

# INTERNATIONAL MONETARY SPILLOVER TO EMERGING MARKETS

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**ABSTRACT.** In this paper, I investigate the spillover effect of monetary conditions between large countries and onto emerging markets. Using a system of three-country structural vector autoregressive (SVAR) models, I make recursive identifying assumptions based on country size and find that: (1) monetary shocks in a large economy has significant impact on output growth, inflation, and interest rate of other large economies and emerging markets; (2) the effects are destination-homogenous, i.e. emerging economies are affected and respond systematically; and (3) the effects are origin-heterogenous, i.e. the origin of the monetary shock matters.

The first two findings are consistent with the so-called ‘global financial cycle’ phenomenon that is documented post 2008, while the last finding calls for better theory which involves country sizes and network centrality to explain the heterogeneous spillovers by origin country.

## 1. INTRODUCTION

How do monetary policy loosening – one like the US or Japan’s quantitative easing – affect real and financial conditions home and abroad? Are such policies *beggar-thy-neighbor*, i.e. growth at the cost of neighbors, or *boost-thy-neighbor*? Such questions do not have clear cut answer in the international finance literature.

On one hand, loose monetary condition abroad makes foreign currency depreciates, making home goods relatively more expensive, thus shifting expenditure from home to abroad. Such effect is the *expenditure switching* channel, one that often gets cited in policy debate. On the other hand, lower interest rate abroad stimulates the economy and makes foreign agents feel richer, thus demanding more all goods, including home goods. This is the **demand** channel, which pushes against the first, creating the *boost-thy-neighbor* effect. Finally, lower interest rate abroad incentivizes foreign agent to *search*

for yield, investing more in home assets, increasing asset prices while lowering yield. The influx of capitals would also boost domestic economy, and also *boost-thy-neighbor* (see (Ammer et al., 2016)).

Which of these channels will dominate depend on implicit structure of the world economy, such as the degree of home bias, substitutability between differentiated products, etc. This paper looks at a cross-section of emerging markets, among them the *Fragile Five* countries that were most vulnerable to foreign spillover during the Taper Tantrum, to investigate the true effects of monetary spillovers.

This paper constructs a series of three-country (the US, an emerging market, and a third large economy<sup>1</sup>) structural VAR (SVAR) models to investigate the spillover effect of monetary condition from developed economies (DEs) to emerging markets (EMs). The identification scheme in this paper is two-fold: (1) for each economy, domestic variables (output, inflation, and short-term interest rate) are ranked according to the recursive ordering assumption in the spirit of Sims (1980) and Christiano et al. (1999), and (2) on the world scale, we assume that countries are ranked in the Wold ordering according to the size of their economies: large developed countries are not affected *contemporaneously* by structural shocks originating from emerging markets.

The paper has three main empirical findings.

First, monetary shocks from a third country have statistically and economically significant impact on both real and financial variables of the US and emerging markets. Our analysis finds that a loosening of monetary policy which causes short-term money market interest rate in Japan to lower by 10 basis points increases US quarterly output growth by 0.4% at peak after four quarters, increases US inflation by 0.1% after 6 quarter, and make the Japanese yen depreciates against US dollar by 3% after 4 quarter. The same shock originating from France would temporarily hurt output growth in the US, but increases it by 0.15% six quarters ahead. Inflation also rises modestly by 0.15% and US interest rate is pushed up by 10 basis point six quarters

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<sup>1</sup>The three countries considered each of the SVAR specifications always include (1) the US, (2) an emerging market (e.g. *The Fragile Five* countries: Brazil, Turkey, Korea, India, Indonesia), and (3) a large developed economy (e.g. Japan, the UK, or an EU member such as France). From here on, I will refer to this non-US large developed economy as ‘the third country.’

ahead. The paper discusses in details about how plausible my point estimate is compared to those given in the literature.

Second, the effects on EMs are *destination-homogenous*: most EMs responds to a third-country monetary shock in the same way. Consider the same 10-basis point monetary loosening from Japan: most economies – except for Indonesia – experience output growth surge, lower inflation, and currency depreciation against the dollar in the short-run, before reverting back to trend. The synchronized movements of all emerging variables in most specifications suggest the importance of external spillover factors on domestic economies. We also note another phenomenon. Interest rate responses are highly correlated across countries, a phenomenon which is consistent with recently documented evidence of spillover of financial conditions from developed to emerging markets (c.f. Ammer et al. (2016)).

Third, the monetary spillover effect is *origin-heterogeneous*. In our analysis, monetary shocks that come from the non-US large countries tend to cause output growth in the world economy, while US monetary shocks tend to be *beggar-thy-neighbor*. This asymmetric response of the world economies to monetary shocks is surprising and suggestive of network-structure dependence. Perhaps, though not pursued in this paper, the centrality of the US economy could explain the asymmetry that we see in the SVAR outputs.

## 2. THE SVAR MODEL

**2.1. Data.** I obtain output, inflation, interest rate,<sup>2</sup> and exchange rate data from the Economist Intelligence Unit (EIU) dataset. All data are in quarterly frequency, and taken from 2000Q1 to 2016Q4. All variables are in growth rate (output, inflation) or log (exchange rate), except for interest rate.

**2.2. Specification.** We specify three countries in our model: (1) the US, (2) another large developed economy (e.g. Japan or the UK), and (3) an emerging market. Countries are indexed by  $i = 1, 2, 3$ . Let  $D_{i,t}$  denotes a  $1 \times k$  vector of domestic fundamental variables, which includes inflation  $\pi_{i,t}$ , GDP growth  $\Delta y_{i,t}$ , and the short-term interest rate  $r_{i,t}$ . Let

<sup>2</sup>short-term money market interest rate.

$$Y_t = [D_{1,t}, D_{2,t}, D_{3,t}, \Delta s_3, \Delta s_{EM}]$$

where  $\Delta s_3$  and  $\Delta s_{EM}$  are the depreciation rate of the exchange rate between country (2) and (3) vis-a-vis the US dollar (a positive  $\Delta s$  implies a depreciation of the non-US currency).

The reduced form VAR is

$$(1) \quad A(L)Y_t = u_t$$

for  $A(L) = I - \sum_{j=1}^p A_j L^j$ , and  $\mathbb{E}[u_t u_t'] = \Sigma_u$  (unrestricted). The vector of innovations  $u_t$  is thought of as a linear combination of structural shocks  $\epsilon_t$ :

$$u_t = R^{-1} \epsilon_t$$

where  $R$  is symmetric with  $\text{diag}(R) = \mathbf{1}$ , and  $\mathbb{E}[\epsilon_t \epsilon_t'] = \Sigma_\epsilon$  diagonal.

**2.3. SVAR Identification.** We follow Sims (1986) and Christiano, Eichenbaum, and Evans (1999) to assume recursive ordering (i.e.  $R$  is unit lower triangular) for identification. In particular, the Wold ordering of variable is

$$(\pi_{US}, y_{US}, r_{US}), (\pi_{Dev}, y_{Dev}, r_{Dev}, s_{Dev}), (\pi_{EM}, y_{EM}, r_{EM}, s_{EM})$$

That is, within each country, the ordering is similar to Christiano, Eichenbaum, and Evans (1999), and globally, the US depends contemporaneously only on its own structural shocks, the large developed economy depends contemporaneously on its own and the US' structural shocks, and the EM depends on all structural shocks. The justification of this identification scheme is the same as Christiano, Eichenbaum, and Evans (1999) for domestic variables, while globally, this assumption intrinsically links to the small open economy assumption: the small open economy can only absorb shocks from abroad without influencing the bigger countries by its own shocks.

### 3. SVAR RESULTS

After estimating the SVAR model, we turn to the questions that we asked originally. The questions are, (1) how does a monetary contraction in Japan,

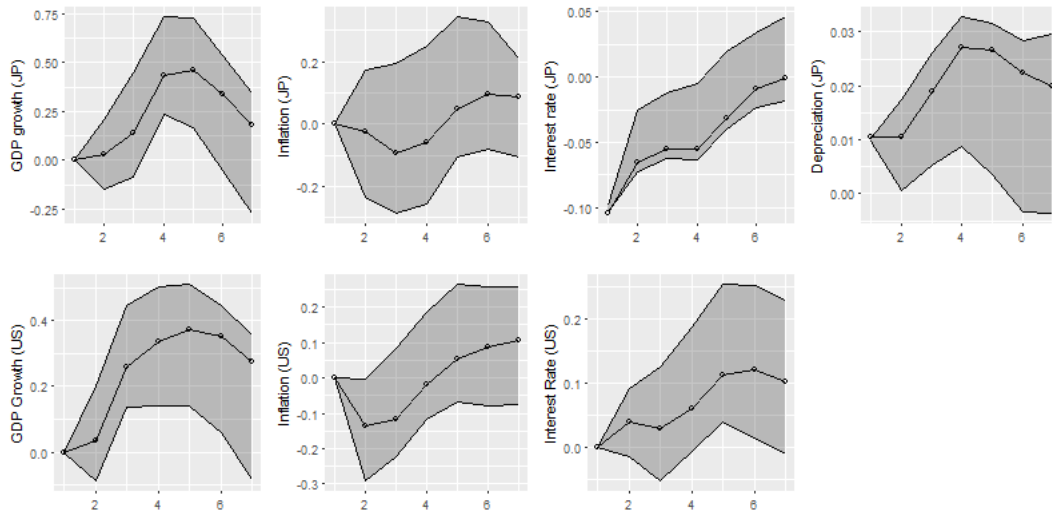


FIGURE 1. Effect of a 10-basis-point interest rate decline in Japan

	$Corr(IRF_{i,t}, IRF_{US,t})$		
	Output	Inflation	Interest rate
Brazil	0.487	0.933	0.968
India	0.284	-0.501	0.860
Indonesia	-0.348	0.223	0.895
South Africa	0.908	0.302	0.641
Korea	0.922	0.631	0.838

TABLE 1. Correlation of international IRFs and US IRFs to a Japanese monetary shock

represented by a 1 standard deviation structural shock to the short-term interest rate, affect the United States, and (2) what is the spill-over effect on an emerging market that does not trade much with Japan?

**3.1. The ‘boost-thy-neighbor’ effect of a Japanese monetary loosening.** Figure (1) describes the response of Japan and US to a 10 basis point decline of Japanese interest rate.

We do see a synchronized movement between the two economies: growth rate increase in the short and medium run, a 0.1% increase in inflation in the long-run, and an interest rate path that almost moves one-to-one together.

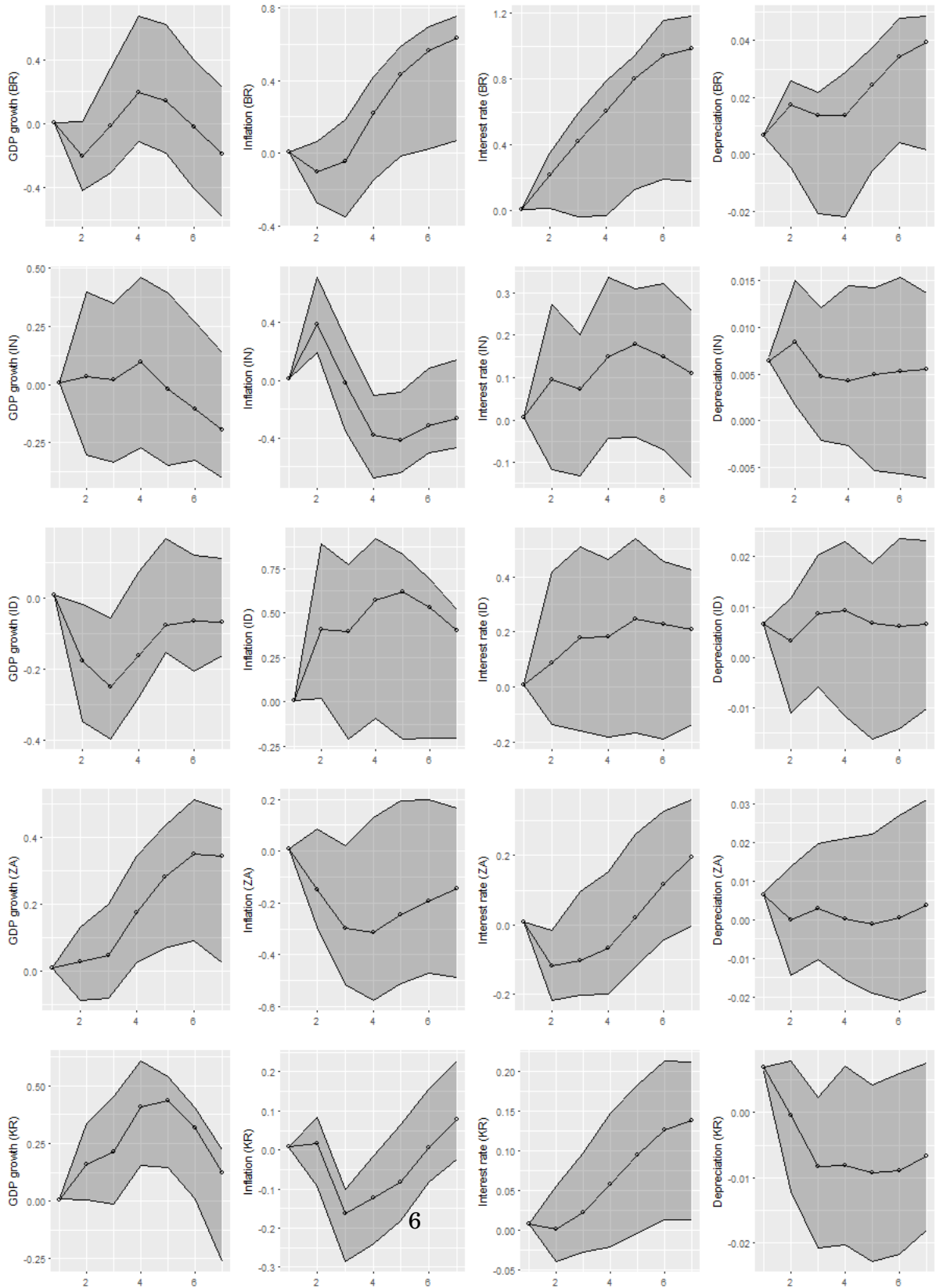


FIGURE 2. Effect of a 10-basis-point interest rate decline in the Japan

	$Corr(IRF_{i,t}, IRF_{US,t})$		
	Output	Inflation	Interest rate
Brazil	-0.374	-0.789	0.0688
India	0.934	0.746	0.159
Indonesia	-0.473	0.115	-0.973
South Africa	-0.948	0.848	-0.349
Korea	-0.267	0.815	0.0888

TABLE 2. Correlation of international IRFs and US IRFs to a US monetary shock

The yen depreciates on impact and continues to do so in the next quarters. A 0.1% interest rate decline in Japan seems to have stimulating effect on both economy, expanding GDP growth and inflation. Thus, monetary spillover in this case is more *boost-thy-neighbor* rather than *beggar-thy-neighbor*.

The effects on emerging market's fundamentals, however, are less synchronized. In figure (2), the emerging markets experience a mild boost of 0.1-0.5% GDP growth at peak (4 quarters after). Inflation tends to shortly lower in the short-run before increasing in the long-run. The effects on emerging market currency seem unclear also, with wider confidence band than fundamental variables. This reflects the volatile nature of the exchange rate versus fundamental variables.

**3.2. Origin heterogeneity: US monetary shock vs. Japan monetary shock.** Now consider the same 10-basis-point decline in interest rate shock, but the shock originates from the US instead of Japan. Figure (3) gives the effect of a 10-basis point interest rate decline in the US.

The domestic monetary loosening contributes to a mild output growth in the US (approximately 0.5%), while contributing to a GDP contraction in Japan. Interest rate continue to decline in both countries, consistent with a Taylor rule responding to output contraction. The Japanese yen slightly appreciate on impact, and converges back to trend after two quarters, consistent with what we expect from UIP.

Figure (4) gives the effect on emerging markets. We see that a monetary loosening in the US has an opposite effect from a monetary loosening in

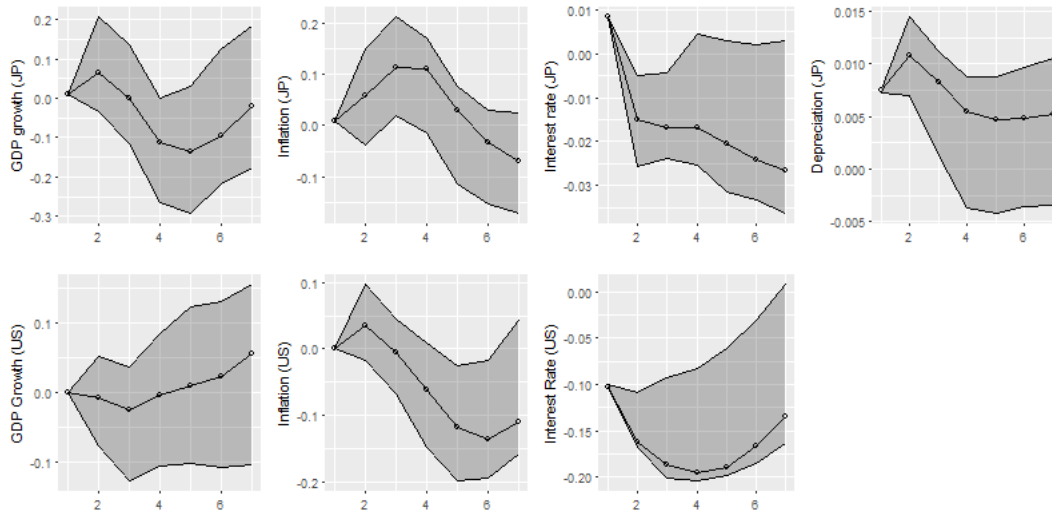


FIGURE 3. Effect of a 10-basis-point interest rate decline in the US

Japan: lower output, lower inflation, and currency depreciation in virtually all emerging markets.

Thus, in contrary to the case of a Japan monetary shock, a US monetary expansion is rather *beggar-thy-neighbor*: the US grows at the cost of Japan and the emerging markets. We call this effect *origin-heterogeneity*, i.e. where the shock starts matter.

**3.3. Destination homogeneity: international comovement.** Table (1) and (2) reports the correlation of international responses versus US responses to a Japanese monetary shock and US monetary shock, respectively.

In terms of size, the first column of (2) and (1) have opposite signs, which demonstrates the *beggar-thy-neighbor* vs. *boost-thy-neighbor* origin heterogeneous effects of the two shocks.

In magnitudes of correlation, we see high output and inflation correlation for Brazil, South Africa, and Korea. Unlike Korea, the former two countries are neither significant trade partners of Japan nor its neighbor. Thus, this synchronized movement suggests that fundamentals of emerging markets are driven by a strong external factor.

To see clearly the channel through which spillover happens, let us look at the interest rate correlation. We can see that interest rate comove strongly



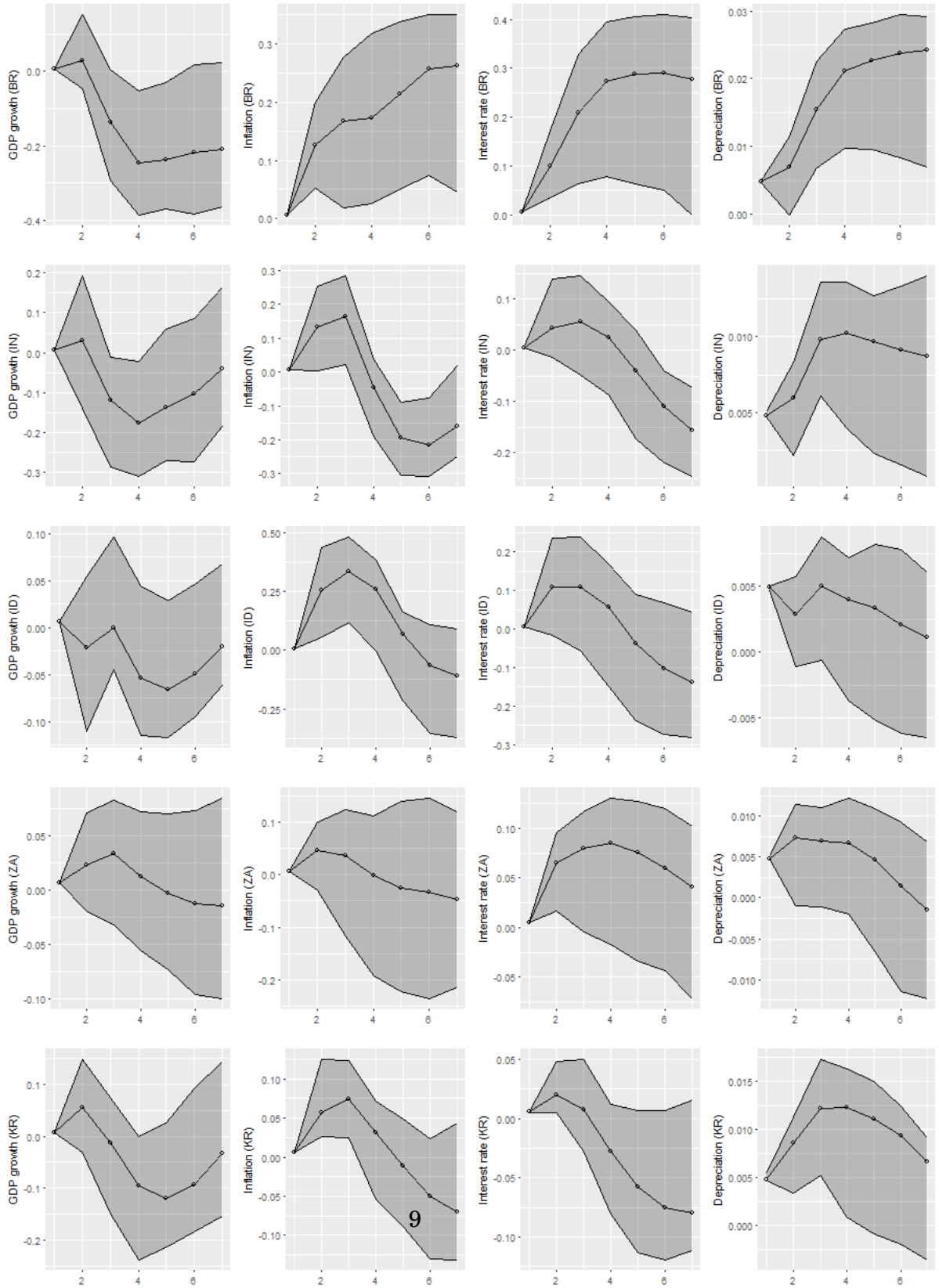


FIGURE 4. Effect of a 10-basis-point interest rate decline in the US

across all countries, and the most synchronized variable in our specification. With correlation at or near 90%, our finding is consistent with the financial spillover story: a lower interest rate in the US causes US investors to reach for yield in outside markets, pressing down yields in other economies as well.

The strong international co-movement suggests to us that financial spillover is *destination-homogenous*: spillover does not discriminate much among emerging markets.

#### 4. ROBUSTNESS CHECK

Appendix A includes further results for alternative specification. I have swapped Japan for the UK and France, and all the empirical phenomenons that I noted still hold true. There is a surprisingly high correlation of responses to any monetary shock across the world (destination-heterogenous), and shocks from UK/France gives opposite qualitative effect to shocks coming from the US (origin-homogenous).

#### 5. CONCLUSION

In this paper, I have found two empirical patterns about monetary spillover: (1) destination homogeneity, and (2) origin heterogeneity.

Destination homogeneity – that emerging markets were affected systematically and responded with high comovement to large countries' shocks – supports the theory of global financial cycle and is consistent with broader evidences in the literature. The fact that a set of emerging markets with a wide range of institutions, level of market development respond to foreign shocks in the same way implies that emerging markets are often affected by external factors, and not in control of their own fundamentals regardless of country differences.

The second effect, origin heterogeneity, means that a monetary loosening shock from Japan, UK, and France would be *boost-thy-neighbor*, while one from the US would have the opposite effects. The importance of the origin of the shock prompts us to use models with *ex-ante* asymmetric countries in our analysis of international spillovers. A possible extension for future work

would be to incorporate size difference, nature of linkages (financial or real), and network structure into theoretical analyses of spillovers.

## APPENDIX A: FIGURES FOR ROBUSTNESS CHECK

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- John Ammer, Michiel De Pooter, Christopher Erceg, and Steven Kamin. International Spillovers of Monetary Policy, 2016. URL <https://www.federalreserve.gov/econresdata/notes/ifdp-notes/2016/international-spillovers-of-monetary-policy-20160208.html>.
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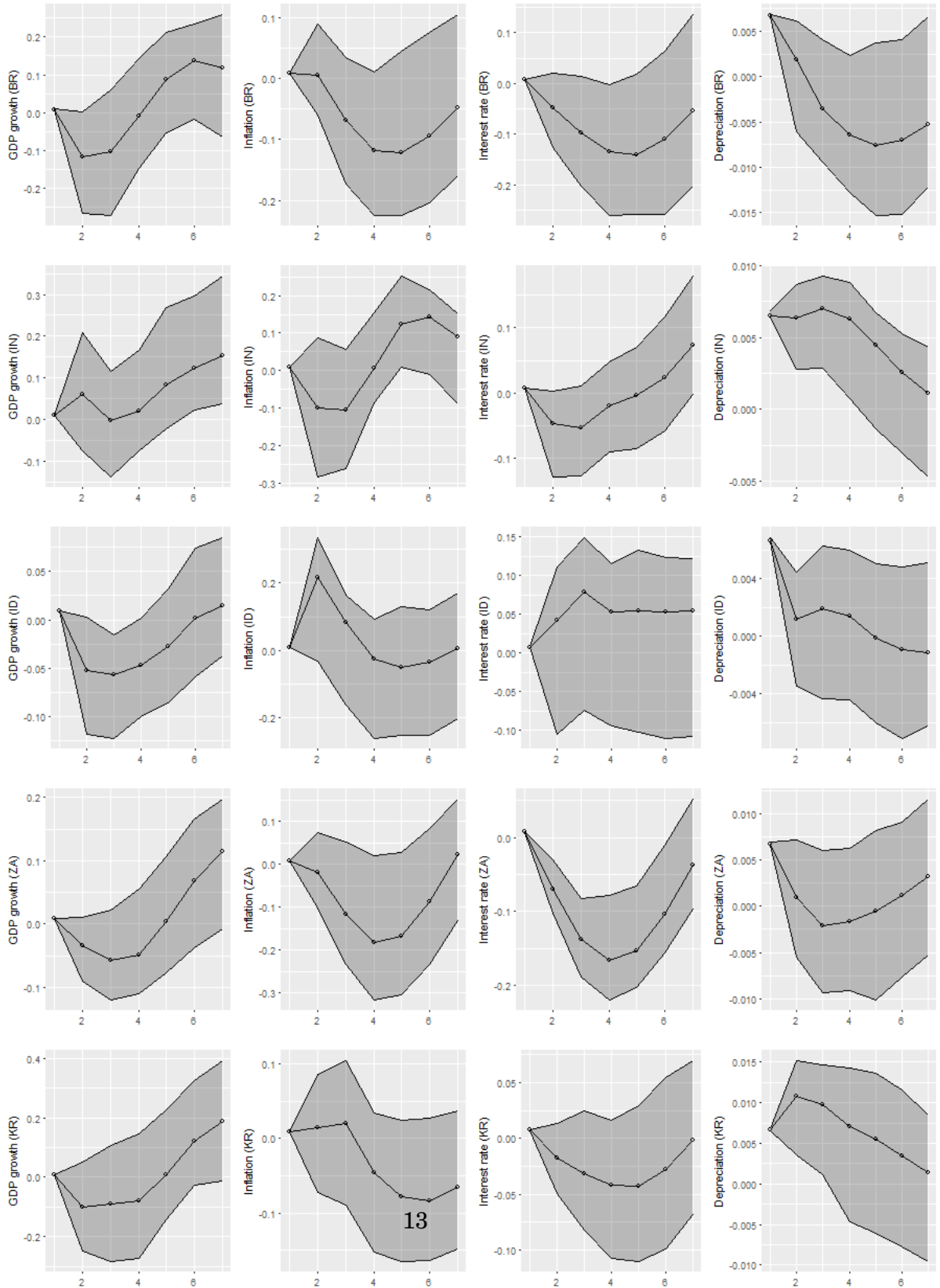


FIGURE 5. Effect of a UK expansionary monetary shock on emerging markets

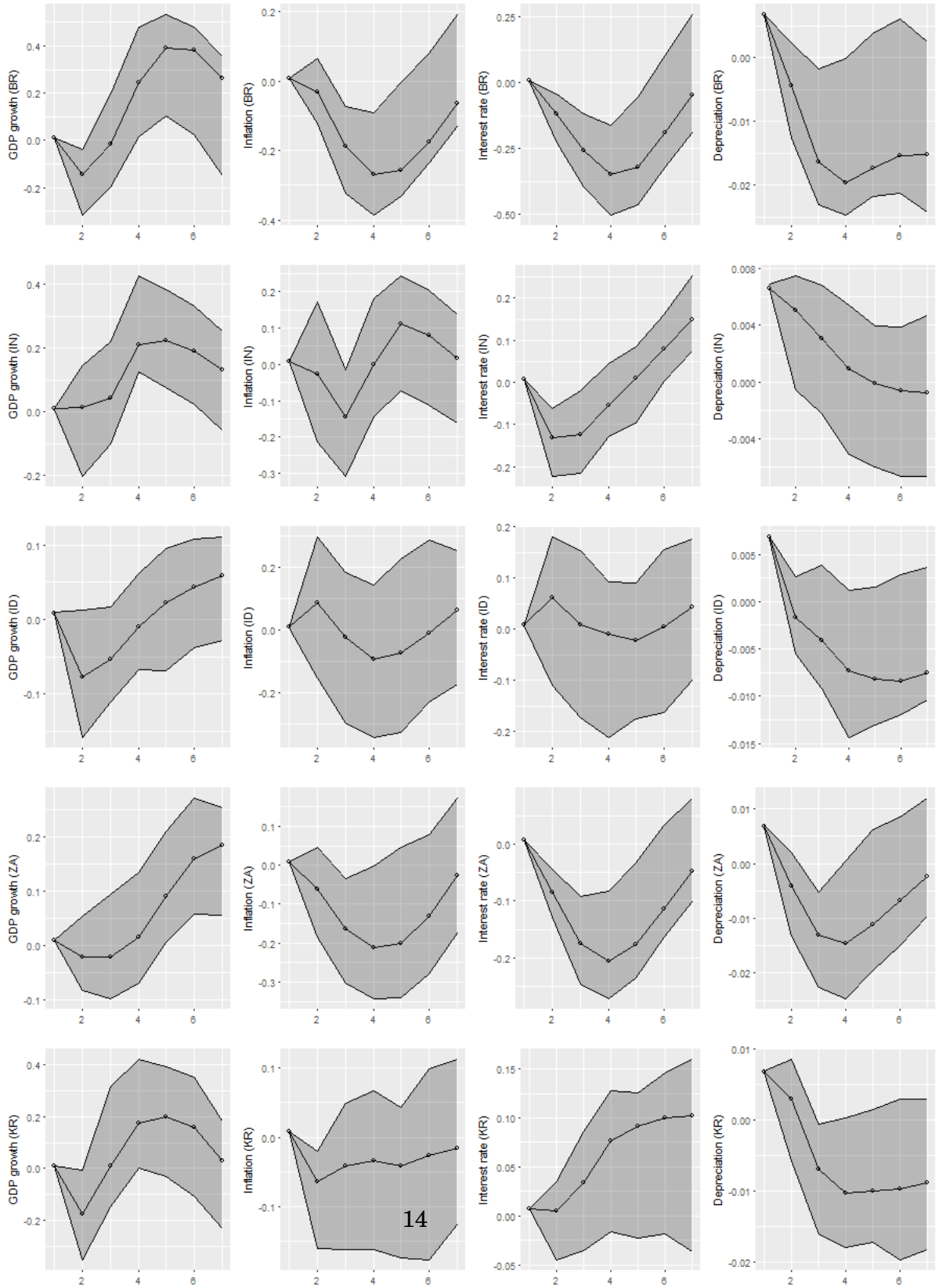


FIGURE 6. Effect of a French expansionary monetary shock on emerging markets