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MONETARY POLICY CYCLICALITY IN EMERGING ECONOMIES

Pierre De Leo
Gita Gopinath
Şebnem Kalemli-Özcan

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ABSTRACT

Conventional wisdom holds that monetary policy in emerging economies is procyclical, unlike in advanced economies. Using a large sample of countries from the mid-1990s onwards, we show that the conduct of monetary policy is not fundamentally different across these two groups of countries. Emerging and advanced economies alike lower their policy rates when economic activity decelerates, both unconditionally and following exogenous U.S. monetary policy tightening. We show that the common practice of using market rates, such as government bond rates, to proxy for the stance of monetary policy leads one to draw inaccurate conclusions about emerging economies' monetary policy cyclicality due to inherent risk premia in those market rates.

Pierre De Leo
University of Maryland
4118E Tydings Hall
College Park, MD 20742
deleop@umd.edu

Gita Gopinath
International Monetary
Fund 700 19th St. NW
Washington, DC 20431
ggopinath@imf.org

Şebnem Kalemli-Özcan
Department of Economics
University of Maryland
Tydings Hall 4118D
College Park, MD 20742-7211
and CEPR
and also NBER
kalemli@econ.umd.edu

1 Introduction

This paper revisits the question of the cyclical behavior of monetary policy in emerging economies (EMEs), and its conduct in the wake of external economic shocks. We show that, since the mid-1990s, the cyclical behavior of EMEs' monetary policy was not fundamentally different from the countercyclical approach that characterizes monetary policy in advanced economies (AEs). First, we show that according to estimated policy rules á la Taylor (1993, 1999) both EMEs and AEs adjust the policy rate significantly in response to changes in both inflation and economic conditions such as the output gap. Second, we find that periods of high real GDP growth are associated with higher policy rates in EMEs in the short run. Third, we document that EMEs' monetary policy is expansionary after negative external shocks: policy rates in EMEs decline in response to exogenous tightening in the U.S. monetary policy. EMEs' monetary policy has thus been largely countercyclical over the last three decades.

Our results challenge the notion that EMEs' monetary policy is procyclical, originating in Kaminsky et al. (2005) and Vegh and Vuletin (2013) and often referred to as an established fact (see, for example, Coulibaly, 2021). Our key observation is that the existing empirical research on EMEs' monetary policy behavior uses market interest rates, such as treasury rates or money market rates, to proxy for monetary policy rates. Because market rates conflate monetary policy stance and risk premia priced-in by the markets, these rates can give misleading results when a country's policy stance transmits imperfectly to market rates. We thus use policy rates directly to measure the stance of EMEs' monetary policy.

While short-term market rates display a significant negative relationship with real GDP, we document that policy rates are positively related to real GDP in emerging economies. We show that using market rates to proxy for the stance of monetary policy in EMEs leads one to find "procyclical monetary policy," including contractionary responses to U.S. monetary policy tightening, even if the underlying policy is in fact countercyclical. Our evidence thus reveals that monetary policy is countercyclical in EMEs, while earlier findings emerge because of the comovement properties of risk premia embedded in EMEs short-term market rates.[1]

[1] The literature on procyclical monetary and fiscal policies in EMEs was initiated by Kaminsky et al. (2005). In a sample that covers 1960-2003, Kaminsky et al. find strong evidence in favor of procylical *fiscal* policy (see also Gavin and Perotti, 1997), but only mild evidence in support of the notion of procyclical *monetary* policy, partly because of scant data on monetary policy rates. In a sample that covers 1960-2009, Vegh and Vuletin (2013) find a negative correlation between the cyclical components of short-term market interest rates and real GDP in emerging economies, but note that in the 2000-2009 sample this correlation becomes positive for one third of EMEs.

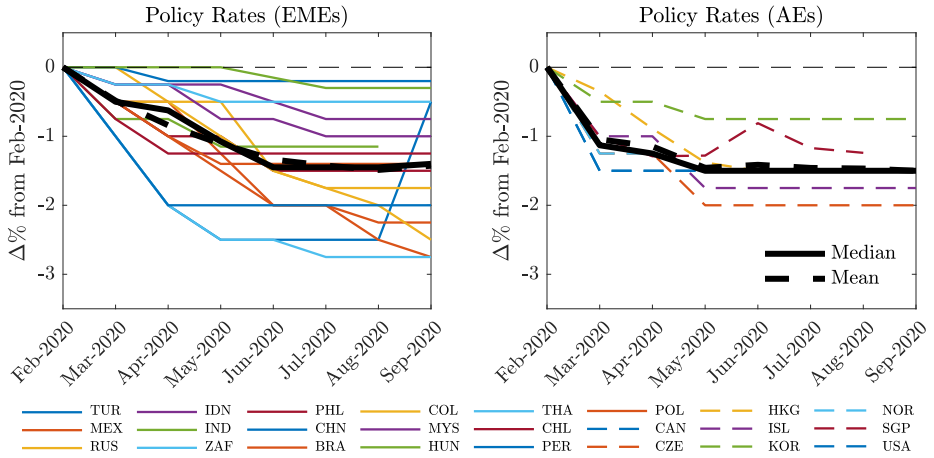
During the COVID-19 pandemic both AEs and EMEs lowered their monetary policy rates to counter the economic recession, as shown in Figure 1a. While the COVID-19 shock has both domestic and external components, EMEs' easing monetary policy in the face of large capital outflows has surprised many (Aguilar and Cantu Garcia, 2020). A monetary policy easing could contribute to currency depreciations and feed back into inflation expectations, damaging EMEs' hard-won reputation in successfully targeting inflation since the early 2000s.[2] In addition, depreciations can cause balance sheet distress for governments and firms that have borrowed in foreign currency. The argument is that these forces can overwhelm the standard desire to cut rates to stimulate the economy. Thus, EME central banks may want to protect the exchange rate with procyclical monetary policy during episodes of capital outflows. However, this narrative alone does not accurately describe the behavior of policy rates during previous events of large capital outflows. In fact, we observe that the vast majority of EMEs' central banks cut their policy rates during both the Global Financial Crisis (GFC) and Taper Tantrum episodes, as shown in the Figures 1b and 1c, respectively.[3]

To formally characterize EMEs monetary policy response to external shocks, we rely on U.S. monetary policy shocks. We do so because not every capital outflow episode can be characterized as an exogenous external shock. We find that *exogenous* U.S. monetary policy shocks drive a wedge between policy rates and short-term market rates in EMEs. After a U.S. monetary tightening, EME policy rates *decline* while EME bond and money market rates *increase*. This result indicates that risk premia in EME short-term market rates are related to external shocks, and they need to be accounted for when studying EMEs monetary policy responses to external shocks. Besides, this evidence reveals that EMEs' monetary policy aims to stimulate economic activity during externally-driven contractions, but the patterns of risk premia counter the stimulative action brought about by lower policy rates, creating a disconnect between the monetary policy rates and short-term market rates. This result is in line with the evidence that EMEs risk premia fluctuate over the global financial cycle, rising during tightening of U.S. monetary policy or global capital outflows (Kalemli-Ozcan, 2019;

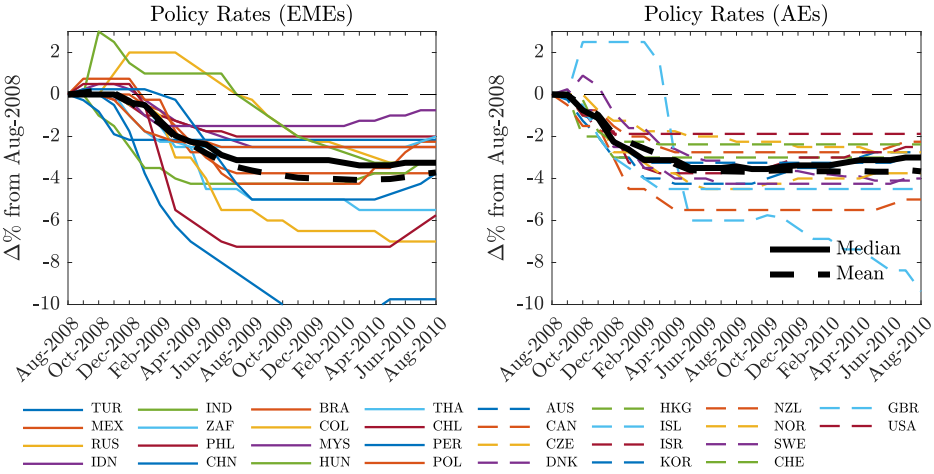
[2] Several studies document a high exchange rate pass-through into import prices in EMEs (see, for example, Burstein and Gopinath, 2014).

[3] Figure 1 uses data from Bloomberg Finance L.P.; IMF, World Economic Outlook database. Focusing largely on the sudden stops occurred in 2008Q4 around GFC, 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).

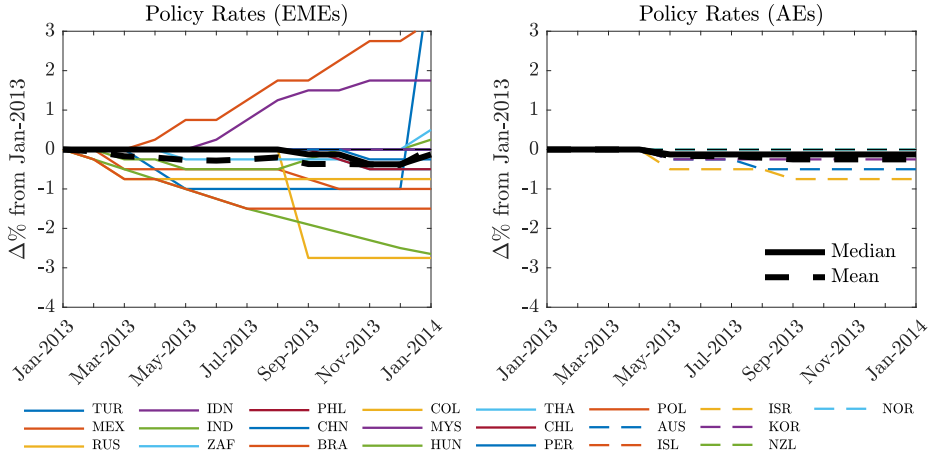
Figure 1: Monetary policy rates around episodes of global financial distress



(a) Monetary policy rates around COVID-19



(b) Monetary policy rates around the Global Financial crisis



(c) Monetary policy rates around the Taper Tantrum

Gourinchas et al., 2021). As a result, market interest rates may rise even though policy rates decline following contractionary external shocks, due to countercylical risk premia in EMEs (Kalemli-Ozcan, 2019).

A distinct, yet related, empirical literature investigates the degree of monetary policy autonomy of EMEs. Some papers analyze the cross-country co-movement of interest rates, although also using market rates to proxy for the monetary policy stance. Shambaugh (2004) examines the extent to which EMEs short-term rates comove with U.S. interest rates, finding that floaters' rates follow U.S. interest rates much less closely than pegs. This result also emerges for exogenous U.S. monetary policy shocks, not just for actual U.S. Fed Funds rate movements (Bluedorn and Bowdler, 2010), and does not appear to rely on the presence of capital controls (Miniane and Rogers, 2007; Klein and Shambaugh, 2015).[4] Recently, Rey (2013) and Miranda-Agrippino and Rey (2020) argue that floaters may not enjoy full monetary autonomy under the global financial cycle. In fact, global leverage and capital flows are significantly affected by changes in global risk aversion and U.S. monetary policy in both in floaters and peggers. Obstfeld et al. (2019) document that floaters experience milder macroeconomic and financial fluctuations than peggers during periods of heightened global risk aversion. These papers do not investigate the different responses of short-term market rates and monetary policy rates. Kalemli-Ozcan (2019) documents that the risk premia in short-term market rates underlie the responses of leverage and capital flows to U.S. monetary policy in floaters. Taken together, all these papers suggest that floating exchange rate regimes grant some degree of monetary policy autonomy to EMEs and partial insulation from external shocks. By examining the different behavior of floating EME's monetary policy response and risk premia in short rates, our paper can shed light on the question of what prevents floaters from enjoying full insulation from external shocks.

2 Monetary Policy in EMEs

In virtually all studies, the stance of monetary policy is *proxied* by short-term market rates such as deposit rates, government bond/treasury rates, money market rates, or lending rates, while actual policy rates are rarely adopted. None of these rates are risk-free in EMEs. Deposit rates are rates that banks pay on deposits, treasury rates are rates at which governments issue their debt instruments, money market rates are rates charged on loans among banks, and

[4] See also Obstfeld et al. (2004), Obstfeld (2015), Aizenman et al. (2010), and Han and Wei (2018).

lending rates are rates on bank loans (typically corporate loans). While closely related, these market rates are not directly comparable, and they measure the stance of monetary policy only imperfectly. In fact, market rates differ from the policy rate by the time-varying risk premia underlying each specific lending relationship. Because the time-variation in short-term risk premia is typically larger in EMEs relative to AEs, distinguishing between policy rates and market rates is of first-order importance in EMEs.

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).[5] We use available quarterly data from 1990:Q1 to 2018:Q4. Appendix A lists the countries included in the dataset.

We collect all available data on policy rates (i^P) as well as treasury rates (i^T) and money market rates (i^M). Policy rates are the target interest rate set by central banks in their efforts to influence short-term interest rates as part of its monetary policy strategy. For policy interest rates, our preferred data source is the *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. The maturity of short-term interest rates in our sample is 3 months.[6] The sources of 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.

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 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: $i_t^P = \rho i_{t-1}^P + (1-\rho)\left(\phi_\pi \pi_t + \phi_y \tilde{y}_t\right) + \varepsilon_t^P$. According to this rule, the central bank adjusts the policy rate in response to changes in inflation (with coefficient ϕ_π) and economic conditions, such as output growth or the output gap (with coefficient ϕ_y). The rule allows for policy

[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).

[6] We find similar results when using 1-month rates or 12-month rates.

smoothing by including a first-order autoregressive term in the Taylor rule, and for i.i.d. monetary policy shocks, ε_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 OLS to estimate the parameters of the Taylor rule. 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 (Δgdp_t) or the country's output gap, $Output\ gap_t$, from IMF (2020, Chapter 3).[7]

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***	0.944***	0.930***
	(0.0058)	(0.0079)	(0.0075)	(0.0082)
π_t	0.394***	0.419***	0.304***	0.265***
	(0.027)	(0.034)	(0.029)	(0.028)
Δgdp_t	0.00892**		0.00133	
	(0.0037)		(0.0017)	
$Output\ gap_t$		0.0591***		0.0844***
		(0.020)		(0.011)
R-Squared	0.93	0.87	0.96	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. These regressions feature country fixed effects. Data are at a quarterly frequency. Standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

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

[7] Spline interpolation is applied to annual output gap data to obtain quarterly figures.

First, we note that the R-squared of these regressions is very high, indicating that Taylor rules appear to describe the conduct of monetary policy in these countries fairly well. Second, the estimates of Tayor 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 ϕ_π and ϕ_y are around 2.4 and 0.34, respectively. 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 interest 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.[8] Appendix Table A.5 reports the estimates of Taylor rule coefficients for this modified sample. All results remain statistically significant.

We thus observe that the monetary policy behavior, as captured by estimated central banks' reaction functions, does not point to "monetary policy procyclicality" in emerging economies. Below we argue that the notion of monetary policy procyclicality emerges only when one uses short-term market rates to proxy for the stance of monetary policy in emerging economies.

Cyclical behavior of short-term rates We now turn to examining the cyclical behavior of short-term 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 interest rates both contemporaneously and at short-term horizons. We do so because policy interest rates tend to respond gradually to observed changes in GDP (see, for example, Table 1). In particular, we use a reduced form local projection approach where we regress interest rates and risk premia at horizons within 2 years on current real GDP growth, controlling for lag of the

[8] Thus, we exclude the "freely falling" category in Ilzetzki et al. (2019).

dependent variable. More specifically, we consider the following regression relationships:

$$i^j_{t+h} = \alpha^j_h + \beta^j_h \Delta gdp_t + \gamma^j_h i^j_{t-1} + \epsilon^j_{t+h}; \tag{2}$$

$$rp^k_{t+h} = \alpha^{rp,k}_h + \beta^{rp,k}_h \Delta gdp_t + \gamma^{rp,k}_h rp^k_{t-1} + \epsilon^{rp,k}_{t+h}; \tag{3}$$

for $j = P, T, M$, $k = T, M$ and $h = 0, \ldots, 8$ quarters.

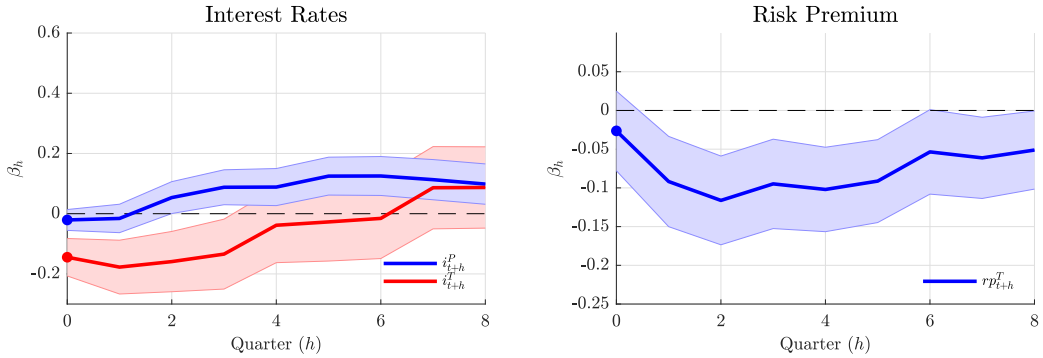
In regression equation (2), i^T and i^M denote the country's short-term treasury and money market rates, respectively, and gdp_t is the country's real GDP. To measure risk premia, we simply take the difference between market rates and policy rates. For instance, in regression equation (3), the risk premium in treasury rates is defined as $rp^T_t = i^T_t - i^P_t$. Here we broadly refer to rp as "risk premium" and acknowledge that it can represent credit, liquidity or policy risk. The coefficients of interest are the β_h's in equations (2) and (3). The β_h's in equation (2) captures the relationship between current real GDP growth and specific interest rates, both contemporaneously and in the near future. Instead, the β_h's in equations (3) capture the dynamic relationship between current real GDP growth and the risk premia in treasury and money market rates.

Figure 2 depicts the estimated β^h's in regression equations (2)-(3) for both emerging and advanced economies. We observe that in emerging economies high real GDP growth predicts a significant increase in policy rates within two years. In these countries, however, high real GDP growth predicts a significant decline in treasury rates within two years as well as a significant decline in the risk premium implied by treasury rates. To the contrary, in advanced economies, policy and treasury rates exhibit a very similar relationship with real GDP growth as well as risk premium that is only mildly countercyclical. Similar results emerge if one uses money market rates instead on treasury rates, as shown in Figure 3.

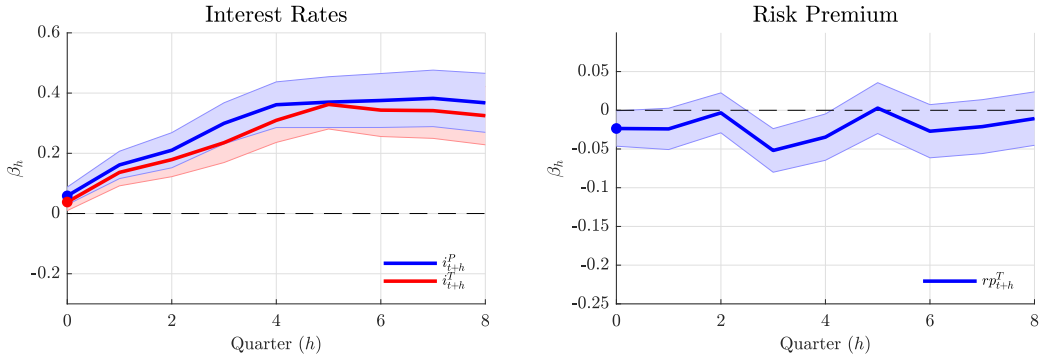
Taken together, these findings indicate that there is a systematic difference in the cyclical behavior of short-term risk premia between emerging and advanced economies. In fact, risk premia are strongly countercyclical in emerging economies while they are largely a-cyclical in advances economies. For this reason, the common practice of using short-term market rates to proxy for the stance of monetary policy leads to inaccurate conclusions about monetary policy cyclicality in emerging economies (whereas this is not the case, qualitatively, in advanced economies). In other words, the evidence based on short-term market rates may induce one to argue that monetary policy acts pro-cyclically in emerging economies but countercyclically

Figure 2: Dynamic properties of interest rates and risk premia

(a) Emerging Economies



(b) Advanced Economies

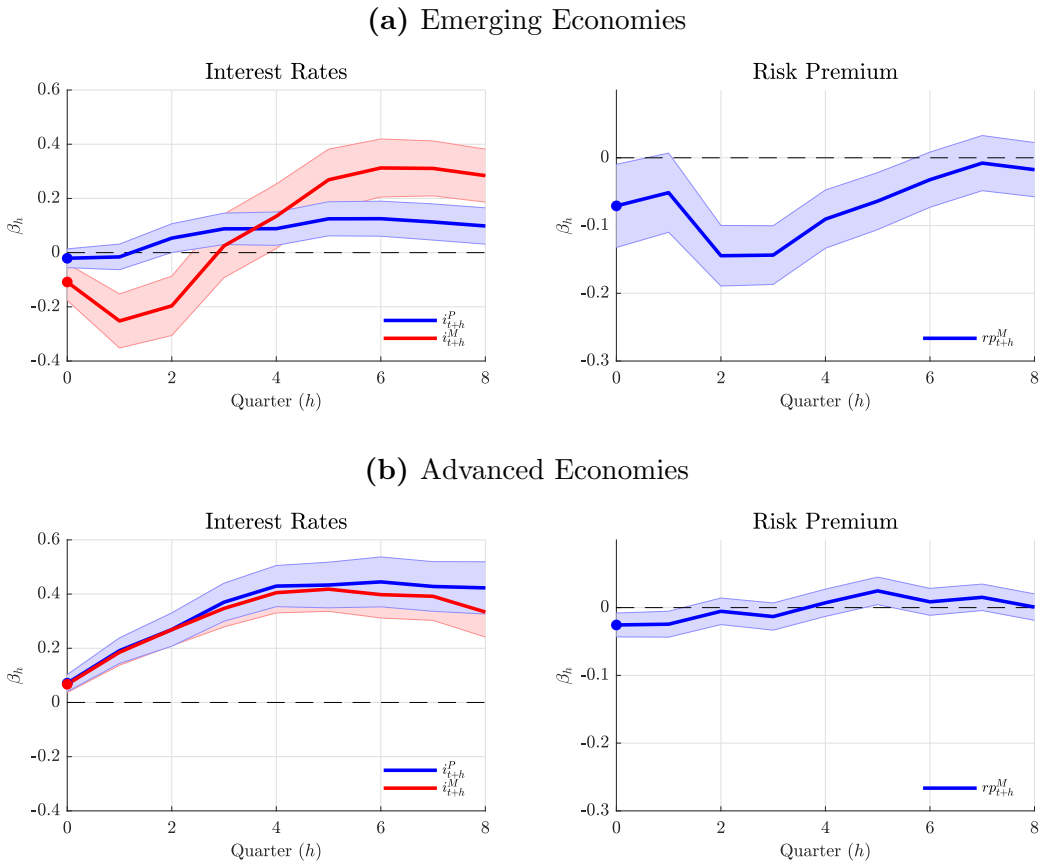


Notes: The figure reports the panel estimates of β_h's in regression equations (2) and (3). 90% confidence intervals are shown by the shaded areas. These regressions feature country fixed effects. Data are at a quarterly frequency.

in advanced economies, even though this is not the case.

Policy rates as measures 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 EMEs 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

Figure 3: Dynamic properties of interest rates and risk premia (using money market rates)



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

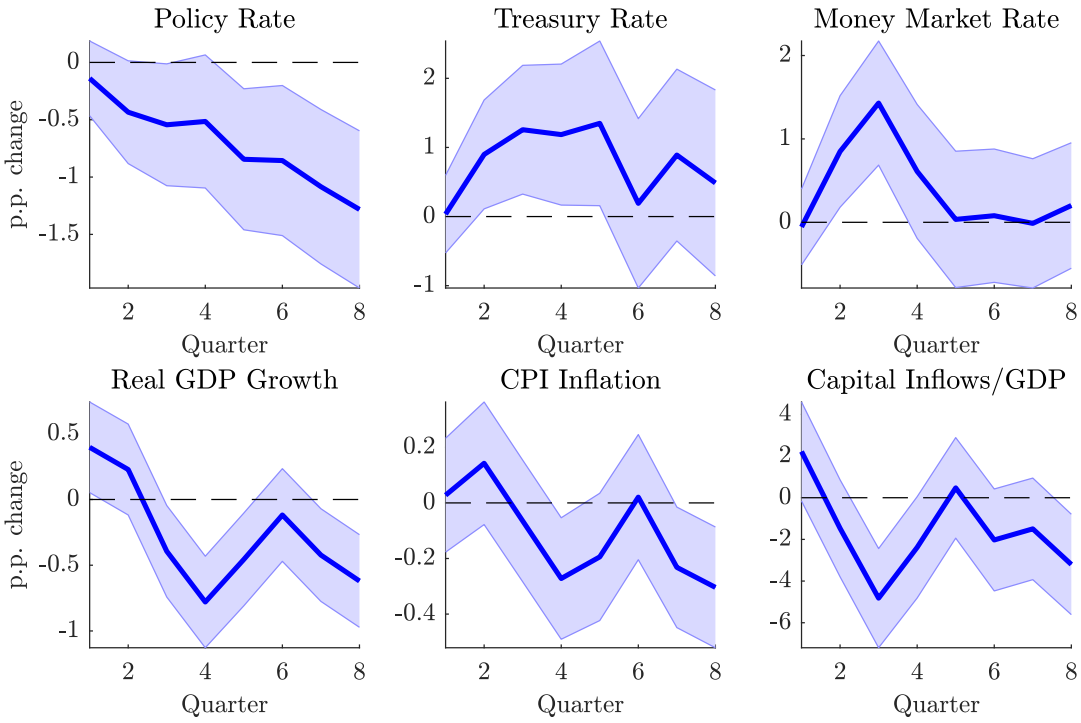
reports, and monetary policy reports issued by central banks.[9] Notwithstanding the smaller sample size, the results for this subsample of EMEs, reported in Figure A.1 align closely with the baseline results, indicating a strong degree of monetary policy counter-cyclicality and a significant difference in cyclicality between policy rates and short-term market rates.

Dynamic effects of a U.S. monetary policy shock The cyclical behavior of policy rates summarizes the general tendencies of monetary policy in EMEs. However, this may conceal a different behavior 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

[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.

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 4: Dynamic effects of a U.S. monetary policy tightening



Notes: Impulse responses of EME short-term rates 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.

All economic agents in EMEs 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). 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:

$$y_{j,t+h} = \alpha_j + \beta_h \hat{i}_t^{US} + \gamma_h W_t + \varepsilon_{j,t+h} \quad h = 0, 1, 2, 3 \ldots \tag{4}$$

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 (4), $\hat{i}_t^{US}$ 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.

Figure 4 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 EMEs GDP, CPI inflation and capital inflows.[10] Although the response of policy rates are unique to our paper, the other responses, including VIX and the exchange rate, are consistent with those in Miranda-Agrippino and Rey (2020) and Kalemli-Ozcan (2019).

Let us elaborate on the response of the policy rate and the short-term interest rates. In the wake of a tightening in U.S. monetary policy, central banks in EMEs cut their policy rates while both treasury and money market rates significantly increase. As a result, a U.S. monetary policy tightening brings about a significant increase in risk premia (Kalemli-Ozcan, 2019) to the point of generating qualitatively opposite responses in policy and market rates.

3 Conclusions

Understanding how central banks conduct monetary policy in EMEs is crucial given that they face complex and evolving trade offs (Gourinchas, 2018; Akinci and Queraltó, 2018; Egorov and Mukhin, 2020; Boz et al., 2020; Auclert et al., 2021). We documented that the average central bank in EMEs is no different then its AE counterpart as it raises its policy rate both in response to higher inflation and higher economic activity, comparable to the average AE. We also showed that the average central bank in EMEs lowers its monetary policy rate in response to an exogenous tightening in U.S. monetary policy that is a contractionary external shock for the EME. Therefore, monetary policy in EMEs does not appear procyclical once time-varying risk premia and the actual policy rate movements are separately measured.

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

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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

Taylor rule estimates excluding high-inflation countries and crisis periods Table A.5 reports the estimates of Taylor rule coefficients for 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.[11] The results for this subsample of EMEs are reported in Table A.5.

Table A.5: 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)
π_t	0.213***	0.330***	0.304***	0.265***
	(0.023)	(0.027)	(0.029)	(0.028)
Δgdp_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 (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

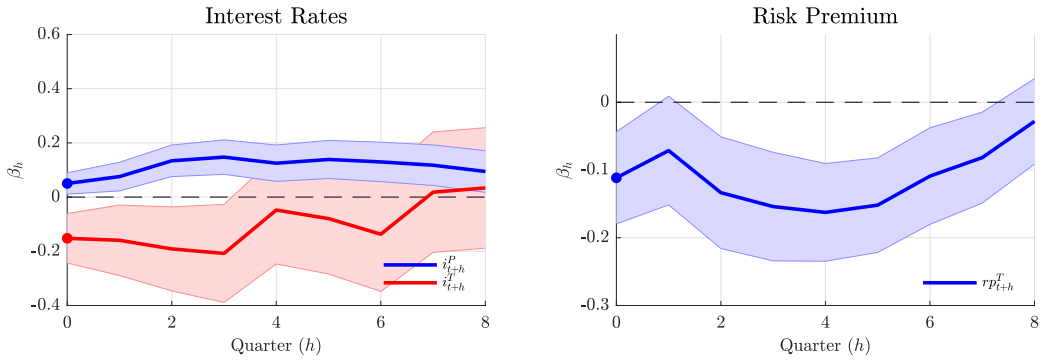
Results for subsample of EMEs that conduct interest-rate-based monetary policy Here we report our main results for the subsample of EMEs that uses a policy rate as the primary monetary policy instrument for most part of the sample period, following Brandão-Marques et al.'s (2021) classification based on the examination of historical reports, such as

[11] Thus, we exclude the "freely falling" category in Ilzetzki et al. (2019).

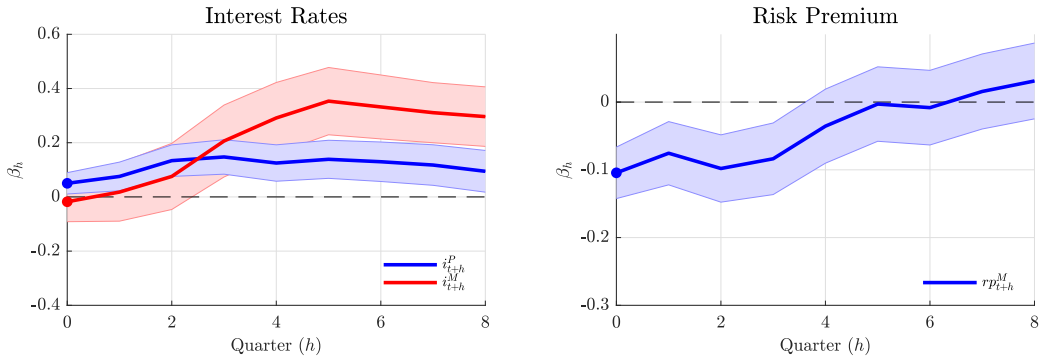
IMF Article IV staff reports, and monetary policy reports issued by central banks. The countries selected as conducting interest-rate based monetary policy are: Armenia, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Egypt, Guatemala, Hungary, Malaysia, Mexico, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russia, South Africa, Sri Lanka, Thailand, Turkey, Ukraine, Uruguay, and Vietnam. The results for this subsample of EMEs are reported in Figure A.1.

Figure A.1: Dynamic properties of interest rates and risk premia (subsample of EMEs that conduct interest-rate-based monetary policy)

(a) Emerging Economies – Treasury Rates



(b) Emerging Economies – Money Market Rates



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