8549	0.0719	0.9542	0.6983
Italy	0.8586	0.0825	0.9516	0.6633
South Korea	0.9128	0.0555	1.0000	0.8351
Spain	0.8946	0.0870	0.9831	0.6805
Sweden	0.8661	0.1456	1.0000	0.5927
Switzerland	0.9965	0.0123	1.0000	0.9575

This table reports the country-level distribution of Eikon local- and foreign-currency bond coverage as a share of total government debt reported by CEIC. The coverage spans 2013–2024. Coverage values are capped at 1.

B.3 Measuring the Fraction of Bonds Maturing

The Refinitiv Eikon database provides comprehensive information on government bonds, including the amount issued, coupon payments, coupon frequency, issuance date, and maturity date. This data allows us to construct the maturity structure for each country in our sample and determine the amount of debt maturing each month, quarter, and year. However, this process is not straightforward. First, we exclude bonds from the analysis if they are missing the amount issued or coupon rate. Second, we calculate the interest payments for each active bond by multiplying the annual coupon rate by the outstanding amount and adjusting the payment based on the frequency of the coupon payment. For example, if the payments are semi-annual, we divide the annual coupon payment by two and assign the payment to the corresponding quarter. If a bond is issued in Q1 2020, the coupon payments would occur in Q3 2020, Q1 2021, and so on. Finally, after calculating the interest payments, we combine them with the principal amount of maturing bonds for each quarter. For example, in Mexico in Q2 2021, the interest payment was 134 million USD, and the amount of bonds maturing was 1.12 billion USD, which makes the total maturing bonds based on our definition to be 1.25 billion USD.

Motivated by previous literature (Almeida et al., 2011; Choi, Hackbarth, and Zechner, 2018), we define the amount of bonds maturing within one year in a quarter t as:

$$DD1_{c,t} = \sum_{j=0}^{3} (\text{maturing bonds})_{c,t+j} \tag{31}$$

where $\text{maturing bonds}_{c,t}$ represents the amount of local currency bonds maturing (in USD) in quarter t. We calculate $\text{maturing bonds}_{c,t}$ by including both the principal and the coupon, as this provides a measure of total cash outflows at maturity (the total amount of money that the government needs to pay to bondholders at a given time).[24]

We then define our measure of exposure to rollover risk for quarter t as follows:

$$FBM_{c,t} = \frac{DD1_{c,t}}{\text{GDP}_{c,t}} \tag{32}$$

where GDP is the nominal annualized GDP in USD from EIU (Economist intelligence unit). Note that we use data at the quarterly level because although we have the amount of bond that matures at the monthly frequency, the nominal GDP in USD is only available

[24] We show that our results remain similar when considering only the principal in constructing $\text{maturing bonds}_{c,t}$. Results are available upon request.

at the quarterly frequency. The average of $FBM_{c,t}$ is approximately 4.59%, the standard deviation is 3.47%, and the max and min are 16.35% and 0, respectively.

Table B.3 presents the characteristics of countries with a high fraction of bonds maturing relative to the rest of the sample.[25] We identify significant differences in the fraction of bonds maturing (FBM), underscoring the importance of rollover risk as a critical factor shaping the financial stability of emerging economies. Countries with a high fraction of bonds maturing tend to have lower GDP growth, slower debt growth, and a higher debt-to-GDP ratio. For example, countries with high rollover-risk exposure have an average debt-to-GDP ratio of 59.64%, compared to 45.44% in other countries. In addition, these countries exhibit higher long-term yields and a higher interest-to-exports ratio relative to the rest of the sample.

Appendix Table B.3. Country-Level Summary Statistics: Low vs. High Rollover Risk

Variable	All			Low Rollover Risk			High Rollover Risk		
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
GDP growth (%)	1.21	0.95	0.018	1.30	0.71	0.01	1.10	0.71	0.03
Debt growth (%)	1.74	1.78	0.027	1.90	1.94	0.03	1.30	1.43	0.02
CA/GDP (%)	-1.04	-1.69	3.43	-1.03	-1.83	3.60	-1.06	-1.23	3.09
Debt/GDP (%)	50.01	44.24	25.07	45.44	42.24	18.03	59.64	47.92	35.89
Interest / Export (%)	4.87	4.44	3.15	4.75	4.28	3.28	5.11	4.70	2.84
CDS Spread	152.42	118.64	112.05	155.81	112.99	128.73	144.28	146.95	63.09
LT Yield (%)	6.17	5.62	3.39	6.07	5.53	3.52	6.39	5.92	3.09
Inflation rate (%)	5.39	3.75	6.44	6.00	4.01	7.00	5.00	3.44	5.00
FBM (%)	4.45	3.67	2.54	2.57	2.52	1.52	8.51	7.48	3.92
Observations		199			136			63	

This table reports the summary statistics of country characteristics. Debt growth is defined as the year-over-year change in government debt. CA/GDP represents the ratio of the current account to GDP. Debt/GDP is the ratio of government debt to GDP. CDS spread is the annual cost, expressed in basis points, that an investor pays to insure against the default of a borrower's debt. LT yield is the yield on 10-year Treasury bonds. Interest due/export is the ratio of government interest due in a particular year to the country's total exports. FBM represents the fraction of bonds maturing as a proportion of GDP. Countries are classified as having high rollover-risk exposure if they are in the top tercile in terms of the FBM measure, while countries classified as low rollover risk are those in the middle and bottom terciles of the FBM distribution.

[25] All data are reported at an annual frequency because more variables are available for comparison at this level.

C. Flows Implied by the Rebalancing

This appendix provides additional information on the construction of the flows implied by the rebalancing (FIR). Section C.1 describes the Government Bond–Emerging Market Index (GBI-EM) series from JP Morgan and the rebalancing mechanism, and Section C.2 details how we measure the Flows Implied by the Rebalancing (FIR).

C.1 J.P. Morgan GBI-EM global diversified

The Government Bond–Emerging Market Index (GBI-EM) series, launched in June 2005, was one of the most frequently followed benchmarks in the EM local currency denominated government bond space, tracked by an estimated $247 billion AUM as of December 2021. In this paper, we use the GBI-EM Global Diversified, which is the largest LC government bond index for emerging countries. It is also the most widely followed benchmark in its class with AUM of $222 billion as of December 2021.

According to J.P. Morgan, a country qualifies for index inclusion if its Gross National Income (GNI) per capita remains below the Index Income Ceiling (IIC) for three consecutive years. The IIC is adjusted annually based on the global GNI per capita growth rate, as reported by the World Bank. In 2024, the IIC level is $23,287. J.P. Morgan determines which securities from each country are included in each index. Bonds entering the GBI-EM Global Diversified must meet quantitative criteria (a minimum face amount outstanding of $1 billion and at least 2.5 years to maturity) and qualitative criteria regarding overall market liquidity and tradability. Specifically, bonds must have both bid and ask prices available. Moreover, the index is denominated entirely in USD, with bond and country weights determined by converting all LC debt into USD.

Countries with explicit capital controls are excluded from the index. That is, countries with capital controls—either de jure or de facto—that limit the ability of international investors to repatriate proceeds from the domestic currency (e.g., restrictions on selling local currency and receiving USD, EUR, etc.) or restrict the free trade of the official currency (e.g., limits on transaction size or the existence of multiple exchange rates) are deemed ineligible. Historically, such situations have led to the exclusion of countries like Egypt (removed in 2024), Nigeria (removed in 2015), and Argentina (removed in 2019), following the imposition of capital controls that impaired investors' ability to adequately replicate exposure.

The index's diversification methodology imposes a 10% weight cap at the country level, with any residual weight redistributed accordingly. No tactical adjustments are made based on recent asset performance. As a result, larger markets such as Indonesia,

China, and Mexico, which have significant index-eligible debt stock, will routinely reach the 10% country cap, while smaller markets with limited issuance will have lower weights in the index. As countries cannot have a benchmark weight higher than 10%, the GBI-EM global diversified is rebalanced monthly on the last weekday of the month. Since the mechanical rebalancings by the GBI-EM Global Diversified index are, in principle, informationless and unrelated to any new information about the economic conditions of a country, this generates exogenous capital flows.

Consider the following example. Suppose that before the rebalancing, Indonesia's weight is 12%, Chile's weight is 7% and Argentina's weight is 1%. For simplicity, assume there are 11 countries in the index, and the other 8 countries are fixed at the 10% cap. The rebalancing mechanism (cap-driven rebalancing) implies that Indonesia's weight is reduced to 10%, Chile's weight is increased to 8.75%, and Argentina's weight is increased to 1.25%. Mutual funds have to sell LC sovereign bonds of Indonesia and buy LC sovereign bonds of Chile and Argentina. As a result, Chile and Argentina will experience capital inflows that are uncorrelated with macroeconomic conditions.

C.2 Measuring Flows Implied by the Rebalancing

We follow Pandolfi and Williams (2019) to construct flows implied by the rebalancings or capital flow shocks (FIR). As discussed above, a significant source of variation in FIR stems from the fund's practice of imposing a 10% cap on the bond weight of each emerging economy within the index. When a country surpasses this 10% cap, the fund divests its ownership of the excess bond holdings to reduce its weight to the stipulated 10%. The remaining holdings are then redistributed proportionally to their market value across the other countries included in the index.

We sum across bonds i and normalize by market size to obtain FIR for country c at time t as follows:

$$FIR_{ct} = \sum_i FIR_{ict} = \sum_i (w_{ict} - w_{ict}^{BH}) \frac{AUM_t}{MV_{ict-1}} \tag{33}$$

where w_{ct} is the weight of a country at time t, $w_{ct}^{BH} = w_{ct-1} \times \left(\frac{R_{ct}}{R_t}\right)$, R_{ct} is the country-level bond's return in month t at the country level, and R_t is the J.P. Morgan GBI-EM Global Diversified Index return in month t. Intuitively, w_{ct}^{BH} is the buy-and-hold weight, i.e., it is the weight a bond would have if the only changes affecting it were due to price movements. AUM_t is Assets under management (in USD) that

tracks the J.P. Morgan GBI-EM Global Diversified, and MV_{ct-1} the previous period USD market value of government debt securities.

Table C.1 presents the summary statistics of the components that build the FIR. Table C.2 shows country-wise breakdown of the components that build the FIR, in line with Table C.1. Table C.3 collects the frequency distribution of countries in our sample. Note that the frequency distribution of countries reported is not the same due to different inclusion dates. For instance, China was included in January 2020, Argentina was included from January 2017 to January 2020, the Czech Republic was included after January 2017, Egypt was included after January 2022, Nigeria was included from January 2013 to January 2016, and Russia was dropped in May 2022.

Table C.4 shows that a higher FIR is associated with lower CDS spreads and lower exchange rates around rebalancing dates. Notably, we find no evidence of pre-trends: in the days prior to the rebalancing, the relationship between FIR and CDS is close to zero and becomes statistically significant only after the rebalancing dates. The impact on exchange rates is qualitatively similar. Although we observe an effect three days before the rebalancing (statistically significant at the 10% level), the effects are much stronger afterward. For example, the effect of FIR on exchange rates is 4.5 times greater when comparing three days before the rebalancing with three days after it.

Appendix Table C.1. Aggregate Level Summary Statistics

	Obs	Mean	Std Dev	Min	Max
Panel (A): FIR components					
FIR (%)	1,792	0.016	1.046	-3.195	5.222
Country Market Value (MV)	1,798	60,112	47,726	644	255,998
Weight in the index (w_{ct})	1,798	0.056	0.037	0.001	0.100
Buy-hold Weight in the index (w_{ct}^{bh})	1,792	0.056	0.037	0.001	0.107
Asset Under Management (AUM_t)	1,798	204,263	11,639	178,716	223,129
Index Return (%)	1,798	0.076	0.032	-0.070	0.091
Bond Return (%)	1,792	-0.139	0.025	-0.455	0.194
Panel (B): Monetary Policy Shocks					
MPS	348	0.000	0.053	-0.240	0.160
Panel (C): Broad Dollar Index					
BDI	4,828	105.445	12.230	85.469	130.214

Panel (A) of this table reports the summary statistics of components that build the flows implied by the index rebalancing (FIR) variables, constructed from the JP Morgan Government Bond Index - Emerging Markets Global Diversified (GBI-EM Global Diversified). The components include country market value in million USD (MV), weight in the index (w_{ct}), buy-hold weight in the index (w_{ct}^{bh}), asset under management in million USD (AUM_t), index return, and bond return. w_{ct}, w_{ct}^{bh}, and returns are expressed in decimal points. FIR is reported in percentage. We exclude months with substantial rebalancing events in the JP Morgan GBI-EM Index due to the upgrade or downgrade of the credit rating of countries in our sample during the analysis period (Jan 2013 - March 2024). Panel (B) presents the summary statistics of monetary policy shocks from Bauer and Swanson (2023) from 1988 to 2023. MPS is the orthogonalized monetary policy surprise (MPS_ORTH) measure, computed as the residuals from regressing MPS raw on macro and financial variables (see Bauer and Swanson (2023) for details). MPS raw is the unadjusted monetary policy computed as the first principal component of the changes in ED1-ED4, scaled so that the impact on ED4 is unity. Panel (C) shows the summary statistics of the broad dollar index (BDI), which is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners from 2006 to 2025.

Appendix Table C.2. Summary Statistics by Country

	FIR (%)	MV	w_{ct}	w_{ct}^{bh}	Return
Argentina	-0.654	6,144	0.007	0.007	0.971
Brazil	-0.003	129,904	0.097	0.097	1.000
Chile	0.068	18,723	0.016	0.016	0.999
China	0.665	125,746	0.091	0.092	1.000
Colombia	0.032	56,528	0.057	0.057	0.998
Czech Republic	0.306	57,670	0.047	0.046	0.998
Dominican Republic	-0.028	1,888	0.002	0.001	1.005
Egypt	-0.204	14,960	0.011	0.012	0.996
Hungary	-0.020	40,940	0.043	0.043	0.998
Indonesia	0.068	97,366	0.095	0.095	0.999
Mexico	0.051	121,325	0.099	0.099	0.998
Malaysia	-0.040	86,718	0.085	0.085	1.000
Nigeria	-0.019	11,671	0.018	0.018	0.989
Peru	0.069	25,015	0.024	0.024	0.998
Philippines	-0.281	2,320	0.003	0.003	0.999
Poland	0.009	93,398	0.088	0.088	0.999
Romania	0.218	30,985	0.029	0.029	1.000
Serbia	0.148	4,263	0.003	0.003	1.000
Russia	-0.033	67,679	0.073	0.073	0.997
Thailand	0.084	89,430	0.086	0.086	1.001
Turkey	-0.234	41,520	0.052	0.052	0.998
Uruguay	-0.109	2,036	0.002	0.002	1.003
South Africa	0.029	92,242	0.090	0.090	0.997

This table reports a country-wise breakdown of the summary statistics for the components that constitute the flows implied by the index rebalancing (FIR) variables. FIR is in percentage, Market Value is in millions of US Dollar, w_{ct}, w_{ct}^{bh}, and Return are in decimal points. The methodology used to calculate these statistics is consistent with that described for Table C.1.

Appendix Table C.3. Frequency Distribution of Countries

Country	Obs	Percent	Cum.
Argentina	21	1.13	1.13
Brazil	100	5.57	6.70
Chile	100	5.57	12.27
China	43	2.36	14.63
Colombia	100	5.57	20.20
Czech Republic	65	3.66	23.86
Dominican Republic	59	3.32	27.18
Egypt	20	1.07	28.25
Hungary	100	5.57	33.82
Indonesia	100	5.57	39.39
Mexico	100	5.57	44.96
Malaysia	100	5.57	50.53
Nigeria	21	1.13	51.66
Peru	100	5.57	57.23
Philippines	97	5.40	62.63
Poland	100	5.57	68.20
Romania	99	5.57	73.78
Serbia	30	1.63	75.41
Russia	78	4.33	79.74
Thailand	100	5.57	85.31
Turkey	100	5.57	90.88
Uruguay	64	3.55	94.43
South Africa	100	5.57	100.00
Total	1,798	100.00	

This table reports the frequency distribution of countries over the analysis period (January 2013–March 2024). Obs denotes the number of observations for each country during this period. We exclude months with substantial rebalancing events in the JP Morgan GBI-EM Index resulting from credit rating upgrades or downgrades of countries in our sample.

Appendix Table C.4. Pretrend and Post-Rebalancing Analysis

Panel (A): CDS									
	[d-4]	[d-3]	[d-2]	[d-1]	[d]	[d+1]	[d+2]	[d+3]	[d+4]
FIR_{ct}	-0.047	-0.050	-0.101	-0.134	-0.205	-0.256**	-0.224*	-0.294**	-0.332**
	(0.0597)	(0.0561)	(0.0572)	(0.0588)	(0.0737)	(0.1384)	(0.1392)	(0.1535)	(0.1780)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,571	1,571	1,571	1,571	1,571	1,571	1,571	1,571	1,555
Number of countries	18	18	18	18	18	18	18	18	18
R^2	0.355	0.350	0.418	0.469	0.489	0.490	0.498	0.499	0.471
Panel (B): Exchange Rates									
	[d-4]	[d-3]	[d-2]	[d-1]	[d]	[d+1]	[d+2]	[d+3]	[d+4]
FIR_{ct}	-0.058	-0.069*	-0.133***	-0.190***	-0.288***	-0.283***	-0.294***	-0.311***	-0.292***
	(0.0379)	(0.0367)	(0.0415)	(0.0458)	(0.0652)	(0.0703)	(0.0706)	(0.0747)	(0.0811)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,756	1,756	1,756	1,756	1,756	1,756	1,756	1,756	1,736
Number of countries	23	23	23	23	23	23	23	23	23
R^2	0.2137	0.2522	0.2682	0.3165	0.3212	0.3184	0.3246	0.3475	0.3111

This table reports the estimated coefficients of FIR on CDS spreads (Panel A), and exchange rates (Panel B). FIR is the measure of standardized flows implied by the rebalancings (see Section 3). The cumulative log change is measured over an interval from four days prior to the rebalancing date (d) to four days after. All regressions include time and country fixed effects. Robust standard errors clustered at the country level are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

D. Local Currency versus Foreign Currency Debt

This appendix provides summary statistics on countries' debt maturity structures. Table D.1 reports local- and foreign-currency debt as a share of GDP, the average maturity of local- and foreign-currency debt, and the fraction of bonds maturing for both. Tables D.3 and D.2 present a country-level breakdown of these statistics. The LC/GDP and FC/GDP statistics are computed using annual LC and FC general government debt securities data from BIS and GDP data from the World Bank. Debt maturities and the fraction of bonds maturing are computed from our bond-level data from Refinitiv Eikon at quarterly frequency.

Appendix Table D.1. Summary Statistics: Local vs. Foreign Currency

	Obs	Mean	Median	p25	p75	Std.Dev
LC/GDP	216	0.289	0.271	0.153	0.371	0.164
FC/GDP	212	0.072	0.057	0.021	0.107	0.061
Diff (LC - FC)	212	0.220	0.201	0.084	0.308	0.192
Debt Maturity in LC	1,104	7.950	7.452	5.312	10.189	3.519
Debt Maturity in FC	1,079	10.406	10.581	6.859	12.810	5.200
Debt Maturity (LC-FC)	1,079	-2.490	-2.433	-5.692	0.230	5.689
$FBM_{c,t}$	734	0.045	0.038	0.019	0.061	0.034
$FBM_FC_{c,t}$	734	0.010	0.007	0.002	0.014	0.011
FBM (LC-FC)	734	0.035	0.028	0.011	0.051	0.035

This table reports the summary statistics of a country maturity structure. LC/GDP is the LC general government debt securities over GDP, and FC/GDP is the FC general government debt securities over GDP. Diff (LC-FC) is the difference between LC/GDP and FC/GDP. Debt Maturity in LC is the local currency average bond maturity structure constructed by taking the weighted average of years to maturity on a country level. Debt Maturity in FC is the foreign currency average bond maturity structure constructed by taking the weighted average of years to maturity on a country level. $FBM_{c,t}$ is the fraction of local currency bonds maturing within one year (see Equation 32), and $FBM_FC_{c,t}$ is the fraction of foreign currency bonds maturing within one year. Debt Maturity (LC-FC) is the difference between debt maturity in LC and debt maturity in FC. FBM (LC-FC) is the difference between $FBM_{c,t}$ and $FBM_FC_{c,t}$. Source: BIS, Refinitiv Eikon, and World Bank.

Appendix Table D.2. Summary Statistics: Local vs. Foreign Currency by Country

	Debt Maturity in LC	Debt Maturity in FC	Debt Maturity (LC-FC)	$FBM_{c,t}$	$FBM_FC_{c,t}$	FBM (LC-FC)
Argentina	7.036	12.612	-5.576	0.0005	0.014	-0.014
Brazil	5.827	8.432	-2.605	0.122	0.005	0.116
Chile	11.725	12.215	-0.490	0.035	0.002	0.032
China	7.437	16.227	-8.789	0.032	0.0001	0.032
Colombia	8.442	14.116	-5.675	0.066	0.007	0.058
Czech Republic	7.151	3.730	3.421	0.036	0.005	0.030
Dominican Republic	6.694	13.093	-6.399	0.064	0.041	0.023
Egypt	2.789	10.161	-7.372	0.153	0.017	0.135
Hungary	5.285	7.198	-1.913	0.100	0.023	0.076
Indonesia	9.811	12.238	-2.428	0.0167	0.008	0.008
Mexico	9.548	12.846	-3.298	0.062	0.014	0.047
Malaysia	8.464	5.395	3.314	0.068	0.0002	0.068
Nigeria	9.867	9.721	0.147	0.0023	0.0005	0.001
Peru	12.411	16.849	-4.438	0.051	0.009	0.0428
Philippines	8.367	10.685	-2.318	0.037	0.011	0.025
Poland	5.375	6.102	-0.727	0.0459	0.015	0.030
Romania	4.905	9.198	-4.293	0.0283	0.0198	0.008
Serbia	3.422	5.314	-1.892	0.0347	0.021	0.013
Russia	5.738	11.441	-5.704	0.0162	0.0058	0.010
Thailand	11.725	2.148	9.672	0.0350	0.00003	0.0349
Turkey	4.589	9.227	-4.639	0.006	0.012	-0.005
Uruguay	10.070	15.772	-5.702	0.0152	0.024	-0.009
South Africa	16.174	11.271	4.903	0.0155	0.0011	0.0143

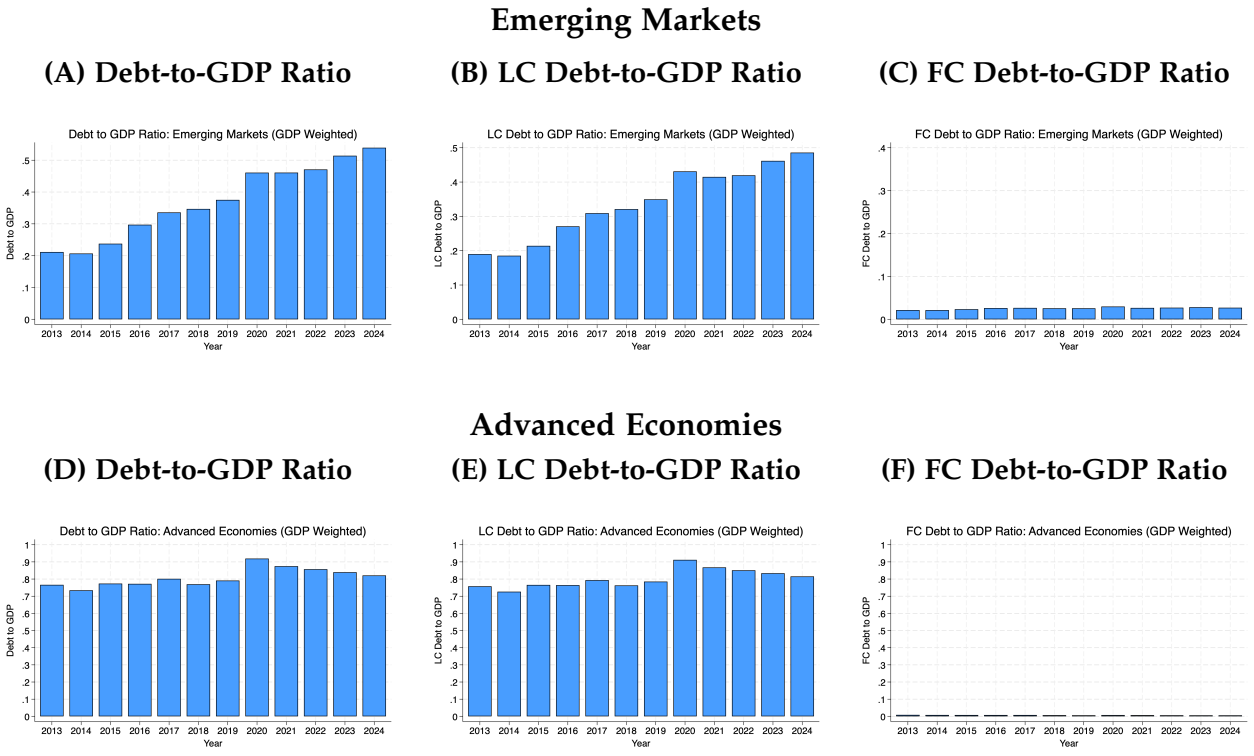
This table reports a country-level breakdown of summary statistics on maturity structure. Debt Maturity (LC) is the mean LC average bond maturity, constructed as the weighted average years to maturity at the country level. Debt Maturity (FC) is the mean FC average bond maturity, constructed analogously. $FBM_{c,t}$ is the mean fraction of LC bonds maturing within one year (see Equation 32), and $FBM_FC_{c,t}$ is the mean fraction of FC bonds maturing within one year. Debt Maturity (LC–FC) is the mean difference between local- and foreign-currency debt maturities. FBM (LC–FC) is the mean difference between $FBM_{c,t}$ and $FBM_FC_{c,t}$.

Appendix Table D.3. Summary Statistics: Local vs. Foreign Currency Debt Share by Country

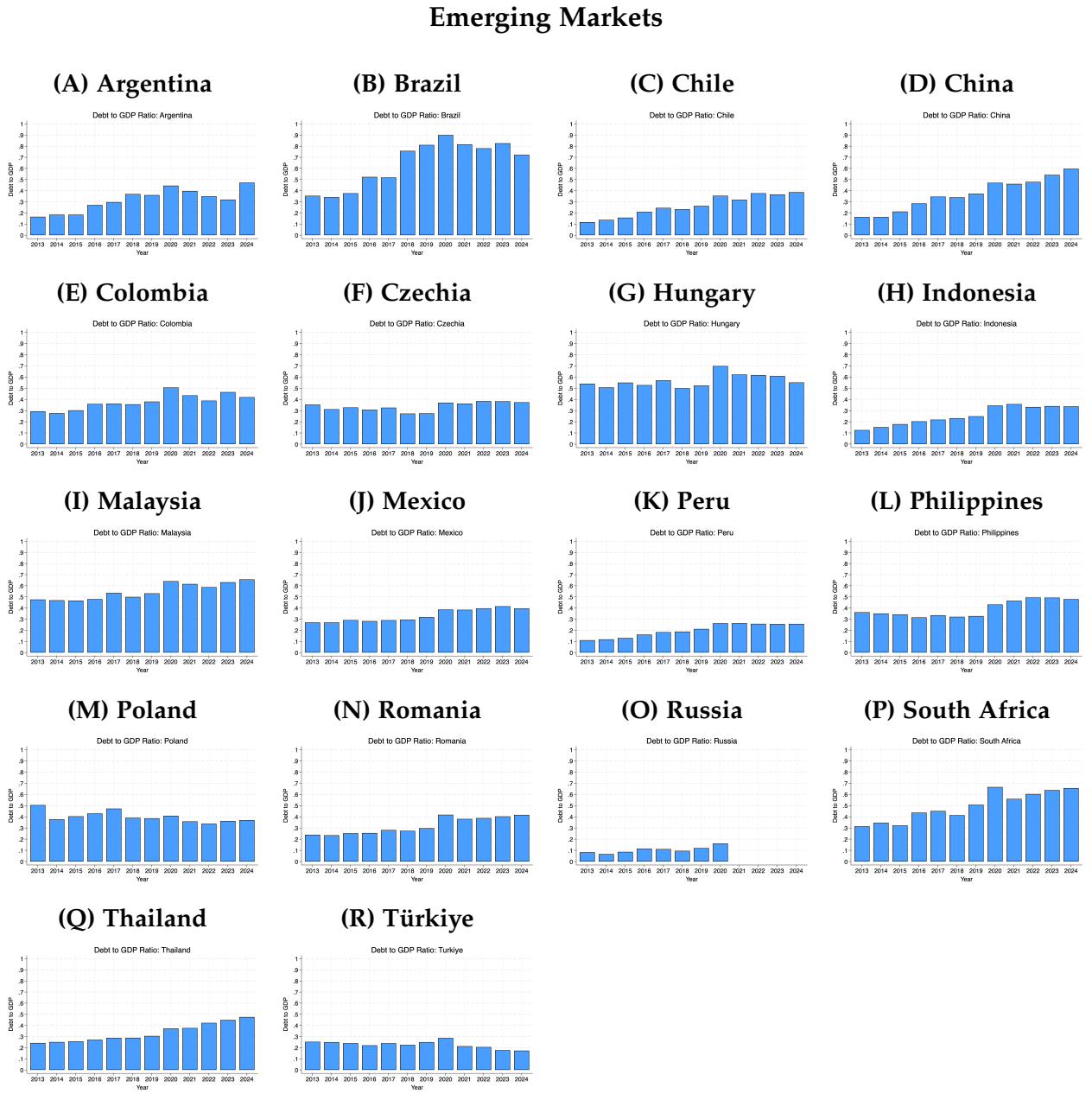
	LC/GDP	FC/GDP	Diff (LC - FC)
Argentina	0.116	0.201	-0.085
Brazil	0.623	0.020	0.602
Chile	0.197	0.066	0.130
China	0.394	0.00	0.394
Colombia	0.290	0.088	0.201
Czech Republic	0.304	0.032	0.272
Hungary	0.401	0.166	0.234
Indonesia	0.192	0.063	0.129
Mexico	0.280	0.052	0.228
Malaysia	0.533	0.015	0.517
Peru	0.123	0.076	0.047
Philippines	0.303	0.090	0.213
Poland	0.310	0.089	0.220
Romania	0.164	0.155	0.008
Russia	0.093	0.023	0.058
Thailand	0.333	0.00	0.333
Turkey	0.134	0.093	0.040
South Africa	0.444	0.049	0.394

This table reports a country-wise breakdown of the summary statistics on each country's currency composition. LC/GDP is the mean of LC general government debt securities over GDP, and FC/GDP is the mean of FC general government debt securities over GDP. Diff (LC-FC) is the difference between LC/GDP and FC/GDP.

E. Debt-to-GDP Ratio: Emerging and Advanced Economies



Appendix Figure E.1. This figure plots the average general government debt-to-GDP ratio (panels A and D), the average LC general government debt-to-GDP ratio (panels B and E), and the average FC general government debt-to-GDP ratio (panels C and F) for the emerging-market economies (panels A–C) and advanced economies (panels D–F) in our sample from 2013 to 2024. To construct each series, we first measure the debt-to-GDP ratio for each country in a given year, and then calculate the GDP-weighted cross-sectional average across all countries in the group for that year. Data sources: Bank for International Settlements (BIS) and World Bank.



Appendix Figure E.2. This figure plots the general government debt-to-GDP ratio for each emerging-market economy in our sample from 2013 to 2024. Each panel shows a single country; panels are ordered alphabetically. The vertical axis is fixed from 0 to 1 (0% to 100%). Data sources: Bank for International Settlements (BIS) and World Bank.



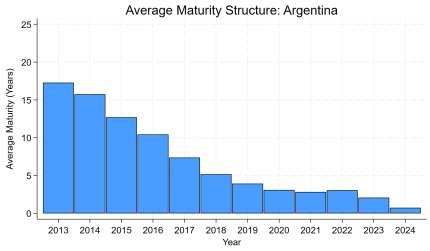
Appendix Figure E.3. This figure plots the general government debt-to-GDP ratio for each advanced economy in our sample from 2013 to 2024. Each panel shows a single country; panels are ordered alphabetically. The vertical axis is fixed from 0 to 1 (0% to 100%), except Japan, Italy, and Spain, whose ratios exceed 100% and are scaled to their own maximum. Data sources: Bank for International Settlements (BIS) and World Bank.

F. Maturity Structure: Emerging and Advanced Economies

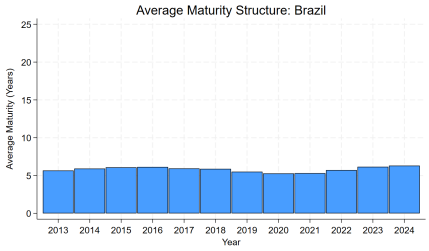
This appendix presents additional evidence on the maturity structure of emerging and advanced economies. Figure F.4 shows the average LC bond maturity, and Figure F.5 plots the amount of bonds maturing within one year as a percentage of GDP for each emerging economy in our sample over time. Figures F.6 and F.7 show the average LC bond maturity, while Figures F.8 and F.9 plot the amount of bonds maturing within one year as a percentage of GDP for each advanced economy.

Local Currency Average Bond Maturity per Country: Emerging Economies.

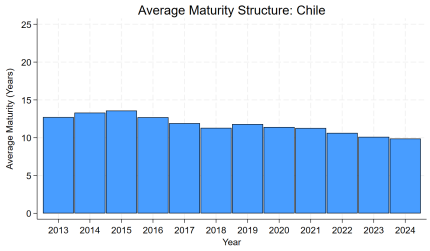
(A) Argentina



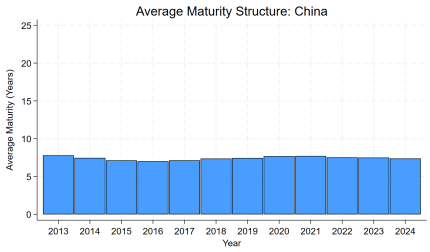
(B) Brazil



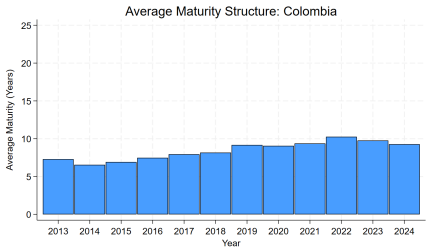
(C) Chile



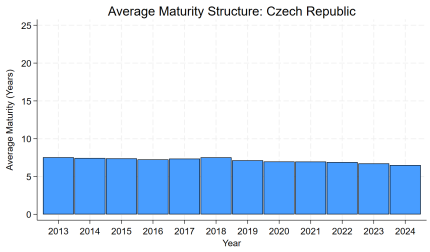
(D) China



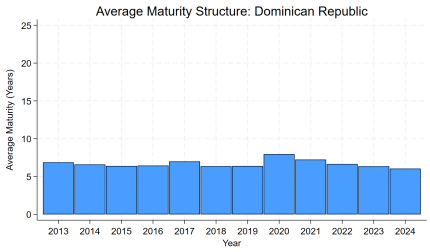
(E) Colombia



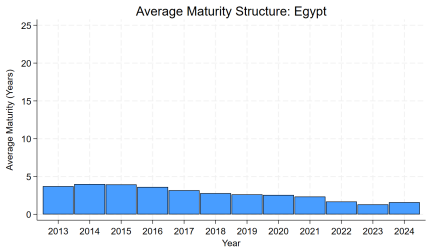
(F) Czech Republic



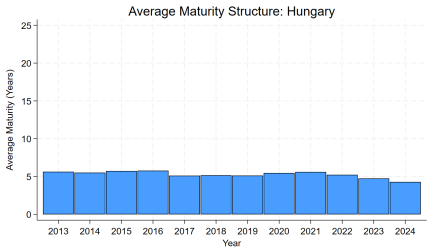
(G) Dominican Republic



(H) Egypt



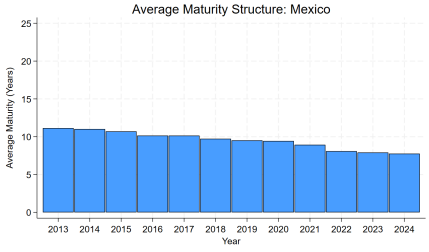
(I) Hungary



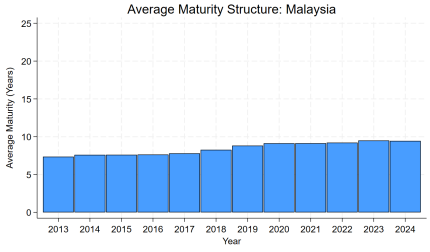
(J) Indonesia

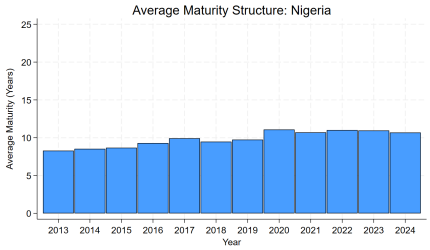


(K) Mexico

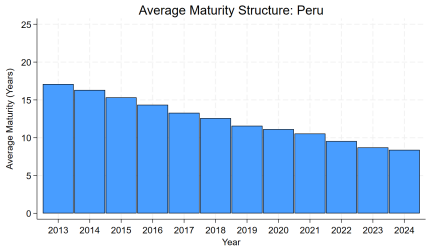


(L) Malaysia

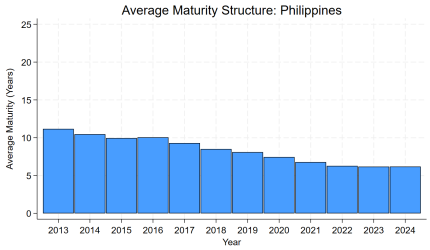




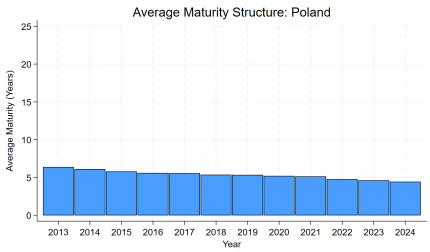
(M) Nigeria



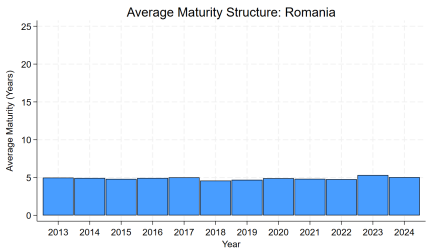
(N) Peru



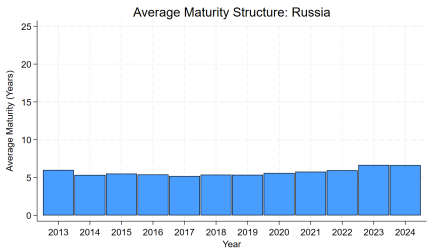
(O) Philippines



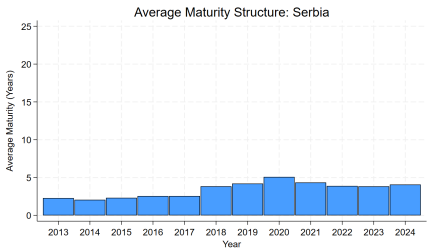
(P) Poland



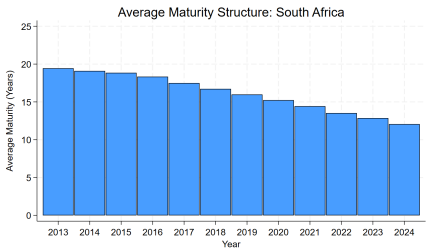
(Q) Romania



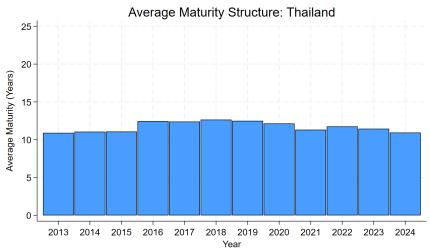
(R) Russia



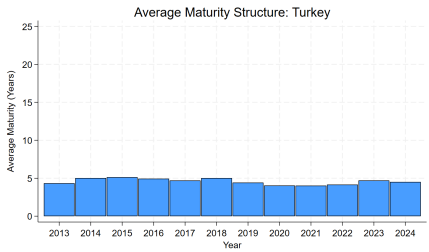
(S) Serbia



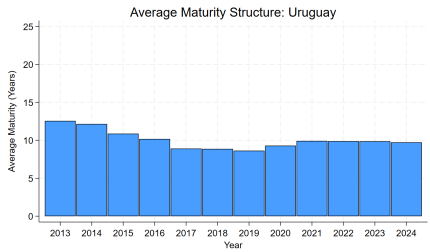
(T) South Africa



(U) Thailand



(V) Turkey

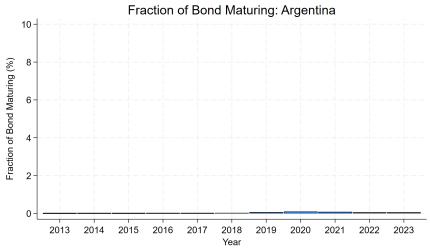


(W) Uruguay

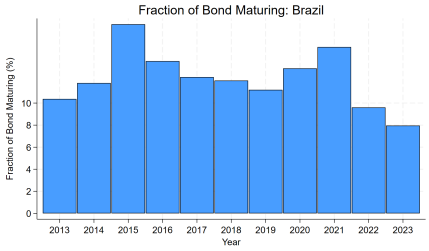
Appendix Figure F.4. This figure reports the local currency (LC) average bond maturity per country from 2013–2024. We construct the LC average maturity by computing the weighted average years to maturity of LC debt at the country level in each year. Source: Refinitiv Eikon.

Fraction of LC Bonds Maturing by Country: Emerging Economies.

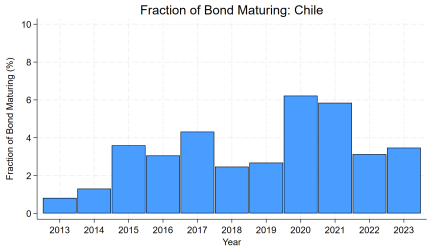
(A) Argentina



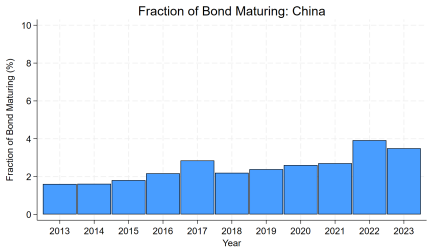
(B) Brazil



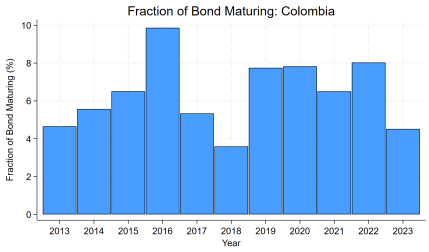
(C) Chile



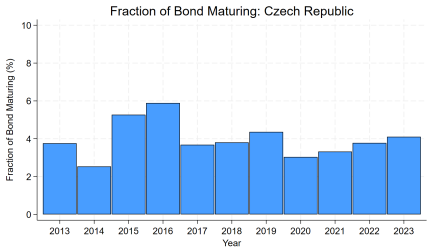
(D) China



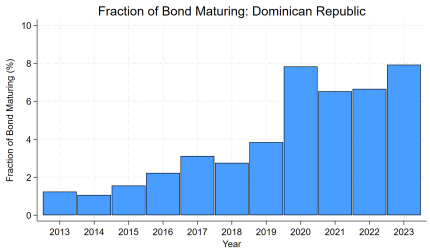
(E) Colombia



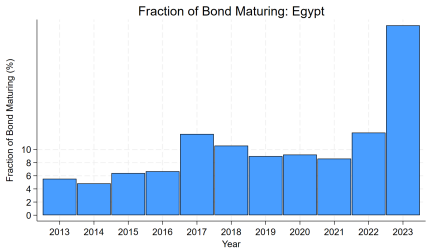
(F) Czech Republic



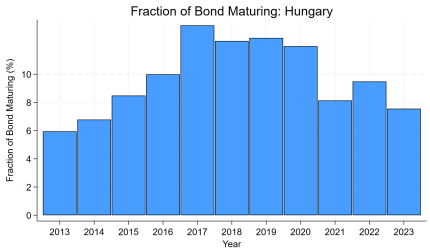
(G) Dominican Republic



(H) Egypt



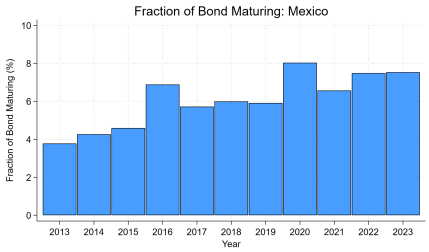
(I) Hungary



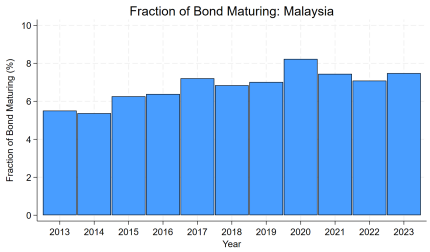
(J) Indonesia

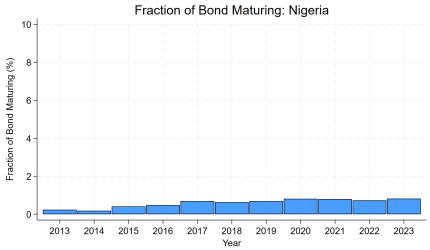


(K) Mexico

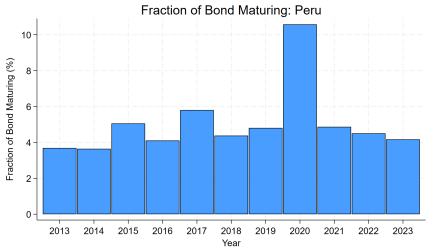


(L) Malaysia

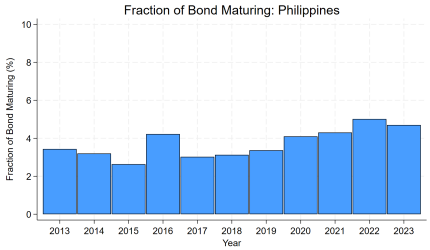




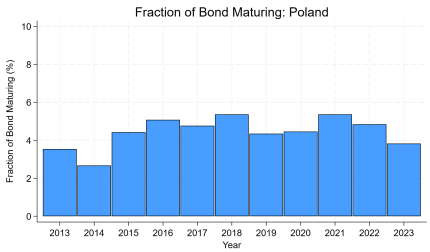
(M) Nigeria



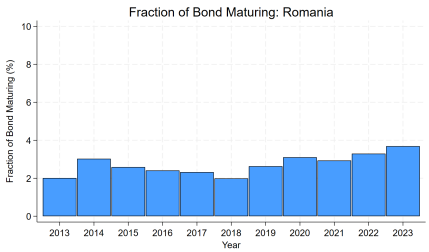
(N) Peru



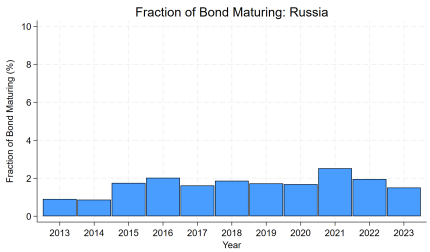
(O) Philippines



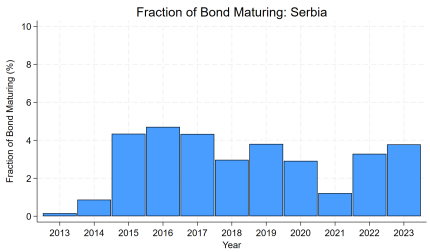
(P) Poland



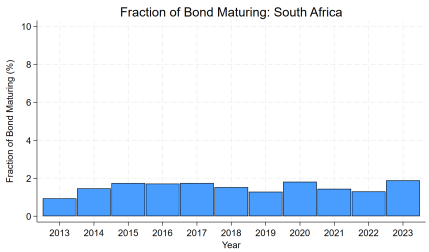
(Q) Romania



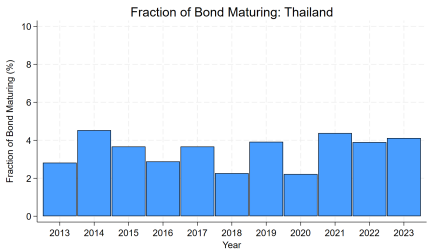
(R) Russia



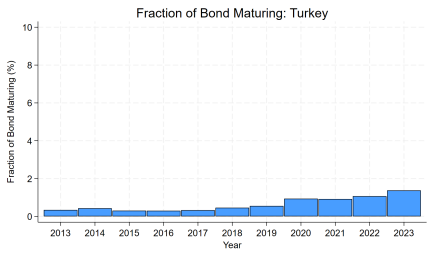
(S) Serbia



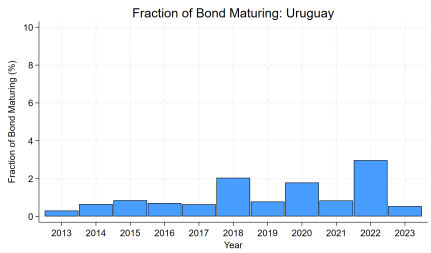
(T) South Africa



(U) Thailand



(V) Turkey

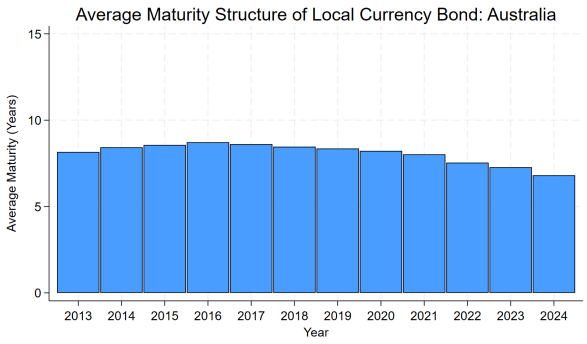


(W) Uruguay

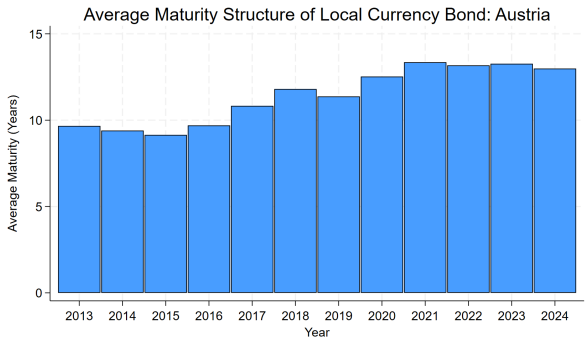
Appendix Figure F.5. This figure reports the amount of bonds maturing within one year as a percentage of GDP for each country in our sample from 2013 to 2024. The fraction of LC bonds maturing is computed by dividing the value of outstanding bonds maturing within one year by GDP. Source: Refinitiv Eikon.

Appendix Figure F.6. Local Currency Average Bond Maturity per Country: Advanced Economies.

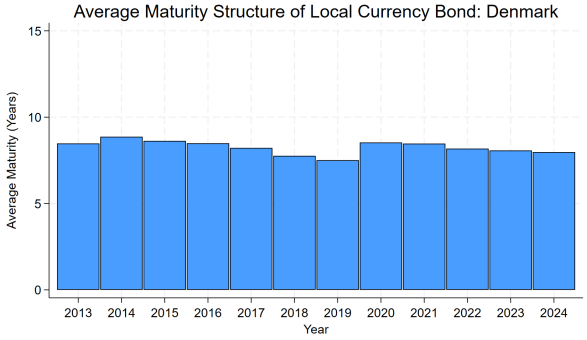
(A) Australia



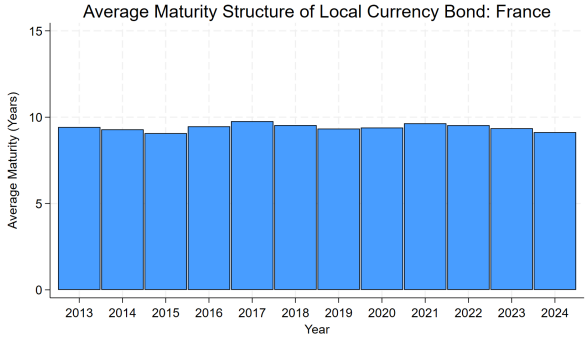
(B) Austria



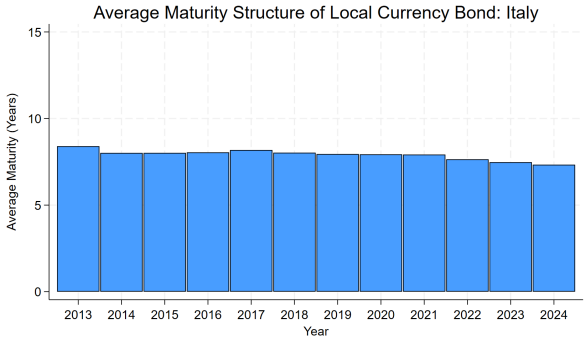
(C) Denmark



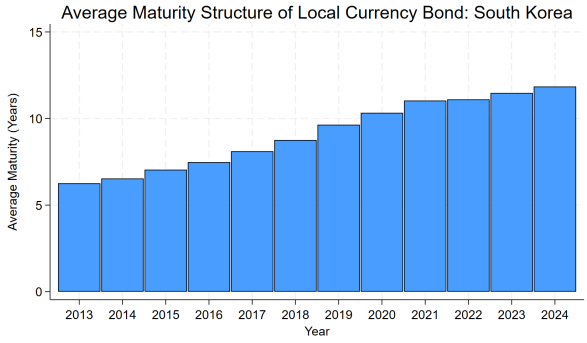
(D) France



(E) Italy

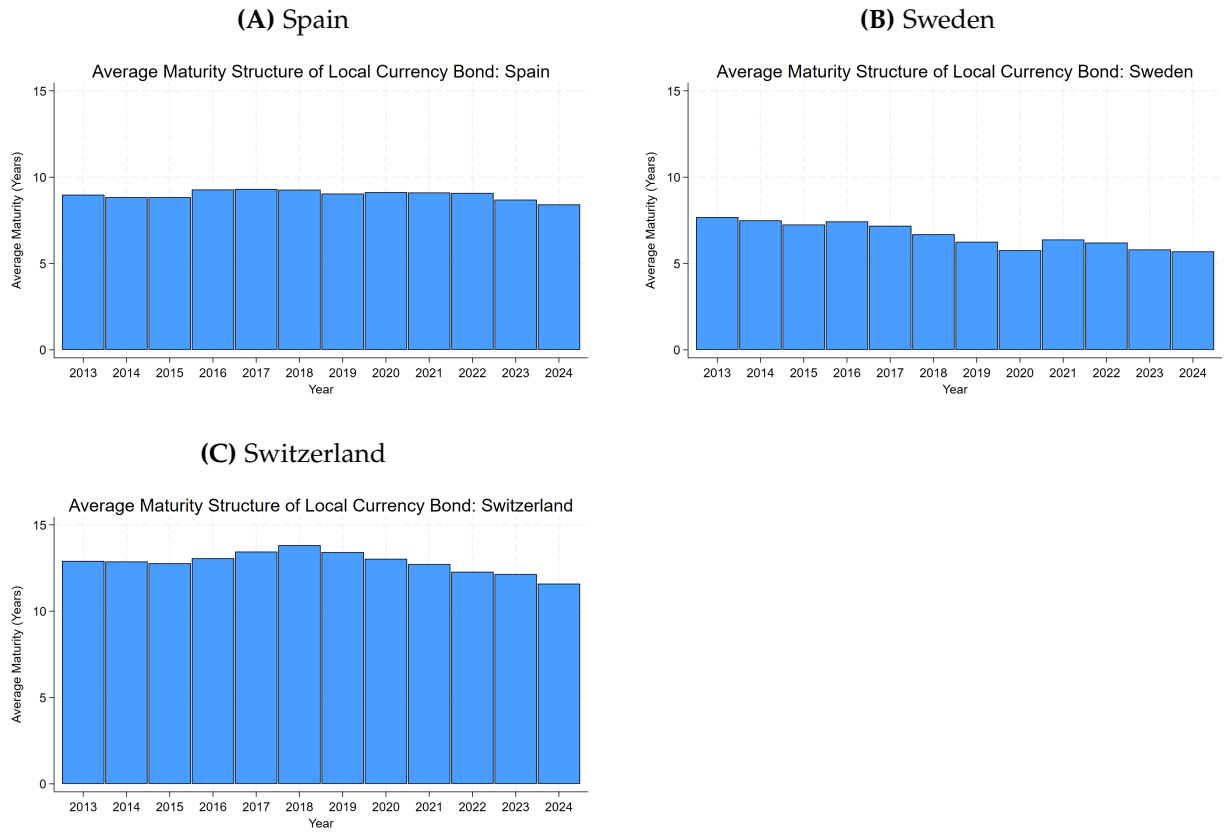


(F) South Korea



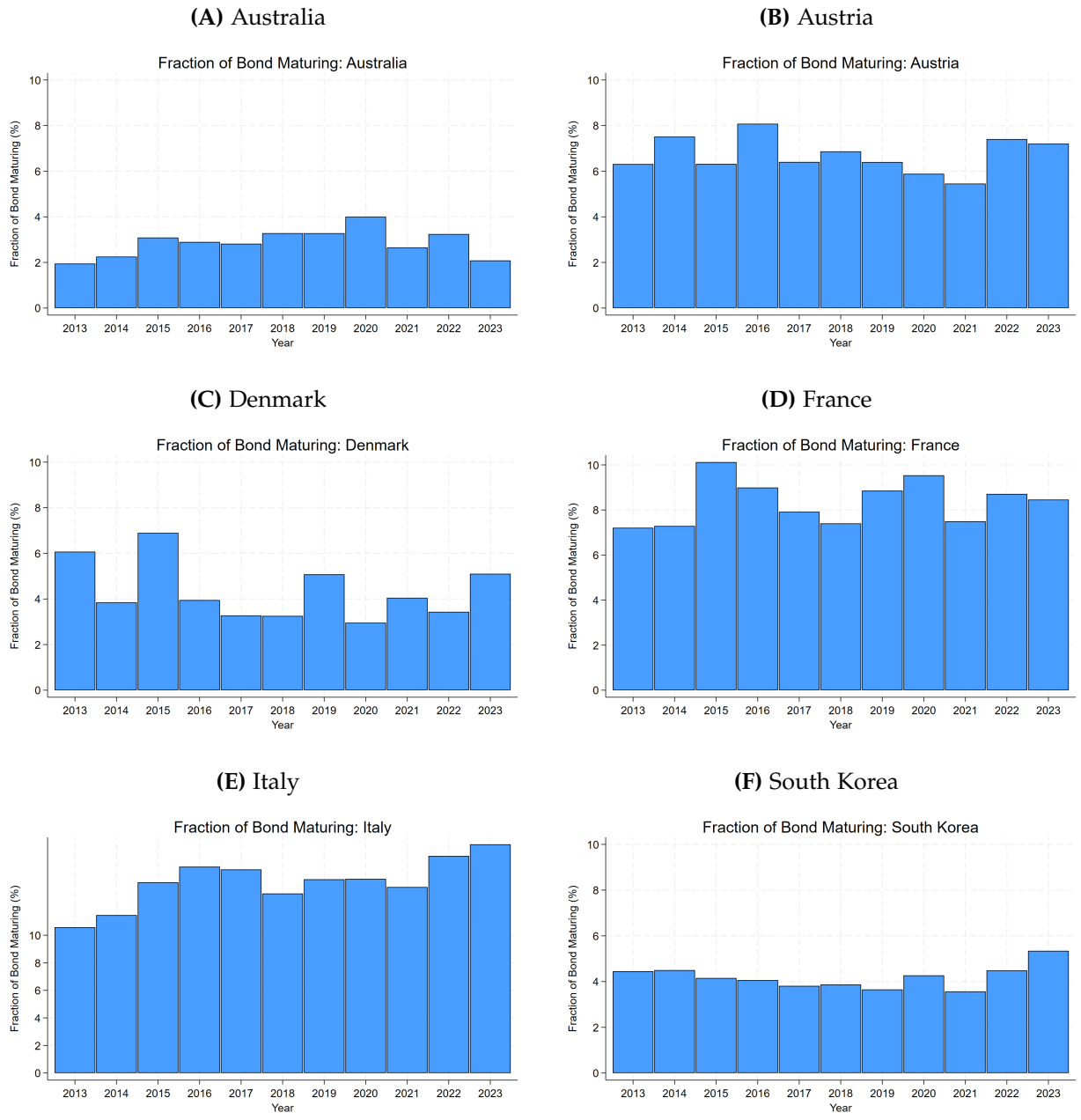
This figure reports the local currency (LC) average bond maturity per country from 2013–2024. We construct the LC average maturity by computing the weighted average years to maturity of LC debt at the country level in each year. Panels (A), (B), (C), (D), (E), and (F) plot the average LC bond maturity for Australia, Austria, Denmark, France, Italy, and South Korea, respectively. Source: Refinitiv Eikon.

Appendix Figure F.7. Local Currency Average Bond Maturity per Country: Advanced Economies



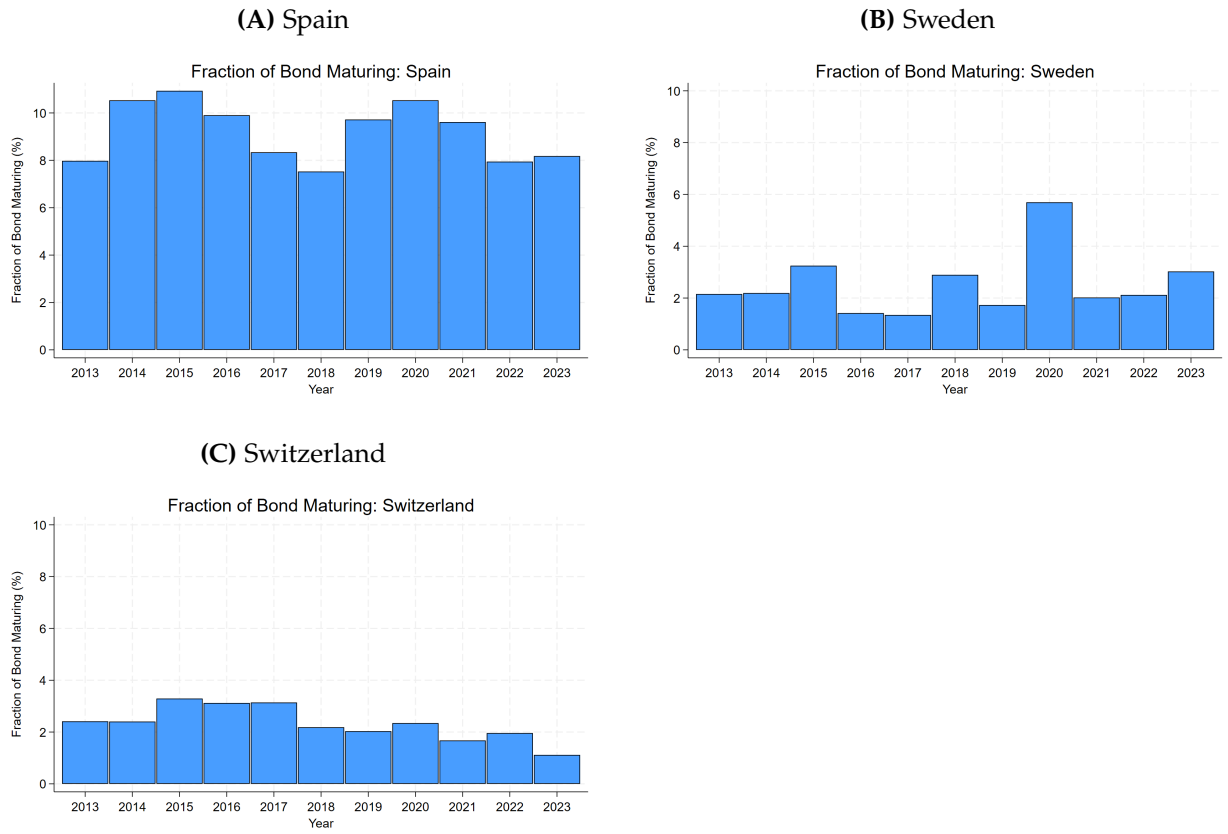
This figure reports the local currency (LC) average bond maturity per country from 2013–2024. We construct the LC average maturity by computing the weighted average years to maturity of LC debt at the country level in each year. Panels (A), (B) and (C) plot the local currency average bond maturity for Spain, Sweden, and Switzerland, respectively. Source: Refinitiv Eikon.

Appendix Figure F.8. Fraction of LC Bonds Maturing by Country: Advanced Economies.



This figure reports the amount of bonds maturing within one year as a percentage of GDP for each country in our sample from 2013 to 2024. The fraction of LC bonds maturing is computed by dividing the value of outstanding bonds maturing within one year by GDP. Panels (A), (B), (C), (D), (E), and (F) plot the fraction of bond maturing for Australia, Austria, Denmark, France, Italy, and South Korea, respectively. Source: Refinitiv Eikon.

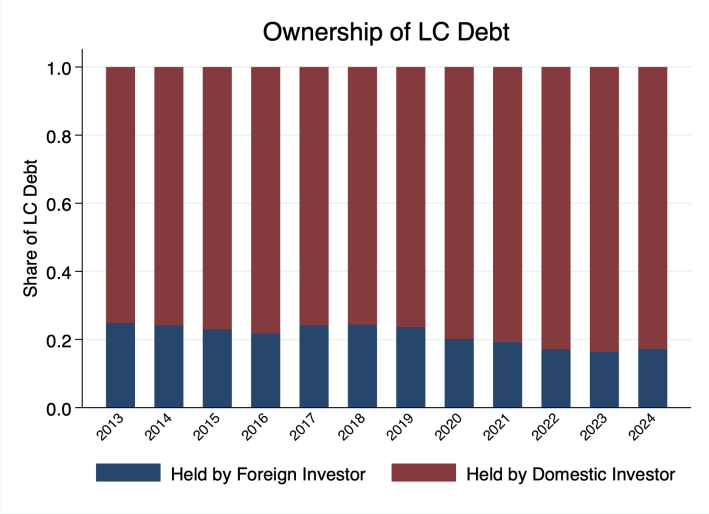
Appendix Figure F.9. Fraction of LC Bonds Maturing by Country: Advanced Economies.



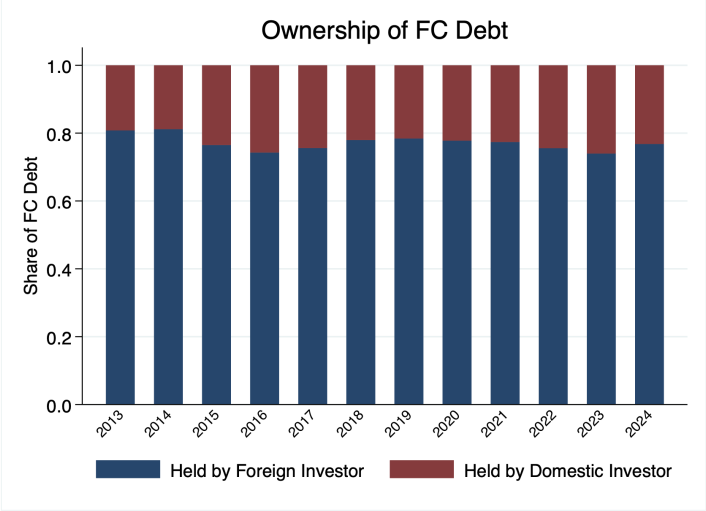
This figure reports the amount of bonds maturing within one year as a percentage of GDP for each country in our sample from 2013 to 2024. The fraction of LC bonds maturing is computed by dividing the value of outstanding bonds maturing within one year by GDP. Panels (A), (B), and (C) plot the fraction of bond maturing for Spain, Sweden, and Switzerland, respectively. Source: Refinitiv Eikon.

G. Ownership of LC and FC Debt

(A) Ownership of LC Debt



(B) Ownership of FC Debt



Appendix Figure G.1. This figure plots the ownership of LC and FC debt. Panel (A) shows the average ownership of LC debt over time. Panel (B) shows the average ownership of FC debt over time. Held by Foreign Investor and Held by Local Investor refer to the shares of debt held by foreign and domestic investors, respectively, as collected from Arslanalp and Tsuda (2014).

H. Inflation and Real Output Growth

A key assumption in our model is that the output cost of inflation is nonlinear: moderate inflation fluctuations impose small costs, while high inflation is substantially more damaging. We test this assumption by regressing real GDP growth on lagged CPI inflation using a panel of 46 countries (23 emerging markets and 23 advanced economies) over the 2013–2024 period, which corresponds to our empirical sample.

Table H.1 presents the results. Columns (1) and (2) estimate a linear specification, regressing GDP growth on lagged inflation. We find that the coefficient on lagged inflation is negative and statistically significant, confirming that higher inflation is on average associated with lower subsequent output growth. Columns (3) and (4) replace the continuous inflation variable with indicator variables for three inflation bins—2% to 5%, 5% to 10%, and above 10%—using inflation below 2% as the omitted category. These specifications reveal a clear nonlinear pattern. The 2%–5% bin is small and statistically insignificant, indicating that inflation within typical central-bank target ranges has no detectable output cost relative to the low-inflation baseline. In contrast, the 5%–10% bin is associated with a GDP growth reduction of approximately 0.9–1.2 percentage points, and inflation above 10% with a reduction of 1.6–1.8 percentage points, with both coefficients statistically significant. The effect is monotonically increasing across bins in all specifications: higher inflation is associated with progressively larger output losses. These results are robust to the inclusion or exclusion of year fixed effects.

Overall, while the linear model detects a significant average effect, it imposes the same marginal cost at all inflation levels. The binned specification reveals that the output cost of inflation is in fact concentrated above 5%, with no detectable effect for moderate inflation and increasingly severe effects at higher levels. This pattern is consistent with a cost function that is increasing and convex in inflation.

Appendix Table H.1. Inflation and Real Output Growth

	Linear		Bins	
	(1)	(2)	(3)	(4)
$\pi_{i,t-1}$	-0.061^{***}	-0.045^{***}		
	(0.018)	(0.015)		
$\mathbb{1}[2\% \leq \pi < 5\%]$			-0.259	-0.220
			(0.338)	(0.328)
$\mathbb{1}[5\% \leq \pi < 10\%]$			-0.919^{**}	-1.242^{**}
			(0.407)	(0.499)
$\mathbb{1}[\pi \geq 10\%]$			-1.564^{***}	-1.776^{***}
			(0.449)	(0.497)
Country FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes
Observations	546	546	546	546
Countries	46	46	46	46
Within R^2	0.010	0.010	0.011	0.021

The dependent variable is real GDP growth (annual %). $\pi_{i,t-1}$ is lagged CPI inflation (annual %). The sample covers 23 emerging-market and 23 advanced economies over 2013–2024. Standard errors clustered by country are reported in parentheses. In Columns (3) and (4), the omitted category is $\pi < 2\%$. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

I. Additional Measures of Capital Flows

I.1 Flows Implied by Shifts in the Broad Dollar Index (BDI)

As our second measure of capital flow shocks, we use changes in the BDI. Prior research shows that dollar appreciations are systematically associated with portfolio outflows and reductions in foreign investor holdings of LC sovereign bonds across emerging markets (Jansen, Shin, and Von Peter, 2024).

We estimate the following regression:

$$\begin{aligned}\Delta y_{ct} = \theta_c + \beta_1 \Delta \log BDI_t + \beta_2 TopFBM_{ct} + \beta_3 \Delta \log BDI_t \times TopFBM_{ct} \\ + \gamma' \text{Controls}_{c,t-1} + \epsilon_{ct}\end{aligned} \tag{34}$$

where y_{ct} is the outcome variable of country c at month t, defined as in Equation (26), but without considering exchange rates, to avoid confounding effects. The broad dollar index (BDI) is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners; an increase represents a stronger US dollar.[26] The vector of controls is the same as in Equation (26).

Table I.1 presents the results. Consistent with our hypothesis, we find that rollover-risk exposure significantly amplifies the effects of BDI shocks, and the economic magnitudes are substantial. In response to a one–standard-deviation increase in the BDI index, the CDS of countries with high rollover-risk exposure increases by 2.19%, corresponding to approximately 13% of one standard deviation of CDS changes, while no effect is observed for other countries.

I.2 Flows Implied by U.S. Monetary Policy Shocks (MPS)

Following Miranda-Agrippino and Rey (2020), we also utilize U.S. monetary policy shocks identified from movements in federal funds futures around Federal Open Market Committee (FOMC) announcements for identification. Contractionary surprises are well documented to trigger global capital retrenchment and tighten financial conditions in emerging markets, thereby offering another plausibly exogenous source of variation in capital flows.

[26] The BDI is composed of the following countries: Euro Area, Canada, Japan, Mexico, China, United Kingdom, Taiwan, Korea, Singapore, Hong Kong, Malaysia, Brazil, Switzerland, Thailand, Philippines, Australia, Indonesia, India, Israel, Saudi Arabia, Russia, Sweden, Argentina, Venezuela, Chile, and Colombia.

Specifically, we measure monetary policy shocks as in Bauer and Swanson (2023), who construct them from changes in the first four quarterly Eurodollar futures contracts within a 30-minute window around FOMC announcements. These measures capture unexpected shifts in interest rate expectations and are widely used as a proxy for U.S. monetary policy shocks.

We estimate the following specification:

$$\Delta y_{c,t} = \theta_{cy} + \beta_1 MPS_t + \beta_2 TopFBM_{ct} + \beta_3 MPS_t \times TopFBM_{ct} + \gamma' Controls_{c,t-1} + \epsilon_{ct} \quad (35)$$

where $y_{c,t}$ is the outcome variable from country c at time t (the outcome variables are the same as in Equation (26)). $\Delta y_{c,t}$, defined as $y_{c,d+z} - y_{c,d-1}$, is the cumulative change over an interval from one day prior to the FOMC date, d, to z days after it. In the baseline results, we use z=$\{0, 1, 2, 3\}$. θ_{cy} represents Country $\times$ Year fixed effects. MPS_t is the monetary policy shock from Bauer and Swanson (2023) described above. The vector of controls is the same as in Equation (26).

Table I.2 shows the results for CDS spreads. We find that rollover-risk exposure significantly amplifies the effects of U.S. contractionary monetary policy shocks, and the magnitudes are again economically meaningful. For example, a one–standard-deviation contractionary shock increases the CDS of countries with high rollover-risk exposure by 2.23% three days after the FOMC announcement, corresponding to about 26% of one standard deviation of CDS changes, which highlights that the effect is substantial in relative terms. We also analyze the impact on exchange rates in Table I.2. We find that contractionary shocks lead to a depreciation of exchange rates in EM economies, and rollover-risk exposure amplifies these effects, but the magnitudes are not statistically significant.

Appendix Table I.1. Capital Flows and Rollover Risk: Broad Dollar Index (BDI)

	Credit Default Swaps	**Credit Default Swaps**
$\Delta \log$ BDI	-0.0073	
	(0.0280)	
$\Delta \log$ BDI $\times$ TopFBM	0.0292***	0.0365***
	(0.0070)	(0.0072)
Observations	879	879
Country FE	Yes	Yes
Time FE	No	Yes
Controls	Yes	Yes
R-squared	0.1761	0.2935

This table reports the estimated coefficients of $\Delta \log BDI$ and $\Delta \log BDI \times$ TopFBM on the changes in the log of CDS spreads. Observations are at the country-month level. The main independent variable is the broad dollar index (BDI), which is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. All regressions control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with $\Delta \log BDI$. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table I.2. Capital Flows and Rollover Risk: Monetary Policy Shocks (MPS)

Panel A: Credit Default Swaps	[d]	[d+1]	[d+2]	[d+3]
MPS	0.0973	-0.0063	0.2554	0.2723
	(0.3052)	(0.3765)	(0.4732)	(0.4674)
$MPS \times TopFBM$	0.1387*	0.1653	0.3058**	0.3072**
	(0.0737)	(0.0994)	(0.1465)	(0.1466)
Observations	1,237	1,237	1,237	1,222
Country x Year	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.1838	0.0831	0.1209	0.1212
Panel B: Exchange Rates	[d]	[d+1]	[d+2]	[d+3]
MPS	0.2404	0.2606	0.2326	0.2442
	(0.1803)	(0.1827)	(0.1972)	(0.2011)
$MPS \times TopFBM$	0.0358	0.0330	0.0169	0.0173
	(0.0311)	(0.0352)	(0.0431)	(0.0437)
Observations	1,416	1,416	1,416	1,399
Country x Year	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.2424	0.2468	0.2280	0.2417

Panel A reports the estimated coefficients of MPS and $MPS \times TopFBM$ on changes in the log of CDS over a four-day window around the FOMC announcement date (d). Panel B reports the estimated coefficients of MPS and $MPS \times TopFBM$ on changes in the log of exchange rates over the same window. MPS is the monetary policy shock from Bauer and Swanson (2023). $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. All regressions control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and their interactions with MPS. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Appendix Table I.3. Broad Dollar Index (BDI) Shocks and Term Structure Effects

Panel A: Impact on Bond Yields by Maturity

	Bond Yields (1–5Y)	Bond Yields (5–10Y)	Bond Yields (10Y+)
$\Delta \log BDI$	-0.2608***	-0.3128**	0.0005
	(0.0803)	(0.1388)	(0.0375)
$\Delta \log BDI \times$ TopFBM	-0.0523***	-0.0495**	0.0087
	(0.0159)	(0.0185)	(0.0133)
Observations	13,727	9,922	8,620
Bond $\times$ Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
R-squared	0.1790	0.2348	0.2501

Panel B: Impact on CDS Spreads by Maturity

	CDS (5Y)	CDS (10Y)
$\Delta \log BDI$	0.0006	0.0568***
	(0.0221)	(0.0172)
$\Delta \log BDI \times$ TopFBM	0.0209***	0.0437***
	(0.0078)	(0.0109)
Observations	2,075	892
Country $\times$ Year FE	Yes	Yes
Controls	Yes	Yes
R-squared	0.1784	0.3692

Panel A of this table reports the estimated coefficients of $\Delta \log BDI$ and $\Delta \log BDI \times$ TopFBM on changes in bond yields across maturity buckets. Observations are at the country-month level. Panel B reports the estimated coefficients of $\Delta \log BDI$ and $\Delta \log BDI \times$ TopFBM on changes in the log of CDS spreads with 5-year and 10-year maturities. The main independent variable is the broad dollar index (BDI), a weighted average of the foreign exchange value of the U.S. dollar against the currencies of a broad group of major U.S. trading partners, interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. All regressions include controls for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and their interactions with $\Delta \log BDI$. Robust standard errors, clustered at the bond level for the bond-yield regressions and at the time level for the CDS regressions, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table I.4. Monetary Policy Shocks (MPS) and Term Structure Effects

	Bond Yields			
	[d]	[d+1]	[d+2]	[d+3]
Panel A: 1–5 Years Maturity				
MPS	0.1502	0.1581	-0.4402	-0.4258
	(0.2055)	(0.3983)	(0.4495)	(0.4472)
MPS× TopFBM	0.2276***	0.2288**	0.0843	0.0812
	(0.0779)	(0.0980)	(0.1247)	(0.1245)
Observations	8,179	8,179	8,179	8,179
Bond × Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.1695	0.1873	0.2150	0.2095
Panel B: 5–10 Years Maturity				
MPS	0.4091**	0.6407*	-0.0981	-0.0797
	(0.2061)	(0.3344)	(0.3396)	(0.3349)
MPS× TopFBM	0.1508*	0.1200	0.0140	0.0128
	(0.0868)	(0.1013)	(0.1326)	(0.1325)
Observations	5,859	5,859	5,859	5,859
Bond × Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.1480	0.1980	0.2191	0.2052
Panel C: Over 10 Years Maturity				
MPS	0.5532**	0.2153	-0.1198	-0.1259
	(0.2270)	(0.3116)	(0.3130)	(0.3134)
MPS× TopFBM	0.1473**	0.1374	0.1594	0.1579
	(0.0702)	(0.0936)	(0.1157)	(0.1158)
Observations	5,138	5,138	5,138	5,138
Bond × Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.1801	0.2306	0.2189	0.2188

	Credit Default Swaps			
	[d]	[d+1]	[d+2]	[d+3]
Panel D: 5-Year CDS				
MPS	0.096	-0.013	0.254	0.271
	(0.305)	(0.376)	(0.473)	(0.467)
MPS× TopFBM	0.134*	0.159	0.300**	0.302**
	(0.074)	(0.100)	(0.146)	(0.146)
Observations	1,245	1,245	1,245	1,229
Country × Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.184	0.083	0.121	0.121
Panel E: 10-Year CDS				
MPS	0.198	0.275	0.439	0.439
	(0.220)	(0.348)	(0.455)	(0.455)
MPS× TopFBM	0.118	0.161	0.247	0.243
	(0.079)	(0.120)	(0.176)	(0.176)
Observations	537	537	537	531
Country × Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.177	0.166	0.205	0.197

Panels A–C of this table report the estimated coefficients of *MPS* and its interaction with *TopFBM* on changes in bond yields across maturity buckets (1–5 years, 5–10 years, and over 10 years). Panels D and E report the effects on the log of CDS spreads with 5-year and 10-year tenors. *d* denotes the FOMC day. MPS is the monetary policy shock from Bauer and Swanson (2023). *TopFBM* is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. All regressions include controls for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and their interactions with MPS. Robust standard errors, clustered at the bond level for the bond-yield regressions and at the time level for the CDS regressions, are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

J. Additional Results and Robustness

This appendix presents additional results and robustness tests to which we subject our baseline findings.

J.1 Importance of Debt/GDP

We examine whether a country's debt-to-GDP ratio implies a differential response to capital flow shocks and compare its importance to rollover-risk exposure. Each quarter, we sort countries into terciles based on the distribution of the debt-to-GDP ratio and create the dummy variable $TopDebt_{c,t}$, which equals one if a country is in the top tercile of this distribution. We then estimate Equations (26), (34), and (35), including $TopDebt_{c,t}$ and its interaction with the capital flow shock, while keeping the same control variables.

Table J.1 reports the results for the FIR shock. First, the coefficient associated with FIR $\times$ TopFBM remains virtually unchanged relative to our baseline findings. Second, rollover-risk exposure appears to play a more important role than "leverage" (Debt/GDP) in explaining a country's differential response to exogenous capital flows. Results using the BDI and monetary policy shocks are reported in Tables J.2 and J.3 and show qualitatively similar patterns. These findings underscore the unique role of rollover-risk exposure in amplifying the effects of capital flows in emerging markets.

J.2 Additional Controls

In this section, we test the robustness of our results to alternative specifications and additional controls. First, we re-estimate our baseline results including the interaction of TopFBM with GDP growth in the set of controls to ensure that the heterogeneous effects of capital flows are not driven by differences in cyclicality (see Jungherr et al. (2022) and others). Tables J.4, J.5, and J.6 show that our findings remain unchanged. Second, Beltran and He (2024) show that flows implied by rebalancing have persistent effects on exchange rates. To address this concern, we re-estimate our baseline results including the lag of FIR as an additional control. Table J.7 shows that our results are qualitatively the same. Overall, these findings suggest that there is little to no confounding effect and that adding controls does not alter the regression results.

J.3 Countries at the 10% threshold

One concern with our results is that, when measuring the flows implied by the rebalancing (FIR), we also use data from countries at the 10% country-weight cap, and the flows from these countries may be correlated with macroeconomic fundamentals. For instance, if Brazil's country weight is rebalanced from 12% to 10%, the resulting outflows from Brazil could be driven by its economic performance, which might also be correlated with broader macroeconomic conditions that affect our outcome variables.

To address this concern, we construct a FIR measure that excludes flows from countries potentially correlated with macroeconomic conditions. The procedure is identical to that described in Subsection C.2, but we exclude countries at the 10% threshold. The idea is that when Brazil's weight is rebalanced from 12% to 10%, it results in an increase in the weight of a smaller country, such as Chile. In this case, the capital flows experienced by Chile's LC bonds would be unrelated to its own economic conditions and would instead reflect the reallocation caused by the larger country reaching the 10% cap. As a result, in this analysis, we exclude the outflows from Brazil and consider only the inflows to Chile.

We then estimate our main results using the FIR measure described above. Table J.8 presents our findings. We consistently find that the impact of FIR on exchange rates, and CDS spreads is significantly amplified for countries facing high rollover-risk exposure. Notably, the magnitudes are also very similar to those in our baseline analysis, which does not exclude countries in the top 10%. This is important as it suggests that the flows implied by the rebalancing are plausibly exogenous. These results highlight the robustness of our identification strategy and further underscore the important role of rollover-risk exposure in the transmission of capital flow shocks.

J.4 Pre-determined Maturity

As previously discussed, asset price movements can themselves affect exposure to rollover risk by influencing investor sentiment and refinancing conditions. To address this concern and better identify the impact of rollover-risk exposure, our baseline approach uses the ex-ante country maturity structure, which helps alleviate these concerns. Specifically, we define TopFBM using the distribution of the one-year lag of FBM, which represents the amount of bonds maturing in a given year as predicted from the previous year.

In this section, we conduct an additional robustness analysis of our bond maturity measure by constructing the FBM measure in a manner similar to Section 3, but using DD2, which captures the amount of bonds maturing in two years. This approach further ensures that the country's maturity structure is predeter-

mined. Tables J.9–J.11 report qualitatively similar findings when using this alternative measure of rollover-risk exposure.

J.5 Uncertainty Shocks

Akinci, Kalemli-Özcan, and Queralto (2022) show that when U.S. uncertainty rises, the foreign country's exchange rate vis-à-vis the dollar depreciates and capital flows out of the country. Motivated by this evidence, we examine how changes in the VIX affect exchange rates and CDS spreads, and whether these impacts are amplified by rollover-risk exposure. To do so, we re-estimate our baseline specification, replacing BDI shocks with uncertainty shocks while keeping the same set of control variables.

Table J.12 presents the results. In response to a one–standard-deviation increase in the VIX, exchange rates depreciate by 6.45%. Rollover-risk exposure amplifies this impact by 38.44%. The findings for CDS spreads are even stronger: a one–standard-deviation increase in the VIX leads to a 6.83% rise in CDS spreads. This effect is approximately 1.1 times larger for countries facing high rollover-risk exposure. Overall, our findings suggest that global uncertainty shocks are transmitted more strongly to countries with greater rollover-risk exposure.

Appendix Table J.1. FIR and Rollover Risk: The importance of Debt/GDP

	Exchange Rate	**Credit Default Swaps**
FIR	-0.0240	-0.0209
	(0.0168)	(0.0278)
FIR $\times$ *TopFBM*	-0.0078**	-0.0421***
	(0.0036)	(0.0138)
FIR $\times$ *TopDebt*	0.0078	0.0262
	(0.0091)	(0.0192)
Observations	672	638
Country FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
R-squared	0.5541	0.5657

This table reports the estimated coefficients of FIR, FIR$\times$ TopFBM, and FIR$\times$ TopDebt on the changes in the log of the exchange rate and the log of CDS. Observations are at the country-quarter level. The main independent variable is the measure of standardized flows implied by the rebalancings accumulated to the quarterly-level interacted with *TopFBM*. *TopFBM* is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. $TopDebt_{c,t}$ is an indicator variable that equals one if a country is in the top tercile of the distribution of Debt/GDP (sorted by quarter). We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with FIR. Robust standard errors clustered at the country level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.2. BDI and Rollover Risk: The importance of Debt/GDP

	Credit Default Swaps	**Credit Default Swaps**
$\Delta \log BDI$	0.0024	
	(0.0289)	
$\Delta \log BDI \times$ TopFBM	0.0268***	0.0318***
	(0.0074)	(0.0076)
$\Delta \log BDI \times$ TopDebt	0.0199*	0.0395***
	(0.0111)	(0.0108)
Observations	878	878
Country FE	Yes	Yes
Time FE	No	Yes
Controls	Yes	Yes
R-squared	0.1778	0.2973

This table reports the estimated coefficients of $\Delta \log BDI$, $\Delta \log BDI \times$ TopFBM, and $\Delta \log BDI \times$ TopDebt on the changes in the log of CDS. Observations are at the country-month level. The main independent variable is the broad dollar index (BDI), which is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. $TopDebt_{c,t}$ is an indicator variable that equals one if a country is in the top tercile of the distribution of Debt/GDP (sorted by quarter). We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with $\Delta \log BDI$. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.3. MPS and Rollover Risk: The importance of Debt/GDP

	Credit Default Swaps			
	[d]	[d+1]	[d+2]	[d+3]
MPS	0.1035	0.0187	0.3228	0.3331
	(0.3278)	(0.4065)	(0.5130)	(0.5050)
$MPS \times TopFBM$	0.1363*	0.1586	0.2893**	0.2921**
	(0.0761)	(0.1000)	(0.1423)	(0.1423)
$MPS \times TopDebt$	0.0122	0.0475	0.1268	0.1145
	(0.0894)	(0.1127)	(0.1348)	(0.1295)
Observations	1,235	1,235	1,235	1,220
Country $\times$ Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.1838	0.0831	0.1211	0.1213

This table reports the estimated coefficients of MPS, $MPS\times$ TopFBM, and $MPS\times$ TopDebt on the changes in the log of CDS, where d is the day of the FOMC. The main independent variable is the monetary policy shock from Bauer and Swanson (2023) interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. $TopDebt_{c,t}$ is an indicator variable that equals one if a country is in the top tercile of the distribution of Debt/GDP (sorted by quarter). We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with MPS. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.4. FIR and Rollover Risk: Cyclicality

	Exchange Rate	**Credit Default Swaps**
FIR	-0.0285**	-0.0353
	(0.0123)	(0.0283)
FIR $\times$ $TopFBM$	-0.0074**	-0.0402***
	(0.0033)	(0.0123)
$TopFBM \times$ GDP Growth	0.0307	0.0580
	(0.0400)	(0.1539)
Observations	673	639
Country FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
R-squared	0.5503	0.5634

This table reports the estimated coefficients of FIR and FIR$\times$ TopFBM on the changes in the log of the exchange rate and the log of CDS. Observations are at the country-quarter level. The main independent variable is the measure of standardized flows implied by the rebalancings accumulated to the quarterly-level interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with FIR. We also control for cyclicality, measured by the interaction of TopFBM with GDP growth. Robust standard errors clustered at the country level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.5. BDI and Rollover Risk: Cyclicality

	Credit Default Swaps	**Credit Default Swaps**
$\Delta \log BDI$	-0.0068	
	(0.0279)	
$\Delta \log BDI \times$ TopFBM	0.0288***	0.0358***
	(0.0071)	(0.0073)
$TopFBM \times$ GDP Growth	0.0511	0.0844
	(0.0857)	(0.0873)
Observations	879	879
Country FE	Yes	Yes
Time FE	No	Yes
Controls	Yes	Yes
R-squared	0.1762	0.2938

This table reports the estimated coefficients of $\Delta \log BDI$ and $\Delta \log BDI \times$ TopFBM on the changes in the log of CDS. Observations are at the country-month level. The main independent variable is the broad dollar index (BDI), which is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with $\log \Delta BDI$. We also control for cyclicality, measured by the interaction of TopFBM with GDP growth. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.6. MPS and Rollover Risk: Cyclicality

	Credit Default Swaps			
	[d]	[d+1]	[d+2]	[d+3]
MPS	0.0981	-0.0035	0.2555	0.2758
	(0.3078)	(0.3775)	(0.4746)	(0.4686)
$MPS \times TopFBM$	0.1382*	0.1634	0.3058**	0.3048**
	(0.0743)	(0.1004)	(0.1475)	(0.1483)
$TopFBM \times$ GDP Growth	0.0039	0.0137	0.0004	0.0171
	(0.0323)	(0.0394)	(0.0503)	(0.0481)
Observations	1,237	1,237	1,237	1,222
Country $\times$ Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.1838	0.0831	0.1209	0.1213

This table reports the estimated coefficients of MPS and $MPS\times$ TopFBM on the changes in the log of CDS, where d is the day of the FOMC. The main independent variable is the monetary policy shock from Bauer and Swanson (2023) interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with MPS. We also control for cyclicality, measured by the interaction of TopFBM with GDP growth. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.7. FIR and Rollover Risk: Persistence

	Exchange Rate	Credit Default Swaps
FIR	-0.0248**	-0.0317
	(0.0101)	(0.0293)
FIR $\times$ $TopFBM$	-0.0059**	-0.0391***
	(0.0027)	(0.0119)
Lag of FIR	-0.0062*	-0.0068
	(0.0032)	(0.0064)
Observations	673	639
Country FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
R-squared	0.5583	0.5643

This table reports the estimated coefficients of FIR and FIR$\times$ TopFBM on the changes in the log of the exchange rate and the log of CDS. Observations are at the country-quarter level. The main independent variable is the measure of standardized flows implied by the rebalancings accumulated to the quarterly-level interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with FIR. We also add one lag of FIR to control for persistence. Robust standard errors clustered at the country level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.8. FIR and Rollover Risk: Excluding countries at 10% threshold

	Exchange Rate	Credit Default Swaps
FIR	-0.0318**	-0.0348
	(0.0122)	(0.0330)
FIR $\times$ $TopFBM$	-0.0066*	-0.0346***
	(0.0034)	(0.0113)
Observations	525	491
Country FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
R-squared	0.5792	0.5299

This table reports the estimated coefficients of FIR and FIR$\times$ TopFBM on the changes in the log of the exchange rate and the log of CDS. Observations are at the country-quarter level. The main independent variable is the measure of standardized flows implied by the rebalancings accumulated to the quarterly-level interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with FIR. We exclude countries at the 10% threshold when constructing the FIR measure. Robust standard errors clustered at the country level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.9. Capital Flows and Rollover Risk: FIR Shocks

	Exchange Rate	Credit Default Swaps
FIR	-0.0419**	-0.0398
	(0.0196)	(0.0347)
FIR $\times$ $TopFBM_DD2$	-0.0090**	-0.0331**
	(0.0042)	(0.0150)
Observations	626	598
Country FE	Yes	Yes
Time FE	Yes	Yes
Controls	Yes	Yes
R-squared	0.5591	0.5610

This table reports the estimated coefficients of FIR and FIR$\times$ TopFBM_DD2 on the changes in the log of the exchange rate, and the log of CDS. Observations are at the country-quarter level. The main independent variable is the measure of standardized flows implied by the rebalancings accumulated to the quarterly-level interacted with $TopFBM_DD2$. $TopFBM_DD2$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM_DD2, sorted by year. $FBM_DD2_{c,t} = \frac{DD2_{c,t}}{\text{GDP}_{c,t}}$, where DD2 is the amount of debt due in two years. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with FIR. Robust standard errors clustered at the country level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.10. Capital Flows and Rollover Risk: BDI Shocks

	Credit Default Swaps	Credit Default Swaps
$\Delta \log BDI$	-0.0134	
	(0.0285)	
$\Delta \log BDI \times TopFBM_DD2$	0.0172*	0.0215**
	(0.0087)	(0.0082)
Observations	799	799
Country FE	Yes	Yes
Time FE	No	Yes
Controls	Yes	Yes
R-squared	0.1685	0.2841

This table reports the estimated coefficients of $\Delta \log BDI$ and $\Delta \log BDI \times TopFBM_DD2$ on the changes in the log of CDS. Observations are at the country-month level. The main independent variable is the broad dollar index (BDI), which is a weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners interacted with $TopFBM_DD2$. $TopFBM_DD2$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM_DD2, sorted by year. $FBM_DD2_{c,t} = \frac{DD2_{c,t}}{\text{GDP}_{c,t}}$, where DD2 is the amount of debt due in two years. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with $\log \Delta BDI$. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.11. Capital Flows and Rollover Risk: Monetary Policy Shocks

	Credit Default Swaps			
	[d]	[d+1]	[d+2]	[d+3]
MPS	0.0588	-0.0984	0.0969	0.1130
	(0.3070)	(0.3790)	(0.4587)	(0.4531)
$MPS \times TopFBM_DD2$	0.0999	0.1213	0.2115	0.2120
	(0.0675)	(0.0963)	(0.1324)	(0.1326)
Observations	1,141	1,141	1,141	1,126
Country $\times$ Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.1957	0.1047	0.1590	0.1599

This table reports the estimated coefficients of MPS and $MPS \times TopFBM_DD2$ on the changes in the log of CDS, where d is the day of the FOMC. The main independent variable is the monetary policy shock from Bauer and Swanson (2023) interacted with $TopFBM_DD2$. $TopFBM_DD2$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM_DD2, sorted by year. $FBM_DD2_{c,t} = \frac{DD2_{c,t}}{GDP_{c,t}}$, where DD2 is the amount of debt due in two years. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with MPS. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.

Appendix Table J.12. VIX and Rollover Risk

	Exchange Rate	Exchange Rate	Credit Default Swaps	Credit Default Swaps
VIX	0.0645***		0.0683***	
	(0.0101)		(0.0243)	
VIX $\times$ TopFBM		0.0248*		0.0740**
		(0.0137)		(0.0333)
Observations	673	673	639	639
Country FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes
R-squared	0.99	0.99	0.82	0.88

This table reports the estimated coefficients of VIX and $VIX \times TopFBM$ on the log of exchange rates and CDS spreads. Observations are at the country-quarter level. The main independent variable is the VIX interacted with $TopFBM$. $TopFBM$ is an indicator variable that equals one if the country is in the top tercile of Lagged FBM, sorted by year. We control for average LC bond maturity, total debt over GDP, GDP growth, interest rates, and the interaction of these variables with VIX. Robust standard errors clustered at the time level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$.