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# MONETARY POLICY AND THE SHORT-RATE DISCONNECT IN EMERGING ECONOMIES

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## ABSTRACT

We document that emerging market central banks adhere to Taylor-type rules and lower their policy rates when economic activity slows down, including as a response to U.S. monetary policy tightening. This suggests a countercyclical monetary policy stance. However, in contrast to advanced economies, short-term market rates do not move in tandem with policy rates. Market rates, if anything, tend to increase during recessions. We present evidence that this disconnect between policy rates and market rates can be significantly explained by fluctuations in dollar funding premia that get transmitted into local market rates through the banking sector that relies on foreign funding. Our findings shed light on the challenges to transmission and effectiveness of monetary policy in emerging economies.

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# 1 Introduction

We show that central banks in emerging economies with flexible exchange rates follow a *countercyclical* monetary policy, that is they reduce their policy rates when local economic activity decelerates. However, the transmission of these policy rates to short-term market rates, the typical channel through which monetary policy transmission works, is significantly hindered due to fluctuating conditions in domestic financial intermediaries' international funding markets.

We begin by studying the typical behavior of emerging economies' policy rates vis-à-vis local inflation and economic activity, since 1990s. To do so, we first estimate policy rules à la Taylor (1993, 1999) and find that central banks adjust the policy rate in response to changes in both inflation and economic conditions (as measured by the output gap or GDP growth). In this regard, we observe that central banks in emerging economies operate similarly to their counterparts in advanced economies. We then study the correlation of local interest rates with local economic activity (as measured by real GDP growth). Similarly, we find that policy rates are lowered when local economic activity decelerates. However, we uncover that short-term market rates, including 3-month treasury or money market rates, tend to increase during economic recessions. This stands in contrast to advanced economies where policy rates and short-term market rates decrease in tandem when economic activity slows down. This evidence indicates that local monetary policy in both emerging and advanced economies has displayed a countercyclical stance over the past three decades. However, emerging economies' market rates exhibit a *disconnect* from local policy rates.

We document that this disconnect between policy and market rates emerges following a U.S. monetary policy tightening, identified using the high-frequency identification approach of Gertler and Karadi (2015), which notably causes a tightening of global financial conditions (Miranda-Agrippino and Rey, 2020; Kalemli-Ozcan, 2019).[1] In response to such a tightening, some emerging market central banks face a trade off between lowering rates to lean against a recession or raising rates to prevent disruptive currency depreciations. We find that on average, emerging economies lower policy rates in response to a U.S. monetary policy tightening. Despite this, market rates increase on average. We observe a similar disconnect between policy rates and market rates during the so-called Taper Tantrum episode, an unexpected

[1] See also Dedola et al. (2017), and Degasperi et al. (2023).

exogenous U.S. monetary policy tightening.

We hypothesize that movements in the local short-term differential, the difference between local market rates and policy rates, originate from emerging economies' reliance on capital flows that make them subject to fluctuating global funding conditions. We present a simple model that focuses on the role of domestic banks in transmitting fluctuations in external financial conditions domestically, influencing the dynamics of local short-term market rates. Within our model, 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). According to our model, 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. The pass-through of monetary policy to short-term rates thus becomes incomplete and dependent on external financing costs.

We verify that the short-rate disconnect, that is the differential between the policy rate and market rate, in emerging economies is significantly related to both dollar funding premia and banks exposure to external funding. Empirically, the short-term differential is higher when the dollar premium, the premium a country pays on its dollar-denominated bonds compared to U.S. bonds, proxied by the EMBI spread, is higher. A 10 p.p. increase in the EMBI spread is associated with a 1.5-2 p.p. higher short-term differential. We also find that a country's short-term differential is larger in periods where its banks' exposure to external funding is larger. We use data from Avdjiev et al. (2022) to measure a country's domestic banking sector share of external liabilities, and find that a 10 p.p. larger share of external liabilities is associated with a 1-1.5 p.p. higher short-term differential. Our model rationalizes these co-movements between quantities, prices and the short-rate disconnect wedge: when dollar funding costs rise or the banks' exposure to these costs rises via their external borrowing, domestic banks require a domestic market rate that exceeds the policy rate to hold the market bond. We emphasize that changes in external financing conditions can reflect both shocks originating in foreign markets (such as Taper Tantrum) as well as foreign investors' reactions to changing domestic conditions (increased credit or recession risk) reflected in their pricing captured by dollar premia. Our evidence shows that both global and local shocks contribute to fluctuations in the short-term differential.

Our paper contributes to a well-established literature in international monetary economics and finance, and 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 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 with floating exchange rate regimes. Obstfeld et al. (2019) contribute to this discussion by documenting that floaters experience milder macroeconomic and financial fluctuations compared to peggers during periods of heightened global risk aversion. Kalemli-Ozcan (2019) bridges these views by documenting the disconnect between short-term rates and monetary policy rates, where this disconnect is amplified with changes in the country-specific risk premium. Thus, the reason for milder reaction of floaters relative to peggers stems from the lower sensitivity of investors' risk perceptions for floaters, making monetary policy more effective in floaters with smaller disconnect. Relative to these earlier papers, our research undertakes a systematic evaluation of monetary policy cyclicality in floating rate emerging markets, including in response to exogenous US monetary policy shocks, and demonstrates the impairment in monetary policy transmission. It relates this impairment to changes in external funding costs and the role of the domestic banking sector.[2]

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 procyclical fiscal policy (see also Gavin and Perotti, 1997), and some evidence in support of the notion of procyclical 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 countercyclical stance, it does not completely transmit to short-term market rates. We thus emphasize that using

[2] 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).

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 stance in emerging economies, before or after 2000s, even though this practice appears justified for advanced economies.

Our paper also contributes to the existing literature on emerging economies' business cycles and the dynamics of real interest rates, initiated by Neumeyer and Perri (2005). The question was later explored by several studies, such as Aguiar and Gopinath (2007), García-Cicco et al. (2010), Fernández and Gulan (2015), Fernández-Villaverde et al. (2011), and Coulibaly (2023). Our paper focuses on a mechanism where local banks' reliance on international markets for funding exposes local short-term funding conditions to global financial fluctuations, with implications for their 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 the disconnect between policy rates and short-term market rates in emerging economies. Section 4 develops a partial-equilibrium model that highlights a possible link between short-term differentials and banks' external funding conditions. Section 5 documents the comovement between the short-term differential, the dollar premium, and banks' external exposure. Section 6 concludes.

# 2 What Do Central Banks in Emerging Economies Do?

We document the behavior of monetary policy vis-à-vis local inflation and economic activity. To characterize the monetary policy stance we use publicly announced policy rates.

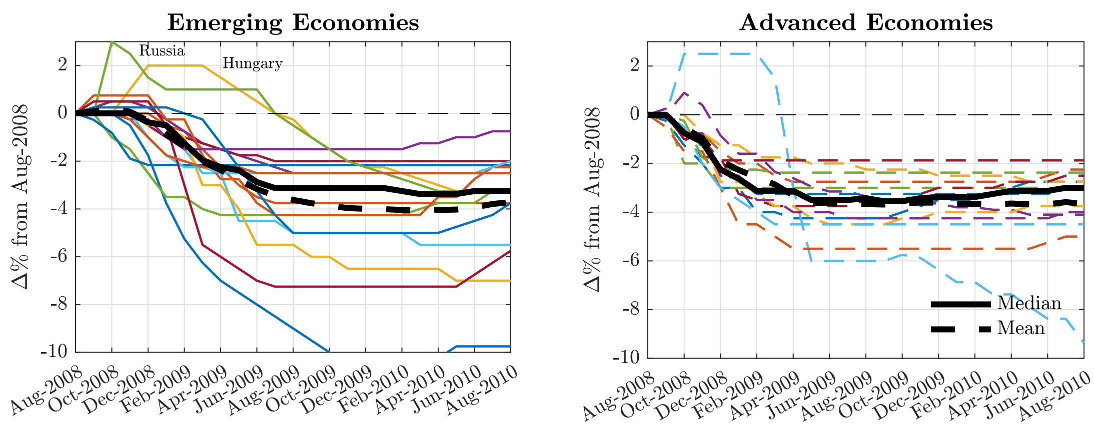
**Dataset** Our sample focuses on countries and time periods that are characterized by a flexible exchange rate regime. For the classification of exchange rate regimes we rely on the historical exchange rate classification in Ilzetzki et al. (2019), which is a country-quarter level time varying classification.[3] 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 ($i^P$). 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*

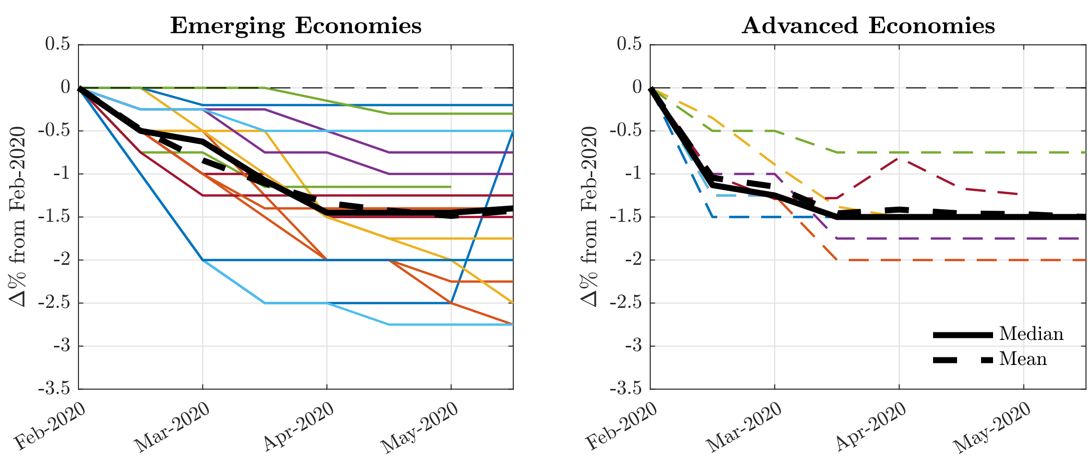
[3] A country is considered to have a flexible exchange rate regime if, in a given quarter, its exchange rate was within a moving band that is narrower than or equal to +/-2 percent or was classified as managed floating, freely floating or freely falling in Ilzetzki et al. (2019).

*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 ($i^M$), specifically treasury rates and interbank money market rates. The maturity of short-term interest rates in our sample is 3 months.The sources of treasury and money market rates are *IMF International Financial Statistics* or national sources retrieved from *Bloomberg*. See Appendix Tables A.2-A.4 for more details about the data.




**(a)** Global Financial Crisis




**(b)** COVID-19

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

*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** To present few examples from our dataset, we explore the behavior of policy rates during two noteworthy episodes of global recessions (often referred to as "risk-off" shocks), namely the Global Financial Crisis and COVID-19. It is evident from Figure 1 that both advanced and emerging economies lowered their policy rates during these two global recessions.[4] We find this result noteworthy as emerging economies currencies depreciated during these events and given a high degree of exchange rate pass-through, such currency depreciations can feed back into inflation.[5] In addition, depreciations can cause balance sheet distress for governments and firms that have borrowed in foreign currency.

**Table 1:** Estimated Central Banks' Reaction Function

| | Emerging Economies | | Advanced Economies | |
|---|---|---|---|---|
| | $i_t^P$ | $i_t^P$ | $i_t^P$ | $i_t^P$ |
| | (1) | (2) | (3) | (4) |
| $i_{t-1}^P$ | 0.860*** | 0.826*** | 0.936*** | 0.917*** |
| | (0.0058) | (0.0079) | (0.0076) | (0.0094) |
| $\pi_t$ | 0.394*** | 0.419*** | 0.280*** | 0.280*** |
| | (0.027) | (0.034) | (0.030) | (0.031) |
| $\Delta\text{GDP}_t$ | 0.00892** | | 0.00104 | |
| | (0.0037) | | (0.0019) | |
| output gap$_t$ | | 0.0591*** | | 0.0996*** |
| | | (0.020) | | (0.013) |
| R-Squared | 0.93 | 0.87 | 0.95 | 0.95 |

*Notes*: The table reports estimates of equation (1) by OLS. For both emerging and advanced economies, columns (1) and (3) use real GDP growth to proxy for economic activity while columns (2) and (4) use the output gap (we apply spline interpolation to annual output gap data to obtain quarterly figures). 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 (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

**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). Such policy rules describe how the monetary authority

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

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

adjusts its policy instrument (typically the short-term policy rate) in response to deviations of inflation and economic conditions from their objectives. A standard version of a Taylor-type rule is: $i_t^P = \rho i_{t-1}^P + (1-\rho)(\phi_\pi \pi_t + \phi_y \tilde{y}_t) + \varepsilon_t^P$. According to this rule, the central bank adjusts the policy rate in response to changes in inflation (with coefficient $\phi_\pi$) and economic conditions, such as output growth or the output gap (with coefficient $\phi_y$). The rule allows for policy smoothing by including a first-order autoregressive term, and for i.i.d. monetary policy shocks, $\varepsilon_t^P$.

To estimate the central bank's reaction function we thus consider the following regression:

$$i_t^P = \alpha + \beta_1 i_{t-1}^P + \beta_2 \pi_t + \beta_3 \tilde{y}_t + \epsilon_t \tag{1}$$

We follow Carvalho et al. (2021) in using ordinary least squares (OLS) to estimate the parameters of the Taylor rule.[6] To estimate equation (1) we use the country's policy rate. Inflation is the rate of change in the consumer price index (CPI). To measure economic conditions, we use either the rate of change in the country's real gross domestic product ($\Delta \text{GDP}_t$) or the country's output gap (output $\text{gap}_t$) from IMF (2020, Chapter 3).

We report the results of the estimated central banks' reaction function in Table 1 for both advanced and emerging economies.

First, we note that the $R$-squared of these regressions is high, indicating that Taylor rules appear to describe the conduct of monetary policy in these countries fairly well. Second, the estimates of Taylor rule coefficients are generally similar across 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 improving economic conditions, measured either with GDP growth or the output gap. For emerging economies, the specification with the output gap implies that the point estimates for $\phi_\pi$ and $\phi_y$ are around 2.4 and 0.34, respectively.[7] These estimates are both statistically and economically significant and, again, similar to the corresponding estimates for advanced economies. In line with the literature, we estimate a significant amount of policy rate smoothing by central banks in both sets of

[6] 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.

[7] One obtains these numbers by mapping the estimates of equation (1) to the reaction function: $i_t^P = \rho i_{t-1}^P + (1-\rho)(\phi_\pi \pi_t + \phi_y \tilde{y}_t) + \varepsilon_t^P$.

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 reports the estimates of Taylor rule coefficients for this modified sample. All results remain statistically significant. In addition, one may wonder if the central bank's reaction function of emerging economies is well characterized by the response to output gap, inflation, and interest rate smoothing, and whether central banks independently respond to exchange rate fluctuations due to fear of floating (Calvo and Reinhart, 2002). In this respect, we have confirmed the robustness of these results to incorporating the rate of nominal exchange rate depreciation into the central bank's reaction function (Appendix Table B.2).[8]

We thus observe that the monetary policy behavior, as captured by estimated central banks' reaction functions, suggests that the stance of monetary policy in emerging economies is countercyclical.

**The Cyclical Behavior of Policy Rates** We now turn to examining the cyclical behavior of policy rates. This is a commonly used metric to assess whether monetary policy acts pro- or countercyclically (see, for example, Kaminsky, Reinhart, and Végh, 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, *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. More specifically, we consider the following regression relationships:

$$i^P_{t+h} = \alpha^P_h + \beta^P_h \Delta GDP_t + \gamma^P_h i^P_{t-1} + \epsilon^P_{t+h}; \tag{2}$$

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

[8] While there might be some resistance to let the exchange rate fluctuate, it can't be a dominant force driving monetary policy decisions in light of our evidence on the cyclical behavior of policy rates and their response to U.S. monetary policy tightening. Put differently, monetary policy stance is countercyclical in spite of fear of floating.

The coefficients of interest are the $\beta_h^P$'s in equation (2). The $\beta_h^P$'s in equation (2) captures the relationship between current real GDP growth and the policy rate, both contemporaneously and in the near future.

Figure 2 (Panel (a)) depicts the estimated $\beta_h^P$'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 countercyclical in emerging economies. We also observe that the correlation between policy rates and GDP growth is milder in emerging when compared to advanced economies. This difference might be due to the relative prevalence of supply shocks in emerging economies (as argued, *e.g.*, in Frankel, 2010).

# 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. For this reason, we now 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 moved away from the practice of using short-term market rates to proxy for the stance of monetary policy. Short-term market rates such as treasury rates or interbank money market rates are not necessarily "risk-free" in emerging economies. Treasury rates are rates at which governments issue their debt instruments, money market rates are rates charged on loans among banks. 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.

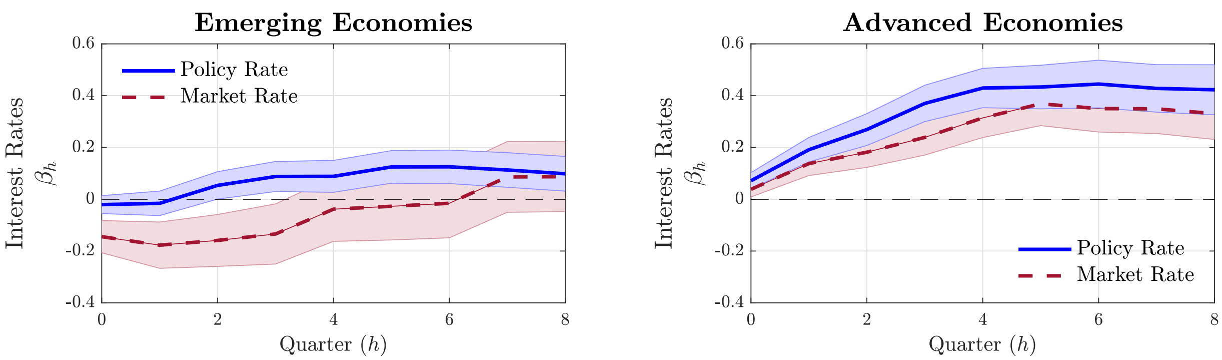
**The Cyclical Behavior of Short-Term Market Rates** We now examine the cyclical behavior of short-term rates. In the baseline analysis, we use 3-month treasury rates as measure of short-term market rates. A corresponding analysis that uses 3-month money market rates as measure of market rates is reported in Appendix B.

As in equation (2) above, we study the dynamic relationship between GDP growth and market rates using reduced form local-projections. That is:

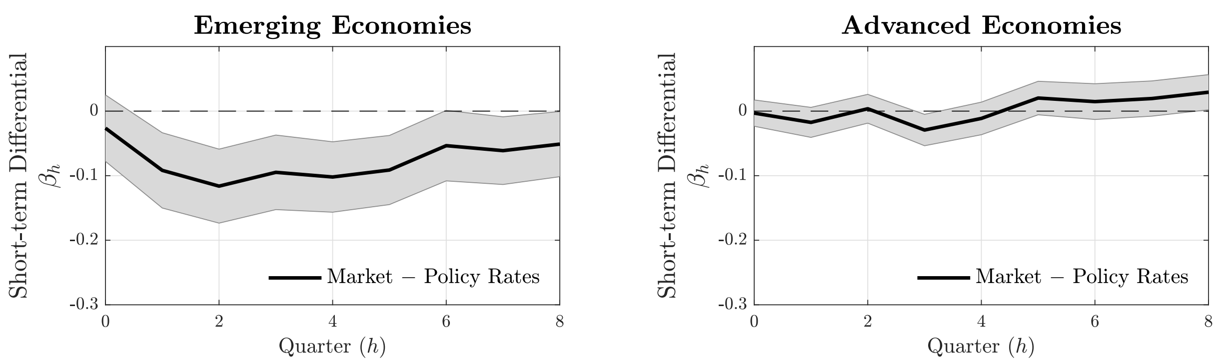
$$i^M_{t+h} = \alpha^M_h + \beta^M_h \Delta GDP_t + \gamma^M_h i^M_{t-1} + \epsilon^M_{t+h}; \tag{3}$$

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

In regression equation (3), $i^M$ denotes the country's short-term market rate and $gdp_t$ is the country's real GDP. Figure 2 depicts the estimated $\beta^M$'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 within two years, 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.




**(a)** Policy Rates and Market Rates




**(b)** Short-Rate Differential

**Figure 2:** Cyclical Behavior of Interest Rates in Emerging and Advanced Economies

*Notes*: The figure reports the panel estimates of $\beta_h$'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.

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 differential* as the difference between market rates and policy rates $(i_t^M - i_t^P)$, and explore the dynamics of this object vis-a-vis real GDP growth in the same local-projection setting as above:

$$i_{t+h}^M - i_{t+h}^P = \alpha_h^d + \beta_h^d \Delta GDP_t + \gamma_h^d \left(i_{t-1}^M - i_{t-1}^P\right) + \epsilon_{t+h}^d; \tag{4}$$

Panel (b) of Figure 2 depicts the estimated $\beta_h^d$'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 differential of market minus policy rate declines in expansions. This is not the case in advanced economies, where the market-policy differential 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 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.

**Policy Rates as Measure of the Monetary Policy Stance** 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.[9] Notwithstanding the smaller sample size, the results for this subsample of emerging economies, reported in Figure B.1 align closely with the baseline results, indicating a strong degree of monetary policy counter-

[9] 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, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russia, South Africa, Sri Lanka, Thailand, Turkey, Ukraine, Uruguay, and Vietnam.

cyclicality and a significant difference in cyclicality between policy rates and short-term market rates.

### 3.1 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.

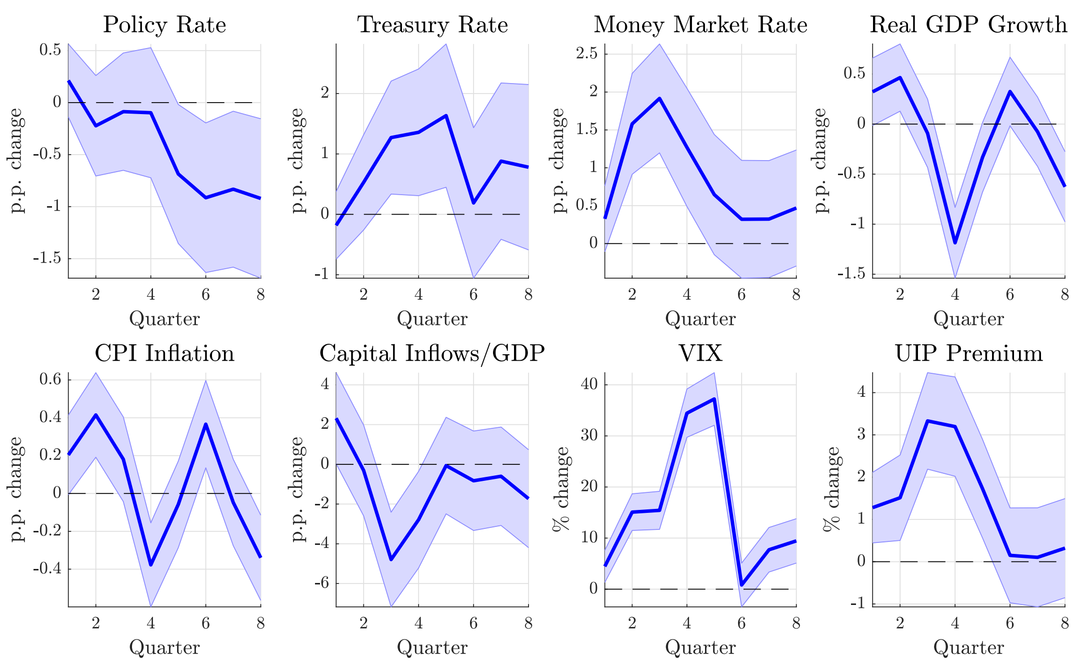



**Figure 3:** Dynamic Effects of a U.S. Monetary Policy Tightening on Emerging Economies

*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).[10] 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 Jordà, 2005, and Stock and Watson, 2018). Our regression specification is:

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

where, as above, $y_{j,t+h}$ is a vector of macro and financial variables of country $j$ at time $t+h$, and controls ($W_t$) 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.3, we show that the monetary policy shocks from Gertler and Karadi (2015) pass conventional weak instrument tests.

Figure 3 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 with delayed capital outflows.[11] The responses of the VIX (a proxy for global risk aversion and uncertainty), and the UIP premium (the expected excess return on the home currency 1-year treasury bond) are consistent with those in Miranda-Agrippino and Rey (2020), and Kalemli-Ozcan (2019).[12]

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 both treasury and money market 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

[10] 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.

[11] Our measure of capital inflows is total debt inflows to GDP from Avdjiev et al. (2022).

[12] See also Dedola et al. (2017) and Degasperi et al. (2023)

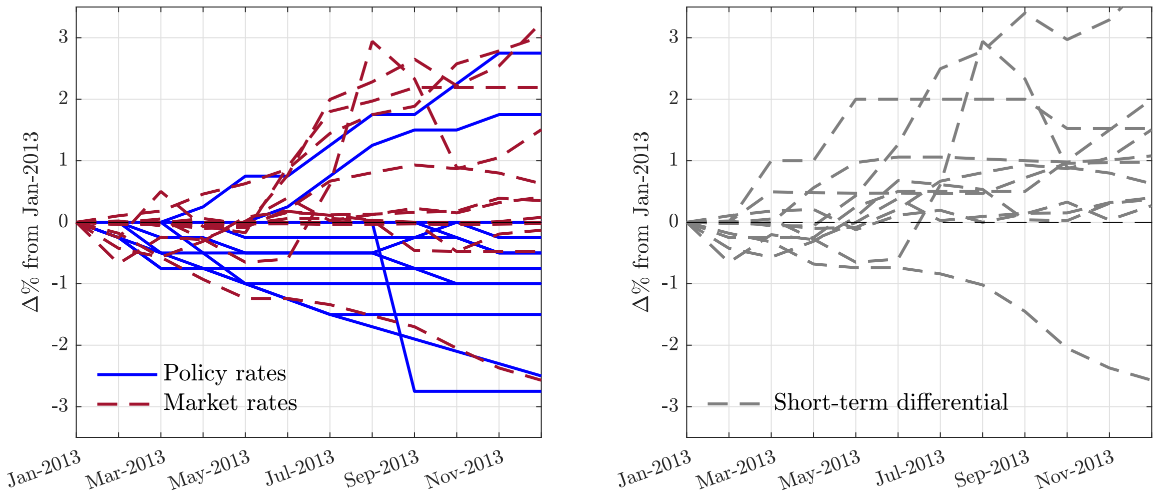



**Figure 4:** Policy Rates and Market Rates around Taper Tantrum

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

a specific episode of unexpected U.S. monetary policy tightening, i.e. the so-called Taper Tantrum episode. The Taper Tantrum of 2013 refers to 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 in May 2013. 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 4 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.[13]

We emphasize that 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. We stress that this evidence does not dispute the importance of exchange rate depreciation driven balance sheet effects in the presence of USD debt. However, our evidence reveals that these forces cannot be the dominant motives in policy rate setting in emerging economies. Of course, balance sheet effects might lead

[13] Witheridge (2023) highlights that lower policy rates following a US monetary policy tightening can result in a model in which the fiscal authority does not adjust taxes sufficiently to stabilize debt, and deficits are financed by a "passive" monetary authority.

emerging economies' central banks to lower rates *less* than what they would have done if they were solely looking at domestic economic conditions.

# 4 A Model of Banks in Emerging Economies

We have documented that short-term market rates can disconnect from policy rates in emerging economies, resulting in time-varying short-term differentials. We hypothesize that these fluctuations derive from the reliance of emerging economies' banking sector on fluctuating external funding conditions. To explore this hypothesis, we present a simple model outlining how the balance sheet of the local banking sector can transmit external financial conditions to home market rates, resulting in an incomplete pass through of local monetary policy to market rates. The model displays two empirically-relevant features of emerging economies: (i) the key role of local financial intermediaries in the short-term local currency bond market; (ii) these intermediaries' significant dependence on the global funding market. We derive testable predictions, and we take them to the data in Section 5.

**Environment** We start from the observation that short (safe) instruments are predominantly held by intermediaries in the country, such as commercial banks and money-market mutual funds. We argue that these intermediaries, which we call "home banks" throughout this paper, are the marginal investor in treasury and money market, hence determine home-currency market rate. This aspect of the model is consistent with the fact that local banks are often designated market makers in treasury bond markets, as well as a dominant player in the money market, in many emerging economies.

**Home Banks** Risk-neutral banks hold short-term market bonds ($B_{t+1}^M$) with gross returns in home currency $R_t^M$. On the liability side, home banks issue deposits to households ($D_{t+1}$) at the gross policy rate $R_t^P$ in home currency or borrow from foreigners ($D_{t+1}^{\star,\$}$) at the gross dollar interest rate $\hat{R}_t^{\star}$. Banks take borrowing rates as given.

We assume all financial contracts are short term and non-contingent. We also assume 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 hedge their foreign-currency liability positions. The banks' realized profits at $t+1$ are therefore

$$\Pi^B_{t+1} = B^M_{t+1} - D_{t+1} - F_t D^{\star,\$}_{t+1}, \tag{6}$$

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

$$\frac{B^M_{t+1}}{R^M_t} = \frac{D_{t+1}}{R^P_t} + \frac{S_t D^{\star,\$}_{t+1}}{\hat{R}^\star_t}. \tag{7}$$

The balance sheet accounting identity implies 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 $\omega_t$ to denote the banks' share of external liabilities in total liabilities (using eq. (7)):

$$\omega_t = \frac{\frac{S_t D^{\star,\$}_{t+1}}{\hat{R}^\star_t}}{\frac{D_{t+1}}{R^P_t} + \frac{S_t D^{\star,\$}_{t+1}}{\hat{R}^\star_t}} = \frac{S_t D^{\star,\$}_{t+1}}{B^M_{t+1}} \frac{R^M_t}{\hat{R}^\star_t}.$$

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

$$\Pi^B_{t+1} \equiv \left(1 - (1-\omega_t)\frac{R^P_t}{R^M_t} - \omega_t \left(\frac{F_t}{S_t}\right) \frac{\hat{R}^\star_t}{R^M_t}\right) B^M_{t+1} \tag{8}$$

Risk-neutrality and perfect competition across banks drive expected bank profits to zero in each period, and the short-term market rate would thus be:

$$R^M_t = (1-\omega_t) R^P_t + \omega_t \left(\frac{F_t}{S_t}\right) \hat{R}^\star_t. \tag{9}$$

The local-currency short-term market rate $R^M_t$ reflects the marginal funding costs of home banks, *i.e.* a weighted average of local policy rates and external funding conditions (evaluated in home-currency). A first implication of equation (9) is that the pass-through of monetary policy to short-term rates is incomplete: an increase in the local policy rate implies a less than one-to-one increase in the short-term market rate, for given external funding conditions. Moreover, the degree of pass-through incompleteness depends on local banks' reliance on the global funding market, governed by $\omega_t$. If $\omega_t = 0$, the pass-through is complete because local banks entirely rely on local deposits. Instead, if $\omega_t = 1$, the pass-through is zero as local banks only borrow from the global funding market. For intermediate levels of banks' external exposure, $\omega_t \in (0,1)$, the pass-through of domestic monetary policy is incomplete.

**Short-Term Differential** Using the covered interest parity condition ($F_t/S_t = R_t^M/R_t^\star$), we rearrange equation (9) and show the relationship between the short-term differential and external dollar funding costs as well as the external exposure of the domestic banking sector:

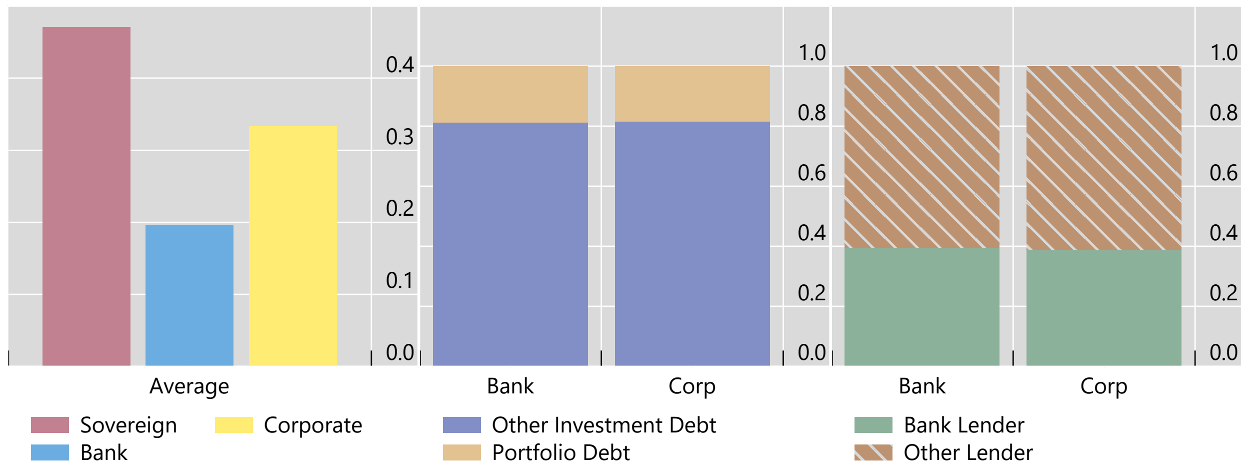
$$\underbrace{\frac{R_t^M - R_t^P}{R_t^M}}_{\substack{\text{Short-term}\\ \text{differential}_t}} = \underbrace{\frac{\omega_t}{1-\omega_t}}_{\substack{\text{Banks}\\ \text{external}\\ \text{exposure}_t}} \underbrace{\left(\frac{\hat{R}_t^\star - R_t^\star}{R_t^\star}\right)}_{\substack{\text{Dollar funding}\\ \text{premium}_t}}. \tag{10}$$

First, the short-term differential comoves with the dollar funding premium as long as the foreign liability share is positive ($\omega_t > 0$). A higher dollar premium results in an increase in the short-term differential. It increases the costs of funding of local banks and, in turn, they pass them to market rates in proportion to banks' external exposure.[14]

Second, the short-term differential increases with banks' external exposure, as measured by the share of external borrowing relative to total borrowing, as long as the dollar funding premium is positive ($\hat{R}_t^\star - R_t^\star > 0$, 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.

**Evidence on the External Debt of Emerging Economies** The model delivers a tight link between banks' external funding conditions and the local market rate. Two elements primarily contribute to this result. 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

[14] Bianchi and Lorenzoni (2022) propose a model in which time-varying dollar premium – due to changes in risk appetite of global intermediaries – is a primary source of economic fluctuations in emerging economies. We model these premia as an exogenous variable, and study how changes in them influence the home bank's demand for the market bond. In principle, however, the dollar funding premium can be correlated with domestic or external shocks, including US monetary policy surprises.




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

**Figure 5:** Facts about the External Debt of Emerging Economies

*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.

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) shows that the share of external liabilities of the domestic banking sector is around 35% on average for the emerging economies reporting to the *BIS*.

In Figure 5, 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 in 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 in 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.

# 5 Short-Rate Disconnect and Global Financial Conditions

We have documented that short-term market rates tend to depart from policy rates over the business cycle in emerging economies. In this section, we verify that the time-varying short-term differentials correlate with the premium on dollar funding, influenced by conditions in global financial markets, and the banking sector's external exposure.

We use the EMBI spread to proxy for the premium that a country pays on its dollar-denominated bonds relative to U.S. bonds $\hat{R}_t^{\star} - R_t^{\star}$.[15] To measure the share of external liabilities of the banking sector we use domestic banks' foreign liabilities (portfolio debt + other investment debt) as fraction of total domestic banks' liabilities (domestic + external) from Avdjiev et al. (2022).

Table 2 reports the estimated coefficients of a panel regression of the short-term differential on the dollar funding premium and banks' external exposure. The regression is at monthly frequency and includes country fixed effects, or country and month fixed effects.

First, Table 2 reveals that the short-term differential – the difference between the *home* market rate and the *home* policy rate – significantly comoves with the dollar 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. This supports the model's prediction that fluctuations in a country's external funding conditions transmit to the short-term market rate and contribute to its divergence from the policy rate.

Second, Table 2 indicates that the short-term differential widens at higher levels of banks' external exposure. Specifically, a 10 p.p. increase in a country's share of external liabilities

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

**Table 2:** Short-term Differential and Funding Conditions

| | Dependent variable: Short-term differential | | | | | |
|---|---|---|---|---|---|---|
| Dollar Funding Premium | 0.211*** | | 0.154*** | 0.157*** | | 0.088* |
| | (0.030) | | (0.029) | (0.036) | | (0.036) |
| Banks 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 | | | | ✓ | ✓ | ✓ |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

*Notes*: We use the EMBI spread to proxy for the premium that a country pays on its dollar-denominated bonds relative to U.S. bonds $\hat{R}_t^\star - R_t^\star$. To measure the share of external liabilities of the banking sector we use domestic banks' foreign liabilities (portfolio debt + other investment debt) as fraction of total domestic banks' liabilities (domestic + foreign) from Avdjiev et al. (2022).

corresponds to a 1-1.5 p.p. higher short-term differential. This relationship is both statistically and economically significant, and it supports the model's prediction. In the model, when external funding is costlier than domestic funding, an increase in banks' external exposure leads to a rise in their overall cost of funding, and this cost is transmitted to local market rates.[16]

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 differential.

Finally, in our analysis, we have operated under the assumption that the covered interest parity (CIP) condition remains valid. Should CIP not hold, the short-term differential would exhibit comovement with CIP deviations. Deviations from CIP would indeed impact the funding costs of domestic banks, leading to fluctuations in the required return on the domestic market bond.[17]

[16] Appendix Table B.4 indicates that money market rates are also related to banks' external exposure and funding conditions.

[17] In a prior version of this paper, we empirically confirmed that the short-term differential 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 higher CIP deviations. Importantly, we found no systematic relationship

# 6 Conclusions

Understanding how central banks conduct monetary policy in emerging economies is crucial as they face complex and evolving trade offs (Gourinchas, 2018; Akinci and Queralto, 2023; Kalemli-Ozcan, 2019; Egorov and Mukhin, 2023; Boz et al., 2020; Auclert et al., 2021). In this paper, we document that monetary policy transmission in emerging economies can be impaired, in a way that manifests itself through a 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.

We provide evidence that the short-term disconnect is related to fluctuations in external financial conditions, even after controlling for time fixed effects. We interpret this evidence through the lenses of a simple model of the banking sector of emerging economies. If local banks borrow a fraction of their liabilities from the global funding market in U.S. dollar and hedge their currency mismatch, as required by the regulation, market rates depart from the policy rate and the differential is related to global funding conditions and the external borrowing of domestic banks. As a result both local and foreign shocks can affect these funding conditions of domestic banks.

Our results have important policy implications. Since foreign investors' pricing of risk pass-through domestic banks, domestic policies and regulation have a critical role in affecting external funding conditions that domestic intermediaries are subject to. As a result, other policies have the potential to increase the effectiveness of monetary policy in emerging markets.

between the short-term differential and movements in uncovered interest parity (UIP) deviations. This is consistent with the model in Section 4, where banks fully hedge their foreign-currency positions. It is worth noting that UIP deviations may still significantly influence emerging economies through channels other than fluctuations in the short-term differentials. Our model implies, with full hedging of the domestic financial intermediary, UIP will not matter for the market-policy rate disconnect.

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# Appendix

## A Sample

**Table A.1:** List of Countries

*A. Emerging Economies*

| | | | |
|---|---|---|---|
| Afghanistan, Islamic Republic of | Ecuador | Malta | Serbia, Republic of |
| Albania | Egypt | Mauritania | Seychelles |
| Angola | Gambia, The | Mauritius | Sierra Leone |
| Argentina | Georgia | Mexico | Singapore |
| Armenia, Republic of | Ghana | Moldova | Slovak Republic |
| Azerbaijan, Republic of | Guatemala | Mongolia | Slovenia |
| Bangladesh | Hungary | Morocco | South Africa |
| Belarus | India | Mozambique | Sri Lanka |
| Bolivia | Indonesia | Myanmar | Tanzania |
| Brazil | Iraq | Nepal | Thailand |
| Bulgaria | Jamaica | Nicaragua | Tunisia |
| Cambodia | Kazakhstan | Nigeria | Turkey |
| Chile | Kenya | Pakistan | Uganda |
| China | Korea, Republic of | Paraguay | Ukraine |
| Colombia | Kosovo, Republic of | Peru | Uruguay |
| Congo, Democratic Republic of | Kuwait | Philippines | Vietnam |
| Costa Rica | Kyrgyz Republic | Poland | Zambia |
| Croatia | Latvia | Romania | |
| Czech Republic | Libya | Russian Federation | |
| Dominican Republic | Malaysia | Rwanda | |

*B. Advanced Economies*

| | | | |
|---|---|---|---|
| Australia | Germany | Japan | Sweden |
| Canada | Iceland | New Zealand | Switzerland |
| Denmark | Ireland | Norway | United Kingdom |
| Euro Area | Israel | Portugal | |
| Finland | Italy | Spain | |

**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.

**Table A.4:** Dataset: Money Market Rates

| Country | Start | End | Observations | Country Group | Source | *Bloomberg* ticker |
|---|---|---|---|---|---|---|
| Australia | 1996q4 | 2018q4 | 89 | AE | Bloomberg | ADBB3MCMPNCurncy |
| Canada | 1991q4 | 2018q4 | 109 | AE | Bloomberg | CDOR03 |
| Denmark | 1990q1 | 1998q4 | 36 | AE | Bloomberg | CIBO03M |
| Euro Area | 1998q4 | 2014q4 | 65 | AE | Bloomberg | EUDRCCMPNCurncy |
| Finland | 1990q1 | 1994q4 | 20 | AE | IMF | |
| Iceland | 1998q3 | 2018q4 | 82 | AE | Bloomberg | SEDL3MDE |
| Ireland | 1991q2 | 1996q3 | 22 | AE | Bloomberg | DIBO03M |
| Israel | 2000q4 | 2018q4 | 73 | AE | Bloomberg | TELBOR03 |
| Italy | 1991q1 | 1996q3 | 23 | AE | Bloomberg | RIBORM3M |
| Japan | 1990q1 | 2017q2 | 106 | AE | Bloomberg | JY0003M |
| New Zealand | 1995q4 | 2018q4 | 93 | AE | Bloomberg | NDBB3MCMPNCurncy |
| Norway | 1990q1 | 2018q4 | 116 | AE | Bloomberg | NIBOR3M |
| Portugal | 1990q1 | 1993q2 | 14 | AE | Bloomberg | OEPTR005 |
| Sweden | 1990q1 | 2015q1 | 101 | AE | Bloomberg | STIB3M |
| Switzerland | 1990q1 | 2011q2 | 86 | AE | Bloomberg | SF0003M |
| United Kingdom | 1990q1 | 2018q4 | 116 | AE | Bloomberg | BP0003M |
| Argentina | 2001q4 | 2011q4 | 41 | EME | Bloomberg | ARLBP90 |
| Chile | 2001q4 | 2018q4 | 69 | EME | Bloomberg | CLTN90DS,CLTN90DN |
| China | 2005q3 | 2018q4 | 54 | EME | Bloomberg | CNIBR3M,SHIF3M |
| Colombia | 1995q1 | 2018q4 | 96 | EME | Bloomberg | COMM90D |
| Costa Rica | 2016q1 | 2018q4 | 12 | EME | Bloomberg | CRRI3M |
| Czech Republic | 1993q2 | 2018q4 | 103 | EME | Bloomberg | PRIB03M |
| Hungary | 1997q2 | 2018q4 | 87 | EME | Bloomberg | BUBOR03M |
| India | 1998q4 | 2018q4 | 81 | EME | Bloomberg | IN003M |
| Indonesia | 1997q2 | 2018q4 | 87 | EME | Bloomberg | JIIN3M |
| Kazakhstan | 2001q3 | 2018q4 | 70 | EME | Bloomberg | KZDR90D |
| Korea | 2004q3 | 2018q4 | 58 | EME | Bloomberg | KRBO3M |
| Kuwait | 1990q1 | 2002q4 | 44 | EME | IMF, Bloomberg | KIBOB3M,4436586 |
| Malaysia | 1990q1 | 2018q4 | 89 | EME | Bloomberg | KLIB3M |
| Mexico | 1997q1 | 2018q4 | 88 | EME | IMF, Bloomberg | MXIB91DT,2736586 |
| Nigeria | 2008q1 | 2018q4 | 42 | EME | Bloomberg | NRBO3M |
| Pakistan | 2001q3 | 2018q4 | 69 | EME | Bloomberg | PKDP3M |
| Paraguay | 2012q3 | 2018q4 | 26 | EME | Bloomberg | PYMM3MON |
| Peru | 2002q3 | 2018q4 | 66 | EME | Bloomberg | PRBOPRB3 |
| Philippines | 2001q2 | 2018q4 | 70 | EME | Bloomberg | PREF3MO |
| Poland | 1996q3 | 2018q4 | 90 | EME | Bloomberg | WIBR3M |
| Romania | 1998q1 | 2012q3 | 59 | EME | Bloomberg | BUBR3M |
| Russia | 2000q3 | 2018q4 | 74 | EME | Bloomberg | MMIBR3M,MOSKP3 |
| Serbia | 2005q3 | 2018q4 | 54 | EME | Bloomberg | 9421P276 |
| Singapore | 1999q3 | 2018q4 | 78 | EME | Bloomberg | SIBF3M |
| Slovak Republic | 1995q1 | 2008q4 | 56 | EME | Bloomberg | BBOR3M |
| South Africa | 1999q1 | 2018q4 | 80 | EME | Bloomberg | JIBA3M |
| Sri Lanka | 2000q4 | 2018q4 | 70 | EME | Bloomberg | SLBR3MON |
| Thailand | 2002q2 | 2018q4 | 67 | EME | Bloomberg | BOFX3M |
| Tunisia | 2016q2 | 2018q4 | 11 | EME | Bloomberg | TUNBOR3M |
| Turkey | 2006q4 | 2018q4 | 49 | EME | Bloomberg | TRLXB3M |
| Vietnam | 2009q2 | 2018q4 | 39 | EME | Bloomberg | VNCD3MO |

*Notes*: The table reports the sample coverage of money market 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 | |
|---|---|---|---|---|
| | $i_t^P$ | $i_t^P$ | $i_t^P$ | $i_t^P$ |
| $i_{t-1}^P$ | 0.889*** | 0.873*** | 0.944*** | 0.930*** |
| | (0.0066) | (0.0073) | (0.0075) | (0.0082) |
| $\pi_t$ | 0.213*** | 0.330*** | 0.304*** | 0.265*** |
| | (0.023) | (0.027) | (0.029) | (0.028) |
| $\Delta\text{GDP}_t$ | 0.0102*** | | 0.00133 | |
| | (0.0034) | | (0.0017) | |
| output gap$_t$ | | 0.0324** | | 0.0844*** |
| | | (0.016) | | (0.011) |
| R-squared | 0.90 | 0.89 | 0.96 | 0.95 |

*Notes*: The table reports estimates of equation (1) by OLS. For both emerging and advanced economies, the first specification uses real GDP growth to proxy for economic activity while the second specification uses the output gap. These regressions feature country fixed effects. Data are at a quarterly frequency. 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 (including Rate of Exchange Rate Depreciation)

| | Emerging Economies | | Advanced Economies | |
|---|---|---|---|---|
| | $i_t^P$ | $i_t^P$ | $i_t^P$ | $i_t^P$ |
| $i_{t-1}^P$ | 0.857*** | 0.824*** | 0.939*** | 0.921*** |
| | (0.0057) | (0.0078) | (0.0075) | (0.0094) |
| $\pi_t$ | 0.356*** | 0.368*** | 0.290*** | 0.289*** |
| | (0.027) | (0.034) | (0.029) | (0.031) |
| $\Delta\text{GDP}_t$ | 0.00908** | | 0.00109 | |
| | (0.0037) | | (0.0018) | |
| output $\text{gap}_t$ | | 0.0780*** | | 0.0966*** |
| | | (0.020) | | (0.013) |
| $\Delta$ Spot Ex. $\text{Rate}_t$ | 0.0681*** | 0.0573*** | -0.0199*** | -0.0157*** |
| | (0.0071) | (0.0077) | (0.0043) | (0.0044) |
| R-Squared | 0.93 | 0.87 | 0.95 | 0.95 |

*Notes*: The table reports estimates of equation (1) by OLS. For both emerging and advanced economies, the first specification uses real GDP growth to proxy for economic activity while the second specification uses the output gap. These regressions feature country fixed effects. Data are at a quarterly frequency. Standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

**Table B.3:** 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 |
| Money Market Rate | 180.50 | 180.48 |
| 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 |
| UIP Premium | 95.12 | 95.07 |

*Notes*: The weak instrument test results are displayed above for the baseline specification (Figure 3) 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.

**Table B.4:** Short-Rate Differential and Funding Conditions (using Money Market Rates)

| | Dependent variable: Short-term differential | | | | | |
|---|---|---|---|---|---|---|
| Dollar Funding Premium | 0.363*** | | 0.346*** | 0.448*** | | 0.412*** |
| | (0.072) | | (0.076) | (0.093) | | (0.099) |
| Banks External Exposure | | 0.044* | 0.014 | | 0.054** | 0.022 |
| | | (0.019) | (0.020) | | (0.020) | (0.021) |
| R-squared | 0.366 | 0.360 | 0.367 | 0.408 | 0.403 | 0.408 |
| Observations | 2113 | 2113 | 2113 | 2113 | 2113 | 2113 |
| Countries | 20 | 20 | 20 | 20 | 20 | 20 |
| Country FE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Time FE | | | | ✓ | ✓ | ✓ |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

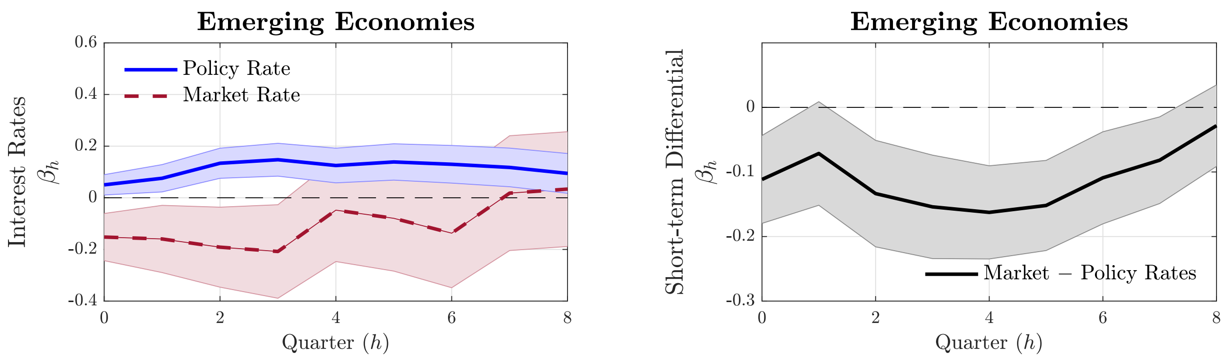
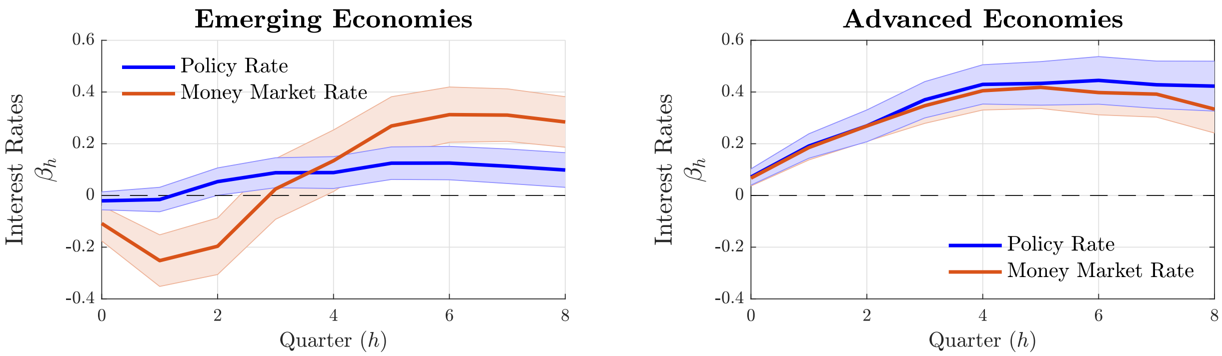
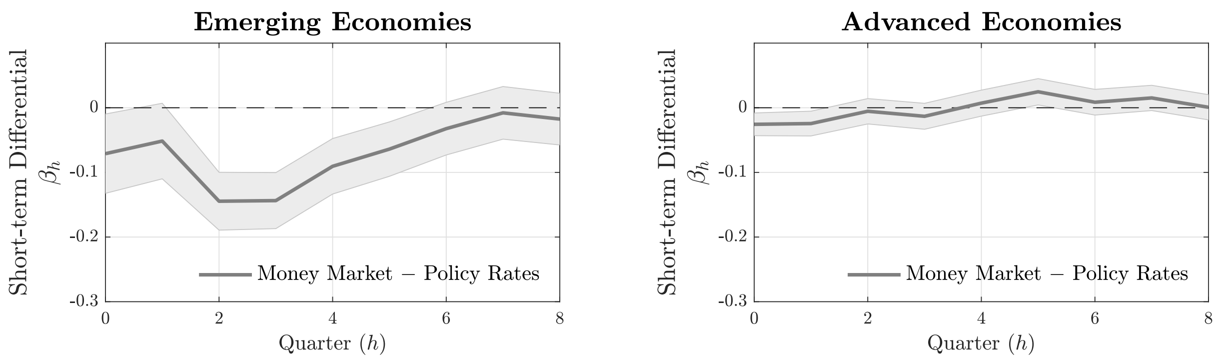



**Figure B.1:** Cyclical Behavior of Interest Rates in Emerging and Advanced Economies (using Sub-Sample of Emerging Economies that Conduct Interest-Rate-Based Policy)

*Notes*: The figure reports the panel estimates of $\beta_h$'s in regression equations (2) and (3) 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 EMEs 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, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russia, South Africa, Sri Lanka, Thailand, Turkey, Ukraine, Uruguay, and Vietnam.




**(a)** Policy Rates and Market Rates




**(b)** Short-Rate Differential

**Figure B.2:** Cyclical Behavior of Interest Rates in Emerging and Advanced Economies (using Money Market Rates)

*Notes*: The figure reports the panel estimates of $\beta_h$'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.