Monetary Policy and the Short-Rate Disconnect in Emerging Economies*

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Abstract

We find that central banks in emerging markets with floating exchange rates follow the Taylor-rule, lowering policy rates during economic slowdowns, indicating a counter-cyclical monetary policy stance. However, unlike in advanced economies, short-term market rates in many of these emerging markets do not always move in sync with policy rates; when policy rates are pro-cyclical, market rates often turn counter-cyclical. This short-rate disconnect can be explained by fluctuations in the external funding conditions of domestic financial intermediaries. Emerging markets with banks holding significant external liabilities, and thus facing higher external finance premiums, experience impaired monetary policy effectiveness, leading to an incomplete pass-through of policy rate changes into market rates.

JEL classification: E43; E50; E52; F30.

Keywords: Monetary Policy Transmission, Financial Intermediation, U.S. Monetary Policy Shocks.

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1 Introduction

We show that central banks in emerging economies, on average, adopt a counter-cyclical approach to monetary policy, lowering policy rates during economic slowdowns and raising them during periods of economic expansion. However, the effectiveness of this policy is often compromised. Specifically, the impact of policy rate changes on short-term market rates—the primary conduit for monetary policy—is frequently impeded by fluctuations in international funding costs faced by domestic financial intermediaries. This misalignment can significantly hinder the intended effects of monetary policy on the economy.

Our sample is comprised of countries that *do not fix their exchange rates*, based on the country-quarter classification of Ilzetzki et al. (2019) covering the period 1990:Q1 to 2018:Q4.[1] Henceforth, when we refer to emerging markets we are referring to the subset whose exchange rates are not fixed.

We begin by studying the typical behavior of emerging economies' policy rates vis-à-vis local inflation and economic activity since 1990s by estimating policy rules à la Taylor (1993, 1999). We find that central banks adjust the policy rate pro-cyclically: raising rates with higher inflation and higher real GDP growth or more positive output gaps. This is similar to their counterparts in advanced economies.

We then examine the correlation of domestic interest rates with domestic economic activity, as measured by real GDP growth. While policy rates are lowered when local economic activity decelerates, we document that short-term market rates, namely 3-month treasury rates, tend to increase during economic recessions in many emerging economies. This stands in contrast to advanced economies where policy rates and short-term market rates decrease in tandem when economic activity slows down. Thus while policy rates in emerging and advanced economies have displayed a pro-cyclical behavior over the past three decades, in emerging economies it does not translate to market rates which instead display counter-cyclical behavior. We refer to this phenomenon as the *short-rate disconnect*.

In addition to correlations, we examine the response to a well identified shock: a U.S.

[1] Note that the majority of emerging economies are managed floats. Following the country-quarter classification of Ilzetzki et al. (2019), we drop fixed exchange rate countries (category 1) and use country-quarter observations with categories 2 to 5. Category 1 is a hard peg; category 2 is crawling peg or a crawling band narrower than or equal to +/- 2%; category 3 is a crawling band that is wider than +/-2% and other managed floats; category 4 is freely floating, and 5 is freely falling. We drop the freely falling category in the robustness analysis.

monetary policy tightening, identified using the high-frequency identification approach of Gertler and Karadi (2015). We document that the disconnect between policy and market rates also emerges following such a shock. While policy rates decline in emerging markets on average as economic activity slows, market rates tend to increase.

Following a US monetary policy tightening which causes a tightening of global financial conditions (Miranda-Agrippino and Rey, 2020; Kalemli-Ozcan, 2019) some emerging market central banks face a trade off between lowering rates to lean against a recession and raising rates to prevent disruptive currency depreciations. Our analysis of emerging markets with managed floats and flexible exchange rates reveals that, on average, these economies *lower* policy rates in response to tightening U.S. monetary policy and therefore maintain countercyclical policy. This of course does not rule out the presence of "fear of floating," only that this fear does not prevent countercyclical monetary policies, on average, for emerging markets. The data in addition reveals that despite these policy rate cuts market interest rates rise.

This disconnect between policy and market rates was also notably evident during the Taper Tantrum episode in 2013, an episode triggered by news of a potentially earlier start to US monetary policy tightening. As detailed later, most emerging markets reduced their policy rates during this episode even as a few increased them. Market rates, on the other hand, rose across the board, illustrating the broader disconnect observed in emerging markets during this period.

While on average emerging markets display the short-rate disconnect there is heterogeneity across our sample. We next document that this heterogenity can at least partly be explained by the extent of a country's reliance on external capital flows. Such reliance exposes the country to fluctuations in external funding costs that arise either through exogenous changes in global funding conditions and/or to endogenous changes in external premia in response to changes in domestic conditions, such as increased credit or recession risk.

In particular, we show that the short-rate disconnect wedge is markedly counter-cyclical in emerging economies whose domestic financial intermediary sector has a large external exposure, as measured by intermediaries' external liabilities. Such an exposure comes with a large and volatile external financing premia for these economies, as measured by the EMBI spread, the premium on emerging market governments borrowing in dollars.[2] On the other

[2] While the EMBI (emerging market bond index) spread is the premium on emerging market governments dollar borrowing, CEMBI (corporate emerging market bond index) is the firm/bank counterpart. Given limited availability of CEMBI for our countries, we use EMBI as the two move very closely in the common

hand, countries with low levels of external exposure or external premia, do not exhibit a significant short-rate disconnect. Empirically, a 10 p.p. increase in the EMBI spread is associated with a 1.5-2 p.p. higher short-rate disconnect wedge, while a 10 p.p. larger share of external liabilities is associated with a 1-1.5 p.p. higher wedge.

Lastly, we present a simple model that can qualitatively match these findings. The model places at its center domestic banks that transmit fluctuations in external financial conditions to domestic markets. The domestic banks rely both on domestic deposits and on international markets for dollar funding (in line with the evidence in Baskaya et al., 2017, and Hahm et al., 2013). Fluctuations in dollar funding conditions and banks exposure to external funding directly impact the marginal funding costs of domestic banks, and, consequently, influence the equilibrium local market rates. In the model, large external exposure and financing premia limit the influence of domestic monetary policy on short-term rates, thus generating a disconnect between policy and market rates. Relatedly, the model rationalizes the comovements between external conditions and the wedge: when external funding costs rise or the banks' exposure to these costs rises via their external borrowing the short-rate disconnect increases.

A few clarifications of our findings may be helpful: First, while we find that emerging markets in our sample implement counter-cyclical monetary policies, on average, not all do and not all the time. Second, the existence of the short-rate disconnect does not necessarily imply that monetary policy transmission, as measured by the impact of an exogenous change in monetary policy on short-rates, is impaired. In the data policy rate changes are overwhelmingly a response to developments in the economy. Our findings are consistent with changes in external funding costs (arising exogenously or endogenously) playing a sizeable role in the business cycles of emerging markets with large external exposures. While policy rates move pro-cyclically it is not enough to overturn the impact of these external funding changes on market rates.

Relation to Literature. Our paper builds on previous studies that have examined the transmission of the global financial cycle through local banks' funding conditions (di Giovanni et al., 2022; Fendoglu et al., 2019) and changes in global risk perceptions (Miranda-Agrippino and Rey, 2020; Kalemli-Ozcan, 2019; Chari et al., 2021). We are related to the literature that examines the challenges to monetary policy effectiveness in emerging economies. We draw

sample.

upon the work of Rey (2013) and Miranda-Agrippino and Rey (2020), who document that changes in global risk aversion and U.S. monetary policy significantly affect global leverage and capital flows, in both floaters and peggers, and argue that the global financial cycle may limit the monetary autonomy of countries even with floating exchange rate regimes. Kalemli-Ozcan (2019) further shows monetary policy can be more effective in floaters who have lower risk premia. Relative to these earlier papers, our research undertakes a systematic evaluation of monetary policy cyclicality in floating rate emerging markets and demonstrates the link between impairment in the transmission of counter-cyclical monetary policy and fluctuating external funding conditions that pass through the domestic banking sector.[3,4]

The literature on monetary and fiscal policies in emerging markets was initiated by the seminal work of Kaminsky et al. (2005). In a sample that covers 1960–2003, Kaminsky et al. find strong evidence in favor of pro-cyclical fiscal policy (see also Gavin and Perotti, 1997), and some evidence in support of the notion of pro-cyclical monetary policy. More recently, in a sample that covers 1960–2009, Vegh and Vuletin (2013) find a positive correlation between the cyclical components of policy rates and real GDP in emerging economies especially in the more recent part of the sample, after 2000. Our contribution is to show that even though emerging markets' central banks' monetary policy has displayed a counter-cyclical stance, short-term market rates are pro-cyclical in many emerging economies. We thus emphasize that using short-term market rates to proxy for the stance of monetary policy may lead one to draw inaccurate conclusions about the cyclical properties of the monetary policy in emerging economies, before or after 2000s, even though this practice is innocuous for advanced economies.

Our paper also contributes to the existing literature on emerging economies' business cycles and the dynamics of real interest rates, as in Neumeyer and Perri (2005), Aguiar and Gopinath (2007), García-Cicco et al. (2010), Fernández and Gulan (2015), Fernández-Villaverde et al. (2011), Coulibaly (2023), Arellano et al. (2020), and Morelli et al. (2022). Our paper focuses on a mechanism where local banks' reliance on international markets for funding exposes

[3] A related strand of the literature studies the cross-country co-movement of market interest rates, where floaters' market rates move less than one-to-one with U.S. market rates. A list of papers include Shambaugh (2004); Bluedorn and Bowdler (2010); Miniane and Rogers (2007); Klein and Shambaugh (2015); Obstfeld (2015); Han and Wei (2018).

[4] We note that our definition of short-rate disconnect is different from Lenel et al.'s (2019) notion of "short-rate disconnect," that is the spread between a "shadow" short rate – measured as the short end of a yield-curve model estimated with only medium and long maturity Treasury rates – and the three month T-bill rate.

local short-term funding conditions to global financial fluctuations, with implications for emerging markets' business cycles.

The rest of the paper proceeds as follows. Section 2 studies the behavior of monetary policy rates in emerging economies. Section 3 documents that counter-cyclical monetary policy does not generate counter-cyclical short-term market rates which instead exhibit pro-cyclicality, in contrast to advanced economies. Section 4 establishes an empirical link between the short-term disconnect wedge, the external finance premium, and banks' external exposure. Section 5 develops a partial-equilibrium model that highlights the link between the short-term disconnect wedge and banks' external funding conditions. Section 6 concludes.

2 What Do Central Banks in Emerging Economies Do?

In this section we document the behavior of monetary policy by examining policy rates around episodes of global distress, by estimating reaction functions *ala* Taylor (1993, 1999), and by estimating the cyclicality of policy rates. To characterize the monetary policy stance we use publicly announced policy rates.

Dataset Our sample focuses on countries and time periods that are not part of a fixed exchange rate regime. For the classification of exchange rate regimes we rely on the historical exchange rate classification in Ilzetzki et al. (2019), which is a country-quarter level time varying classification.[5] We use available quarterly data from 1990:Q1 to 2018:Q4, an unbalanced sample. Appendix A lists the countries included in the dataset.

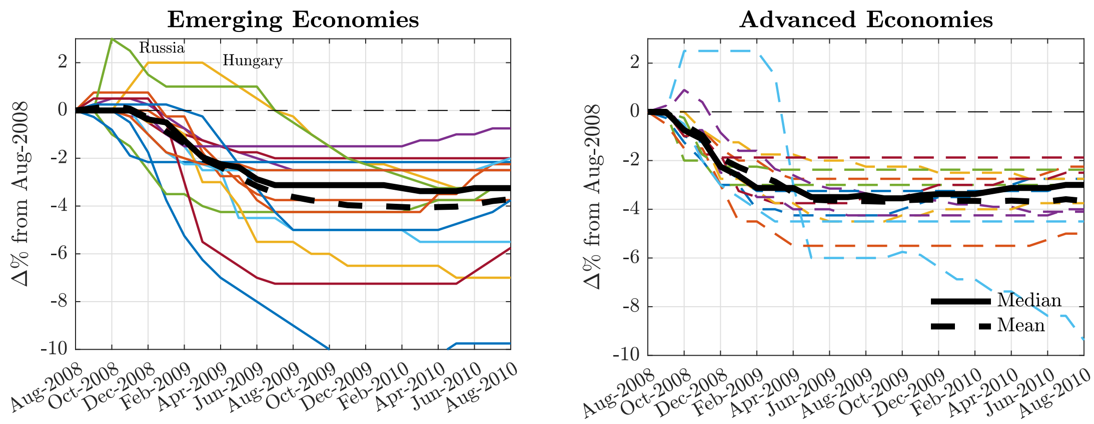
We collect all available data on policy rates ($i^P_{c,t}$), defined as: "Policy rates are the target interest rate set by central banks in their efforts to influence short-term interest rates as part of their monetary policy strategy." For policy interest rates, our preferred data source is the *Bank of International Settlements (BIS)*. If *BIS* data are not available we use data from the *IMF International Financial Statistics* or from national sources retrieved from *Bloomberg*. The choices of the sources are of no material difference. In fact, when all sources are available the correlation between *BIS* rates and data from alternative sources is always above 0.96.

We also collect all available data on short-term market rates ($i^M_{c,t}$), specifically treasury rates. The maturity of short-term interest rates in our sample is 3 months. The sources of

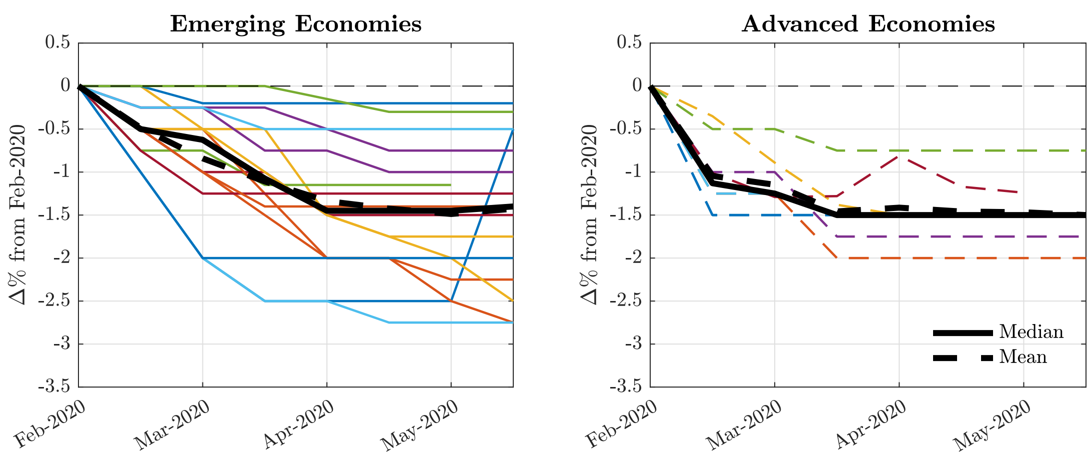
[5] A country is considered to have a flexible exchange rate regime if, in a given quarter, its exchange rate was within a moving band that is narrower than or equal to +/-2 percent or was classified as managed floating, freely floating or freely falling in Ilzetzki et al. (2019).

treasury rates are *IMF International Financial Statistics* or national sources retrieved from *Bloomberg*. See Appendix Tables A.2 and A.3 for more details about the data.

Figure 1: Monetary Policy Rates around Episodes of Global Financial Distress



(a) Policy Rates during Global Financial Crisis



(b) Policy Rates during COVID-19

Notes: The figure report the p.p. change in policy rates in both emerging and advanced economies during the 2008-2009 Global Financial Crisis (Panel (a)) and during COVID-19 (Panel (b)).

Policy Rates around Episodes of Global Distress It is useful to examine the behavior of policy rates during two noteworthy episodes, the Great Financial Crisis and COVID-19. It is evident from Figure 1 that both advanced (AEs) and emerging economies (EMEs) lowered their policy rates during these two downturns.[6] This went along with depreciations

[6] Focusing largely on the sudden stops occurred around the global financial crisis, Eichengreen and Gupta (2018) find that monetary policy was eased in response to these sudden stops more often than it is tightened

in emerging economies currencies. Accordingly, despite concerns that weaker currencies can spur inflation[7] or generate disruptive financial conditions (arising from currency mismatches on balance sheets), emerging markets cut policy rates.

Table 1: Estimated Central Banks' Reaction Function

	Emerging Economies	Advanced Economies
i^P_{t-1}	0.826***	0.917***
	(0.0079)	(0.0095)
π_t	0.420***	0.282***
	(0.034)	(0.032)
output gap$_t$	0.0597***	0.0996***
	(0.020)	(0.013)
R-Squared	0.91	0.96
No. of Countries	38	11

Notes: The table reports panel estimates of equation (1) by OLS. Data are at a quarterly frequency. To construct quarterly output gap we apply spline interpolation to annual output gap data. We include countries with at least 20 quarters of observations. These regressions feature country fixed effects. The sample period is 1990:q1–2018:q4. Standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

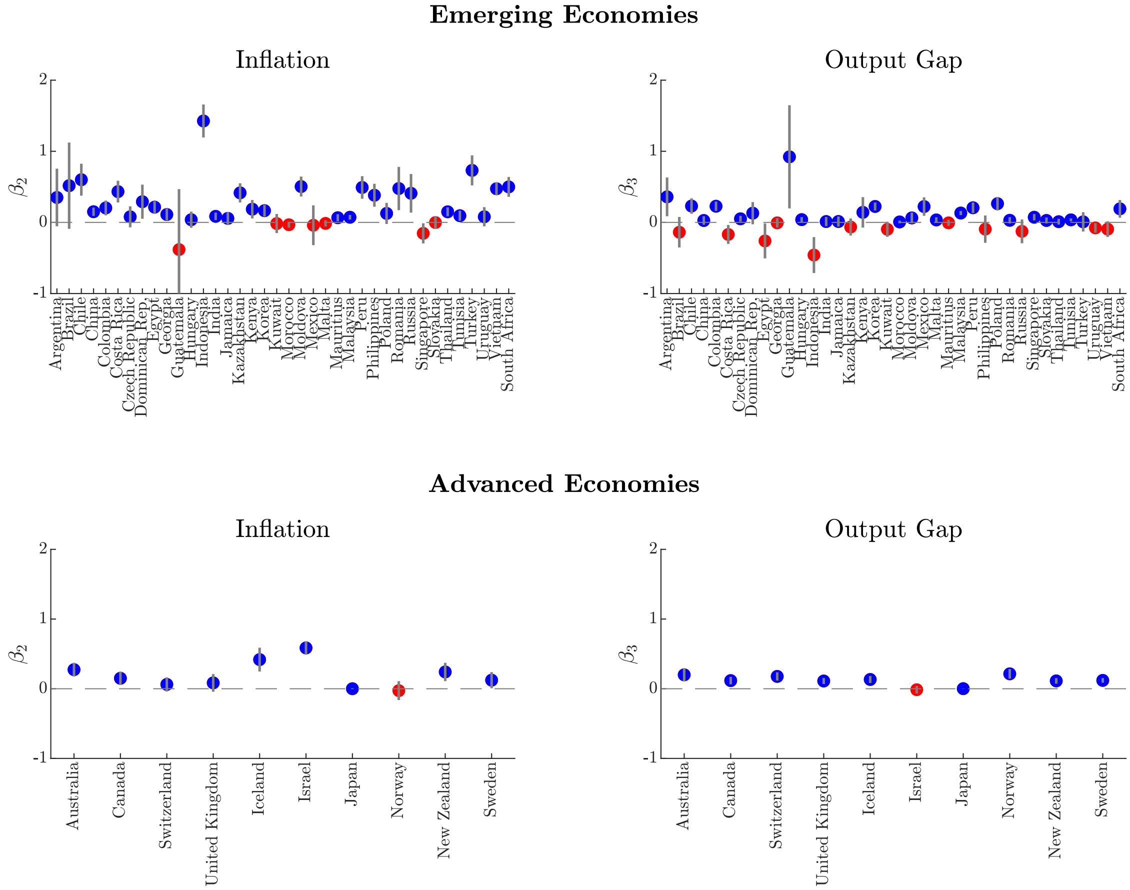
Estimation of Central Banks' Reaction Function To summarize a central bank's reaction function macroeconomists frequently use interest rate rules such as the ones put forward by Taylor (1993, 1999). A standard version of a Taylor-type rule is: $i^P_{c,t} = \rho i^P_{c,t-1} + (1-\rho)\left(\phi_\pi \pi_{c,t} + \phi_y \tilde{y}_{c,t}\right) + \varepsilon^P_{c,t}$. According to this rule the central bank adjusts the policy rate in response to changes in inflation (with coefficient ϕ_π) and economic conditions (with coefficient ϕ_y). The rule allows for policy smoothing by including a first-order autoregressive term, and for i.i.d. monetary policy shocks, $\varepsilon^P_{c,t}$.

We follow Carvalho et al. (2021) in using ordinary least squares (OLS) to estimate the

(only 8 out of 43 EMs tightened). They rely on IMF reports and market commentary to code changes in monetary policies, following the narrative approach of Romer and Romer (1989) and Alesina et al. (2018).

[7] Several studies document a high exchange rate pass-through into import prices in EMEs (see, for example, Burstein and Gopinath, 2014).

Figure 2: Estimated Central Banks' Reaction Function (Country-specific Estimates)



Notes: The figure reports the country-level estimates of equation (1) by OLS. Data are at a quarterly frequency. To construct quarterly output gap we apply spline interpolation to annual output gap data. We include countries at least 20 quarters of observations. Vertical bands denote 90% confidence intervals.

parameters of the Taylor rule.[8]

$$i^P_{c,t} = \alpha_c + \beta_1 i^P_{c,t-1} + \beta_2 \pi_{c,t} + \beta_3 \tilde{y}_{c,t} + \epsilon_{c,t} \tag{1}$$

In (1) $i^P_{c,t}$ is the country's policy rate, $\pi_{c,t}$ is the inflation rate measured by the change in the consumer price index (CPI), $\tilde{y}_{c,t}$ reflects economic conditions measured using the country's output gap as estimated in IMF (2020, Chapter 3), and α_c is a country fixed effect.

We report the panel estimates of the central banks' reaction function in Table 1 for both

[8] Carvalho et al. (2021) argue that OLS outperforms instrumental variables (IV) in small samples if the structural monetary policy innovations explains only a small fraction of the variance of regressors in the Taylor rule regression. We find it plausible that the systematic component of monetary policy dominates the variation in policy rates, and thus structural monetary policy innovations are quantitatively unimportant in both in advanced and emerging economies.

advanced and emerging economies. We find that the estimates of Taylor rule coefficients are generally similar across the panel of emerging and advanced economies, both qualitatively and quantitatively. In both sets of economies, the central bank raises its policy rate in response to higher inflation and output gap. For emerging economies, the panel estimates of β_1, β_2 and β_3 in eq. (1) implies point estimates for ϕ_π and ϕ_y are around 2.4 and 0.34, respectively.[9] These estimates are both statistically and economically significant and, again, similar to the corresponding estimates for advanced economies. In line with the literature, we observe a significant amount of policy rate smoothing by central banks in both sets of economies.

We verify that these results are not driven by the high-inflation countries or crisis periods. To do so, we exclude countries that have experienced inflation rates above 40 percent over a 12-month period and periods during the 6 months immediately following a currency crisis and accompanied by a regime switch (Appendix Table B.1). We also obtain similar estimates when using real GDP growth as a proxy for economic slack, instead of the output gap (Appendix Table B.2).

It can be argued that reaction functions of emerging market central banks include the exchange rate as an independent variable in addition to inflation and output gaps, especially when there is fear of floating (Calvo and Reinhart, 2002). In this respect, we confirm the robustness of our results to incorporating the rate of nominal exchange rate depreciation into the central bank's reaction function (Appendix Table B.3). While there might be resistance to let the exchange rate fluctuate our evidence on the cyclical behavior of policy rates and later finding on the policy reaction to US monetary policy tightening suggests that it is likely not the dominant force driving monetary policy decisions.[10]

Lastly, Figure 2 reports the country-level estimates of equation (1). In emerging economies, approximately 80% (60%) show a positive (and statistically significant) coefficient for inflation, while about 70% (40%) exhibit a positive (and statistically significant) coefficient for the output gap. These results align with the panel estimates presented in the Table 1, with few exceptions.

The Cyclical Behavior of Policy Rates We now turn to examining the cyclical behavior of policy rates, a commonly used metric to assess whether monetary policy acts pro- or

[9] One obtains these numbers by mapping the estimates of equation (1) to the reaction function: $i^P_{c,t} = \rho i^P_{c,t-1} + (1-\rho)\left(\phi_\pi \pi_{c,t} + \phi_y \tilde{y}_{c,t}\right) + \varepsilon^P_{c,t}$.

[10] The coefficient on the exchange rate in Appendix Table B.3 loses significance in the small subsample of countries with a freely floating exchange rate regime (category 4 in Ilzetzki et al., 2019).

counter-cyclically (see, *e.g.*, Kaminsky et al., 2005, and Vegh and Vuletin, 2013).

To this end, we study the relationship between current GDP growth and policy rates both contemporaneously and at short-term horizons (since policy rates tend to respond gradually to observed changes in GDP, see *e.g.*, Table 1). In particular, we adopt a reduced-form local projection approach: we regress policy rates at horizons within 2 years on current real GDP growth, controlling for lag of the dependent variable:

$$i^P_{c,t+h} = \alpha^P_{c,h} + \beta^P_h \Delta \text{GDP}_{c,t} + \gamma^P_h i^P_{c,t-1} + \epsilon^P_{c,t+h}; \tag{2}$$

for $h = 0, \ldots, 8$ quarters.

The coefficients of interest are the β^P_h's in equation (2) which capture the relationship between current real GDP growth and the policy rate, both contemporaneously and in the near future.

Figure 3 (Panel (a)) depicts the estimated β^P_h's in regression equation (2) (blue line) for both emerging and advanced economies. In both advanced and emerging economies, we observe that high real GDP growth predicts a significant increase in policy rates within two years. These results are consistent with the estimates of the Taylor rule coefficients (Table 1), and indicate that the monetary policy stance is generally counter-cyclical in emerging economies. We also observe that the correlation between policy rates and GDP growth is lower in emerging when compared to advanced economies. This difference may arise from the relative prevalence of supply shocks in emerging economies (as argued, *e.g.*, in Frankel, 2010) that induce a negative co-movement between output (gap) and inflation resulting in a lower correlation between GDP growth and policy rates.

3 Short-Term Market Rates in Emerging Economies

Policy rates are the target interest rate set by central banks in their efforts to influence short-term interest rates as part of their monetary policy strategy. We thus explore whether the monetary policy stance implied by policy rates is reflected in the dynamics of short-term market rates. In doing so, we note that we have moved away from the practice of using short-term market rates to proxy for the stance of monetary policy.

Treasury rates are rates at which governments issue their debt instruments. While closely related, these market rates are not directly comparable, and they measure the stance of monetary policy only imperfectly. Below, we show that distinguishing between policy rates and market rates is of first-order importance in emerging economies.

The Cyclical Behavior of Short-Term Market Rates We now examine the cyclical behavior of short-term rates. As in equation (2) above, we study the dynamic relationship between real GDP growth and market rates using reduced form local-projections:

$$i^M_{c,t+h} = \alpha^M_{c,h} + \beta^M_h \Delta\text{GDP}_{c,t} + \gamma^M_h i^M_{c,t-1} + \epsilon^M_{c,t+h}; \tag{3}$$

for $h = 0, \ldots, 8$ quarters.

In regression equation (3), $i^M_{c,t}$ denotes the country's short-term market rate and $\Delta\text{GDP}_{c,t}$ is the country's real GDP growth. Figure 3 (Panel (a)) depicts the estimated β^M_c's in regression equation (3) for both emerging and advanced economies (red lines). Although in emerging economies high real GDP growth predicts a significant increase in policy rates, high real GDP growth also predicts a significant decline in 3-month treasury rates within two years. To the contrary, in advanced economies policy and market rates exhibit a very similar relationship with real GDP growth, moving very much in tandem over the business cycle.

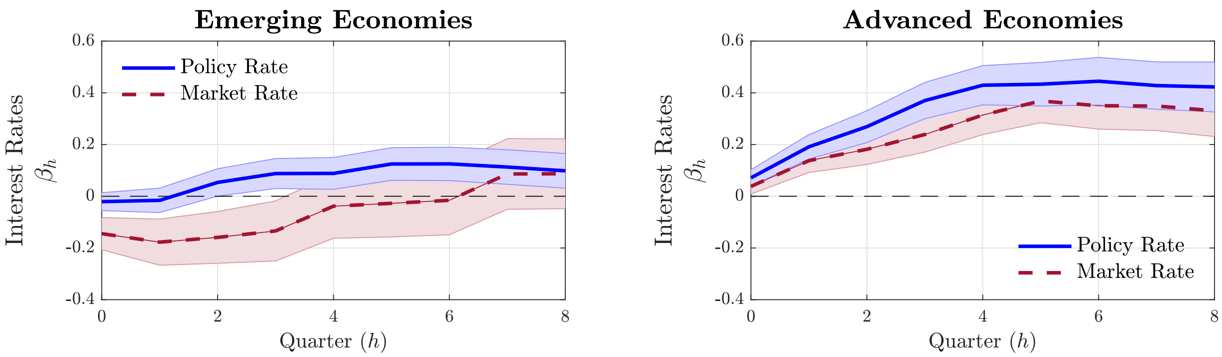
The above evidence reveals that, unlike in advanced economies, there is a disconnect between policy rates and market rates over the business cycle in emerging economies. We define the *short-term disconnect wedge* as the difference between market rates and policy rates, that is $i^M_{c,t} - i^P_{c,t}$, and explore its dynamics *vis-a-vis* real GDP growth in the same local-projection setting as above:

$$i^M_{c,t+h} - i^P_{c,t+h} = \alpha^d_{c,h} + \beta^d_h \Delta GDP_{c,t} + \gamma^d_h \left(i^M_{c,t-1} - i^P_{c,t-1}\right) + \epsilon^d_{c,t+h}; \tag{4}$$

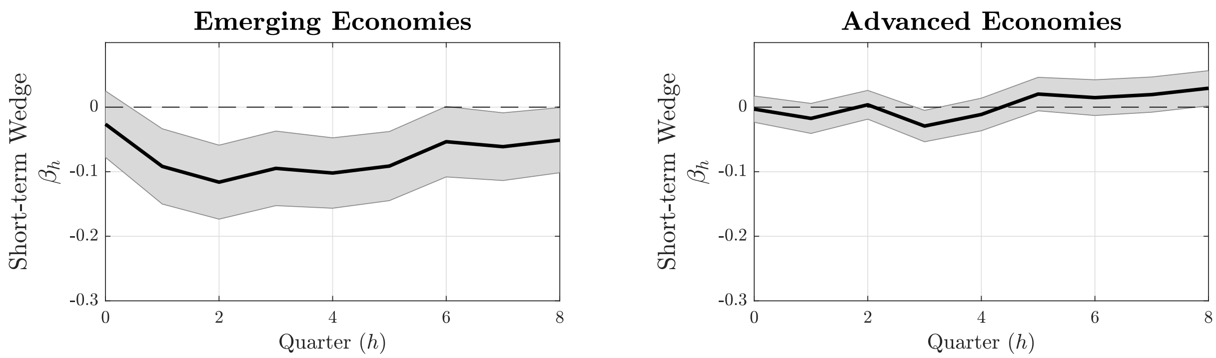
Panel (b) of Figure 3 depicts the estimated β^d_h's in regression equation (4). The results confirm that high GDP growth is associated with a systematic divergence between policy rates and market rates. Because policy rates tend to increase more than market rates during expansions, the short-term disconnect wedge declines in expansions. This is not the case in advanced economies, where the market-policy wedge is virtually uncorrelated with GDP growth.

Taken together, these findings indicate that there is a systematic difference in the cyclical behavior of short-term market rates between emerging and advanced economies. An important

Figure 3: Cyclical Behavior of Interest Rates in Emerging and Advanced Economies



(a) Policy Rates and Market Rates



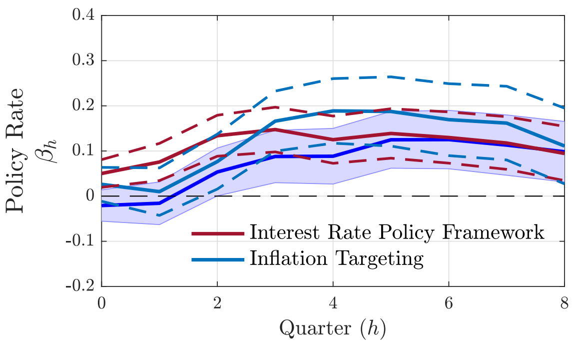
(b) Short-term Wedge

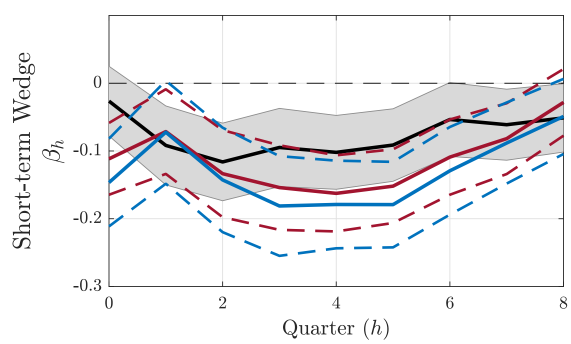
Notes: The figure reports the panel estimates of β_h's in regression equations (2) and (3) (top panels) and regression equation (4) (bottom panels). 90% confidence intervals are shown by the shaded areas. These regressions feature country fixed effects. Data are at a quarterly frequency.

implication of this result is that the common practice of using short-term market rates to proxy for the stance of monetary policy may lead to inaccurate conclusions on monetary policy cyclicality in emerging economies.

In the context of emerging and developing economies, one may be concerned that policy rates are not an appropriate measure of the monetary policy stance. In fact, some of these countries may not use an interest rate as the main monetary policy tool. To address this concern, we reproduce our main results for the subsample of emerging economies that conduct interest-rate-based monetary policy. To determine whether the central bank uses a policy rate as the primary monetary policy instrument for most part of the sample period, we follow Brandão-Marques et al.'s (2021) classification based on the examination of historical reports, such as IMF Article IV staff reports, and monetary policy reports issued by central banks. Notwithstanding the smaller sample size, the results for this subsample of emerging economies, reported in Figure 4 align closely with the baseline results, indicating a strong degree of monetary policy counter-cyclicality and a significant difference in cyclicality between policy rates and short-term market rates. In Figure 4, we also verify that the above documented cyclical properties of policy rates and short-term disconnect wedge also emerge in the subsample of emerging economies that explicitly follow an inflation-targeting monetary policy.

Figure 4: Short-Rate Wedge across Monetary Policy Regimes

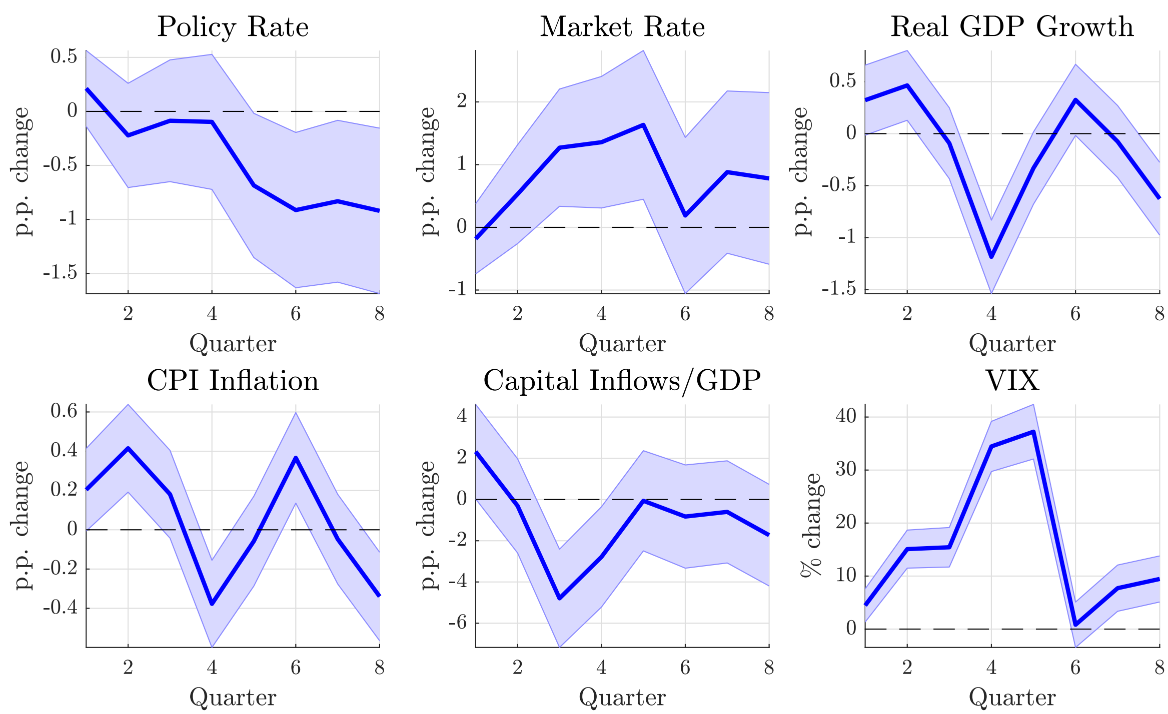




Notes: The figure reports the panel estimates of β_h's in regression equation (2) and regression equation (4). 90% confidence intervals are shown by the shaded areas. These regressions feature country fixed effects. Data are at a quarterly frequency. These figures focus on the subsample of emerging economies that uses a policy rate as the primary monetary policy instrument for most part of the sample period, following Brandão-Marques et al.'s (2021) classification based on the examination of historical reports, such as IMF Article IV staff reports, and monetary policy reports issued by central banks. The countries selected as conducting interest-rate based monetary policy are: Armenia, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Egypt, Guatemala, Hungary, Malaysia, Mexico, Paraguay, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey and Uruguay. Meanwhile, the subset of inflation-targeting countries includes Brazil, Chile, Colombia, Dominican Republic, Guatemala, Hungary, Mexico, Paraguay, Peru, Philippines, Poland, Romania, South Africa, Thailand and Turkey.

Effects of U.S. Monetary Policy Tightening on Emerging Economies While the cyclical behavior of policy rates summarizes the general tendencies of monetary policy in emerging economies, it may conceal different conduct of central banks in response to different shocks. We now study the effects of an identified U.S. monetary policy shock, which is exogenous and external from the viewpoint of the small open economies in the sample. We trace out the effects of the U.S. monetary policy shocks on policy rates as well as short-term market rates and macroeconomic aggregates.

Figure 5: Dynamic Effects of a U.S. Monetary Policy Tightening on Emerging Economies



Notes: Impulse responses are obtained from panel local projections. 90% confidence intervals (calculated using Newey-West standard errors) are shown by the shaded areas. The U.S. policy (12-month U.S. treasury rate) is instrumented by Gertler and Karadi (2015) shock FF4 (estimated from surprises in 3-month Fed Fund Futures). Controls include 4 lags of the dependent variable, U.S. 12-month treasury rate, output growth and inflation differentials. The impulse is an impact 1 percentage point increase in the U.S. policy rate. These regressions feature country fixed effects.

Economic agents in emerging economies pay close attention to the stance of U.S. monetary policy as it affects global demand as well as the cost of international borrowing. To extract the exogenous component in U.S. monetary policy changes we follow the high-frequency identification approach in Gertler and Karadi (2015).[11] In particular, the baseline U.S. policy indicator is the 12-month U.S. treasury rate, and it is instrumented with Gertler and Karadi's (2015) estimated surprises in 3-month Fed Fund Futures (FF4). To trace out the effects of U.S. monetary policy shocks, we use panel local projections with instrumental variables (see

[11] We emphasize the importance of isolating the local policy rate reaction to external U.S. monetary policy shocks, rather than examining the unconditional correlation between local and U.S. policy rates. This correlation could be influenced by the endogenous response of policy rates to numerous, potentially correlated shocks.

Jordà, 2005, and Stock and Watson, 2018). The regression specification is:

$$y_{c,t+h} = \alpha_c + \beta_h \hat{i}_t^{US} + \gamma_h W_{c,t} + \varepsilon_{c,t+h} \quad h = 0, 1, 2, 3 \ldots \tag{5}$$

where, as above, $y_{c,t+h}$ is a vector of macro and financial variables of country c at time $t + h$, and controls ($W_{c,t}$) include four lags of the dependent variable, U.S. 12-month treasury rate, global capital inflows, output growth differentials and inflation differentials. In regression equation (5), $\hat{i}_t^{US}$ denote the instrumented 12-month U.S. treasury rate, obtained from the first stage regression equation: $\hat{i}_t^{US} = \alpha + \delta Z_t + u_t$ where Z_t are Gertler and Karadi's (2015) estimated surprises in 3-month Fed Fund Futures. In Appendix Table B.4, we show that the monetary policy shocks from Gertler and Karadi (2015) pass conventional weak instrument tests.

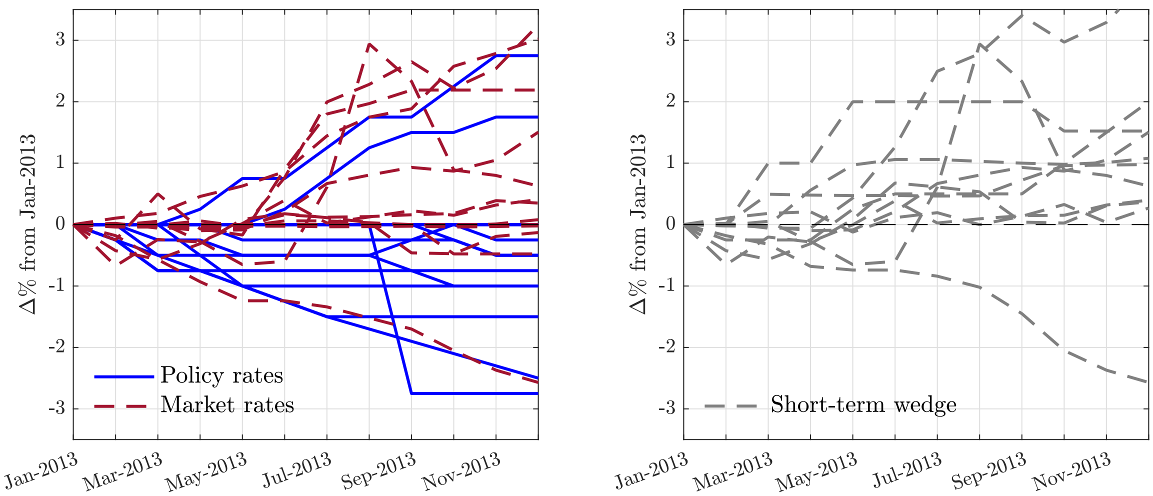
Figure 5 reports the impulse responses to an identified U.S. monetary tightening. We find that an exogenous increase in U.S. interest rates leads to a delayed decline in emerging economies' GDP as well as capital outflows.[12] The response of the VIX (a proxy for global risk aversion and uncertainty) is consistent with that in Miranda-Agrippino and Rey (2020).[13]

Let us elaborate on the response of the policy rate and the short-term interest rates. After an exogenous tightening in U.S. monetary policy, central banks in EMEs cut their policy rates while treasury rates significantly increase. This evidence is consistent with the notion that U.S. monetary policy shocks bring about significant changes in short-term risk premia captured by market rates, as in Kalemli-Ozcan (2019).

We observe that a similar disconnect between policy rates and market rates occurred during the Taper Tantrum of 2013, a period of financial market volatility that occurred when then Federal Reserve Chairman Ben Bernanke suggested it might scale back its quantitative easing (QE) program sooner than expected. As a result of the announcement, investors feared that the reduction in bond purchases would lead to rising U.S. interest rates with significant spillovers in emerging economies (see, *e.g.*, Chari et al., 2021). Figure 6 reports the evolution of policy and market rates in emerging economies starting from January 2013. Notably, while policy rates predominantly decreased throughout 2013, market rates tended to rise during the same period.[14]

[12] Our measure of capital inflows is total debt inflows to GDP from Avdjiev et al. (2022).
[13] See also Dedola et al. (2017) and Degasperi et al. (2023).
[14] Witheridge (2023) shows that lower policy rates following a U.S. monetary policy tightening can result in

Figure 6: Policy Rates and Market Rates of Emerging Economies around Taper Tantrum



Notes: The figure report the p.p. change in policy rates and 3-month treasury rates of emerging economies (left panel) and the short-term wedge (right panel) from January 2013.

To be clear, our findings do not suggest that emerging economies are insulated from the Federal Reserve's actions. On the contrary, the tightening of the Fed's monetary policy affects emerging economies mainly through a contraction in their economies, prompting central banks to lower rates in response. In addition, this evidence does not dispute the importance of balance sheet effects driven by exchange rate depreciation in the presence of U.S. dollar debt (Céspedes et al., 2004). However, our evidence reveals that these forces do not prevent most emerging economies from cutting rates, even if they may do so by less owing to balance sheet frictions or inflationary concerns from weaker currencies.

4 Short-Rate Disconnect and External Factors

We have documented that short-term market rates can disconnect from policy rates in emerging economies, resulting in time-varying short-term wedges. We hypothesize that these fluctuations derive from the reliance of emerging economies on fluctuating external funding conditions. To test this hypothesis, we explore the relationship between short-term wedges and a country's external funding conditions.

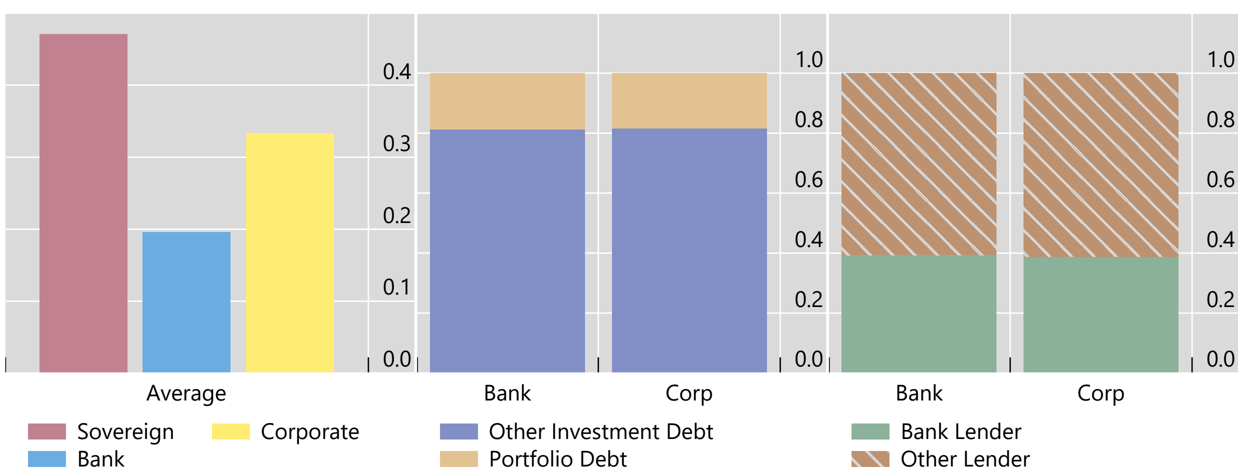
To measure a country's exposure to external funding conditions we use the share of domestic banks' foreign liabilities (portfolio debt + other investment debt) as a fraction of

a model in which the fiscal authority does not adjust taxes sufficiently to stabilize debt, and deficits are financed by a "passive" monetary authority.

total domestic banks' liabilities (domestic + external) from Avdjiev et al. (2022). We focus on the domestic banking sector's reliance on foreign funding because of the extensive evidence on the key role of local financial intermediaries in short-term treasury and interbank markets, as well as their significant dependence on the global funding market.

Two elements contribute to our choice of the external liability share of the domestic banking sector as a relevant measure of external exposure of a country, also represented in the model in Section 5. First, home financial intermediaries are the key players in the short-term home-currency bond market. Using data from Fang et al. (2022) and Hardy and Zhu (2023), we gather that domestic banks held, on average, around 30% of outstanding government bonds in emerging economies in 2022. The second key element is that home banks borrow a fraction of their liabilities from the global funding market in U.S. dollars. Hahm et al. (2013) show that the share of external liabilities of the domestic banking sector is around 35% on average for the emerging economy reporting to the *BIS*.

Figure 7: Facts about the External Debt of Emerging Economies



(a) Share of External Debt **(b)** Shares of Instruments **(c)** Shares of Lenders

Notes: The source of the data for these figures is Avdjiev et al. (2022). See also Fang et al. (2022), Hardy and Zhu (2023), and Arslanalp and Tsuda (2014). The data are stocks in 2022:Q4 for 34 emerging economies.

In Figure 7, we report some evidence on the relevance of the intermediary role of domestic and global banks. Using 34 emerging economies in 2022, panel (a) shows that most of the foreign capital is borrowed by the sovereign of the country, followed by corporates and then banks. Historically, banks and corporates had equal shares, and banks had even higher shares if one includes the 1980s and 1990s (Avdjiev et al., 2022). Here, we plot the latest year available to show that banks are still important intermediaries notwithstanding changing patterns in global liquidity where non-bank lenders acquire an increasingly important role and domestic corporates issue more international bonds as EMs increasingly join corporate bond indices. Panel (b) zooms into the blue (bank) and yellow (corporate) bars in panel (a) and documents that when these borrowers borrow, they mainly borrow using loans (purple) and not bonds (brown). Panel (c) zooms into that brown part of panel (b) and reports the type of lender for the "Portfolio debt" in panel (b). Even though a large part of the portfolio flows come from non-bank lenders (brown-white stripes), as also documented by the literature (*e.g.* Avdjiev et al., 2020), a non-negligible part shown in green in panel (c) comes from global banks. Global banks are also the lenders accounting for the "Other Investment Debt", *i.e.* loans, section in panel (b).

Despite the rise in global non-bank financial intermediation via portfolio investors (such as mutual funds) for emerging markets, global and domestic banks remain the main intermediaries that allocate and intermediate global capital to and within these countries, supporting the main structure of our model in the next section.

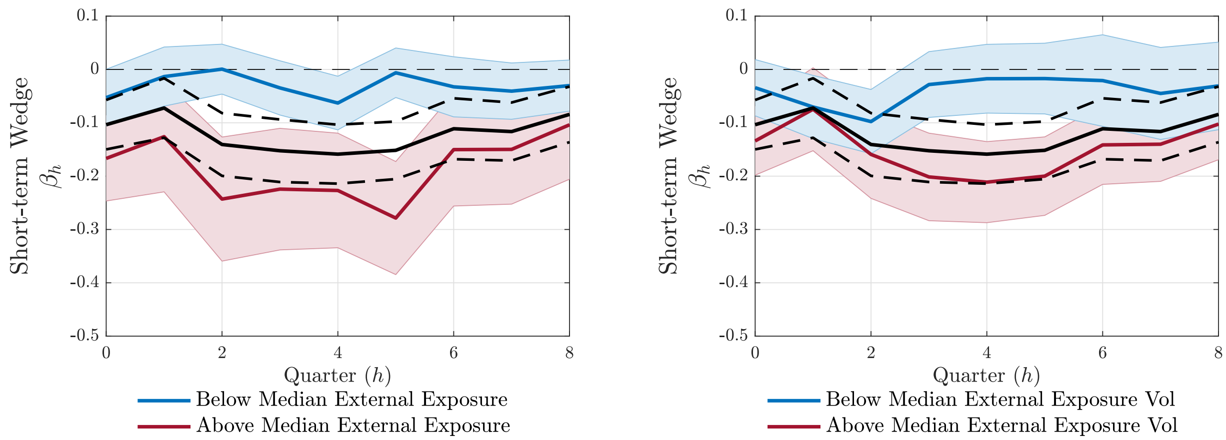
To measure a country's external funding premium, we use the EMBI spread – the premium that a country pays on its dollar-denominated long-term government bonds relative to U.S. long-term government bonds.[15] The EMBI spread is a widely used measure in the emerging market business cycle literature (*e.g.* Uribe and Yue, 2006), and it is available for a large number of emerging economies.

Next, we study whether the occurrence of the short-rate disconnect – the cyclical property of the short-term wedge – varies across countries with different external exposure and external premium. To this end, we separate emerging economies according to the incidence of these external factors, and study the cyclicality of their short-term wedges.

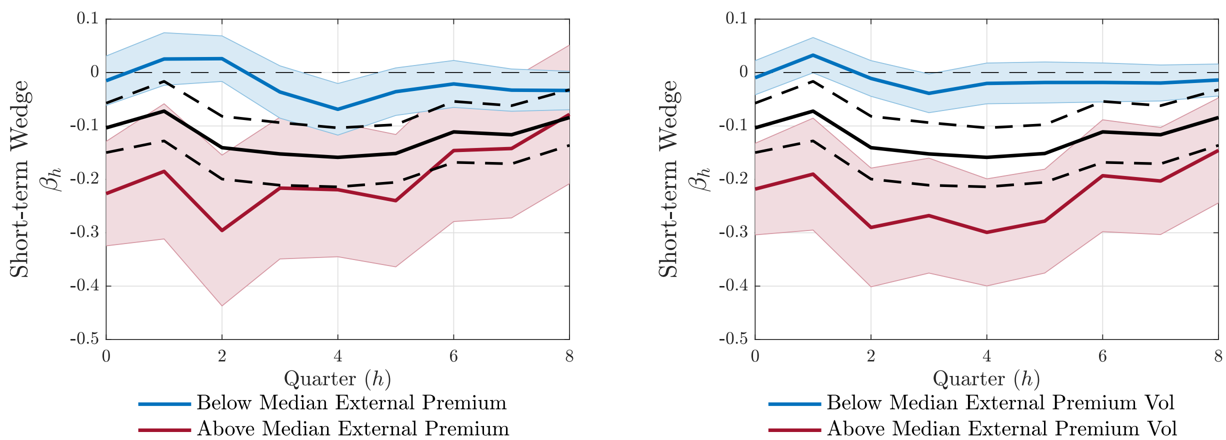
In Panel (a) of Figure 8 we report the cyclical behavior of the short-term wedge for countries with high and low levels (left panel) and volatility (right panel) of external exposure. It is evident that countries with large and volatile external exposure display a marked short-rate disconnect. To the contrary, countries with low and stable external exposure do not, and their short-term wedge does not seem to vary with business cycles, similar to advanced economies

[15] Gopinath et al. (2023) show that the dollar premium for sovereign bonds correlates with U.S. monetary policy shocks and VIX.

Figure 8: The Cyclical Behavior of Short-term Disconnect Wedge and External Conditions



(a) Short-term Wedge and External Exposure



(b) Short-term Wedge and External Premium

Notes: The figure reports the panel estimates of β_d regression equation (4). Panel (a) separates emerging economies according to level or volatility of their external exposure. Panel (b) separates emerging economies according to the level or volatility of their external premium. The black line depicts the estimates for the overall group of emerging economies. 90% confidence intervals are shown by the shaded areas. These regressions feature country fixed effects. Data are at a quarterly frequency.

(see Figure 3). Importantly, we observe a related cross-country difference in Panel (b) of Figure 8. There, we examine the cyclicality of the short-term wedge across countries with different levels and volatility of external financing premia. Countries that experience large and volatile external premia feature a pronounced short-rate disconnect, while countries with low and stable external premia do not exhibit a significant cyclical pattern of their short-term wedge.

We then explore whether movements in external factors influence the fluctuations in short-term wedges. Table 2 reports the estimated coefficients of a panel regression of the short-term wedge on the external funding premium as well as external exposure. The regression is at monthly frequency and includes country fixed effects, or country and month fixed effects. Formally, the regression reads:

$$i^M_{c,t} - i^P_{c,t} = \gamma_c + \gamma_t + \beta_1 \text{External Premium}_{c,t} + \beta_2 \text{External Exposure}_{c,t} + \epsilon_{c,t} \tag{6}$$

The estimates in Table 2 point to a significant influence of external factors on the local short-term wedge. Indeed, the difference between the *local* market rate and the *local* policy rate significantly comoves with the external funding premium, a measure that is heavily influenced by *global* financial conditions. A 10 p.p. increase in the EMBI spread is associated, on average, with around 1.5-2 p.p. increase in the short-term market rate relative to the policy rate. Thus, fluctuations in a country's external funding premium transmit to the short-term market rate and contribute to its divergence from the policy rate. In addition, Table 2 indicates that the short-term wedge widens with higher levels of banks' external exposure. Specifically, a 10 p.p. increase in a country's share of external liabilities corresponds to a 1-1.5 p.p. higher short-term wedge. This relationship is both statistically and economically significant.

Table 2: The Influence of External Funding Conditions on the Short-term Wedge

	Dependent variable: Short-term wedge					
External Premium	0.211***		0.154***	0.157***		0.088**
	(0.030)		(0.029)	(0.036)		(0.036)
External Exposure		0.144***	0.133***		0.126***	0.120***
		(0.012)	(0.012)		(0.012)	(0.012)
R-squared	0.442	0.460	0.465	0.496	0.512	0.513
Observations	3027	3027	3027	3027	3027	3027
Countries	30	30	30	30	30	30
Country FE	✓	✓	✓	✓	✓	✓
Month FE				✓	✓	✓

Notes: The table reports panel estimates of equation (6). Data are at a monthly frequency. These regressions feature country fixed effects, or country and time fixed effects. The sample period is 1990:q1–2018:q4. Standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Importantly, we find that these estimates remain statistically and economically significant in a specification that includes time fixed effects. This indicates that changes in external financing conditions reflecting common shocks originating in foreign markets as well as foreign investors' reactions to country-specific conditions both contribute to fluctuations in the short-term wedge.

5 A Model of Domestic Financial Intermediation in Emerging Economies

In Section 4 we documented an empirical link between the short-term wedge and external funding conditions. We now present a simple model that can rationalize these patterns in the data. The model outlines how the balance sheet of the local banking sector can transmit external financial conditions to local market rates, thus limiting the influence of domestic monetary policy on these rates. The model hinges on two empirically-relevant features of several emerging economies: (i) the crucial role of local financial intermediaries in the short-term local-currency bond market; (ii) these intermediaries' significant dependence on the global funding market (see discussion above).

Environment We start from the observation that short (safe) instruments are predominantly held by intermediaries in the country. We argue that these intermediaries, which we call "home banks," are the marginal investor in the treasury market and hence determine home-currency market rates. This assumption of the model is consistent with the fact that local banks are often designated market makers in treasury bond markets in many emerging economies.

Home Banks Risk-neutral banks in country c hold short-term market bonds ($B^M_{c,t+1}$) with gross returns in home currency $R^M_{c,t}$. On the liability side, home banks issue deposits to households ($D_{c,t+1}$) at the gross deposit rate $R^P_{c,t}$ in home currency, which coincides with the policy rate, or borrow from foreigners ($D^{\star,\$}_{c,t+1}$) at the gross dollar interest rate $\hat{R}^{\star}_{c,t}$. Banks take borrowing rates as given.

We assume all financial contracts are short term and non-contingent, and that foreign financial contracts are all denominated in foreign currency. Thus, home banks' assets are in home currency but a fraction of their liabilities are in foreign currency. Consistent with the prevailing regulatory regimes in many emerging economies that limit currency mismatches on the balance sheet of financial intermediaries, we assume that home banks completely hedge their foreign-currency liability positions.

The banks' realized profits at $t+1$ are therefore:

$$\Pi^B_{c,t+1} = B^M_{c,t+1} - D_{c,t+1} - F_{c,t} D^{\star,\$}_{c,t+1}, \tag{7}$$

where $F_{c,t}$ denotes the forward exchange rate, defined as the forward price of U.S. dollars in terms of home currency of country c. Hedging of foreign currency positions implies that the banks' time-$t+1$ foreign-currency debt is converted into home currency at the forward rate $F_{c,t}$. The bank's balance sheet accounting identity reads

$$\frac{B^M_{c,t+1}}{R^M_{c,t}} = \frac{D_{c,t+1}}{R^P_{c,t}} + \frac{S_{c,t} D^{\star,\$}_{c,t+1}}{\hat{R}^\star_{c,t}},$$

implying that time-t total assets equal time-t total liabilities, expressing the time-t dollar liability position in home currency at the spot exchange rate S_t.

To simplify the analysis, we abstract from modeling the investment and funding decisions of these banks, and assume they have some pre-existing financial positions, which are possibly time-varying. We use $\omega_{c,t}$ to denote the banks' share of external liabilities in total liabilities of country c at time t:

$$\omega_{c,t} = \frac{\frac{S_{c,t} D^{\star,\$}_{c,t+1}}{\hat{R}^\star_{c,t}}}{\frac{D_{c,t+1}}{R^P_{c,t}} + \frac{S_{c,t} D^{\star,\$}_{c,t+1}}{\hat{R}^\star_{c,t}}} = \frac{S_{c,t} D^{\star,\$}_{c,t+1}}{B^M_{c,t+1}} \frac{R^M_{c,t}}{\hat{R}^\star_{c,t}}.$$

Using these definitions, home bank's profits can be written as:

$$\Pi^B_{c,t+1} \equiv \left(1 - (1-\omega_{c,t}) \frac{R^P_{c,t}}{R^M_{c,t}} - \omega_{c,t} \left(\frac{F_{c,t}}{S_{c,t}}\right) \frac{\hat{R}^\star_{c,t}}{R^M_{c,t}}\right) B^M_{c,t+1} \tag{8}$$

Risk-neutrality and perfect competition across banks drive bank profits to zero in each period t, implying the following relationship between local market rates, policy rates and external borrowing rate:

$$R^M_{c,t} = (1-\omega_{c,t}) R^P_{c,t} + \omega_{c,t} \left(\frac{F_{c,t}}{S_{c,t}}\right) \hat{R}^\star_{c,t}. \tag{9}$$

The local-currency short-term market rate $R^M_{c,t}$ reflects the marginal funding costs of home banks, that is a weighted average of local policy rates and (covered) external funding costs. In our baseline setting, we assume that covered interest parity (CIP) holds for deposit rates, that is $\frac{F_{c,t}}{S_{c,t}}\frac{R^{\star}_{c,t}}{R^{P}_{c,t}} = 1$. This pins down $\frac{F_{c,t}}{S_{c,t}}$ in eq. (9) and implies:

$$\frac{R^{M}_{c,t}}{R^{P}_{c,t}} - 1 = \omega_{c,t}\left(\frac{\hat{R}^{\star}_{c,t}}{R^{\star}_{c,t}} - 1\right). \tag{10}$$

Time-varying Short-term Wedge An immediate implication of equation (10) is that the short-term wedge of country c is time-varying and linked to external funding conditions. In particular, to a first-order approximation, the short-term wedge is:[16]

$$i^{M}_{c,t} - i^{P}_{c,t} \approx \omega_{c}\left(\hat{i}^{\star}_{c,t} - i^{\star}_{t}\right) + \left(\hat{i}^{\star}_{c} - i^{\star}\right)\omega_{c,t}. \tag{11}$$

where $i^{M}_{c,t} - i^{P}_{c,t} \approx R^{M}_{c,t}/R^{P}_{c,t} - 1$ and $\hat{i}^{\star}_{c,t} - i^{\star}_{t} \approx \hat{R}^{\star}_{c,t}/R^{\star}_{c,t} - 1$. Model equation (11) can be mapped to regression equation (6). The short-term wedge comoves with the external funding premium as long as the foreign liability share is positive ($\omega_c > 0$). A higher external premium increases the costs of funding of local banks and, in turn, they pass them to market rates in proportion to banks' external exposure, resulting in a higher short-term wedge.[17] In addition, the short-term wedge increases with banks' external exposure, as measured by the share of external borrowing relative to total borrowing, as long as the average external funding premium is positive ($\hat{i}^{\star}_{c} - i^{\star} > 0$, the empirically relevant case). In the model, a higher fraction of external liabilities increases banks' borrowing costs, which, in turn, pass them to market rates in proportion to banks' external exposure. This model can thus explain why country-time specific movements in external conditions are reflected in their local short-term wedge, as empirically documented in Table 2. It is also in line with the micro evidence on the transmission of the global financial cycle through local banks' funding conditions (di Giovanni et al., 2022; Fendoglu et al., 2019).[18]

Monetary policy effectiveness A second implication of equation (11) is that the influence of local monetary policy on short-term rates is incomplete. Using equation (11), we derive the share of market rate fluctuations due to local policy rate movements:

[16] We assumed that the exogenous processes of $i^{P}_{c,t}$, $\hat{i}^{\star}_{c,t} - i^{\star}_{t}$, and $\omega_{c,t}$ are independent of each other. See Appendix C.1 for derivations.

[17] Bianchi and Lorenzoni (2022) propose a model in which time-varying external premium – due to changes in risk appetite of global intermediaries – is a primary source of economic fluctuations in emerging economies.

[18] See Fontanier (2023) for a general-equilibrium model that also gives rise to the short-rate disconnect.

$$\frac{\text{var}(i^M_{c,t}|i^P_{c,t})}{\text{var}(i^M_{c,t})} = \frac{1}{1 + \left[\omega_c^2 \frac{\sigma^2_{\hat{i}^\star_c}}{\sigma^2_P} + \left(\hat{i}^\star_c - i^\star\right)^2 \frac{\sigma^2_{\omega_c}}{\sigma^2_P}\right]}, \tag{12}$$

where we assume that the exogenous processes of $i^P_{c,t}$, $\hat{i}^\star_{c,t} - i^\star_t$, and $\omega_{c,t}$ are independent of each other, and use $\sigma_{i^P_c}$, $\sigma_{\hat{i}^\star_c}$, and σ_{ω_c} to denote their respective standard deviations. In this model, fluctuations in the short-term market rate not only depend on domestic monetary policy, but also on factors that are outside of the control of local central banks. As long as local banks rely, at least in part, on external funding, *i.e.* $\omega_c > 0$, fluctuations in external financing premia or external exposure of the domestic banking sector also result in fluctuations in local market rates. This model can thus explain why countries with large and volatile external exposure or external financing premia tend to experience larger departures of market rates from their policy rates.

Discussion Our model is intentionally simple to illustrate a potential relationship between external funding and local market rates, while also highlighting possible challenges to the effectiveness of monetary policy. A key simplification in this model is the assumption that external exposure and funding premia are exogenous. However, these external factors can, in reality, be correlated with domestic or external shocks, including changes in domestic and foreign monetary policy. A more detailed analysis that incorporates the underlying determinants of these external factors, as well as other forces constraining domestic monetary policy, could highlight why central banks do not lower policy rates further during recessions, or in response to U.S. monetary tightening, to ensure a decrease in the market rate.

Note on CIP deviations While we assumed that the covered interest parity (CIP) condition remains valid for deposit rates, it fails for market rates.[19] In Appendix C.2, we show that, should CIP not hold for deposit rates, the short-term wedge would exhibit comovement with these CIP deviations. They would indeed impact the funding costs of domestic banks, contributing to fluctuations in the local market rate (see also related discussions in Cerutti et al., 2021, and Gourinchas, 2021, and Keller, 2021).[20]

[19] In our baseline setting, CIP deviations for market rates are related to the external borrowing premium.

[20] In a prior version of this paper, we empirically confirmed that the short-term wedge exhibits a correlation with CIP deviations for a subset of emerging economies of Table 2 for which we could construct reliable CIP deviations. This finding aligns with recent evidence from Keller (2021) suggesting that banks in Peru engage in arbitrage when faced with CIP deviations.

6 Conclusions

Understanding how central banks manage monetary policy in emerging economies is critical given the complex and dynamic trade-offs they face (Obstfeld, 2015; Gourinchas, 2018; Akinci and Queralto, 2023; Kalemli-Ozcan, 2019; Egorov and Mukhin, 2023; Boz et al., 2020; Auclert et al., 2021). Our study reveals that monetary policy effectiveness in many emerging economies is often imperfect, as evidenced by the disconnect between policy rates and short-term market rates. Even though central banks respond to economic recessions by cutting policy rates – a counter-cyclical monetary policy stance – their stimulus transmits to short-term market rates – the rates relevant for consumption and investment decisions – only imperfectly.

This disconnect is not uniform across all emerging markets, nor is it constant over time. We find that a portion of this heterogeneity depends on countries' exposure to dollar funding and the cost associated with it. The short-rate disconnect wedge is markedly counter-cyclical in emerging economies whose domestic financial intermediary sector has a large external exposure, as measured by intermediaries' external liabilities, and experience a large and volatile external financing premia, as measured by the premium on its government dollar borrowing. To the contrary, emerging economies with limited external liabilities or small external financing premia do not exhibit a significant short-rate disconnect.

A policy implication of our research is that the balance sheets of domestic financial intermediaries matter for the effectiveness of monetary policy. Specifically, high external exposure of the intermediaries combined with high spreads can lead to substantial deviations between market and policy rates. The effectiveness of monetary policy can therefore be enhanced either by limiting external exposure when external funding premiums are high or by following policies that reduce the level of the external funding premiums including by reducing credit risks.

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Appendix

A Sample

Table A.1: List of countries and relevant sample

A. Emerging Economies

Country	Relevant sample periods	Percentage of full sample
Afghanistan, Islamic Republic of	2015q1:2018q4	13.79%
Albania	1992q3:2013q4	74.14%
Angola	2011q4:2018q4	25%
Argentina	2002q1:2018q4	58.62%
Armenia, Republic of	1999q4:2018q4	66.38%
Azerbaijan, Republic of	1993q1:1995q4; 2015q1:2018q4	23.28%
Bangladesh	1990q1:2011q4	75.86%
Belarus	2000q1:2002q4; 2011q1:2018q4	37.93%
Bolivia	1999q1:2008q3	33.62%
Brazil	1994q3:2018q4	84.48%
Bulgaria	1991q1:1996q4	20.69%
Cambodia	1994q1:1994q2; 1995q1:1997q3	11.21%
Chile	1995q2:2018q4	81.90%
China	2005q3:2018q4	46.55%
Colombia	1995q2:2018q4	81.90%
Congo, Democratic Republic of	2006q1:2009q4; 2016q1:2018q2	22.41%
Costa Rica	2006q1:2018q4	44.83%
Croatia	1993q4:1998q4	18.10%
Czech Republic	1995q4:2018q4	80.17%
Dominican Republic	2004q1:2017q3	47.41%
Egypt	2006q1:2009q3; 2011q1:2018q4	33.62%
Gambia, The	1990q1:2018q4	100%
Georgia	2008q1:2018q4	37.93%
Ghana	1990q1:2018q1	97.41%
Guatemala	1997q1:2018q4	75.86%
Hungary	1990q1:2018q4	100%
India	1990q1:1991q2; 1995q3:2018q4	86.21%
Indonesia	1990q1:2018q4	100%
Iraq	2004q3:2008q4	15.52%
Jamaica	2002q1:2018q1	56.03%

Kazakhstan	2005q2:2018q4	47.41%
Kenya	2006q2:2018q3	43.10%
Korea	1999q2:2018q4	68.10%
Kuwait	1990q1:1990q2; 1991q1:2002q4	43.10%
Kyrgyz Republic	2000q1:2018q4	65.52%
Libya	1990q1:1993q4; 1990q2:2013q1	65.52%
Malaysia	1995q4:1998q3; 2005q3:2018q4	56.90%
Malta	1990q1:2007q4	62.07%
Mauritania	1990q1:2012q4	79.31%
Mauritius	2006q4:2018q4	42.24%
Mexico	1998q4:2018q4	69.83%
Moldova	2000q1:2018q4	65.52%
Mongolia	2007q3:2018q4	39.66%
Morocco	1994q1:1995q1; 1997q4:2008q2	41.38%
Mozambique	2012q1:2018q4	19.83%
Myanmar	2012q2:2018q2	21.55%
Nepal	1990q1:1992q4; 1995q3:2018q4	90.52%
Nicaragua	1990q1:1991q1; 1993q1:1995q1	12.07%
Nigeria	2007q1:2018q4	41.38%
Pakistan	2015q3; 2016q3:2018q3	5.17%
Paraguay	2011q1:2018q4	27.59%
Peru	2001q1:2018q4	62.07%
Philippines	1990q1:1995q2; 1997q3:2018q4	93.10%
Poland	1993q1; 1995q2:2018q4	82.76%
Romania	2003q1:2012q3	33.62%
Russia	1992q1:1993q3; 1994q2:1996q2; 1998q3:2018q4	84.48%
Rwanda	1990q1:2009q1; 2009q4:2011q3; 2014q1:2017q2	85.34%
Serbia	1997q1:2000q4; 2003q1:2018q4	68.97%
Sierra Leone	1990q1:1992q4; 2011q1:2018q4	37.93%
Singapore	1990q1:2018q4	100%
Slovak Republic	2001q2:2008q4	26.72%
Slovenia	1992q1:2001q2	32.76%
South Africa	1995q1:2018q4	82.76%
Tanzania	1992q2:2012q4	71.55%
Thailand	2000q2:2018q4	64.66%
Tunisia	2000q1:2018q4	65.52%
Turkey	1990q1:2018q4	100%
Uganda	2011q3:2018q4	18.97%
Uruguay	2007q3:2018q2	37.93%

Vietnam	1996q1:2018q3	78.45%
Zambia	2012q2:2018q4	23.28%

B. Advanced Economies

Country	Relevant sample	Percentage of full sample
Australia	1990q1:2018q4	100%
Canada	1992q4:2017q3	86.21%
Denmark	1990q1:1998q4	31.03%
Euro Area	1998q4:2018q4	69.83%
Germany	1990q1:1998q4	31.03%
Iceland	1998q1:2018q4	65.52%
Israel	1995q1:2018q4	82.76%
Japan	2008q4:2015q4	25%
New Zealand	1999q1:2018q4	68.97%
Norway	1990q1:2017q1	93.97%
Portugal	1990q1:1993q2	12.07%
Sweden	1994q2:2014q4	64.66%
Switzerland	2000q1:2011q2	39.66%
United Kingdom	1990q1:2018q4	100%

Notes: The table reports the country sample. The relevant sample periods refers to periods in which the country belongs to a flexible exchange rate regime (categories 2-5 in Ilzetzki et al., 2019) and data on policy rates is available. The full sample spans from 1990q1 to 2018q4.

Table A.2: Dataset: Policy Rates

Country	Start	End	Observations	Country Group	Source	*Bloomberg* ticker
Australia	1990q1	2018q4	116	AE	BIS, IMF	
Canada	1992q4	2017q3	100	AE	BIS, IMF	
Denmark	1990q1	1998q4	36	AE	BIS, IMF	
Euro Area	1998q4	2018q4	81	AE	Bloomberg	EURR002W
Germany	1990q1	1998q4	36	AE	Bloomberg	DERPDRT
Iceland	1998q1	2018q4	76	AE	BIS, Bloomberg	ICBRANN
Israel	1995q1	2018q4	96	AE	BIS, Bloomberg	ISBRANN
Japan	2008q4	2015q4	29	AE	BIS, Bloomberg	BOJDPBAL
New Zealand	1999q1	2018q4	80	AE	BIS, IMF	
Norway	1990q1	2017q1	109	AE	BIS, IMF	
Portugal	1990q1	1993q2	14	AE	IMF	
Sweden	1994q2	2014q4	75	AE	BIS, Bloomberg	SWRRATEI
Switzerland	2000q1	2011q2	46	AE	BIS, Bloomberg	SZLTTR
United Kingdom	1990q1	2018q4	116	AE	BIS, Bloomberg	UKBRBASE
Afghanistan, Islamic Republic of	2015q1	2018q4	16	EME	.	
Albania	1992q3	2013q4	86	EME	IMF	
Angola	2011q4	2018q4	29	EME	IMF	
Argentina	2002q1	2018q4	68	EME	BIS, Bloomberg	ARLLMONP
Armenia, Republic of	1999q4	2018q4	77	EME	IMF	
Azerbaijan, Republic of	1993q1	2018q4	27	EME	IMF	
Bangladesh	1990q1	2011q4	88	EME	Bloomberg	BNRPREPO
Belarus	2000q1	2018q4	44	EME	IMF	
Bolivia	1999q1	2008q3	39	EME	Bloomberg	BOPXIX
Brazil	1994q3	2018q4	98	EME	BIS, IMF	
Bulgaria	1991q1	1996q4	24	EME	IMF	
Cambodia	1994q1	1997q3	13	EME	IMF	
Chile	1995q2	2018q4	95	EME	BIS, IMF	
China	2005q3	2018q4	54	EME	BIS, Bloomberg	CHLR12MC
Colombia	1995q2	2018q4	95	EME	BIS, IMF	
Congo, Democratic Republic of	2006q1	2018q2	26	EME	IMF	
Costa Rica	2006q1	2018q4	52	EME	IMF	
Croatia	1993q4	1998q4	21	EME	BIS, IMF	
Czech Republic	1995q4	2018q4	93	EME	BIS, Bloomberg	CZARANN
Dominican Republic	2004q1	2017q3	55	EME	Bloomberg	BCRDONRT
Egypt	2006q1	2018q4	39	EME	Bloomberg	EGBRDRAR
Gambia, The	1990q1	2018q4	116	EME	IMF	
Georgia	2008q1	2018q4	44	EME	Bloomberg	9151P270
Ghana	1990q1	2018q1	113	EME	Bloomberg	GHBRPOLA
Guatemala	1997q1	2018q4	88	EME	Bloomberg	GUIRLR
Hungary	1990q1	2018q4	116	EME	BIS, Bloomberg	HBBRANN
India	1990q1	2018q4	100	EME	BIS, Bloomberg	RSPOYLDP
Indonesia	1990q1	2018q4	116	EME	BIS, IMF	
Iraq	2004q3	2008q4	18	EME	Bloomberg	IQITPR
Jamaica	2002q1	2018q1	65	EME	.	
Kazakhstan	2005q2	2018q4	55	EME	IMF	
Kenya	2006q2	2018q3	50	EME	IMF	
Korea	1999q2	2018q4	79	EME	BIS, IMF	
Kuwait	1990q1	2002q4	50	EME	IMF	
Kyrgyz Republic	2000q1	2018q4	76	EME	IMF	

Libya	1990q1	2013q1	76	EME	IMF	
Malaysia	1995q4	2018q4	66	EME	BIS, IMF	
Malta	1990q1	2007q4	72	EME	IMF	
Mauritania	1990q1	2012q4	92	EME	IMF	
Mauritius	2006q4	2018q4	49	EME	IMF	
Mexico	1998q4	2018q4	81	EME	BIS, Bloomberg	2736R001
Moldova	2000q1	2018q4	76	EME	Bloomberg	9216R001
Mongolia	2007q3	2018q4	46	EME	IMF	
Morocco	1994q1	2008q2	48	EME	IMF	
Mozambique	2012q1	2018q4	23	EME	Bloomberg	MZBRANN
Myanmar	2012q2	2018q2	25	EME	Bloomberg	MMDRCBR
Nepal	1990q1	2018q4	105	EME	IMF	
Nicaragua	1990q1	1995q1	14	EME	IMF	
Nigeria	2007q1	2018q4	48	EME	Bloomberg	NGCBANN
Paraguay	2011q1	2018q4	32	EME	IMF	
Peru	2001q1	2018q4	72	EME	BIS, Bloomberg	PRRRONUS
Philippines	1990q1	2018q4	108	EME	BIS, Bloomberg	PPCBON
Poland	1993q1	2018q4	96	EME	BIS, Bloomberg	POREANN
Romania	2003q1	2012q3	39	EME	BIS, Bloomberg	ROKEPOLA
Russia	1992q1	2018q4	98	EME	BIS, IMF	
Rwanda	1990q1	2017q2	99	EME	IMF	
Serbia	1997q1	2018q4	80	EME	BIS, Bloomberg	SEKEPOLA
Sierra Leone	1990q1	2018q4	44	EME	Bloomberg	7246R001
Singapore	1990q1	2018q4	116	EME	Bloomberg	5766R001
Slovak Republic	2001q2	2008q4	31	EME	IMF	
Slovenia	1992q1	2001q2	38	EME	IMF	
South Africa	1995q1	2018q4	96	EME	BIS, IMF	
Tanzania	1992q2	2012q4	83	EME	IMF	
Thailand	2000q2	2018q4	75	EME	BIS, Bloomberg	BTRRHALL
Tunisia	2000q1	2018q4	76	EME	Bloomberg	TNPORATE
Turkey	1990q1	2018q4	115	EME	BIS, Bloomberg	TUBROBRA
Uganda	2011q3	2018q4	22	EME	Bloomberg	UGCBANNC
Uruguay	2007q3	2018q2	44	EME	Bloomberg	URDAIC
Vietnam	1996q1	2018q3	91	EME	IMF	
Zambia	2012q2	2018q4	27	EME	Bloomberg	ZMCBRATE

Notes: The table reports the sample coverage of policy rates and their sources. When data come from national sources we retrieve it from *Bloomberg* and report the relevant *Bloomberg* ticker in the last column.

Table A.3: Dataset: Treasury Rates

Country	Start	End	Observations	Country Group	Source	*Bloomberg* ticker
Australia	2009q2	2018q4	39	AE	Bloomberg	GACGB3M
Canada	1997q3	2018q4	85	AE	IMF, Bloomberg	GCAN3M,1566591
Denmark	1993q2	1998q4	23	AE	Bloomberg	GDGT3M
Germany	1993q2	1998q4	23	AE	Bloomberg	GETB1
Iceland	2000q1	2018q3	51	AE	Bloomberg	ICLB3MAY
Israel	1992q1	2018q4	108	AE	Bloomberg	ISMB03M
Italy	1990q4	1996q3	24	AE	Bloomberg	GBOTS3MO
Japan	1992q3	2014q3	89	AE	Bloomberg	GJTB3MO,GTJPY3MGovt

New Zealand	1999q1	2018q4	80	AE	Bloomberg	NZB3MAY
Norway	1995q2	2018q4	95	AE	Bloomberg	GNGT3M
Portugal	1990q1	1993q2	14	AE	IMF, Bloomberg	GTPTE3MGovt,1826591
Sweden	1993q2	2015q1	88	AE	Bloomberg	GSGT3M
Switzerland	2002q1	2011q2	38	AE	Bloomberg	SWIB3MAY
United Kingdom	2000q1	2018q4	76	AE	Bloomberg	UKTT3MAY
Albania	2010q1	2013q4	16	EME	IMF, Bloomberg	ALAT3MAV,9146591
Angola	2004q3	2018q3	34	EME	Bloomberg	AOTB3MAY,6146R005
Argentina	2015q4	2018q3	12	EME	Bloomberg	LBAC3MAY
Armenia, Republic of	2010q4	2018q4	32	EME	Bloomberg	ARTB3MAY
Brazil	2007q1	2018q4	48	EME	IMF, Bloomberg	2236591,GEBR03M
China	2011q1	2018q4	32	EME	Bloomberg	GCNY3M,OECNR002,findIMFversion
Czech Republic	1993q3	2018q4	83	EME	Bloomberg	9356R003,CZTA3MAY
Egypt	2006q1	2018q4	52	EME	Bloomberg	EGTBY3,EGPT3MCBEP
Gambia, The	2015q3	2018q4	12	EME	Bloomberg	CBGMTP3M
Ghana	1990q1	2018q4	116	EME	IMF, Bloomberg	6526591,GHAB3MAY
Hungary	1990q1	2018q3	114	EME	IMF, Bloomberg	HUTZ3MAY,GTHUF3MGovt,9446591
India	2000q2	2018q1	72	EME	Bloomberg	IYTB3M,FBTB3M
Indonesia	2012q1	2018q4	28	EME	Bloomberg	BV3M0132,ASCIAY3M
Iraq	2002q4	2008q4	22	EME	Bloomberg	4336R002
Jamaica	1997q4	2018q4	75	EME	Bloomberg	JMTB3MYL
Kenya	1995q1	2018q4	96	EME	IMF, Bloomberg	KNRETB91,6646591
Korea	1999q2	2018q4	69	EME	Bloomberg	GTKRW3MGovt
Kosovo, Republic of	2012q1	2017q1	12	EME	Bloomberg	KSTT3MAY
Kuwait	1990q1	2002q4	46	EME	IMF	
Kyrgyz Republic	1994q1	2018q4	100	EME	IMF	
Latvia	1994q3	1999q4	22	EME	IMF, Bloomberg	LRTB03AD,9416591
Malaysia	1990q1	2016q4	80	EME	IMF, Bloomberg	MA3MAY,C1133M,5486R001,5486591
Malta	1990q1	2007q4	72	EME	IMF, Bloomberg	1816591,CBMP3M
Mauritius	1997q3	2018q4	77	EME	Bloomberg	BMTB91WY
Mexico	1991q1	2018q4	105	EME	Bloomberg	GCETAA91,MPTBCCMPNCurncy
Moldova	2013q2	2018q4	23	EME	Bloomberg	MKTB3MNY
Mongolia	2012q4	2017q3	18	EME	Bloomberg	MGFX12WK
Mozambique	2003q2	2018q3	62	EME	IMF, Bloomberg	MZTB3MAY,6886591
Myanmar	2015q1	2018q4	16	EME	Bloomberg	MB3MAY
Nepal	1990q1	2018q4	106	EME	IMF, Bloomberg	NPRTTB91,5586591
Nigeria	2008q1	2018q4	44	EME	Bloomberg	NIAT3MAV,NGTB3M
Pakistan	1998q3	2018q4	81	EME	Bloomberg	PAK3CY
Philippines	1990q1	2018q3	106	EME	IMF, Bloomberg	GTPHP3MGovt,5666591
Poland	1995q2	2008q4	48	EME	Bloomberg	PDAT3MAY
Romania	1994q1	2012q3	67	EME	IMF	
Russia	2010q1	2018q4	36	EME	Bloomberg	MICXRU3M
Rwanda	2009q2	2018q4	38	EME	Bloomberg	RWTB3MAY
Serbia	2003q2	2016q1	49	EME	Bloomberg	SRAT3MAV,BIEEBO3M
Seychelles	2008q1	2018q4	44	EME	Bloomberg	SCTB3MAY
Sierra Leone	1990q1	2018q4	116	EME	IMF, Bloomberg	SETT3MAY,7246591
Singapore	1998q1	2018q4	84	EME	Bloomberg	MASB3M
Slovenia	1998q2	2001q2	13	EME	IMF, Bloomberg	9616591,SVAT3MAY
South Africa	1995q1	2018q4	96	EME	IMF, Bloomberg	SATA3MAV,1996591
Sri Lanka	1995q1	2018q4	96	EME	Bloomberg	SLTN3MYD
Tanzania	1993q4	2018q2	99	EME	IMF, Bloomberg	TZTB3MAY,7386591
Thailand	1999q4	2018q2	58	EME	Bloomberg	TH3MAY
Turkey	1990q1	2008q2	58	EME	IMF	

Uganda	1990q1	2018q4	116	EME	IMF, Bloomberg	UATB3MAY,7466591
Ukraine	2014q1	2018q4	11	EME	Bloomberg	UKAUAY3M
Uruguay	2015q2	2018q3	13	EME	Bloomberg	NUTB3MAY
Zambia	2003q4	2018q4	61	EME	Bloomberg	ZMITTBAM,ZITB3MAY

Notes: The table reports the sample coverage of treasury rates and their sources. When data come from national sources we retrieve it from *Bloomberg* and report the relevant *Bloomberg* ticker in the last column.

B Additional Tables and Figures

Table B.1: Estimated Central Banks' Reaction Function (excluding High-Inflation Countries and Crisis Periods)

	Emerging Economies	Advanced Economies
$i^P_{c,t-1}$	0.878***	0.917***
	(0.0082)	(0.0095)
$\pi_{c,t}$	0.277***	0.282***
	(0.027)	(0.032)
output gap$_{c,t}$	0.0432***	0.0996***
	(0.015)	(0.013)
No. of Countries	38	11
R-squared	0.91	0.96

Notes: The table reports panel estimates of equation (1) by OLS. Data are at a quarterly frequency. To construct quarterly output gap we apply spline interpolation to annual output gap data. We include countries with at least 20 quarters of observations. These regressions feature country fixed effects. The sample period is 1990:q1–2018:q4. Standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). This table focuses on a sample that excludes countries that have experienced inflation rates above 40 percent over a 12-month period and periods during the 6 months immediately following a currency crisis and accompanied by a regime switch. (Thus, we exclude the "freely falling" category in Ilzetzki et al. (2019).)

Table B.2: Estimated Central Banks' Reaction Function (with GDP growth)

	Emerging Economies	Advanced Economies
$i^{P}_{c,t-1}$	0.860***	0.944***
	(0.0058)	(0.0075)
$\pi_{c,t}$	0.394***	0.304***
	(0.027)	(0.029)
$\Delta\text{GDP}_{c,t}$	0.00892**	0.00133
	(0.0037)	(0.0017)
No. of Countries	48	12
R-Squared	0.96	0.96

Notes: The table reports panel estimates of equation (1) by OLS. We use real GDP growth to proxy for slack in economic activity. We include countries with at least 20 quarters of observations. These regressions feature country fixed effects. Data are at a quarterly frequency. The sample period is 1990:q1–2018:q4. Standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table B.3: Estimated Central Banks' Reaction Function (with Exchange Rate Depreciation)

	Emerging Economies	Advanced Economies
$i^P_{c,t-1}$	0.823***	0.921***
	(0.0078)	(0.0095)
$\pi_{c,t}$	0.369***	0.290***
	(0.034)	(0.032)
$\Delta s_{c,t}$	0.0576***	-0.0156***
	(0.0078)	(0.0045)
ouput gap$_{c,t}$	0.0787***	0.0966***
	(0.020)	(0.013)
R-Squared	0.92	0.96
No. of Countries	38	11

Notes: The table reports panel estimates of equation $i^P_{c,t} = \alpha_c + \beta_1 i^P_{c,t-1} + \beta_2 \pi_{c,t} + \beta_3 \text{output gap}_{c,t} + \beta_4 \Delta s_{c,t} + \epsilon_{c,t}$ by OLS, where $\Delta s_{c,t}$ is the rate of country-c currency depreciation relative to the U.S. dollar. Data are at a quarterly frequency. To construct quarterly output gap we apply spline interpolation to annual output gap data. We include countries with at least 20 quarters of observations. These regressions feature country fixed effects. The sample period is 1990:q1–2018:q4. Standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table B.4: Weak Instrument Test for U.S. Monetary Policy Shock

Dependent variable	Cragg-Donald Wald F statistic	Kleibergen-Paap rk Wald F statistic
Policy Rate	311.90	311.87
Treasury Rate	173.63	173.69
Real GDP growth	458.87	459.21
CPI Inflation	476.25	476.86
Capital Inflows/GDP	304.05	304.03
VIX	442.12	442.80

Notes: The weak instrument test results are displayed above for the baseline specification (Figure 5) and for $h = 1$. We report the Cragg-Donald Wald F statistic and the Kleibergen-Paap rk Wald F statistic. The Stock-Yogo weak ID test critical value at 10% maximal IV size is equal to 16.38.

C Model Derivations and Extensions

C.1 Market Rates and Short-term Wedge in Baseline Model

We first use the CIP condition $\frac{F_{c,t}}{S_{c,t}}\frac{R^{\star}_{c,t}}{R^{P}_{c,t}} = 1$ in the equation for the equilibrium market rate, eq. (9):

$$i^M_{c,t} - i^P_{c,t} = \omega_{c,t}\left(\hat{i}^{\star}_{c,t} - i^{\star}_t\right) \tag{C.1}$$

where $i^M_{c,t} - i^P_{c,t} \approx {R^M_{c,t}}/{R^P_{c,t}} - 1$ and $\hat{i}^{\star}_{c,t} - i^{\star}_t \approx {\hat{R}^{\star}_{c,t}}/{R^{\star}_{c,t}} - 1$. Then, we take the first-order approximation of equation (C.1):

$$i^M_{c,t} \approx i^P_{c,t} + \left[\left(\hat{i}^{\star}_c - i^{\star}\right)\omega_{c,t} + \omega_c\left(\hat{i}^{\star}_{c,t} - i^{\star}_t\right)\right] \tag{C.2}$$

Then, assuming that the exogenous processes of $i^P_{c,t}$, $\hat{i}^{\star}_{c,t} - i^{\star}_t$, and $\omega_{c,t}$ are independent of each other and using $\sigma_{i^P_c}$, $\sigma_{\hat{i}^{\star}_c}$, and σ_{ω_c} to denote their respective standard deviations, the share of variance of the policy rate in the overall variance of the market rate is:

$$\frac{\mathrm{var}(i^M_{c,t}|i^P_{c,t})}{\mathrm{var}(i^M_{c,t})} = \frac{1}{1 + \left[\omega_c^2\frac{\sigma^2_{\hat{i}^{\star}_c}}{\sigma^2_P} + \left(\hat{i}^{\star}_c - i^{\star}\right)^2\frac{\sigma^2_{\omega_c}}{\sigma^2_P}\right]}$$

This is equation (12) in Section 5.

The first-order approximation of the short-rate wedge, equation (11) in Section 5, is obtained by rearranging (C.2):

$$i^M_{c,t} - i^P_{c,t} \approx \left[\left(\hat{i}^{\star}_c - i^{\star}\right)\omega_{c,t} + \omega_c\left(\hat{i}^{\star}_{c,t} - i^{\star}_t\right)\right].$$

C.2 Extended Model with CIP Deviations in Deposit Rates

Define CIP deviations in deposit rates, using ξ_t, as:

$$\xi_{c,t} = i^{\star}_t - \left(i^P_{c,t} - (f_{c,t} - s_{c,t})\right)$$

where $s_{c,t}$ and $f_{c,t}$ are the spot and forward exchange rates – defined as home-currency per U.S. dollar. A negative CIP deviation implies that synthetic dollar borrowing $i^P_{c,t} - (f_{c,t} - s_{c,t})$ is more expensive than cash dollar borrowing $i^{\star}_t$.

When allowing for CIP deviations in the equation for the equilibrium market rate, eq. (9), the short-rate wedge becomes:

$$i_{c,t}^{M} - i_{c,t}^{P} = \omega_{c,t} \left(\xi_{c,t} + \hat{i}_{c,t}^{\star} - i_{t}^{\star} \right). \tag{C.3}$$

Relative to the baseline equation (C.1), equation (C.3) implies that the short-term wedge would comove with CIP deviations. Deviations from CIP would impact the funding costs of domestic banks, leading to fluctuations in the required return on the domestic market bond. A negative CIP deviation lowers the cost of covered dollar borrowing (the relevant cost for the bank) and thus lowers the market rate, relative to the policy rate.

In our model, currency mismatch hedging by domestic financial intermediaries implies that UIP deviations do not directly matter for the market-policy rate disconnect. It is worth noting that UIP deviations may still significantly influence emerging economies through channels other than fluctuations in the short-term disconnect wedge.