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Cross-country spillover effects of interest rate and credit constraint policies

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ABSTRACT

Both rising interest rates and tighter credit constraints decrease investors' funding positions in a given currency and cause the currency to appreciate. I extend the Gabaix and Maggiori (2015) global multi-country currency and bond model and show that the policy interventions have opposite effects on the value of an alternative funding currency through investor positioning. Rising interest rates encourage investors to shift their positioning and cause the alternative currency to depreciate. Tightening credit conditions have the contrasting effect and prompt appreciation for both currencies. Empirical evidence on Japanese Yen returns is consistent with the model.

1. Introduction

Global market participants will seek funding from where it is most advantageous for their investment goals. Both increasing interest rates and tightening credit conditions make a currency less desirable as a funding source, see, e.g., Gabaix and Maggiori (2015) or Brunnermeier et al. (2008). As investors close their short positions and buy the funding currency, both policies result in currency appreciation.

This paper argues that increasing interest rates and tightening credit conditions in one funding country have an opposite, to each other, impact on the investor positioning in *other* funding countries. Consequently, the effects of the policies on the value of the alternative funding currencies are also divergent. The result is obtained from a version of the influential (Gabaix and Maggiori, 2015) model with two funding countries, i.e., countries with excess supply of capital and a single investment country with excess demand of funds.

Assuming a positive correlation between two funding currencies, increasing interest rates in one of the funding countries results in increased investor positions in the currency of the other funding country, as it has become cheaper vis-à-vis its alternative. On the other hand, tightening limits for risky credit exposures in one funding currency leads to decreased positions in both currencies. This happens because the correlation means that positions in the other currency also contribute towards meeting the constraints for risky credit in the first currency.

I show empirical evidence that is consistent with the model. Increases in interest rates and Japanese TED spreads, which approximate funding constraints, are both associated with an appreciation of the Yen. Conversely, tightening credit constraints

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in a basket of other potential funding currencies are linked to the appreciation of the Japanese Yen, while increases in the interest rates of these other funding currencies lead to Japanese Yen depreciation.

To my knowledge, this paper is the first to discuss the combined effects of monetary and credit policy changes to *other* currencies via the financial channel. In doing so, it relates to three topical literatures. First, it contributes to the literature on how financial intermediary capital flows influence currency valuation. In an important contribution, Gabaix and Maggiori (2015) model how unbalanced international trade, together with credit constraints, can drive currency values to differ from UIP. Filipe et al. (2023) provide empirical evidence on how funding conditions drive the currency markets more generally. Yin (2020) shows that intermediary capital predicts FX rates, and Shahzad et al. (2018) show that developed market currencies, as funding sources, drive other currency valuations.

Second, the study relates to the relatively new literature that describes the international interactions of monetary and macroprudential credit measures. Takáts and Temesvary (2021) are one of the first papers to empirically describe the effects of monetary and macroprudential policies on international bank lending. However, they do not address the explicit impact on currency values. Bruno et al. (2017) use a cross-section of countries to evaluate monetary and credit policies for the domestic economies but do not widen the discussion into currency valuation.

Third, this paper relates to the literature on how intermediary cross-border lending activity influences monetary policy transmission. Consistent with my approach, Bräuning and Ivashina (2016) show that monetary policy affects intermediary lending in other currencies when credit is constrained. Georgiadis and Mehl (2016) show that the financial transmission channel has become more important in transferring monetary policy shocks. Finally, Yang and Zhang (2021) confirm the domestic impact of monetary policy.

2. Model

I add country specific exogenous interest rates, set by the central banks, to the model of Gabaix and Maggiori (2015). The model has a continuum of two agent types in each country: households and financiers, and discrete time t with periods $t \in 0, 1$. I have $i = 0, \dots, n-1$ countries, of which one is the central country 0, called "US". Importantly, financiers cannot trade on the spot FX markets, but rather on bond markets. Financiers take all positions against the US dollar. Financiers balance sheet consists of q dollars worth of Dollar bonds and $-q/e^0$ foreign currency units worth of foreign bonds. I have exchange rate e_i^t measured as the units of foreign currency in US dollars at time t.

The friction in the system arises from the fact that financiers can divert a portion of the funds. If financier diverts, households that invested will recover a portion $1 - \Gamma \left|q/e^0\right|$ of their position of $\left|q/e^0\right|$. The credit constraint parameter Γ controls the demand curve steepness. Higher parameter signifies higher portion of funds diverted for the financier. The incentive compatibility condition for households becomes:

$$\underbrace{\frac{V^0}{e^0}}_{\text{Financier value in for.currency}} \geq \underbrace{\left|\frac{q}{e^0}\right|}_{\text{Financier assets}} \underbrace{\Gamma\left|\frac{q}{e^0}\right|}_{\text{Diverted Portion}} = \underbrace{\Gamma\left(\frac{q}{e^0}\right)^2}_{\text{Profit from divertion}}.$$

Financiers maximize the expected value of their firm and their constrained problem becomes

$$\begin{aligned} \max_q \quad & V^0 = \mathbb{E}\left[\beta\left(R - R^* \frac{e^1}{e^0}\right)\right] q \\ \text{s.t.} \quad & V^0 \geq \Gamma \frac{q^2}{e^0} \end{aligned} \tag{1}$$

where R and R^* are the interest rates in US and the foreign country, respectively. The value of the company increases linearly and the constraint squared in position size, so the constraint binds. I substitute the value of the firm to the constraint, define $\beta = 1/R$ and integrate over all financiers to get the multi-currency solution:

$$\mathbb{E}\left[\boldsymbol{e}^0 - \frac{1}{R}\boldsymbol{R}^*\boldsymbol{e}^1\right] = \boldsymbol{\Gamma}\boldsymbol{q}. \tag{2}$$

Funding positions are increasing expected currency valuation, increasing in interest rate spread and decreasing in the credit constraint.

2.1. Global trade networks

The global currency imbalances in the model arise due to unbalanced trade. In the trade surplus countries, there is excess money that the financiers channel to the trade deficit countries through the bond market.

Global trade is introduced through utility-maximizing households who consume local non-tradable goods[2] and goods tradable on the global market. Households have a stochastic preference for foreign goods. The household problem is not essential for this

[2] The local goods do not show up in the solution as I assume that the local households' preferences change in line with the production and the consumption of the local non-tradable good.

study and is discussed thoroughly in Gabaix and Maggiori (2015). I take the imbalances of the global trade given and concentrate on the currency effects.

I normalize the USD rate so that $e_0^t = 1$. For $i \neq j$, I call $\xi_{ij} \leq 0$ the exports from country i to j, and $x_i = -\xi_{i0} > 0$ the exports to country 0. Import weights are defined as

$$\xi_{ii} \equiv - \sum_{j=0,1,2,j\neq i} \xi_{ji} (> 0).$$

Note that exports are always denoted in the currency of the importing country, so that ξ_{ii} equals the total imports of country i. At time 0, country i imports a dollar value of $\xi_{ii}^0 e_i^0$, creating a positive $\xi_{ii}^0 e_i^0$ supply for the currency. It also exports a dollar value of $-\sum_{j\neq 0, j\neq i} \xi_{ij}^0 e_j^0 + x_i^0$. Financiers hold θ_i of country i's bonds with dollar value of q_i. The net supply for currency i in the spot market, expressed in dollars and in vector form, has to be 0 in equilibrium:

$$\boldsymbol{\xi}^0 \boldsymbol{e}^0 - \boldsymbol{x}^0 - \boldsymbol{q} = 0. \tag{3}$$

At time t=1, the position $\boldsymbol{q}$ has grown to be $\boldsymbol{R}\boldsymbol{q}$. For simplicity, the financiers keep their profits in the local currencies without additional cash flows at time $t = 1$ so that the market settles

$$\boldsymbol{\xi}^1 \boldsymbol{e}^1 - \boldsymbol{x}^1 + \boldsymbol{R}\boldsymbol{q} = 0. \tag{4}$$

2.2. An illustrative three country case

To illustrate the key dynamics, I define a three-country model with a single investment country, "The US", and two identical funding countries so that financiers will start with equal positions in each.[3] I follow (Gabaix and Maggiori, 2015) and argue that the financier position limits are tied to the riskiness of their positions and model the financier constraints[4] as

$$\boldsymbol{\Gamma} = \begin{bmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 \\ \rho\sigma_1\sigma_2 & \sigma_2^2 \end{bmatrix} \begin{bmatrix} \gamma_1 & 0 \\ 0 & \gamma_2 \end{bmatrix} = \begin{bmatrix} \gamma_1\sigma_1^2 & \gamma_2\rho\sigma_1\sigma_2 \\ \gamma_1\rho\sigma_1\sigma_2 & \gamma_2\sigma_2^2 \end{bmatrix}.$$

In the setup, γ_1 and γ_2 represent the exogenous control variables that allow policymakers to adjust currency-specific funding conditions, e.g., by adjusting capital or risk limits for financial intermediaries. The risk parameters σ_1, σ_2, and the correlation coefficient ρ arise endogenously in the model. The model stochasticity stems from the uncertain household demand for funding country imports to the US at time 1, so the currency correlation ρ between countries is ultimately determined by the trade correlation between the funding countries. It can be derived from the model solution. Without loss of generality, the funding countries do not trade with each other, $\boldsymbol{\xi}^0 = \boldsymbol{\xi}^1 = \boldsymbol{I}$. Online Appendix A derives the solution of the three country model as

$$\begin{aligned} \boldsymbol{e}^0 &= \left((\boldsymbol{R}^*)^{-1}(\boldsymbol{I} - \boldsymbol{\Gamma}) + \boldsymbol{I}\right)^{-1} \left(\boldsymbol{x}^0 + R\mathbb{E}[\boldsymbol{x}^1] - (\boldsymbol{R}^*)^{-1}\boldsymbol{\Gamma} x^0\right) \\ \boldsymbol{e}^1 &= \boldsymbol{R}\boldsymbol{x}^0 + \mathbb{E}[\boldsymbol{x}^1] + \{\boldsymbol{x}^1\} - \boldsymbol{R}\boldsymbol{e}^0 \\ \boldsymbol{q} &= \boldsymbol{\Gamma}^{-1}\left((\boldsymbol{I} + \boldsymbol{R}^*)e^0 - \boldsymbol{R}^* x^0 - \frac{\boldsymbol{R}^*}{R}\mathbb{E}[\boldsymbol{x}^1]\right). \end{aligned} \tag{5}$$

I normalize the US demand for goods are time $t = 0$ to 1 for both funding countries, $\boldsymbol{x}^0 = 1$. At time $t = 1$ I leave the exact stochastic process for the uncertain US demand for imports unspecified, so that I have $\boldsymbol{x}^1 = \mathbb{E}[\boldsymbol{x}^1] + \{\boldsymbol{x}^1\}$ where $\{\boldsymbol{x}^1\}$ contains all the uncertainty in the model.

To derive the sensitivity of both financiers' positions and currency valuation towards changes in interest rates and credit policies, I will switch the matrix Eqs. (5) to functions

$$\boldsymbol{q} = \begin{bmatrix} q_1(\sigma_1, \sigma_2, \rho, \gamma_1, \gamma_2, \mathbb{E}[x_1^1], \mathbb{E}[x_2^1], R_1^*, R_2^*, R) \\ q_2(\sigma_1, \sigma_2, \rho, \gamma_1, \gamma_2, \mathbb{E}[x_1^1], \mathbb{E}[x_2^1], R_1^*, R_2^*, R), \end{bmatrix} \tag{6}$$

$$\boldsymbol{e}^0 = \begin{bmatrix} e_1^0(\sigma_1, \sigma_2, \rho, \gamma_1, \gamma_2, \mathbb{E}[x_1^1], \mathbb{E}[x_2^1], R_1^*, R_2^*, R) \\ e_2^0(\sigma_1, \sigma_2, \rho, \gamma_1, \gamma_2, \mathbb{E}[x_1^1], \mathbb{E}[x_2^1], R_1^*, R_2^*, R) \end{bmatrix} \tag{7}$$

Online Appendix B uses these functional forms and derives a necessary condition for the financier capital flows to go from countries 1 and 2 towards country 0 as $\mathbb{E}[x^1] < 1$.

---

[3] The model solution is general, and this assumption is not too restrictive. Indeed, to derive the key partial derivatives, I only need to assume that parameters are sensible, e.g., positive volatilities and that both countries are funding countries, see Appendix B. Further, assuming the countries are similar renders the analytical solutions tractable.

[4] In the standard mean–variance setting, we would have $\boldsymbol{\Gamma} = \gamma \boldsymbol{Var}(e^1)$, where $\boldsymbol{Var}(e^1)$ is the covariance matrix and γ is the risk aversion parameter. I assume positive-semidefiniteness.

2.3. Sensitivities to tightening credit constraints

Proposition 1. *Assuming a positive correlation $\rho > 0$, the funding currencies' sensitivities to changes in credit constraint γ_1 in country 1 are positive, with $\frac{\partial e_1^0}{\partial \gamma_1} > 0$ and $\frac{\partial e_2^0}{\partial \gamma_1} > 0$. The sensitivities of the investor positions in both countries to changes in γ_1 are negative, $\frac{\partial q_1}{\partial \gamma_1} < 0$ and $\frac{\partial q_2}{\partial \gamma_1} < 0$.*

Proof. The funding countries are similar, so that I have $\sigma_1 = \sigma_2 = \sigma$ and $\mathbb{E}[x_1^1] = \mathbb{E}[x_2^1] = \mathbb{E}[x^1]$. To abstract away from interest rates, I set $R_1^* = R_2^* = R = 1$. Differentiating (6) with respect to credit conditions γ_1 in country 1 gives

$$
\begin{aligned}
\frac{\partial q_1(\sigma,\sigma,\rho,\gamma,\gamma,\mathbb{E}[x^1],1,1,1)}{\partial \gamma_1} &= \frac{\sigma(\mathbb{E}[x^1]-1)\left(\gamma\left(\rho^2-1\right)\sigma-2\right)}{(\gamma(\rho-1)\sigma-2)(\gamma(\rho+1)\sigma+2)^2} \\
\frac{\partial q_2(\sigma,\sigma,\rho,\gamma,\gamma,\mathbb{E}[x^1],1,1,1)}{\partial \gamma_1} &= -\frac{2\rho\sigma(\mathbb{E}[x^1]-1)}{(\gamma(\rho-1)\sigma-2)(\gamma(\rho+1)\sigma+2)^2}.
\end{aligned} \tag{8}
$$

Because we had $\mathbb{E}[x^1] < 1$, the change in position q_1 is always negative.

For country 2, the sign of the derivative depends on the correlation coefficient ρ. If the goods of the two funding countries are complements in US, $\rho > 0$, then $\frac{\partial q_2}{\partial \gamma_1} < 0$. The financiers position in country 2 decrease when credit conditions tighten in country 1. If the goods are substitutes for US consumers, $\rho < 0$, then $\frac{\partial q_2}{\partial \gamma_1} > 0$. The sensitivities of foreign exchange rates to the credit constraints in country 1 are very similar to Eqs. (8), only the signs are reversed.

$$
\begin{aligned}
\frac{\partial e_1(\sigma,\sigma,\rho,\gamma,\gamma,\mathbb{E}[x^1],1,1,1)}{\partial \gamma_1} &= -\frac{\sigma(\mathbb{E}[x^1]-1)\left(\gamma\left(\rho^2-1\right)\sigma-2\right)}{(\gamma(\rho-1)\sigma-2)(\gamma(\rho+1)\sigma+2)^2} \quad \square \\
\frac{\partial e_2(\sigma,\sigma,\rho,\gamma,\gamma,\mathbb{E}[x^1],1,1,1)}{\partial \gamma_1} &= \frac{2\rho\sigma(\mathbb{E}[x^1]-1)}{(\gamma(\rho-1)\sigma-2)(\gamma(\rho+1)\sigma+2)^2}.
\end{aligned} \tag{9}
$$

2.4. Sensitivities to interest rate

Proposition 2. *Assuming a positive correlation $\rho > 0$, the currency sensitivities to changes in the interest rate R_1 in country 1 are as follows: the sensitivity of currency 1 is positive, $\frac{\partial e_1^0}{\partial R_1} > 0$, while the sensitivity of currency 2 is negative, $\frac{\partial e_2^0}{\partial R_1} < 0$. The sensitivity of investor position is negative in country 1, $\frac{\partial q_1}{\partial Ra_1} < 0$, and a positive in country 2, $\frac{\partial q_2}{\partial \gamma_1} > 0$.*

Proof. I assign equal credit constraint coefficients and expected exports to US for the funding countries $\gamma_1 = \gamma_2 = 1$ and $\mathbb{E}[x_1^1] = \mathbb{E}[x_2^1] = \mathbb{E}[x^1]$. I set $R_0 = 1$ and assume that the interest rates are the same for the funding countries $R_1 = R_2 = R$. Differentiating Eqs. (6) with respect to interest rate R_1 in country 1 gives

$$
\begin{aligned}
\frac{\partial q_1(\sigma,\sigma,\rho,1,1,\mathbb{E}[x^1],R,R,1)}{\partial R_1} &= -\frac{\left(R+\sigma^2+1\right)\left((\rho+1)\sigma^2\mathbb{E}[x^1]+\mathbb{E}[x^1]+1\right)}{\left(-(\rho-1)\sigma^2+R+1\right)\left((\rho+1)\sigma^2+R+1\right)^2} \\
\frac{\partial q_2(\sigma,\sigma,\rho,1,1,\mathbb{E}[x^1],R,R,1)}{\partial R_1} &= \frac{\rho\sigma^2\left((\rho+1)\sigma^2\mathbb{E}[x^1]+\mathbb{E}[x^1]+1\right)}{\left(-(\rho-1)\sigma^2+R+1\right)\left((\rho+1)\sigma^2+R+1\right)^2}.
\end{aligned} \tag{10}
$$

The first equation is always negative. When interest rate is increased in country 1, financiers unwind their positions in that country. If $\rho > 0$, the speculators will increase funding positions in country 2 that has now became relatively cheaper: $\frac{\partial q_2}{\partial R_1} > 0$. If $\rho < 0$, the financiers will also unwind the positions in the other country 2: $\frac{\partial q_2}{\partial R_1} > 0$.

The currencies' sensitivities are the same as positions in Eq. (10), just with opposite sign. With positive correlation $\rho > 0$, we thus have $\frac{\partial e_1^0}{\partial R_1} > 0$ and $\frac{\partial e_2^0}{\partial R_1} < 0$. $\square$

3. Empirical results

For several reasons, causal empirical identification for monetary and credit policies is notoriously hard.[5] First, these policies are used conditional on the variables they seek to influence. Second, the timing of the policies may not be exogenous.[6] Third, with a small number of countries, identifying the counterfactual is problematic. Mindful of these facts, I present contemporaneous regressions consistent with the model results.

I use the Japanese Yen (JPY) as an illustrative example of a funding currency. However, we lack a clear candidate for the other funding currency. For example, contrary to the model's assumption that funding countries have depreciating currencies, the Swiss

5 For a more thorough discussion, see, e.g., Bruno et al. (2017) or Takáts and Temesvary (2021).

6 In particular, the effect may occur on the communication day and not the exact policy date. Due to measurement, reporting, and decision-making lags credit policies are inclined to happen late in the credit cycle.

Franc faced significant appreciation pressure in the sample period. As a result, the Swiss National Bank fixed the exchange rate from 2011 until 2015.

Instead of relying on a single currency, I employ a synthetic alternative funding currency composed of the euro (EUR), Swedish krona (SEK), and Swiss francs (CHF) for two main reasons. Firstly, these currencies have consistently exhibited low-interest rates. In a sample of 82 quarters, the euro was included in the short portfolio of a carry strategy – which involves shorting the three currencies with the lowest rates – in 34 instances, while the Swedish krona appeared 28 times. No other currencies, except CHF and JPY, featured in the short portfolio, and none of these four currencies ever appeared in the long portfolio. Secondly, these are the currencies in which the financial intermediaries that lend to global markets operate. McGuire et al. (2024) indicate[7] that while Japanese banks are the most significant global creditors, German and French banks follow closely.

I test Propositions 1 and 2 with respect to the changes in currency values[8] with quarterly frequency so that all the currency returns have time to adjust to policy changes within one time period.[9] For a credit constraint proxy, I follow (Frazzini and Pedersen, 2014) and use the three month TED spread. Online Appendix C presents and discusses the data more thoroughly.

Table 1 shows how the Japanese Yen appreciates with domestic interest rate increases and both domestic and foreign tightening credit constraints while depreciating with foreign interest rate increases. In particular, since 2009 and the financial crisis, when funding has been constrained as presupposed by the model, interest rate changes in Japan and in the currency basket have different signs and statistically significant coefficients, so that interest rate increases in JPY are associated with positive Yen returns and increases in the mean rate of the currency basket are associated with negative returns.

Both domestic and foreign TED spread changes have a positive coefficient, indicating that tightening credit constraints in Japan and the currency basket strengthen the Japanese Yen. The coefficient for the Japanese TED spread is statistically insignificant in the whole sample. However, it is economically significant, suggesting roughly a one percentage point currency return for a 10 bps increase in the TED spread. Panel B shows the domestic credit constraints as statistically significant in the latter half of the sample.

4. Conclusions

Raising interest rates and tightening credit constraints both lead to funding currency appreciation. However, the effects of these policies on an *alternative* funding currency are divergent: monetary tightening leads to depreciation of the other currency, whereas tighter credit constraints increase the value of the other currency. The results are of interest not only to investors but also to policymakers coordinating regulatory policies.

CRediT authorship contribution statement

Juuso Nissinen: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author used ChatGPT for grammar checks and other text editing. After using this tool/service, the author reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Appendix. Supplementary material

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.frl.2024.105617.

[7] This is only a snapshot from 2024, but as Aldasoroa and Ehlers (2019) argue, the concentration to these countries is a structural feature in cross-border bank credit.

[8] Investor positioning is harder to test, as there is not a single intermediary that takes the role of financiers in the model. Takáts and Temesvary (2021) use proprietary the bank balance sheet data to argue how the effects of interest rate changes go through the positioning of international banks. However, McGuire et al. (2024) show that much of the international lending goes today via non-bank entities that are hard to capture.

[9] The long frequency allows for shorter lags, although we cannot observe these lags or causal relationships.

Table 1
This table illustrates the impact of changes in the interest rate and credit constraint measures on the quarterly returns of the Japanese Yen (JPY). ΔJPY represents the quarterly return of the Japanese Yen against the United States Dollar (USD), controlling for the mean return of the G11 currencies against the USD. ΔIR denotes the quarterly change in the spread between the Japanese and US 3-month Libor rates. ΔIR^{other} is the mean of quarterly changes in the spread between the currency-specific and US three-month rates for the currency basket of Euros (EUR), Swedish Krona (SEK), and Swiss Francs (CHF). For EUR, I use the 3-month Euribor rate; for CHF, JPY, and USD, the Libor rate; and for SEK, the three-month LIBOR rate. ΔTED denotes the quarterly change in the Japanese TED spread, defined as the 3-month Libor rate less the 3-month government yield. ΔTED^{other} is the mean of quarterly changes in TED spread for the currency basket. All data is downloaded from DataStream and reported in percentage points. Standard errors are Newey–West adjusted with eight lags. ***,**, and * show statistical significance at 1, 5, and 10 percent, respectively.

(a) From 2001 until the second quarter of 2021.

	ΔJPY (1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔIR	1.99				1.74		8.22***
	(1.21)				(1.32)		(3.05)
ΔTED		24.03***			23.24***		12.66
		(3.20)			(3.43)		(1.48)
ΔIR^{other}			−0.23			0.01	−7.17***
			(−0.27)			(0.01)	(−3.76)
ΔTED^{other}				7.21		7.21	15.28***
				(1.21)		(1.23)	(2.60)
$CONST$	−0.34	−0.17	−0.20	−0.20	−0.29	−0.20	−0.60
	(−0.72)	(−0.31)	(−0.38)	(−0.40)	(−0.57)	(−0.40)	(−1.30)
# of Obs.	82	82	82	82	82	82	82
R^2	0.04	0.14	0.0004	0.03	0.17	0.03	0.33

(b) From 2009 until the second quarter of 2021.

	ΔJPY (1)	(2)	(3)	(4)	(5)	(6)	(7)
ΔIR	−4.26*				−3.42		5.54*
	(−1.90)				(−1.45)		(1.69)
ΔTED		21.71***			20.08***		17.93***
		(5.61)			(4.47)		(3.03)
ΔIR^{other}			−1.87			−1.49	−5.93***
			(−1.33)			(−0.98)	(−3.00)
ΔTED^{other}				19.54***		19.35***	20.48***
				(6.33)		(5.77)	(3.89)
$CONST$	−0.30	−0.07	−0.38	−0.08	−0.07	−0.11	−0.03
	(−0.54)	(−0.12)	(−0.65)	(−0.16)	(−0.11)	(−0.24)	(−0.05)
# of Obs.	50	50	50	50	50	50	50
R^2	0.05	0.12	0.01	0.21	0.15	0.21	0.29

Note: *p<0.1; **p<0.05; ***p<0.01

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