CIP Deviations, Commodity Markets Shocks, and the Role of Macroprudential Policy

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Abstract

We analyze Covered Interest Parity (CIP) deviations across advanced and emerging economies after the crisis, using LIBOR and commercial paper data. Using a lag-augmented local projection framework, we leverage identified demand- and supply-driven commodity shocks and examine their interaction with macroprudential tightenings. We find that a policy tightening alone deepens CIP deviations by 1–2 basis points in advanced economies and by 15–20 in emerging markets. Demand shocks raise deviations by 2–4 basis points in advanced economies but decrease them by 5–10 in emerging markets, while supply shocks have more uniform effects. Additionally, we observe that macroprudential policy can influence the impact of commodity market shocks, whereas this feature does not generalize to other types of global disturbances, such as monetary surprises. These results highlight the complexity of financial regulation and the importance of considering its potential unintended consequences when designing prudential measures.

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1 Introduction

The covered interest parity (CIP) condition has long served as a central assumption of international finance theory, positing that arbitrage should eliminate systematic differences in money market rates across currencies. The 2007–08 financial crisis disrupted this condition, leading to persistent and economically significant CIP deviations that challenge a key assumption underlying standard models (Du and Schreger, 2016; Du, Tepper, and Verdelhan, 2018). While post-crisis research has established that regulatory constraints contribute to these deviations (Ivashina, Scharfstein, and Stein, 2015; Du, Hébert, and Huber, 2022; Augustin, Chernov, Schmid, and Song, 2024), less is known about the interaction of these policies with relevant global markets developments, and their potential for shaping international arbitrage conditions.

A natural example of these global developments are the shocks disrupting commodity markets, which, given their breadth and scope within the financial systems in most countries, lead to a tide of substantial spillovers that may interact with domestic regulatory frameworks. The key intuition behind this is that revised post-crisis macroprudential stances may have changed how intermediaries respond to global shocks. That said, the evidence supporting this idea remains limited and its verification is in order, as these are potentially crucial considerations for the design of effective financial regulation frameworks.

We study these effects of regulation by exploring whether macroprudential policies can shape the way in which commodity market shocks affect CIP deviations. We use a comprehensive empirical approach that combines identified commodity shocks with detailed macroprudential policy measures for advanced and emerging economies. Prior work (Ahnert, Forbes, Friedrich, and Reinhardt, 2021; Chari, Dilts-Stedman, and Forbes, 2022) suggests that macroprudential policies may be effective in mitigating the shocks coming from financial markets, but that they come with potential unintended effects that render the economies more susceptible to new sources of risk. Similarly, a mitigation role to global financial shocks has been associated with other forms of financial regulation (Kwak and Granados, 2025). In a similar spirit, and to recover both the direct effect of regulation and their potential interaction effects, we employ a lag-augmented local projections to estimate the dynamic responses to demand- and supply-side commodity shocks while accounting for interactions with contemporaneous regulatory changes.

Our empirical strategy has several advantages. First, we leverage recent advances in commodity market shock identification by Baumeister and Hamilton (2019), Baumeister and Guérin (2021), Känzig (2021a), and Baumeister (2023) that allow us to separately identify supply and demand innovations, which, in principle, should have different effects on currency markets and capital flows.[1] Second, we take advantage of a detailed and recent cross-country macroprudential database capturing the scope of post-crisis regulatory changes (Alam, Alter, Eiseman, Gelos, Kang, Narita,

[1] Chari, Dilts Stedman, and Lundblad (2020) and Chari, Dilts-Stedman, and Forbes (2022) suggest focusing on the shocks, as relevant effects for macroprudential policy come from extreme events rather than the median response of the economies.

Nier, and Wang, 2024). Third, following Cerutti and Zhou (2023), we construct high-frequency Libor-based CIP deviations for advanced economies and commercial paper-based measures for emerging markets. We aggregate the deviations to match policy timing and use a local projection framework to trace key dynamic effects over multiple horizons and estimate interaction terms directly.

Our analysis yields three main findings. First, macroprudential policy tightening systematically increases CIP deviations, generating higher cross-border funding premia in a sizable but heterogeneous fashion across different types of economies. More specifically, in estimates based on a quarterly cross-country sample spanning 2008-2019, we find that a one-unit tightening in the domestic macroprudential policy stance generates CIP deviations that are 1-2 basis points more negative for advanced economies and about 20 basis points more negative for emerging markets. We also document that the modal sign of the CIP deviations is negative, and therefore, regulation magnifies their discrepancy from arbitrage-free levels (zero) for all countries, although with a substantial extent of heterogeneity for countries with different extents of financial deepness. These estimates provide new quantitative evidence on how post-crisis regulatory reforms have contributed to the persistence of arbitrage opportunities in international money markets.

Our second finding shows that commodity market shocks are significant drivers of CIP deviations, with the direction and magnitude of effects depending on the underlying nature of the shock. Demand-side shocks, including oil price surprises and expectation-driven shocks, generate a 2-4 basis points increase in the CIP deviations in advanced economies with effects persisting for up to eight quarters. We interpret this as reflecting flight-to-quality dynamics where commodity demand shocks increase market risk, leading to higher USD safe-asset demand and currency depreciation in advanced economies. For emerging markets, the same shocks, by contrast, decrease the deviations by 5 to 10 basis points —magnifying them in absolute value— consistent with appreciation forces in commodity-exporting currencies that reduce risk premia. Supply-side shocks have more uniform effects, typically lowering deviations across both groups approximately by 5 basis points, an outcome explained by a weakened USD safe-haven appeal and currency appreciation forces with spot rates overshooting forward rates.

Third, we find evidence of interactions between macroprudential policy and commodity shocks. For commodity demand shocks, tighter prudential policies act as partial stabilizers by increasing uncertainty and often making responses statistically insignificant at certain horizons, though they do not fully offset the shocks' original effects. This mitigation suggests that balance sheet constraints can potentially dampen commodity-driven capital flow pressures. However, these interaction effects remain modest relative to the direct effects of macroprudential policies, and the combined effects still do not differ substantially in magnitude from the original shock responses. For supply shocks and other commodity innovations, similar patterns emerge in which macroprudential policies primarily increase uncertainty rather than materially altering the economic impacts of the responses. Notably, in the case of US monetary shocks, we find virtually no interaction effects with macroprudential policies, suggesting that the interaction mechanism is specific to commodity market conditions.

Our findings contribute to understanding the international transmission of both commodity shocks and macroprudential policies. While the conventional view treats these as independent forces in the literature, our results indicate that they can interact systematically. This implies that the effectiveness of macroprudential tools is not constant but varies with the global economic environment, and that commodity market developments can have more complex effects on international arbitrage than previously recognized. Moreover, the finding that interactions are specific to commodity shocks but absent for other shocks, such as monetary, suggests the presence of distinct transmission mechanisms operating through commodity-exposed sectors and currencies.

This paper makes several contributions to the literature on exchange rates and commodity shocks. To our knowledge, this is the first study to systematically analyze the role of interactions between commodity shocks and macroprudential policies in shaping CIP deviations. In a similar spirit, Bakshi and Panayotov (2013) and Ready, Roussanov, and Ward (2017a,b) examine the effects of commodity price movements on the CIP deviations, but they focus on the commodity currency premium rather than on shocks as a source of transmission. On the other hand, while Du, Tepper, and Verdelhan (2018) and others document the role of regulation in generating CIP deviations, and Baumeister and Hamilton (2019) analyze commodity shock transmission, no prior study considers how these forces interact. In our case, we leverage a set of comprehensive shocks identified in the commodities' literature while also providing the first cross-country evidence on how macroprudential policy effectiveness depends on the nature of global shocks, thereby contributing to the growing literature on macroprudential policy evaluation. Finally, we document systematic differences between advanced and emerging economies in both shock transmission and policy effectiveness, adding to the understanding of international financial market segmentation in the post-crisis era.

Related literature Our paper is related to several strands of the literature that comprehend financial arbitrage conditions dynamics, commodity markets, and financial regulation design to manage the aftermath of global financial crises. To start, studies such as Caballero, Farhi, and Gourinchas (2008), Ready, Roussanov, and Ward (2017a), and Ready, Roussanov, and Ward (2017b), showed how the subprime crisis experience led to heightened dollar demand, to the pursuit of enhanced risk diversification strategies, to capital reallocation efforts, particularly in emerging economies, and to subsequent elevated interest rate differentials and more dynamic carry trade positions, which ultimately led to stronger cross-country spillovers for financially integrated economies. We build on these observations by characterizing the dynamic behavior of the deviations in the after-crisis period, and inquiring into their high-frequency comovement with other economic variables, as well as their medium term determinants.

On the other hand, a number studies point to the considerable interlinkages between the dynamics of exchange rates, global financial markets, and the developments in oil and other commodity markets. For example, Akram (2009) establishes that commodity price responses to interest rate movements exhibit the same excessive adjustment documented for exchange rates in Dornbusch (1976) and Frankel (1986), suggesting that expansionary monetary policy simultaneously drives currency depreciation and commodity price inflation beyond their long-run equilibrium values. Kilian and Zhou (2022) explores this relationship by augmenting the structural VAR framework of Kilian (2009) with narrative sign restrictions as in Antolín-Díaz and Rubio-Ramírez (2018), finding asymmetric causality such that exchange rate fluctuations affect oil prices through demand-cost channels rather than oil shocks directly influencing currency values. Our study retains similar features to these latter papers, but considers the alternative of a reverse causal direction from commodity innovations to the currency premium embed in CIP deviations.

We motivate our approach, from commodity innovations to CIP deviations —and their associated parts such as the currency forward premium and interest differentials—by the results of studies suggesting the presence of systematic arbitrage opportunities in commodity-linked currency strategies. For example, Bakshi and Panayotov (2013) and Ready, Roussanov, and Ward (2017b) demonstrate that commodity currency carry trades generate positive risk-adjusted returns during periods of elevated funding costs and economic expansion, consistent with pro-cyclical risk-taking behavior. This cyclicality reflects underlying economic structures that favor either technology-intensive or commodity-dependent production. Commodity price shocks then amplify carry trade profitability through sectoral specialization effects. Relatedly, Byrne, Ibrahim, and Sakemoto (2019) shows that commodity currency co-movements constitute a priced risk factor in the cross-section of currency returns, suggesting systematic exposure to commodity-related macroeconomic risks.

Finally, our study relates to the extensive literature that focuses on the on the increased role of macroprudential regulation on shaping the dynamics of international financial markets after the Global Financial Crisis. On this front, Du and Schreger (2016) argue that substantial regulatory restrictions impede optimal risk allocation by constraining portfolio rebalancing in response to exchange rate volatility. Other studies such as Ivashina, Scharfstein, and Stein (2015), and more recently Du, Hébert, and Huber (2022) and Augustin, Chernov, Schmid, and Song (2024), focus on market-segmentation effects and other intermediary-prompted mechanisms in the presence of tighter macroprudential policies. Finally, a number of country-specific studies provide additional evidence on the effect of heighted regulations on the deviations, for example Fabiani, Piñeros, Peydró, and Soto (2022) for Colombia and Cheung and Herrala (2014), Lin, Chen, and Qian (2022), and Balding, Gregoriou, Tarzia, and Zhang (2024) for China, among others. Our paper further contributes on this literature by providing a cross-country study of the role of macroprudential policies in shaping CIP deviations and the spillovers of other global shocks.

The remainder of the paper proceeds as follows. Section 2 presents the data used in the model. Section 3 outlines our identification strategy and empirical methodology. Section 4 presents our main findings on effects of macroprudential policies and their interactions with commodity-markets' shocks. Section 5 provides robustness checks and extensions, and Section 6 concludes with policy implications and directions for future research.

2 Data Description

Our initial analysis is based on daily data on CIP deviations. Then, we move to the estimation of a model at the quarterly frequency that includes other fundamentals (available at lower frequencies). The data we consider is described below.

2.1 CIP deviations

We construct the Covered Interest Parity (CIP) Deviations of advanced and emerging countries against the United States Dollar (USD) following the papers of Du, Tepper, and Verdelhan (2018), Du and Schreger (2022), and Cerutti and Zhou (2023) as[2]

$$\lambda_{t,t+n} = i^{USD}_{t,t+n} - i^{*}_{t,t+n} - f_{t,t+n} + s_t, \tag{1}$$

where $\lambda_{t,t+n}$ is the CIP deviation of the currency against the dollar in basis terms, $i^{USD}_{t,t+n}$ is the dollar funding interest rate, i^* is the foreign country rate, $f_{t,t+n}$ is the forward rate between the period t and the n-periods ahead, and s_t is the spot rate, expressed in foreign currency units per US Dollar. The right-hand-side of equation (1) compares the returns of domestic funding in dollars (i^*) and the effective return rate from a comparable alternative investment in a foreign economy —which implies an associated currency conversion to foreign currency at t and back to US dollars n periods later— where the future conversion is pre-negotiated with a forward contract ($i_{t,t+n} + f_{t,t+n} - s_t$). The latter rate of return is called a synthetic dollar investment as it is the equivalent of acquiring an FX dollar swap in dollar rate, which, if priced correctly —and in absence of frictions— should yield a similar return to the domestic alternative such that the parity holds without deviations, consistent with the absence of arbitrage opportunities in equilibrum ($\lambda_{t,t+n} = 0$). In practice, however, the deviation can differ from zero, with a negative value indicating that the effective foreign rate is higher than the dollar, and the contrary if the deviation (or basis as it is known) is positive.

We follow the literature on exchange rates and classify the countries into two categories: Advanced (AE) and Emerging Economies (EME). The data on spot, forward, and interest rates comes from two sources, Bloomberg and Refinitiv[3]. We will focus only on a low maturity tenor of 3 months to avoid liquidity problems characteristic of higher maturities and ensure as much comparability with the previous literature as possible. As Advanced, we use the Australian Dollar

[2] It should be noted that in this definition the US is implied as the home or domestic economy and the other country as the foreign one.

[3] In Table 5 of Appendix A, we present the tickers of each of the considered exchange and interest rates for the thirty countries considered.

(AUD), Canadian Dollar (CAD), Swiss Franc (CHF), Danish Krone (DKK), Euro (EUR), British Pound (GBP), Japanese Yen (JPY), Norwegian Krone (NOK), New Zealand Dollar (NZD), and the Swedish Krona (SEK). We show our calculation of the CIP deviations for these economies in Figure 2 where we can see that these deviations are typically negative, with the DKK being the lowest, but with some extensions, notably NZD, and the AUD, which can display positive deviations. The focus on the post-crisis 2007 is based on the findings of Du et al. (2018), Cerutti et al. (2021), and Du and Schreger (2022) that show that the previous period was characterized to be one such that the assumption of parity was statistically met. Another event that brought higher deviations was the dash-for-cash of March 2020, which generated momentarily higher deviations that went back to their previous trend.

Figure 1: CIP deviations of Developed Currencies 2007-2024

For the emerging economies, we use the same twenty countries as in Cerutti and Zhou (2023), such as Brazilian Real (BRL), Chilean Peso (CLP), Chinese Yuan (CNY), Colombian Peso (COP), Czech Koruna (CZK), Hungarian Forint (HUF), Indonesian Rupiah (IDR), Israeli Sheqel (ILS), Indian Rupee (INR), South Korean Won (KRW), Mexican Peso (MXN), Malaysian Ringgit (MYR), Peruvian Sol (PEN), Philippine Peso (PHP), Polish Zloty (PLN), Russian Ruble (RUB), Thai Baht (THB), Turkish Lira (TRY), Taiwan Dollar (TWD), and the South African Rand (ZAR). A relevant consideration for emerging economies is that the benchmark measure of interest rates, the Libor rate, is not the best baseline because of their relatively high exposure to default risk. Therefore, for this group of countries we instead opt for a measure of deviations based on the A2/P2 noncommercial paper interest rate as in Cerutti and Zhou (2023), which accounts more comprehensively for the presense of high risk premia. [4] At the same time, for defining the domestic returns in all cases ($i^{USD}_{t,t+n}$), we take a conservative approach —to avoid potential measurement issues—and use the average between the 90-day rate of Bloomberg (DCPD090Y Index) and the one in Refinitiv (FRCP23M) instead of the US Libor rate directly.

An additional characteristic of emerging economies is the existence of segmentation in the market, where two types of forwards are traded: Non-Deliverable Forwards (NDF) and Deliverable Forwards (DF). We present in Figure 2 the two types of Deviations generated by these types of forwards, where we can see that the average DF has a lower volatility and deviation compared to the case of NDF. Four outlier countries, two by type, are the Indonesian Rupiah and the Russian Ruble, as well as the Thai Baht and the Turkish Lira.

For the case of a binding parity we can rearrange the right-hand-side of Equation (1) to compare the two main components of the deviations:

$$i^{*}_{t,t+n} - i^{USD}_{t,t+n} = f_{t,t+n} - s_t, \tag{2}$$

where the equality tells us that in equilibrium —and in absence of deviations— any variation of the interest rates should be matched by an equivalent variation in lthe difference between forward and spot rates. Kalemli-Özcan and Varela (2021) carries a similar comparison for the case of Uncovered Interest Parity (UIP) deviations and show that they are driven mainly by fluctuations in the interest differential. In a similar spirit, we present the correlation between the CIP deviations and each of the involved interest rates in tables 1 and 2. The predominantly negative correlations between CIP deviations and domestic interest rates across developed markets, ranging from -0.37 for AUD and GBP to near-zero for JPY (-0.02), show that most deviations from CIP are consistent with movements in their own (national) rate rather than with fluctuations in the US returns.

[4] We still carry out the estimation for the Libor rates as a robustness exercise.

Figure 2: CIP deviations of Emerging Currencies

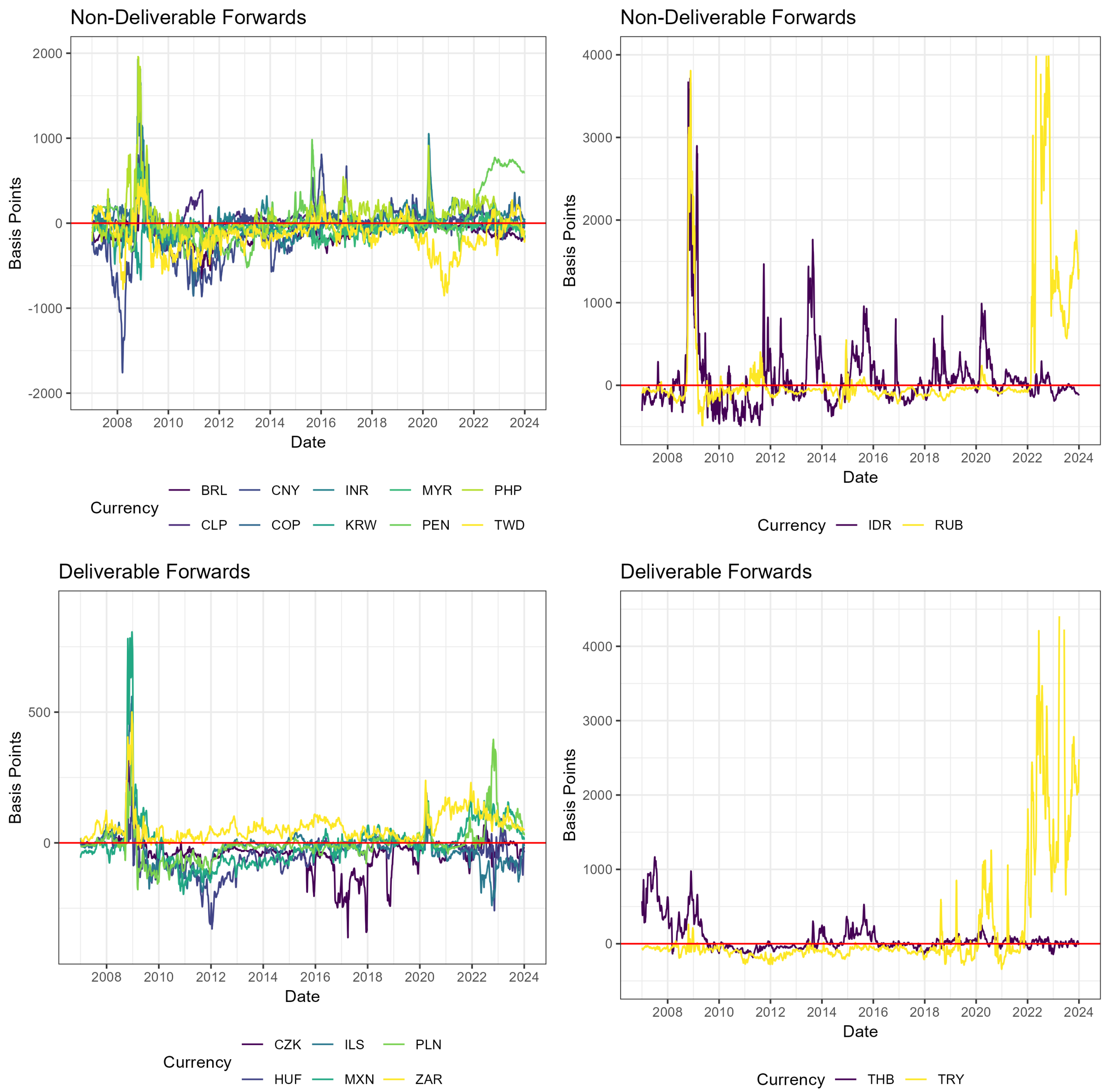


Table 1: Correlation between CIP deviations and interest rates for Developed Markets

	Offshore	
Currency	Own Rate	US Rate
AUD	-0.37	0.15
CAD	-0.32	0.14
CHF	-0.14	0.08
DKK	-0.17	0.08
EUR	-0.16	0.19
GBP	-0.37	0.25
JPY	-0.02	0.11
NOK	-0.15	0.04
NZD	-0.07	0.09
SEK	-0.09	0.03

Table 2: Correlation between CIP deviations and interest rates for Emerging Markets

	Offshore			Offshore	
Currency	Own.Rate	US.Rate	Currency	Own.Rate	US.Rate
BRL	-0.23	0	MXN	-0.34	-0.02
CLP	-0.27	0.04	MYR	-0.01	0.02
CNY	-0.04	0.07	PEN	-0.17	0.05
COP	-0.13	0.02	PHP	-0.18	-0.02
CZK	-0.9	-0.01	PLN	-0.28	0
HUF	-0.16	0.01	RUB	-0.01	-0.01
IDR	-0.05	0.02	THB	-0.03	0.03
ILS	-0.1	0.01	TRY	-0.09	0
INR	-0.05	0.02	TWD	-0.04	0.02
KRW	-0.06	-0.09	ZAR	-0.25	0.01

The differential correlation patterns between developed and emerging market currencies reveal the heterogeneous nature of CIP deviations across different currency groups. The emerging market results demonstrate substantially weaker negative correlations with their local (own) rates, with several currencies (MYR, RUB, CNY, TWD) showing correlations near zero, while others like CZK exhibit a higher negative one of -0.90. This heterogeneity reflects the additional frictions and risk factors that characterize emerging market dollar funding conditions, including heightened sensitivity to global risk appetite and more pronounced regulatory and institutional constraints that affect arbitrage capital.

The consistently weak correlations between CIP deviations and US interest rates across both developed and emerging markets, with most coefficients clustering around zero, support a key finding from the post-crisis CIP literature. Changes in a number of risk- and policy-related factors have a significant association with the evolution of CIP deviations beyond simple interest rate differentials. This pattern suggests that CIP deviations are primarily driven by factors other than US monetary policy stance, such as balance sheet constraints of financial intermediaries, regulatory capital requirements, and currency-specific funding liquidity conditions (Du, Tepper, and Verdelhan, 2018; Cerutti, Obstfeld, and Zhou, 2021; Cerutti and Zhou, 2023).

2.2 Other variables

To analyze the effect of other variables in the CIP deviations, we construct a quarterly dataset with 30 economies for the period 2008-2024. We consider earlier years (starting in 2000) for robustness analyses but perform our main estimates starting after the Global Financial Crisis due to the notion that the breakdown of the CIP deviations started after the regulatory changes implemented after the crisis (Du, Tepper, and Verdelhan, 2018; Bacchetta, Davis, and van Wincoop, 2023). Our sample includes emerging (EM) and advanced (AE) economies. For our target variable, the CIP deviations, we compute the quarterly average of the daily data described before. Our panel will also include a macroprudential policy stance variable obtained from the Integrated Macroprudential Policy Database (iMAPP) from the IMF and Alam, Alter, Eiseman, Gelos, Kang, Narita, Nier, and Wang (2024). From this source, we obtain the policy stance indicators for 17 policy tools. We discuss the structure of the policy indicators and the specific instruments considered in the next subsection.

At the same time, we consider a set of commodity market-related shocks. These come from several sources and are described in Table 3. The shocks will span different types of innovations, including prices, quantity, inventories, expectations, and news, among others. We classify them into broader categories, namely supply and demand, whenever possible, with only one exception that recovers both types of effects.

It is important to note that some shocks are refined functions of other ones, or may be obtained within the same model structure (e.g., the BSVAR-derived shocks). On this latter group, we also would have a global economic activity shock that, even if not related directly to commodity markets, consists of the output shock from the SVAR that considers output and commodity variables in its vector of observable variables. Similarly, an example of the former is the news shock, which consists of a surprise shock after removing the effect of other fundamentals (in an IV setup).

Table 3: Commodity markets shocks considered

Shock	Description	Source	Type
Real Commodity Prices Factor	Principal component of set of commodity prices	Baumeister and Guérin (2021)	Demand
1-month oil price surprise	Percent deviations of oil expectations from realized price	Baumeister (2023)	Demand
Pure oil price expectation	Filters out Pure expectation component from 1-month oil surprise after removing the effect of fundamental shocks	Baumeister (2023)	Demand
Oil supply	Shock from the BSVAR equation associated to oil quantities	Baumeister and Hamilton (2019)	Supply
Oil consumption	Shock from the BSVAR equation associated to oil prices	Baumeister and Hamilton (2019)	Demand
Inventories shock	Shock from the BSVAR equation associated with inventories. Inventories are defined as the excess production of oil (supply minus demand)	Baumeister and Hamilton (2019)	Both supply and demand
Oil supply news	Oil futures surprise measure with additional filtering to retain news component only	Känzig (2021b)	Supply

We display the correlation of our calculations of CIP deviations with the commodity market shocks listed above in Table 4. From these figures we can gauge systematic differences in the correlation between CIP deviations and oil market shocks across advanced and emerging market currencies that align with established theoretical predictions. Advanced economy currencies exhibit a consistent pattern of negative correlations with demand-driven oil shocks, particularly oil consumption demand (ranging from -0.05 to -0.20) and inventory demand (-0.13 to 0.03), consistent with Lustig, Roussanov, and Verdelhan (2014)'s finding that currency risk premia vary countercyclically with global risk factors. This pattern is most pronounced for commodity-exporting currencies such as the Australian dollar (-0.20), Canadian dollar (-0.08), and Norwegian krone (-0.12), which aligns with the fact that commodity currencies systematically benefit from positive demand shocks through improved terms of trade as discussed by Ready, Roussanov, and Ward (2017b). At the same time, the modest positive correlations with oil supply shocks (0.05 to 0.19) align with Kilian (2009) where supply-driven price increases benefit commodity exporters differently than demand-driven increases, and finally, we see uniformly negative correlations with oil supply news (-0.11 to -0.30), a result that resembles the findings of Känzig (2021a), where positive supply news reduces oil prices, thereby weakening commodity currencies through reduced scarcity rents.

Table 4: Correlation CIP Deviations and Oil Shocks

	Oil Supply	Oil Consumption Demand	Oil Inventory Demand	1-Month Oil	Pure Price Oil	Oil Supply News
AUD	0.19	-0.20	-0.02	-0.17	0.04	-0.30
CAD	0.09	-0.08	0.03	-0.12	-0.08	-0.14
CHF	0.10	-0.13	0.00	-0.11	0.02	-0.19
DKK	0.10	-0.05	0.03	-0.04	0.03	-0.11
EUR	0.15	-0.14	0.03	-0.11	0.03	-0.22
GBP	0.05	-0.06	-0.06	-0.05	0.02	-0.17
JPY	0.16	-0.11	0.03	-0.11	0.01	-0.24
NOK	0.09	-0.12	-0.00	-0.06	0.06	-0.16
NZD	0.11	-0.16	-0.13	-0.10	0.12	-0.14
SEK	0.12	-0.12	-0.03	-0.10	0.03	-0.17
BRL	0.01	-0.09	-0.02	-0.07	0.05	-0.08
CLP	-0.06	-0.03	-0.09	-0.03	0.03	-0.03
CNY	-0.07	-0.00	-0.19	-0.07	-0.04	-0.03
COP	-0.04	-0.05	0.11	0.05	0.10	0.02
CZK	-0.02	0.02	-0.08	0.01	-0.01	-0.07
HUF	-0.05	0.03	0.05	0.06	0.01	0.13
IDR	0.04	-0.01	-0.00	-0.05	-0.06	-0.08
ILS	-0.09	0.03	-0.09	0.03	0.01	0.01
INR	0.02	-0.12	-0.04	-0.04	0.10	-0.14
KRW	-0.06	0.09	-0.05	0.03	-0.06	0.16
MXN	0.11	-0.12	-0.03	-0.07	0.10	-0.28
MYR	-0.00	0.06	0.11	0.06	0.01	0.12
PEN	0.07	-0.02	-0.23	-0.09	0.00	-0.05
PHP	0.04	-0.13	-0.08	-0.07	0.08	-0.22
PLN	0.08	-0.06	-0.02	-0.04	0.05	-0.15
RUB	-0.01	-0.06	0.08	-0.00	0.04	-0.07
THB	0.02	0.05	-0.04	0.03	0.02	0.02
TRY	0.03	-0.02	-0.05	-0.03	0.02	-0.07
TWD	-0.18	0.10	0.01	0.13	-0.02	0.12
ZAR	-0.13	0.05	-0.11	0.18	0.19	-0.07

Notes: The table shows the correlation of each of the currencies against the oil shocks.

The correlation patterns for emerging market currencies display substantially greater heterogeneity and weaker magnitudes, consistent with the global dollar funding constraints documented by Du, Tepper, and Verdelhan (2018) and Avdjiev, Bruno, Koch, and Shin (2019). Unlike the systematic responses observed for advanced economies, emerging market currencies show mixed correlations with oil demand shocks, with some currencies such as the Korean won (0.09) and Malaysian ringgit (0.06) exhibiting positive correlations while others such as the Indian rupee (-0.12) and Mexican peso (-0.12) maintain negative correlations. This heterogeneity reflects Ready (2018)'s observation that oil price transmission varies significantly across countries depending on their economic structure and financial development. Notably, several emerging market currencies exhibit positive correlations with oil supply news, particularly the Korean won (0.16), Hungarian forint (0.13), Malaysian ringgit (0.12), and Taiwan dollar (0.12), contrasting sharply with advanced economies. This divergent pattern is consistent with the argument by Du and Schreger (2022) that emerging markets are more sensitive to global risk sentiment due to constrained access to dollar funding markets. The weaker correlations with fundamental oil shocks but stronger sensitivity to news-based measures suggest that emerging market CIP deviations are more driven by financial market frictions and sentiment than by underlying commodity market fundamentals, as predicted by the global dollar funding literature.

On the other hand, we consider various economic controls. A first group will be country-specific variables such as GDP growth, CPI inflation, exchange rate depreciation (vis-a-vis the US dollar), and monetary policy rates. We also consider global variables (common to all countries in the data panel) such as VIX, and the first principal component of the real GDP growth of three major economies (US, EU, Japan), based on the typical variables in the empirical international finance literature (e.g. Aizenman and Binici, 2016; Coman and Lloyd, 2022, among others), Coman and Lloyd (2022), and in addition, based on our explorations of the daily data before the quarterly panel estimation, we include a broad USD index, and a market leverage ratio variables as described below.[5]

Additional global controls based on daily data comovements We also verify the high-frequency comovement of the deviations with a set of daily financial data described in Table 9 in Appendix E. The variables that showed a stronger co-movement with the daily deviations are the market leverage and the US Dollar index. We are including them as additional controls in our baseline specification as these may capture global developments that may be absorbed by the country-specific dynamics of the deviations if omitted. We note, however, that as part of our robustness checks, we verify an alternative model without these additional variables.[6]

Leverage We account for the effects of intermediary leverage by following He, Kelly, and Manela (2017), Du, Hébert, and Huber (2022), and Cerutti and Zhou (2023), which show the importance of intermediaries in potentially driving global markets-wide effects on covered interest parity deviations. The measure is based on the aggregate capital ratio of the intermediary sector, η_t, as the ratio of the market value of equity and total assets, measured as the sum of the market value of equity and book debt, of the primary dealers of the FX currencies in international markets. We then calculate it as:

$$\eta_{i,t} = \frac{\text{Market Equity}_{i,t}}{\text{Market Equity}_{i,t} + \text{Book Debt}_{i,t}},$$

where $\text{Market Equity}_{i,t}$ is the product of the share price and the total shares outstanding, and $\text{Book Debt}_{i,t}$ is the total assets minus the common equity. We aggregate the capital ratio with equal weights to create a single market measure. As shown by He, Kelly, and Manela (2017), we can invert the capital ratio and square it, thereby approximating the risk of intermediaries as in He and

[5]It should be noted that using time effects in our specification is not feasible as we are interested in the effect of shocks that are common to all countries in the panel. With this in mind, we incorporate a comprehensive set of global controls.

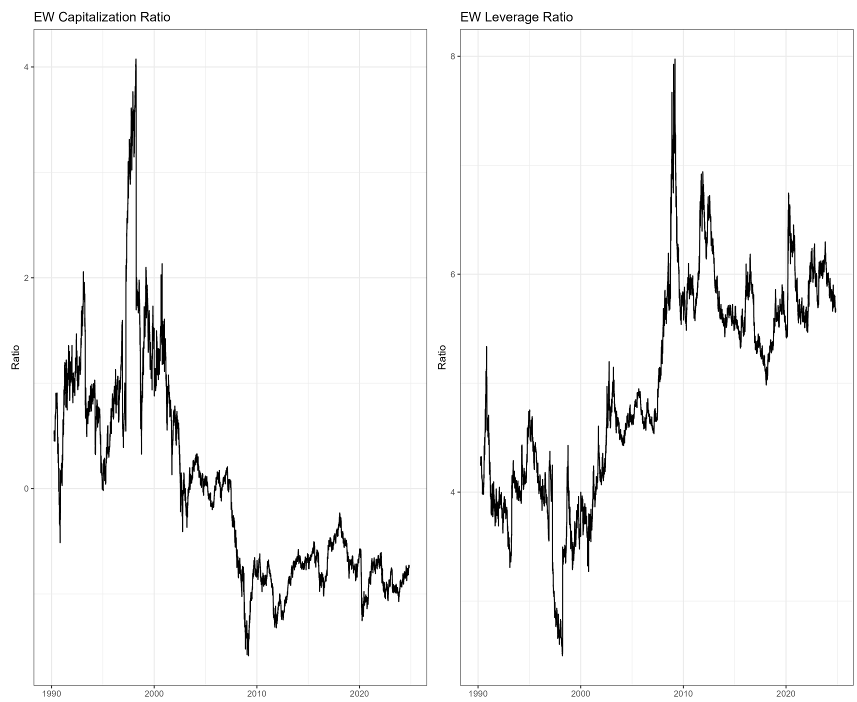
[6]We show the list of variables and associated correlations with the CIP deviations in each country in our sample in Figure 13 in Appendix E.

Krishnamurthy (2012). Then, we will have the square inverse of the capital ratio,

$$Lev_{i,t}^2 = \frac{1}{\eta_{i,t}^2},$$

which measures the non-linear effect of increasing the level of leverage. We take the square root of this definition and include it as a control in our panel specification. In Figure 3, we can see the graph of both measures, where we can see that leverage had a clear change in its average after the GFC of 2008 (right panel). At the same time, the peaks of this variable are predictive of tighter financial conditions, such as the liquidity run of March 2020, which shows that the average level of debt-to-equity increased.

Figure 3: Standardized Intermediary Capitalization and Leverage Ratio under different weights



USD Index At the same time, we include a measure of USD Traded Weighted Index due to its potential relation with the deviations but also because we expect the CIP itself to account for valuation dynamics of the US dollar that are common to all countries even if the currencies involved in the CIP definition are bilateral.

We also consider other controls in robustness exercises, such as the capital inflows to GDP, credit to GDP (to domestic deposit institutions), and a principal component of the policy rates of some major economies (corrected by the presence of a zero lower bound by using shadow rates). In many of these cases, the source of the data is the IMF-IFS database. These latter variables are ultimately excluded from the sample as they lacked significance (in the presence of the other controls and main variables).

The source for many of the variables included as controls is the IMF-IFS, however, we amend missing data whenever possible with information from other sources such as the BIS Statistics warehouse and the Macro-financial dataset of Monnet and Puy (2019), who provide IMF-IFS consistent series for a large number of economies. A table with the full list of variables in the quarterly dataset (included in the baseline and considered in other exercises) can be found in Appendix B Table 6.

Finally, we adjusted the monetary policy variables for some countries to account for the presence of dates with a binding zero-lower bound (ZLB). For these cases, we replace the rate at ZLB dates by the shadow rates, reported by Wu and Xia (2016) for the US, EU, and UK, and by Krippner (2013) for Japan. It should be noted, nonetheless, that in more recent years, these economies are no longer at the zero lower bound, and thus, by the end of the sample, the shadow rates take on the same values as the original rates.

2.3 Macroprudential Policy Stance Variable

We obtain a macroprudential policy stance measure from the Integrated Macroprudential Policy Database reported by the IMF (iMAPP) based on Alam, Alter, Eiseman, Gelos, Kang, Narita, Nier, and Wang (2024). The data consists of policy indicators for 17 instruments (shown in Table 7 in the Appendix B). For each tool and period, an indicator is calculated according to the policy change observed:

$$MaPP_{i,t}^{j} = \begin{cases} 1 & \text{if tightened} \\ 0 & \text{if unchanged} \\ -1 & \text{if loosened} \end{cases},$$

for instruments $j = \{1, 2, 3, \cdots, 17\}$ and country i.

We aggregate the indexes through the available instruments and obtain the indicator of the average policy stance of each economy i at time t as: $MaPP_{i,t} = \sum_{j=1}^{17} MaPP_{i,t}^{j}$. This indicator will take values between -17 and 17 at each date, depending on the individual changes in each instrument. In that sense, and similar to the case of Fernández, Rebucci, and Uribe (2015) for capital controls, this net tightening indicator can be interpreted as a measure of the overall macroprudential stance of an economy, with higher values indicating a stricter regulatory stance.

Now, although this measure accounts for the stance, it is still given in terms of policy changes, which implies that a policy stance adjustment (e.g., a tightening) would be reflected only for one period in the indicator and future values of the variable may fail to capture the posture of the prudential regulators. Because of that, a common practice in the literature (e.g. Richter, Schularick, and Shim, 2019; Coman and Lloyd, 2022) consists of using a rolling sum of this indicator. We do that as well and focus on the 4-quarter rolling sum, meaning that in each period our policy index accounts for the annual macroprudential policy stance (current and previous three quarters). The resulting policy indexes are shown in Figure 14 in Appendix E. Additionally, we will focus on the change in the annual policy stances in our estimations, as it could be argued that the annual indexes for some countries may be non-stationary for our sample period —for example, if a country has repeatedly tightened its toolkit after the GFC.

This database is relatively recent and has the advantage of distinguishing between types of policy tightenings rather than reporting only the use of prudential regulations with dummy indicators.[7]

3 Empirical Strategy

Our empirical setup follows a lag-augmented local projection (LP) approach along the lines of Coman and Lloyd (2022) or Richter, Schularick, and Shim (2019) that builds on the projection method of Jordà (2005). The method is being increasingly applied in empirical studies, as it is found to be relatively robust to misspecifications compared to traditional VAR methods (Haug and Smith, 2012; Montiel-Olea and Plagborg-Moller, 2021). We apply this method to analyze the effect of commodity market-related shocks and macroprudential policy actions on the CIP deviations.

Identification We leverage the availability of several identified commodity market-related shocks and thus include them directly in our setup. These shocks are related to different features of the commodity markets, although a majority of them focus especially on the oil markets. A summarized description of the shocks is included in the Table 3. We note that we broadly include demand-side and supply-side shocks. However, we also consider a few other shocks whose type is somewhat less delimited. At the same time, we consider macroprudential policy stances, consisting of four-quarter cumulative prudential intervention indicators themselves aggregated across 17 individual policy instruments. This variable is considered more slowly moving than the deviations and other financial variables, and it mostly consists of lagged policy actions, which allows us to include it directly without major concerns regarding its endogeneity with the deviations.

3.1 Specification

For our baseline LP estimation, we set up a panel regression for a measure of the CIP deviations as a function of contemporaneous and lagged regressors and controls. There are two main variables of interest, one is the change in the (cumulated) macroprudential policy stances and the other is the commodity-market shock, which we will incorporate by estimating the model for each of the

[7] Similarly, other comprehensive macroprudential policy data has been produced, for example, the Macroprudential Policies Evaluation Database (MaPPED) of the ECB reported in Budnik and Kleibl (2018) that covers the life-cycle of the prudential interventions for the European Union.

shocks in Table 3 (as well as an activity shock). At the same time, we include an interaction between the shock and the macroprudential policy changes, along similar lines as Coman and Lloyd (2022). Such an interaction will inform whether the effect of the shocks is altered in any way in by the presence of macroprudential policy tightening interventions. Our estimation setup also accounts for other standard control variables. Finally, we consider fixed country effects.

The estimation is set in terms of CIP deviation changes, that is, it will inquire on how higher or lower the deviation in local (US) to foreign returns (adjusted by the implied Forward rate depreciation) will be after the onset of the shocks and policy changes for several horizons (quarters) $h = 0, 1, \cdots, H(= 12)$:[8]

$$\begin{aligned} \text{CIPdev}_{i,t+h} - \text{CIPdev}_{i,t-1} = \alpha^{(h)} + \beta_1^{(h)}\text{shock}_t + \beta_2^{(h)}\Delta MaP_{i,t} + \beta_3^{(h)}(\text{shock}_t \times \Delta MaP_{i,t}) \\ + \sum_{k=0}^{4} \gamma^{(h)} X_{i,t-k} + \sum_{k=0}^{4} \phi^{(h)} Z_{t-k} + FE_i^h + \epsilon_{i,t+h}, \end{aligned} \tag{3}$$

where t and h denote quarter and horizon.

$X_{i,t-k}$ represents a set of controls (contemporaneous and lagged) that include individual controls, namely, the real GDP growth, CPI inflation, changes in the monetary policy rate, exchange rate depreciation (vis-a-vis the US Dollar), the changes in capital inflows to GDP, [9] as well as four lags of the other explanatory variables (shocks and prudential policy stance) and the dependent variable. Z_{t-k} is a set of global controls that include the change in the VIX, a principal component of the GDP growth of a selection of advanced economies (US, UK, Japan), the market leverage, and a trade-weighted USD index. The global controls are included because of the fact that we are interested in the effect of global commodity shocks that are common to several countries, which makes the inclusion of time effects unfeasible.

Our target estimates will be the responses of the CIP deviations after macroprudential policy changes (β_2), after either of the aforementioned shocks in Table 3 (β_1), and the combined effect of the shock in the presence of regulatory changes ($\beta_1 + \beta_3$). We obtain these effects for several horizons in each specification and build the associated impulse responses reported as results.

4 Results

We present the impulse response functions (IRFs) of CIP deviations after a shock with and without a simultaneous macroprudential tightening. Each type of estimation will include one of the shocks in Table 3 and will be conducted by a given group of countries (AEs and EMEs). The responses are

[8] It has been documented that the response recovered in this format is analogous to one using a local projections setup in levels, however, the "long-difference" format is still preferred as it reports better bias and confidence interval coverage properties in finite samples. For details, see Piger and Stockwell (2023).

[9] This variable is measured as a smoothed flow along the lines of Forbes and Warnock (2012) and Cavallo, Izquierdo, and León (2017).

reported as the additional fluctuation in the CIP deviation for 12 quarters after the onset of a shock (and potentially of a financial regulation change). The responses are given in basis points.

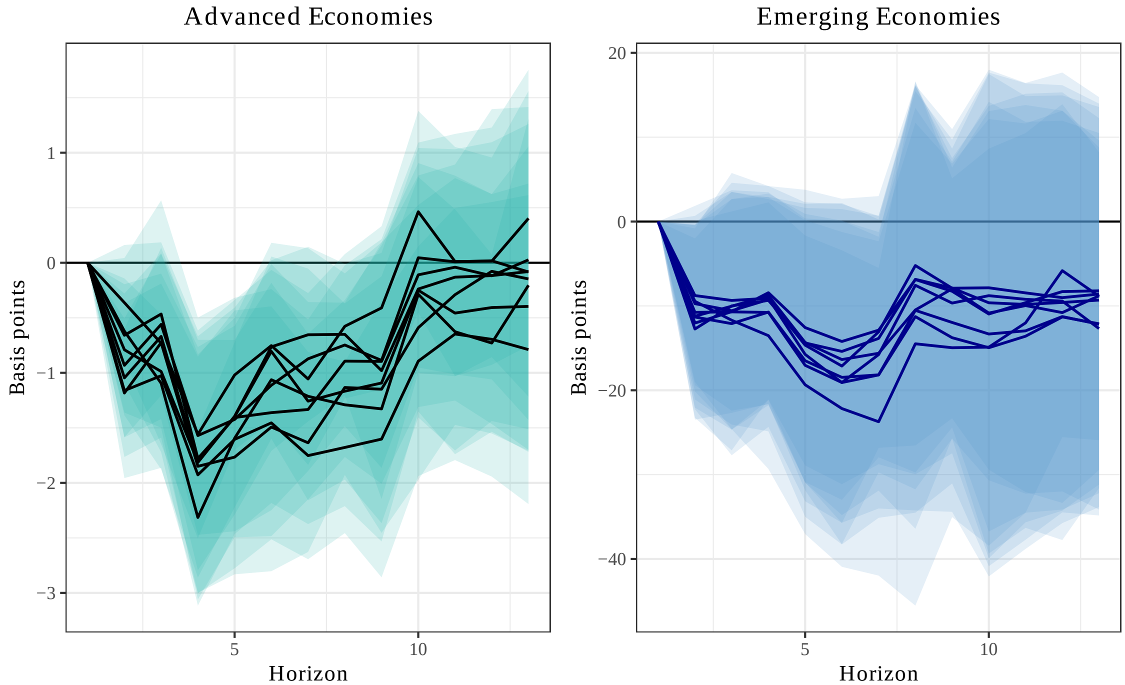
As mentioned before, the CIP deviations can be computed based on the returns of several types of assets. In our case, and as standard in the literature, we consider the Libor (offshore) based deviations as the baseline for advanced economies. On the other hand, and as mentioned before, for emerging economies we consider the A2/P2 commercial paper-based deviations as the baseline to account for the fact that these assets better resemble the actual cost of debt of these types of countries.

For interpretability, it is important to note that our LP specification trades off the smoothness and volatility of the estimates in favor of lower bias. Ultimately, that is the dilemma for a practitioner in opting for these models as opposed to VAR models of a similar order. At the same time, it is useful to keep in mind that in either type of setup (LP or VAR), we should put more weight in the horizons that are closer to our lag-order (Montiel-Olea, Plagborg-Møller, Qian, and Wolf, 2025; Baumeister, 2025). Remembering this is relevant, in particular for LPs, as their higher variance property makes them depict volatile and jagged confidence intervals, and at later horizons, the response of interest may even switch signs relative to the initial periods.

4.1 The Effect of Regulation

To begin, we can consider the isolated effect of a macroprudential tightening. This is given by $\beta_2^{(h)}$ in our specification in equation (3). We report this effect in Figure 4 for all the baseline estimations where the shocks in Table 3 are included in the model individually (one at a time). For each case, we report the IRF of the CIP deviation to a macroprudential tightening or increase in the policy stance indicator. The darker lines are the point estimates of the response, and the shaded areas are the associated confidence intervals. A first salient result is that, regardless of the shock included in the specification, the effect of regulation on the CIP deviations is robustly negative. This is clearer for Advanced Economies where it is significant for all shocks and by a wide margin, but also for emerging economies, where it is significant a majority of the shocks, and the other cases are insignificant by a very narrow margin, and thus are not strongly indicative of null effects—given the greater volatility of the EMs data, and the increased variance inherent in the local projections and documented in the literature (e.g. Montiel-Olea et al., 2025)

Figure 4: LP IRFs to a Macroprudential Policy Tightening



Note: These plots depict the IRF of the CIP deviations in our baseline specification to a macroprudential policy tightening for specifications with different commodity-market-related shocks as listed in Table 3. For each shock, the IRF and 95% confidence intervals are plotted.

We also obtain salient differences between the effects in each type of country. The effect in advanced economies is smaller in absolute value and is subject to lower uncertainty (narrower confidence intervals). The effect for these countries hovers around -1 to -2 basis points, while for emerging economies, the effect is stronger, implying a ten-fold magnitude difference, reaching -20 basis points. On the other hand, the effect of regulatory changes materializes more quickly in advanced economies than in emerging economies, as the former become significant by the end of the first year. For emerging countries, in contrast, we see significant effects with a delay of 1-2 additional quarters.

If we consider the facts documented in Section 2, whereby the deviations —defined in terms of the spread between US and foreign returns— are negative on average, we have that the regulation further impedes the covered interest rate parity (CIP) from holding (by driving the deviation further from zero). That is, here we recover the expected result consistent with the notion that stricter regulatory oversight after the GFC has contributed to violations of the CIP.

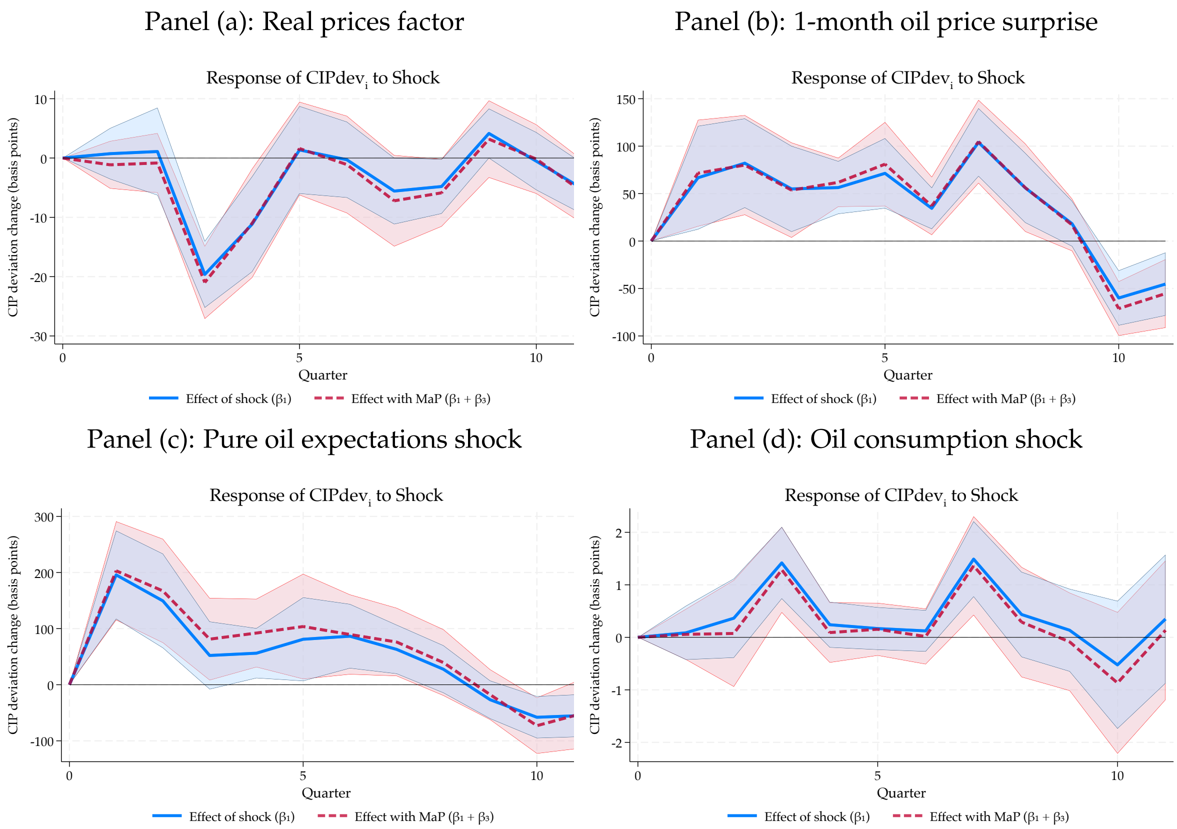
Another, possibly less straightforward, question is whether the regulatory effect interacts with shocks that impact CIP deviations, and if so, whether that interaction further exacerbates the deviations or, alternatively, offsets the effect of the shocks. We present the results of this analysis for the same set of shocks in the rest of this section.

4.2 Commodity shocks and the interaction with policy

We consider a relatively diverse set of commodity-market-related shocks (reported in Table 3). For a simpler interpretation, we can group them in broader categories, namely, supply-side, demand-side, and other shocks. The results for estimations of equation (3) for each demand-side shock and the subsample of advanced economies are reported in Figure 5. As suggested by the figure, demand shocks can more typically be associated with increases in the CIP deviations as reflected by three out of the four shocks in this group (1-month oil price surprises, oil expectations, and oil consumption). A possible interpretation is related to a flight-to-quality argument, where the shocks —typically favoring emerging markets— can also be associated to an increase in effective market risk, which leads to an increased USD-safe-asset demand, causing the advanced economies currencies to depreciate, and generating a decrease in the forward premium term in the CIP deviation —an absolute value decrease in the non-interest rate differential component of (1)— which pushes the deviation upwards. Similarly, at medium horizons, investors price in higher expected U.S. yields, maintaining the elevated deviation through carry-trade dynamics. As for the remaining shock (the commodity prices factor), there is also an increase, but towards the final part of the horizon, which is typically less reliable than the initial effects, which are instead negative. In this final case, the contrary effect is consistent with the expectation of interest rate hikes in advanced economies in the presence of the shock. An effect that overcomes the aforementioned one for this particular shock —possibly because it is the only shock not tightly related to oil markets and that instead is based on a larger set of commodity prices.

We also estimate the effects in the presence of policy interventions and plot them as dashed lines. We can observe that for these countries, the implementation of tighter prudential policies results in a slight mitigation of the effects for some horizons. This arises due to increased uncertainty, which renders the combined effect insignificant in some cases but does not fully offset the impact of the shock when the original effect is stronger. Instead, it causes the shock to dissipate somewhat more quickly in subsequent periods. This contrasts with the main effect of prudential policies, which seems more qualitatively relevant since it is more clearly significant and negative.

Figure 5: LP-IRFs to demand shocks and interactions with policy - Advanced Economies

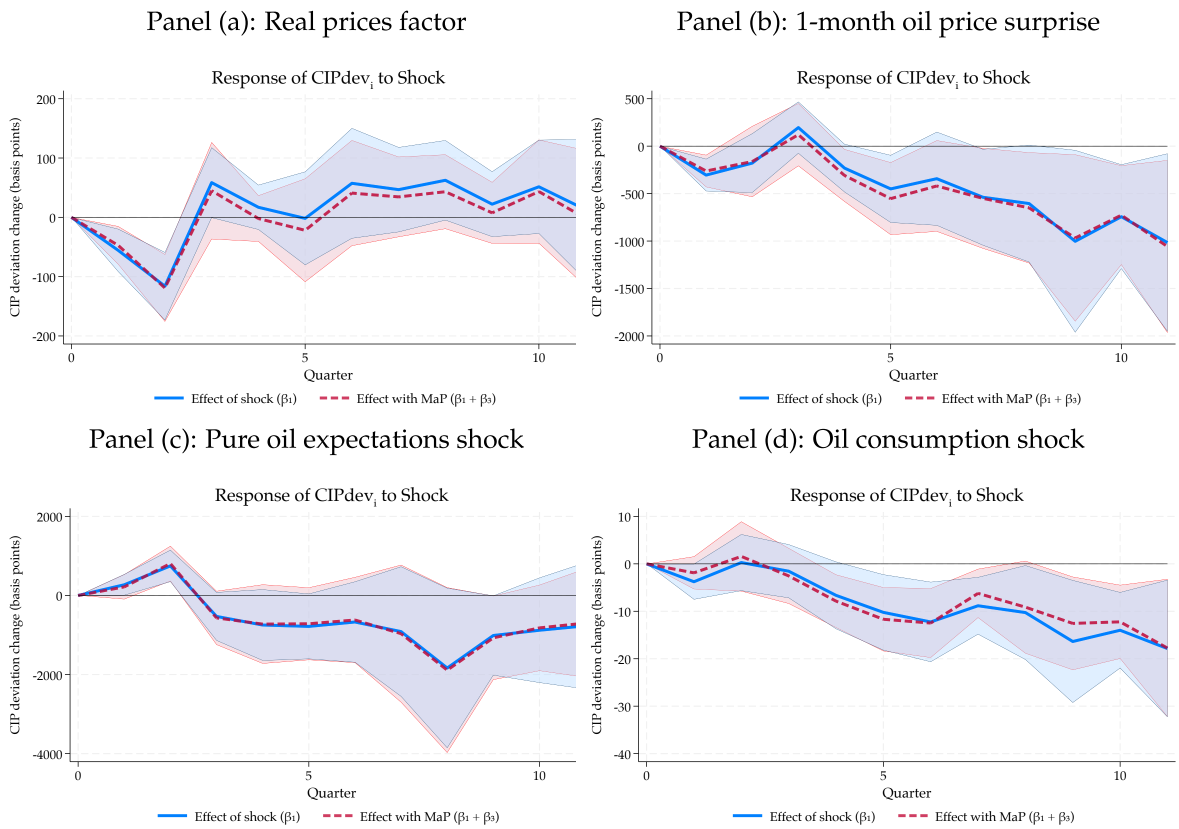


Note: Each plot depicts the IRF of the CIP deviation after a different commodity-related shock. In blue, the main IRF is plotted, and in red and dashed, the red dashed line shows the shock effect in the presence of a macroprudential policy tightening (effect with interaction). The confidence intervals have a 95% coverage in all cases.

The effect of demand-side shocks in emerging countries is reported in Figure 6. For these countries, and in contrast to the effects in advanced economies, the responses are significantly negative in most cases. These negative responses can be rationalized as the effect of appreciation forces in EM currencies (as many of these countries are commodity exporters), which leads to a decrease in the risk premium (given an overshooting of the spot rate). Over later horizons, the effect is sustained by the prospect of increased capital inflows and demand for currency, given the expectation of higher returns. By contrast, the expectation shock generates an initial positive effect, consistent with a potential risk-on interpretation that increases demand for safe assets. However, the appreciation effects seem more relevant in later horizons, rendering the mean effect negative. It is worth noting that responses for emerging markets are subject to persistent uncertainty relative to those for advanced economies, given the substantially higher volatility of their observed deviations.

The interactions between these effects and the prudential policies are also present, but relatively minor as before. The combined effect is subject to greater uncertainty, which renders insignificant some previously relevant effects for some of the later horizons. However, the induced change in the overall effect is not made weaker or insignificant at their peaks.

Figure 6: LP-IRFs to demand shocks and interactions with policy - Emerging Economies



Note: Each plot depicts the IRF of the CIP deviation after a different commodity-related shock. In blue, the main IRF is plotted, and in red and dashed, the effect is the shock effect in the presence of a macroprudential policy tightening (effect with interaction). The confidence intervals have a 95% coverage in all cases.

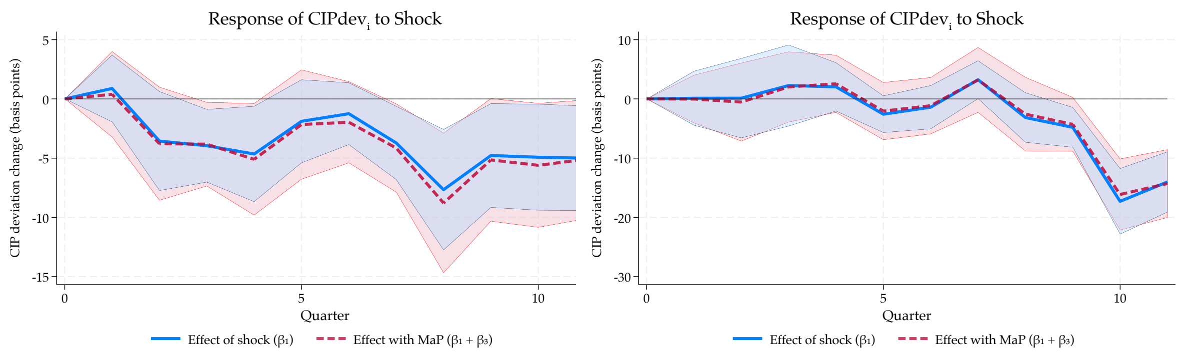
A second group of relevant shocks comprises supply-side innovations. We examine two such shocks: the SVAR-identified oil-supply shock and an oil-supply-news shock constructed as a filtered measure of futures surprises. Figures 7 and 8 present the impulse responses of CIP deviations for advanced and emerging economies, respectively.

In advanced economies, both supply shocks generate a statistically significant and persistent negative response in CIP deviations of approximately -5 basis points. A potential explanation follows the forward-premium mechanism: improved oil-supply conditions are generally positive for global markets and reduce the USD's safe-haven appeal, leading AE currencies to appreciate (both spot and forward rates decline), with the spot rate overshooting the forward rate ($|\Delta s| > |\Delta f|$). This raises the forward premium $(f - s)$, lowering the deviation.

In emerging economies, the same supply shocks and appreciation forces are at work. However, the initial response of CIP deviations is positive. This reflects a decline in emerging markets (EM) funding premia (i.e., lower risk premia) that drives the forward rate down more sharply than the spot rate ($|\Delta f| > |\Delta s|$), reducing the forward premium $(f - s)$ and thereby increasing the deviations. At longer horizons, the response turns negative, as in AE countries, but the overall effect is only marginally significant given the greater uncertainty in the EM data.

Figure 7: LP-IRFs to supply shocks and interactions with policy - Advanced Economies

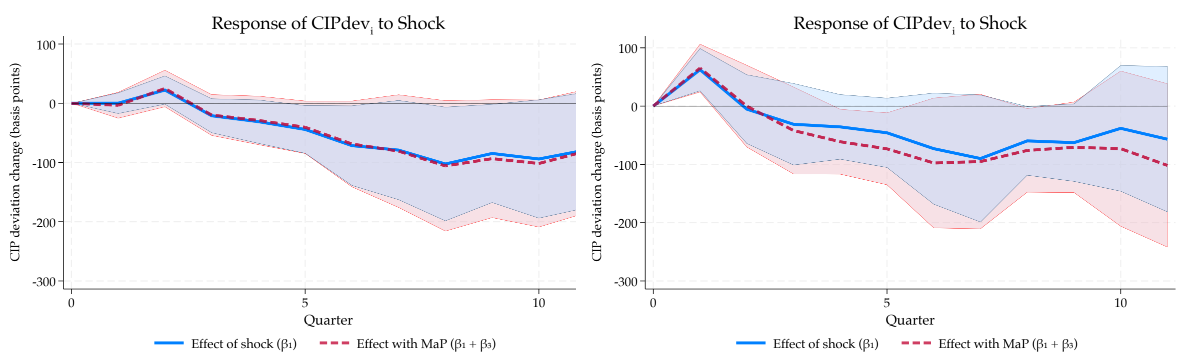
Panel (a): Oil supply shock　　　　Panel (b): Oil supply news shock



Note: Each plot depicts the IRF of the CIP deviation after a different commodity-related shock. In blue, the main IRF is plotted, and in red and dashed, the effect is the shock effect in the presence of macroprudential policy tightening (effect with interaction). The confidence intervals have a 95% coverage in all cases.

Figure 8: LP-IRFs to supply shocks and interactions with policy - Emerging Economies

Panel (a): Oil supply shock　　　　Panel (b): Oil supply news shock



Note: Each plot depicts the IRF of the CIP deviation after a different commodity-related shock. In blue, the main IRF is plotted, and in red and dashed, the effect is the shock effect in the presence of macroprudential policy tightenings (effect with interaction). The confidence intervals have a 95% coverage in all cases.

The interactions with policy indicate a partial mitigation of the effect at certain horizons. However, as before, this is attributable to the higher uncertainty of the joint coefficient (the effect with interaction) rather than differences in median responses.

Other commodity shocks As a final set of shocks, we consider an oil inventories-related shock that potentially reflects both supply and demand components of the oil market, along with a global activity shock. The latter is not a standard TFP shock. Rather, it is derived from the same BSVAR model used to identify the commodity-related demand and supply shocks analyzed earlier

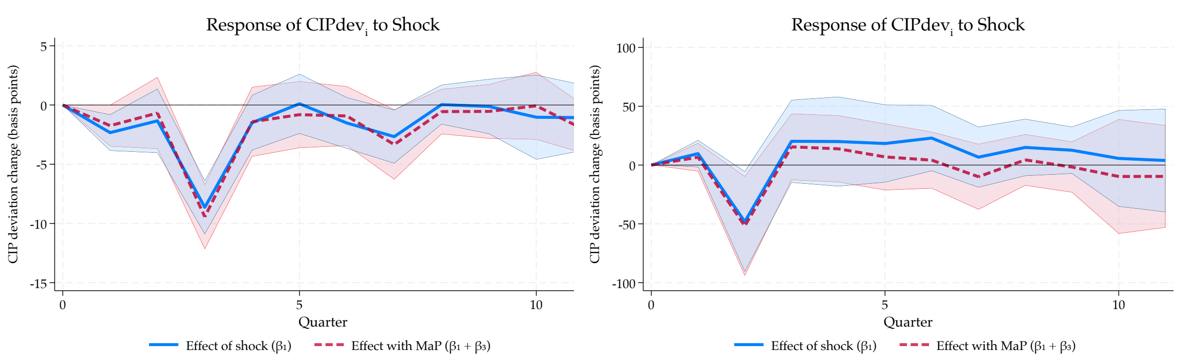
(Baumeister and Hamilton, 2019). In this sense, the activity shock is linked to GDP dynamics, but it is identified within a framework designed to isolate commodity market features.

The responses to the inventories shock for both country groups are shown in Figure 9. In advanced economies, the shock induces a statistically significant decline in CIP deviations of roughly -10 basis points in the third quarter, with effects that persist for several periods. As before, this response can be explained by forward-premium dynamics: higher inventories reduce the USD's safe-haven appeal, leading to an appreciation of AE currencies relative to the USD. With the spot rate overshooting the forward rate, the forward premium rises, thereby lowering the CIP deviation. On the other hand, in emerging economies the shock yields no statistically significant responses across most horizons. This may reflect offsetting supply and demand effects associated with inventories, combined with the higher volatility of CIP deviations, resulting in muted overall responses.

Figure 9: LP-IRFs to inventories shocks and interactions with policy

Panel (a): Advanced Economies

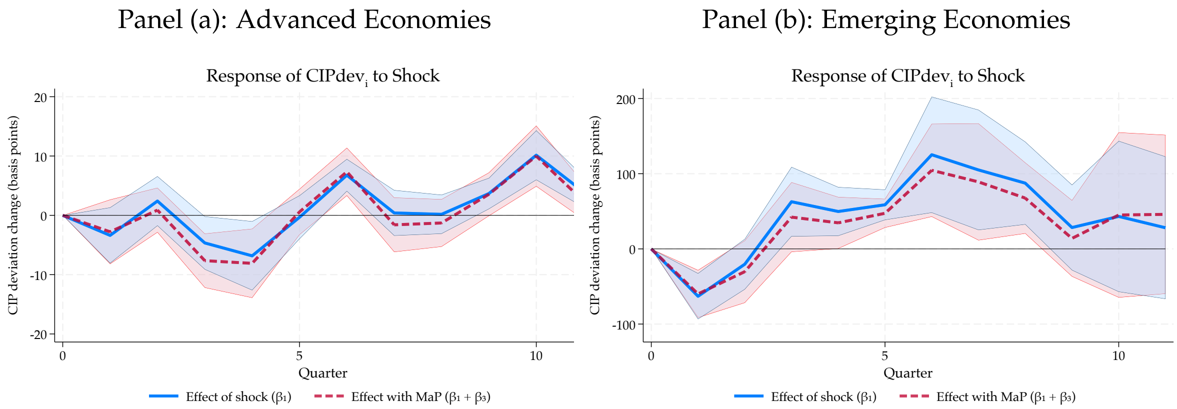
Panel (b): Emerging Economies



Note: Each plot depicts the IRF of the CIP deviation after a different commodity-related shock. In blue, the main IRF is plotted, and in red and dashed, the effect is the shock effect in the presence of macroprudential policy tightenings (effect with interaction). The confidence intervals have a 95% coverage in all cases.

As in previous cases, interactions with prudential tightening partially offset the shock's effects in advanced economies, bringing the deviations closer to zero and rendering some additional horizons statistically insignificant. In emerging economies, a similar pattern is observed; however, the combined effect of the shock and policy interaction remains statistically insignificant in most periods.

Figure 10: LP-IRFs to activity shocks and interactions with policy



Note: Each plot depicts the IRF of the CIP deviation after a different commodity-related shock. In blue, the main IRF is plotted, and in red and dashed, the effect is the shock effect in the presence of macroprudential policy tightenings (effect with interaction). The confidence intervals have a 95% coverage in all cases.

Finally, the responses to global activity shocks are shown in Figure 10. These responses serve in part as a robustness check, given that they are not exactly related to commodity market developments. However, they remain consistent with the commodity shock results, as they are identified within the same econometric framework. These effects are best interpreted jointly for both country groups. During a global boom, there is a risk-on reallocation of capital flows from advanced economies (AEs and the U.S.) toward emerging market (EM) countries. In this scenario, AEs can also depreciate against the dollar, as the latter is purchased to acquire EM currencies and assets. As a result, in AEs the forward premium falls and CIP deviations rise, while the reverse occurs in EMs. At the same time, the effects are altered by tighter financial regulations only in emerging economies.

Gauging the interaction effects of regulation changes We observe that some effects may be influenced by tighter prudential regulations. However, it is difficult to determine whether the interaction effect is meaningful, as the average responses are not substantially different and the interaction primarily introduces additional uncertainty into the combined effect of the shocks (the direct shock and its interaction with regulation). This increased uncertainty can reduce statistical significance in certain periods but not during peak response horizons. Therefore, any mitigation effect appears at most mild and partial, in contrast to the consistently strong negative direct effects of prudential regulations observed across all countries, regardless of the included shock, as shown in Figure 4. That said, an alternative view is that, given that in practice the varied prudential toolkit moves in tandem — as there are several similar instruments affecting the same financial intermediaries — the indirect mitigating effects may be stronger than implied by our estimates above that are given in terms of a single tightening by construction (increases in the prudential stance of one unit which is prompted by a tightening of any one of the instruments listed in Table 7).

5 Robustness Checks

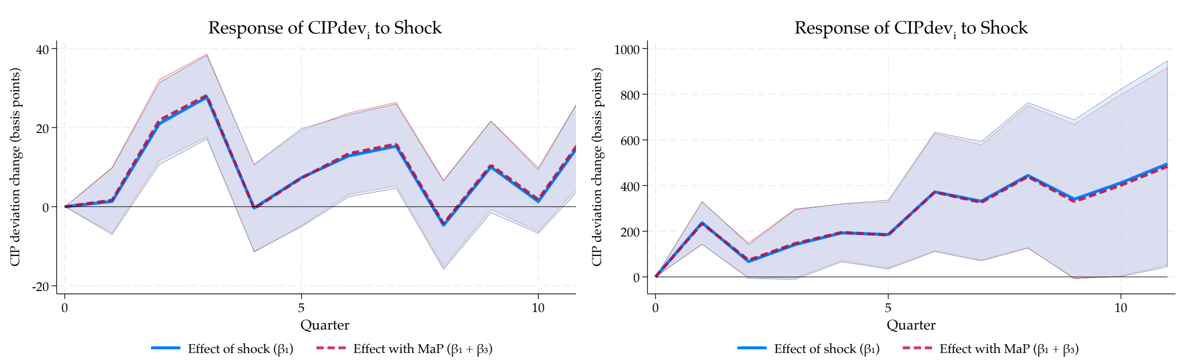
We implement several departures from our baseline specification to assess the robustness of our results and to determine whether the role of prudential policies and their interactions is relevant in general, or only in particular for commodity market-related developments.

Alternative shocks: A standard case of interest is that of US monetary shocks, representing a tightening in global financial conditions. As a comparison, we can assess the effect of these shocks and examine potential interactions with prudential tightenings. In this case, we estimate local projections using IV techniques, by instrumenting with the monetary shocks reported by Jarociński and Karadi (2020). The results are shown in Figure 11. As expected, given that the US is the home country in the parity equation, the shock generates a positive reaction in the CIP deviation for both types of economies. At the same time, in contrast to the commodity-related innovations, the effect does not exhibit any interaction in the presence of prudential policy tightenings.

On the other hand, the direct response of regulation remains analogous to that shown in Figure 4. Overall, these results suggest that macroprudential policies are relevant for inducing negative changes in CIP deviations but, in contrast with the innovations in commodity markets, they do not shape the reaction to global monetary spillovers.

Figure 11: LP-IRFs to US monetary shocks and interactions with policy

Panel (a): Advanced Economies Panel (b): Emerging Economies



Note: Each plot depicts the IRF of the CIP deviation after a different commodity-related shock. In blue, the main IRF is plotted, and in red and dashed, the effect is the shock effect in the presence of macroprudential policy tightenings (effect with interaction). The confidence intervals have a 95% coverage in all cases.

Exclusion of global financial controls: We assess the results using a more parsimonious set of global controls. Specifically, the global controls include only the VIX and a measure of global economic growth, representing a simpler yet comparable specification to those used in other studies. This specification excludes the USD index and the leverage measure that we identified as relevant in the daily data analysis. The point estimates remain largely similar. However, our baseline specification yields tighter confidence intervals. These findings further support our baseline setup, as our variables of interest produce the same point responses, but the coverage of the confidence intervals is better approximated in the baseline with the extended controls. This suggests that including additional relevant controls and their lags helps mitigate the relatively large variances characteristic of local projection regressions. This improvement is comparable to the one typically observed when increasing the lag order of the model, as recommended by Montiel-Olea, Plagborg-Møller, Qian, and Wolf (2025) and Baumeister (2025).

Inclusion of monetary surprises as a control: We further extend the baseline controls by including a measure of monetary surprises reported by Jarociński and Karadi (2020). This modification enables us to control for global variations more precisely, as the surprise variable closely aligns with the US interest rate component in the CIP deviation formula. Most results remain similar, although a minority become statistically insignificant at certain horizons. These additional results are consistent with what we report in Section 2 where we obtain that the CIP deviations comove more closely with the national or own interest rate (foreign rate in equation (1) where the USD is set as domestic).

Other controls and lags: Additionally, we test further domestic and global controls in our estimations, including net capital flows, credit-to-GDP ratios, and a global rates variable constructed as the principal component of the policy rates in major economies. The results remain similar to those of the baseline, and these additional variables are not statistically significant given the other regressors. Given these results, and the substantial increase in missing observations from their inclusion, we abstain from expanding the set of controls with these variables in our baseline. Conversely, including more lags yields similar responses in the first half of the IRF horizon but reduces significance in later periods. Given that this type of model is typically most reliable at short lags, where results are consistent, we retain the formulation with one year of lagged observations in all variables; and finally, the inclusion of fewer lags also delivers analogous results, although with even more significant results for additional horizons; for example, we report the direct effects to prudential tightenigns in a model with three lags in Figure 15 in Appendix F, where we can see that the effect is similar to the reported in Section 4.

6 Conclusions

In this paper, we analyze the measurement and behavior of Covered Interest Parity (CIP) deviations across a panel of advanced and emerging economies by constructing daily-frequency bases from LIBOR and commercial paper rates. We then aggregate them to a quarterly frequency to explore their economic drivers, focusing especially on country-specific macroprudential policy actions and global commodity shocks. The prudential policies are represented as a net-tightening index that aggregates interventions across seventeen regulatory tools. Empirically, we combine identified supply- and demand-side innovations in oil and commodity markets with a specification that directly estimates both shock effects and their interaction with contemporaneous policy adjustments.

Our results indicate that macroprudential tightenings consistently cause more negative CIP deviations, aligning with higher cross-border funding premia. During a policy change, advanced economies typically see shifts of one to two basis points, while emerging markets —characterized by shallower financial markets and greater regulatory sensitivity—experience deviations of up to twenty basis points. Commodity-market disruptions also cause notably different responses: oil-demand shocks increase deviations in advanced economies due to safe-haven inflows into U.S. assets but decrease deviations in emerging markets through currency appreciation and lower risk premia. Conversely, supply-side shocks uniformly lead to more negative deviations in both groups as improved global supply weakens U.S. safe-haven demand.

We also find that macroprudential regulations can partly influence the impact of commodity-market shocks on the deviations. Although the intermediation effect is relatively modest and insufficient to fully insulate the deviations from these shocks, it can still delay and lessen their impact over certain periods, suggesting a potential additional stabilizing role for policy. Moreover, since the prudential toolkit typically moves in tandem in practice, the indirect mitigation effects may be stronger than indicated by our simplified estimates (based on an implied single tool instrument). Additionally, the indirect effects of macroprudential policies on shaping how global commodity shocks influence CIP deviations are not applicable to other types of financial shocks.

These findings contribute to the literature on international financial regulation and capital market segmentation by highlighting a trade-off: post-crisis macroprudential reforms strengthen domestic resilience but create barriers to capital mobility and cross-border arbitrage, potentially hampering monetary transmission and leading to beggar-thy-neighbor effects. From a policy perspective, our evidence indicates that regulators should tailor macroprudential tools based on the specific shock to reduce unintended spillovers. Additionally, the new barriers introduced by regulations may also present opportunities for macroprudential policy coordination. Future research could assess the welfare effects of larger CIP deviations, examine other global shocks—such as sovereign debt crises or pandemics—and develop normative frameworks that account for the interactions between stricter policy measures and external disturbances.

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A CIP Deviations Data

For the construction of the CIP deviations with Onshore and Offshore data for Developed and emerging markets, we use data from both Bloomberg and Refinitiv to match the Benchmark rates, using Libor rates, and government bonds as presented in 5. We focus on the short maturities in 3-month Libor and Government Bonds and contrast them with the Libor and Treasury rates of the US market. As a reference, we use the government bonds from Du and Schreger (2016) and Du et al. (2018), the Libor rates in Du et al. (2018), and the data from emerging markets used in Cerutti and Zhou (2023). We annualize the data and adjust by maturity of the forward rates of both Onshore and Offshore. For the case of Korea and Malaysia, where the source is Refinitiv, we assume that the days to maturity are the same for Offshore and Onshore. The whole analysis is based on 10 developed countries and 20 emerging countries.

Table 5: Data Tickers

		Forward Rates			Government Rates	
Currency	**Spot**	**Offshore**	**Onshore**	**Libor**	**3 Months**	**10 Years**
AUD	AUD Curncy	AUD3M Curncy		ADBB3M Curncy	C1273M Index	C12710Y Index
CAD	CAD Curncy	CAD3M Curncy		CDOR03 Index	C1013M Index	C10110Y Index
CHF	CHF Curncy	CHF3M Curncy		SFO003M Index	C2563M Index	C25610Y Index
DKK	DKK Curncy	DKK3M Curncy		CIB003M Index	C2673M Index	C26710Y Index
EUR	EUR Curncy	EUR3M Curncy		EUR003M Index	C9103M Index	C91010Y Index
GBP	GBP Curncy	GBP3M Curncy		BP0003M Index	C1103M Index	C11010Y Index
JPY	JPY Curncy	JPY3M Curncy		JY0003M Index	C1053M Index	C10510Y Index
NOK	NOK Curncy	NOK3M Curncy		NIBOR3M Index	C2663M Index	C26610Y Index
NZD	NZD Curncy	NZD3M Curncy		NDBB3M Curncy	C2503M Index	C25010Y Index
SEK	SEK Curncy	SEK3M Curncy		STIB3M Index	C2593M Index	C25910Y Index
USD				US0003M Index	C0823M Index	C08210Y Index
			Emerging			
BRL	BRL Curncy	BCN3M Curncy	BC03M Curncy	PREDI90 Index	I39303M Index	I39310Y Index
CLP	CLP Curncy	CHN3M Curncy	CHO3M Curncy	CHSWPC Curncy	C9903M Index	C99010Y Index
CNY	CNY Curncy	CCN3M Curncy	CC03M Curncy	SHIF3M Index	C0203M Index	C02010Y Index
COP	COP Curncy	CLN3M Curncy	CLO3M Curncy	DTF RATE Index	C4773M Index	C47710Y Index
CZK	CZK Curncy	CZK3M Curncy		PRIB03M Index	C4803M Index	C48010Y Index
HUF	HUF Curncy	HUF3M Curncy		BUBOR03M Index	C1143M Index	C11410Y Index
IDR	IDR Curncy	IHN3M Curncy	IHO3M Curncy	JIIN3M Index	C1323M Index	C13210Y Index
ILS	ILS Curncy	ILS3M Curncy		TELBOR03 Index	I32503M Index	I32510Y Index
INR	INR Curncy	IRN3M Curncy	IRO3M Curncy	*INROS3M*	F12303M Index	F12310Y Index
KRW	KRW Curncy	*KRW3M=*	KW03M Curncy	KRBO3M Index	C2323M Index	C23210Y Index
MXN	MXN Curncy	MXN3M Curncy		*MXTIIE3M=RR*	C4763M Index	C47610Y Index
MYR	MYR Curncy	MRN3M Curncy	*MYR3M=MY*	KLIB3M Index	C1283M Index	C12810Y Index
PEN	PEN Curncy	PSN3M Curncy		PRBOPR3 Index	C9953M Index	C99510Y Index
PHP	PHP Curncy	PPN3M Curncy	PPO3M Curncy	PREF3MO Index	PDSR3MO Index	PDSR10Y Index
PLN	PLN Curncy	PLN3M Curncy		WIBR3M Index	C1193M Index	C11910Y Index
RUB	RUB Curncy	RUB3M Curncy		MOSKP3 Index	C4963M Index	C49610Y Index
THB	THB Curncy	THB3M Curncy	TBO3M Curncy	BOFX3M Index	C1223M Index	C12210Y Index
TRY	TRY Curncy	TRY3M Curncy		TRLIB3M Index	C9653M Index	C96510Y Index
TWD	TWD Curncy	NTN3M Curncy	NTO3M Curncy	TAIBOR3M Index	C1263M Index	C12610Y Index
ZAR	ZAR Curncy	ZAR3M Curncy		JIBAR3M Index	C2623M Index	C2623M Index

Notes: Most of the table are tickers from Bloomberg. Italics reference data only available in Refinitiv (Datastream). As in Cerutti and Zhou (2023), the only countries that have and offshore and onshore forwards markets are emerging markets.

A.1 Offshore and Onshore Deviations in EM

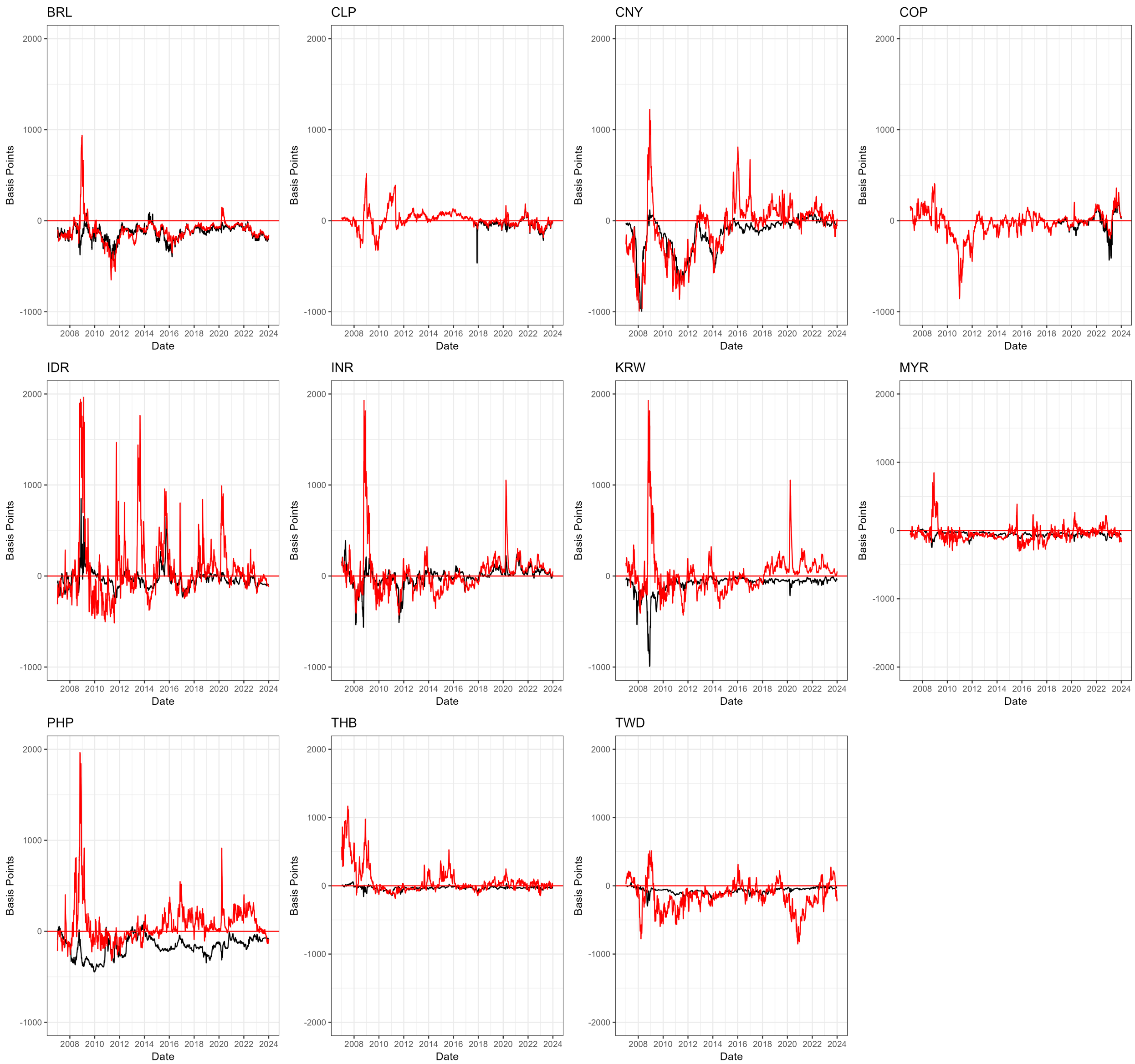


Figure 12: CIP deviations of Emerging Currencies

B Data Sources

Table 6: Variables included in the quarterly panel dataset

Name	Description	Source
CIP Deviations		
CIP Deviations AE	Offshore interest rate differential plus differential between the log of the forward rate and the log of the spot rate (as in equation 1)	Bloomberg and Refinitiv (see Table 5)
CIP Deviations EM	Commercial paper (A2/P2) interest rate differential plus differential between the log of the forward rate and the log of the spot rate (as in equation 1)	Bloomberg and Refinitiv (see Table 5)
Main variables of interest		
Commodity shocks	Identified shocks related to features of international oil and commodity markets	Previous studies as described in Table 3
Macroprudential policy index	Aggregate of macroprudential tightenings and loosenings across 17 policy instruments (shown in Table 7	IMF-integrated Macroprudential Policies Database (iMaPP)
Control variables		
GDP growth	Non-seasonally adjusted GDP and interpolations from missing data	IMF-IFS, Monnet and Puy (2019), and Central Banks, and Statistical agencies.
Inflation	Consumer Price Index annual growth. Missing index data is interpolated from other sources.	IMF-IFS, Monnet and Puy (2019), and Central Banks, and Statistical agencies.
Monetary policy rate	Short-term policy rate with replacement for shadow rates in selected countries for the period with zero lower bound; for the US, EU, UK, obtained from Wu and Xia (2016), for JP obtained from Krippner (2013).	IMF-IFS, BIS Statistics warehouse, and individual central banks' data.
Nominal Depreciation	Nominal Exchange rate annual depreciation (price of 1 USD in terms of local currency, average of period)	IMF-IFS
Capital inflows	Capital inflows to GDP, quarterly smoothed variable as in Forbes and Warnock (2012)	IMF-IFS
VIX	Chicago Board Options Exchange S&P500 Volatility Index	FRED
Global growth	Principal component of real output growth from selected countries (US, GB, EU, JP)	—
US Monetary Policy Rates	Effective Federal Funds Rate	FRED
US Monetary Surprises (shocks)	Surprises based on the 3-month ahead Federal Funds Rate	Jarociński and Karadi (2020)

Table 7: Macroprudential policy instruments considered in the policy stance variable

Countercyclical Capital Buffer	Conservation Cap. Buffer	Capital Requirements
Limits to Leverage	Loan Loss Provision	Limits to Credit Growth
Loan Restrictions	Limits on Foreign Currency Lending	Debt Service to Income Ratio
Loan-to-Value Ratio (LTV)	Taxes	Liquidity Requirements
Loan-to-Deposit Ratio	Limits on FX positions	Reserve Requirements
SIFI (Too-big-to-fail institutions)	Other (e.g., stress testing, structural measures)	

C Convenience Yield and Oil Shocks

We can modify the Equation 1 to analyze the effects of the oil shocks on the government basis, such that we can take into account the variations of prices. From Du et al. (2018) and Jiang et al. (2018) we can write it as

$$\lambda^{Tr}_{t,t+n} = i^{Tr,\$}_{t,t+n} - i^{Tr,USD} - f_{t+n} + s_t \tag{4}$$

where $\lambda^{Tr}_{t,t+n}$ is the treasury basis of the US market, $i^{Tr,\$}$ is the treasury equivalent rate in the foreign currency, and $i^{Tr,USD}$ is the rate of the treasury bills in the US. The treasury basis is called the convenience yield of using the treasuries instead of their government treasury because of their liquidity and safety properties that the safe asset of the foreign market doesn't offer. Notice that $\lambda^{Tr}_{t,t+n}$ is, by construction, the negative of the basis in the Libor market.

D Intermediaries Capital Ratio and Leverage

To estimate a measure of Intermediaries' Leverage, we followed the model of He et al. (2017) and Cerutti and Zhou (2023) to generate a measure of leverage of the main intermediaries in the FX market. We use the same intermediaries used in the last, to guarantee replicability. We take Euromoney's annual FX survey of 2022 as a reference, and select the top participants and exclude the non-bank firms that span from January 1990 to December 2024. In Table 8, we present the name, country of the main headquarters, and Bloomberg Ticker. For the calculation of the leverage, we used the mid price (PX_MID) and the Shares Outstanding (BS_SH_OUT) for the calculation of the market equity and the Total Common Equity (TOT_COMMON_EQY) and Total Assets (BS_TOT_ASSET) for the Book Debt.

E Explanatory Variables and CIP Determinants

To explain the effects of the different factors on the CIP deviations, we use different explanatory variables as a set of controls. Table 9 presents the variables used with their respective Bloomberg Tickers. The Volatility indices VIX and VXO capture the uncertainty in the stock market that is a source of dispersion in the prices and capital flows, the US Dollar Indices capture the fluctuations of

Table 8: Main FX World Intermediaries

Name	Country	Bloomberg Ticker
BNP Paribas SA	France	BNP FP Equity
Barclays PLC	United Kingdom	BARC LN Equity
Bank of America Corporation	United States	BAC US Equity
Citigroup Inc.	United States	C US Equity
Credit Suisse Group AG	Switzerland	CSGN SW Equity
Deutsche Bank AG	Germany	DBK GR Equity
The Goldman Sachs Group, Inc.	United States	GS US Equity
HSBC Holdings plc	United Kingdom	HSBA LN Equity
JP Morgan Chase & Co.	United States	JPM US Equity
Morgan Stanley	United States	MS US Equity
Société Générale SA	France	GLE FP Equity
Standard Chartered PLC	United Kingdom	STAN LN Equity
State Street Corporation	United States	STT US Equity
UBS Group AG	Switzerland	UBSG SW Equity

Notes: The table uses the information from Bloomberg based on the intermediaries used in Cerutti and Zhou (2023) and the Euromoney FX Survey 2022.

the dollar rather than specific variations of individual exchange rates, the TED spread measure the overall liquidity of the market, the Futures of the Federal Funds and the West Texas Intermediate (WTI), the Baltic Dry Index to measure trade transportation costs, the corporate 1 minus 5 year index to measure corporate credit risk, and the Standard and Poor's indices to account for changes in the asset market of our reference economy.

Table 9: Data Tickers

Name	Bloomberg Ticker
CBOE S&P 100 Volatility Index (VXO)	VXO Index
CBOE S&P 500 Volatility Index (VIX)	VXVWA Index
Trade-Weighted U.S. Dollar Index	USTWBGD Index
U.S. Dollar Index	DXY Curncy
TED Spread	BASPTDSP Index
Federal Funds Futures (3rd Month)	FF3 Comdty
Federal Funds Futures (4th Month)	FF4 Comdty
WTI Crude Oil Futures (3rd Month)	CL3 Comdty
WTI Crude Oil Futures (4th Month)	CL4 Comdty
Baltic Dry Index	BDIY Index
Bloomberg U.S. Corporate BBB 1–5 Year Index	CSI BBB Index
S&P 500 Index	SPX Index
S&P 100 Index	OEX Index

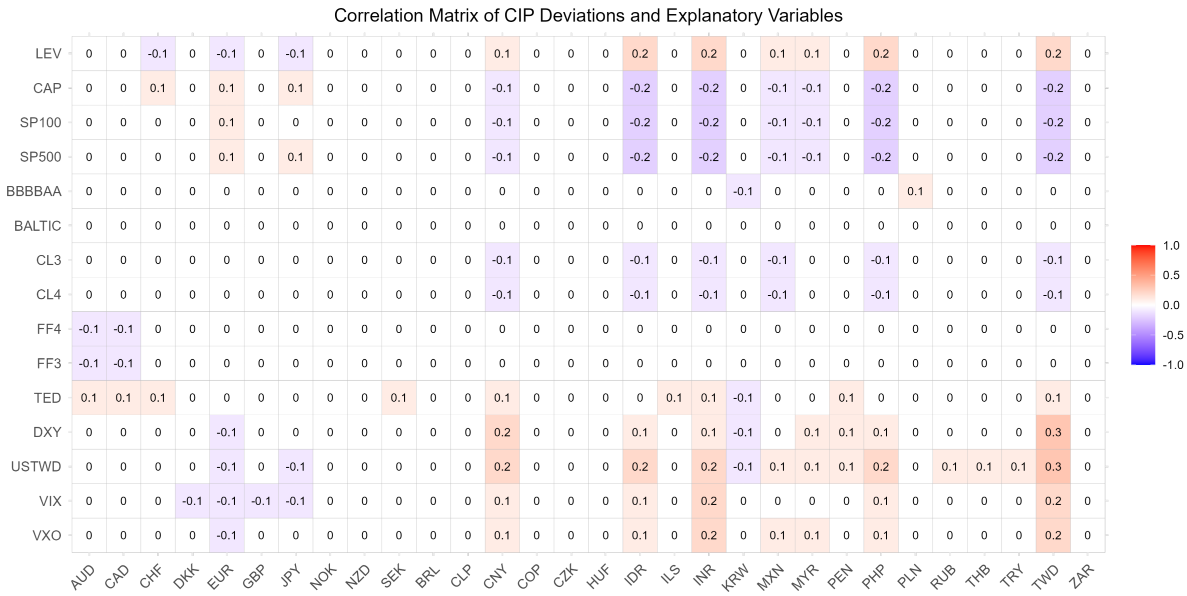


Figure 13: Correlation Matrix (whole sample)

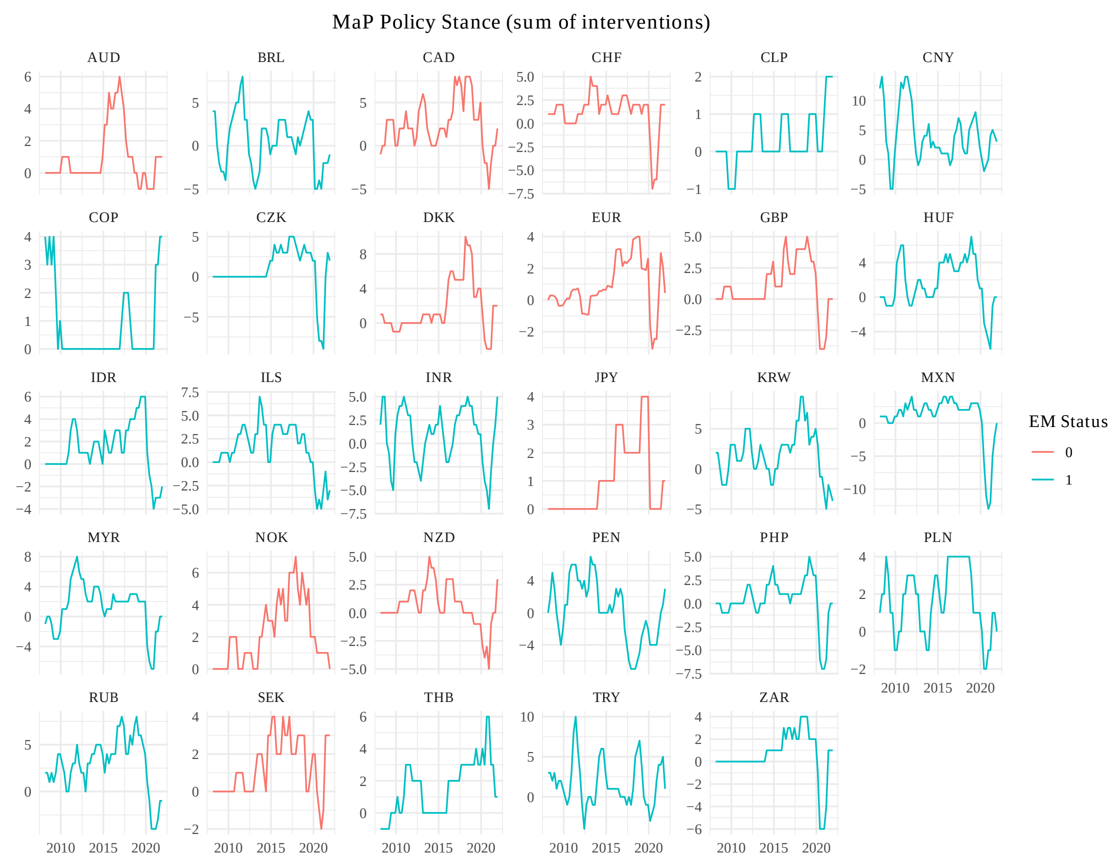


Figure 14: Macroprudential Policy Stances (4-quarter window sum of interventions - all tools)

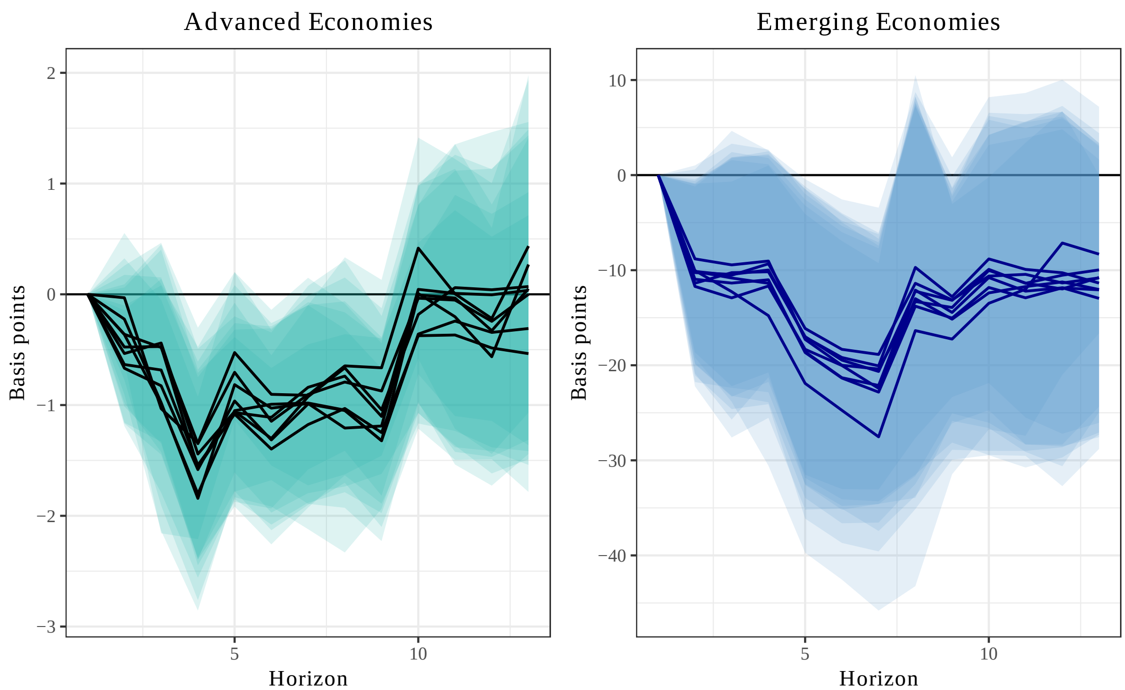
Table 10: Descriptive Statistics on the Dependent Variables.

	VXO	VIX	USTWD	DXY	TED	FF3	FF4	CL4	CL3	BALTIC	BBBBAA	SP500	SP100	CAP	LEV
Observations	12724	7178	12724	12724	8705	12724	12724	12724	12724	12724	8074	12724	12724	12635	12635
Minimum	-0.38	-0.41	-0.03	-0.03	-80.66	-0.47	-0.40	-0.28	-0.34	-0.19	-0.56	-0.13	-0.12	-0.47	-0.92
Maximum	0.76	0.98	0.02	0.03	83.62	0.52	0.52	0.19	0.24	0.20	0.52	0.11	0.11	0.46	0.94
Mean	-0.00	0.00	0.00	0.00	-0.00	0.00	0.00	0.00	0.00	-0.00	-0.00	0.00	0.00	-0.00	0.00
Median	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Variance	0.00	0.00	0.00	0.00	13.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
St. Dev	0.06	0.06	0.00	0.00	3.67	0.03	0.03	0.02	0.02	0.02	0.03	0.01	0.01	0.02	0.03
Skewness	0.90	1.54	0.14	-0.06	0.81	-0.17	0.28	-1.20	-1.35	0.49	0.42	-0.45	-0.36	-1.37	1.37
Excess Kurtosis	10.39	15.93	7.55	4.02	142.66	62.51	42.25	24.28	32.76	14.32	63.65	16.77	15.22	128.03	128.03
Unit Root Tests															
ADF	-8.36	-6.71	-1.59	-1.96	-4.92	-2.27	-2.18	-1.90	-1.96	-2.95	-1.46	2.31	2.69	-2.26	-5.68
PP	-7.76	-6.37	-1.63	-1.96	-5.07	-2.24	-2.16	-1.87	-1.92	-2.80	-1.66	2.34	2.74	-2.15	-5.13
Crt. Val.	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86	-2.86

Notes: The table presents the descriptive statistics of the explanatory variables used in the model. The Unit Root tests used are the Augmented Dickey-Fuller (ADF) and Phillips and Perron Tests (PP), which share the same null hypothesis that the series has a Unit Root. The second and third panels correspond to the test statistics and critical values for each of the tests under a 95% confidence level. Both the ADF and the PP share the same critical values. Excess Kurtosis is the kurtosis level above a normal distribution (mesokurtic) of three.

F Other panel estimation results

Figure 15: LP IRFs to a Macroprudential Policy Tightening - model with three lags



Note: These plots depict the IRF of the CIP deviations in our baseline specification to a macroprudential policy tightening for specifications with different commodity-market-related shocks as listed in Table 3. For each shock, the IRF and 95% confidence intervals are plotted.