This article explores the interaction between capital inflows and global factors. A panel regression analysis covering 39 developed and emerging countries reveals that capital inflows into each country are closely associated with the leverage of the U.S. financial intermediaries, and more importantly, the effects of this leverage on capital inflows are non-linear: they are stronger in economies with larger deviations of the bank credit-to-GDP ratio. The results suggest that economies that are further in the expansionary phase of the financial cycle are more strongly exposed to spillover effects of the U.S. monetary policies because the leverage of the U.S. financial intermediaries is closely tied with federal fund rate shocks.
1. Introduction

Calvo et al. (1993, 1996) revealed how financial and monetary conditions in core countries (i.e., global “push” factors) can drive capital inflows into emerging countries, whereas country-specific conditions (i.e., domestic “pull” factors) play a more limited role. More recently, Bruno and Shin (2015a, 2015b) and Forbes and Warnock (2012) found that the U.S. broker–dealer leverage and the CBOE volatility index (VIX) work well as global factors in explaining the dynamics of capital inflows, especially cross-border bank inflows. For example, when risk aversion or uncertainty in global financial markets (measured by the VIX) is low or when short-term dollar interest rates are low, the U.S. financial intermediaries increase their leverage by expanding short-term wholesale funding and channel liquidity to other countries, producing tight relations between capital inflows and global factors.

The literature provides substantial insights about the determinants of cross-border capital transactions. However, do capital-receiving countries respond to global factors in a homogenous or linear manner? Although Avdjiev et al. (2017), Cerutti, Claessens, and Puy (2015), and Cerutti, Claessens, and Ratnovski (2017) demonstrated that the sensitivity of capital inflows to global factors differs by country groups, types of inflows, and market structures, no study, to my knowledge, explores the sensitivity of capital inflows to global factors while focusing on the phase of local financial cycle measured by deviations of the bank credit-to-GDP ratio. As revealed by Jordà et al. (2016a), economies with a higher bank credit-to-GDP ratio may have different characteristics than economies with a lower ratio.

In this study, a panel regression analysis covering 39 developed and emerging countries reveals that the sensitivity of capital inflows to the U.S. broker–dealer leverage is higher in economies that experience larger deviations of the bank credit-to-GDP ratio compared with its trends. The result indicates that the effects of global factors on capital inflows are non-linear, depending on the phase of local financial cycle. This suggests that economies that are further in the expansionary phase of the financial cycle are more strongly exposed to spillover effects of the U.S. monetary policies because the U.S. broker–dealer leverage is closely tied with federal funds rate shocks, as revealed by Bruno and Shin (2015b) and Rey (2013). Thus, this study contributes to existing literature (e.g., McCauley et al., 2015; Miranda-Agrippino and Rey, 2015; Passari and Rey, 2015) by capturing non-linearity in an empirical model of the international spillovers of the U.S. monetary policy.

The reminder of this study is organized as follows: Section 2 describes material and methods, Section 3 presents results and discussion, and Section 4 concludes.

2. Material and Methods

Following previous literature (Avdjiev et al., 2017; Bruno and Shin, 2015a), the estimation consists of a panel regression with fixed effects and country-clustered standard errors:

\[
Inflow_{j,t} = \beta_0 + \beta_1 \text{Leverage}_{t-1} + \beta_2 (\text{Leverage}_{t-1} \times \text{CreditDev}_{j,t-1}) + \beta_3 \text{VIX}_{t-1} + \beta_4 \text{DomesticFactor}_{j,t-1} \text{ or } t-4 + \gamma_j + \epsilon_{j,t}
\]  

(1)

where the dependent variable \(Inflow_{j,t}\) is gross inflows divided by the external liability of borrower country \(j\) at time \(t\); \(\text{Leverage}_{t-1}\) is the log of the U.S. broker–dealer leverage at time \(t-1\); \(\text{CreditDev}_{j,t-1} = \text{Leverage}_{t-1} \times \text{CreditDev}_{j,t-1}\) is the interaction term of the log of the U.S. broker–dealer leverage, with a deviation of the bank credit-to-GDP ratio from its trend (calculated using a four-quarter moving average) of country \(j\) at time \(t-1\); \(\text{VIX}_{t-1}\) is the log of VIX at time \(t-1\); \(\text{DomesticFactor}_{j,t-1} \text{ or } t-4\) is the country-specific condition of country \(j\).
at time $t-1$ or $t-4$; $\gamma_j$ represents country fixed effects; and $\varepsilon_{j,t}$ is the error term.\(^1\)

### Table 1. Variables and Data Sources

<table>
<thead>
<tr>
<th>Variable</th>
<th>Note</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Inflow</td>
<td>Gross capital inflow (divided by external liability)</td>
<td>IFS</td>
</tr>
<tr>
<td>Direct Investment</td>
<td>Direct investment (divided by external liability)</td>
<td>IFS</td>
</tr>
<tr>
<td>Portfolio Investment</td>
<td>Portfolio investment (divided by external liability)</td>
<td>IFS</td>
</tr>
<tr>
<td>Other Investment</td>
<td>Other investment (divided by external liability)</td>
<td>IFS</td>
</tr>
<tr>
<td>Bank-to-bank</td>
<td>Exchange-rate-adjusted change in cross-border bank claims of all BIS reporting countries on the banking sector (divided by external liability)</td>
<td>BIS, IFS</td>
</tr>
<tr>
<td>Bank-to-non-bank</td>
<td>Exchange-rate-adjusted change in cross-border bank claims of all BIS reporting countries on the non-bank sector (divided by external liability)</td>
<td>BIS, IFS</td>
</tr>
<tr>
<td>Leverage</td>
<td>U.S. broker-dealer leverage defined as the ratio of asset over equity (logged)</td>
<td>FRB</td>
</tr>
<tr>
<td>CreditDev</td>
<td>Deviation of bank credit to the non-financial private sector to the GDP ratio, from its trend, calculated by a four-quarter-moving average</td>
<td>BIS</td>
</tr>
<tr>
<td>CreditHP</td>
<td>Deviation of total credit to the non-financial private sector to the GDP ratio, from its trend, estimated by an HP filter</td>
<td>BIS</td>
</tr>
<tr>
<td>ΔCredit/GDP</td>
<td>Growth of bank credit to the non-financial private sector to the GDP ratio</td>
<td>BIS</td>
</tr>
<tr>
<td>VIX</td>
<td>CBOE VIX index of implied volatility of S&amp;P index options (logged)</td>
<td>FRED</td>
</tr>
<tr>
<td>ΔGDP</td>
<td>GDP growth (year-on-year change)</td>
<td>OECD, IFS</td>
</tr>
<tr>
<td>Inflation</td>
<td>CPI change (year-on-year change)</td>
<td>IFS</td>
</tr>
<tr>
<td>ΔREER</td>
<td>Change in the real effective exchange rate (year-on-year change)</td>
<td>BIS</td>
</tr>
<tr>
<td>ΔDebt/GDP</td>
<td>Change in the government gross debt to GDP ratio (year-on-year change)</td>
<td>WEO</td>
</tr>
</tbody>
</table>

### Table 2. Countries Included in the Sample

#### Developed Countries

<table>
<thead>
<tr>
<th>Australia</th>
<th>Austria</th>
<th>Belgium</th>
<th>Canada</th>
<th>Denmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>France</td>
<td>Germany</td>
<td>Greece</td>
<td>Ireland</td>
</tr>
<tr>
<td>Isreal</td>
<td>Italy</td>
<td>Japan</td>
<td>Korea</td>
<td>Luxemburg</td>
</tr>
<tr>
<td>Netherlands</td>
<td>New Zealand</td>
<td>Norway</td>
<td>Portugal</td>
<td>Spain</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Sweden</td>
<td>United Kingdom</td>
<td>United States</td>
<td></td>
</tr>
</tbody>
</table>

#### Emerging Countries

<table>
<thead>
<tr>
<th>Argentina</th>
<th>Brazil</th>
<th>Chile</th>
<th>China</th>
<th>Czech Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hungary</td>
<td>India</td>
<td>Indonesia</td>
<td>Malaysia</td>
<td>Mexico</td>
</tr>
<tr>
<td>Poland</td>
<td>Russia</td>
<td>South Africa</td>
<td>Thailand</td>
<td>Turkey</td>
</tr>
</tbody>
</table>

The analysis uses six dependent variables: $Inflow_{j,t}$, total capital inflows to country $j$, direct investment flows into country $j$, portfolio investment flows into country $j$, other investment flows into country $j$, exchange-rate-adjusted changes in cross-border bank claims of all BIS reporting countries on the banking sector of country $j$ (bank-to-bank flow), and exchange-rate-adjusted change in cross-border bank claims of all BIS reporting countries on the non-bank sector of country $j$ (bank-to-non-bank flow). As country-specific conditions of country $j$, $DomesticFactor_{j,t-1}$ or $t-4$, the regression includes the following variables: GDP growth rate of country $j$ at time $t-1$ ($\Delta GDP_{j,t-1}$), the inflation rate of country $j$ at time $t-1$ ($Inflation_{j,t-1}$), changes in the real effective exchange rate of country $j$ at time $t-1$ ($ΔREER_{j,t-1}$), and country-specific conditions of country $j$. Data on capital inflows are divided by external liability to avoid undesirable effects of outliers that undertake large cross-border capital transactions relative to the size of their real economies (e.g., U.K., Switzerland, Netherlands, and Ireland). The combination of normalizing by GDP and winsorizing cannot fully resolve this problem.

\(^1\) Data on capital inflows are divided by external liability to avoid undesirable effects of outliers that undertake large cross-border capital transactions relative to the size of their real economies (e.g., U.K., Switzerland, Netherlands, and Ireland). The combination of normalizing by GDP and winsorizing cannot fully resolve this problem.
(ΔREER_{jt-1}), and changes in the government gross debt-to-GDP ratio of country \( j \) at time \( t-4 \) (ΔDebt/GDP_{jt-4}). Table 1 summarizes further details on the variables and data sources.

Finally, the sample comprises quarterly data spanning the first quarter of 1990 to the second quarter of 2016 for the 39 developed and emerging countries in Table 2. Limited data availability regarding bank credit-to-GDP ratios constrains the number of countries in the sample.

### 3. Results and Discussion

Table 3 shows the panel regression results. Specifications in columns 1 and 2 use total capital inflows as a dependent variable. As is evident, the coefficient for the U.S. broker–dealer leverage is positively significant, consistent with previous literature (Bruno and Shin, 2015a; Cerutti, Claessens, and Ratnovski, 2017). Moreover, the coefficient of the interaction term for the U.S. broker–dealer leverage, with deviations of the bank credit-to-GDP ratio from its trend, is also positively significant. These results indicate that capital inflows into each country are associated with the U.S. financial and monetary conditions, measured by the U.S. broker–dealer leverage. They also indicate that the sensitivity of capital inflows to conditions can vary, depending non-linearly on the phase of local financial cycle.

As for country-specific conditions, the coefficient for GDP growth rate is positively significant, implying pro-cyclicality of capital inflows. Coefficients for other country-specific conditions are insignificant in this specification, but the signs of coefficients are reasonable and consistent with findings in previous literature. Furthermore, the results hold when specifications include the VIX (column 2). In this specification, the coefficient of the VIX shows the expected negatively significant sign.

---

2 Following Bruno and Shin (2015a), specifications use the four-quarter-lagged debt to GDP ratio because the original data is provided annually.
Table 3. Panel Regression Results

<table>
<thead>
<tr>
<th></th>
<th>Total Inflow</th>
<th>Direct Investment</th>
<th>Portfolio Investment</th>
<th>Other Investment</th>
<th>Bank-to-bank (BIS)</th>
<th>Bank-to-non-bank (BIS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leverage_t-1</td>
<td>5.570***</td>
<td>5.140***</td>
<td>2.008***</td>
<td>1.380**</td>
<td>1.944**</td>
<td>1.647**</td>
</tr>
<tr>
<td></td>
<td>(1.359)</td>
<td>(1.357)</td>
<td>(0.540)</td>
<td>(0.584)</td>
<td>(0.956)</td>
<td>(0.766)</td>
</tr>
<tr>
<td>Leverage_t-1</td>
<td>0.145**</td>
<td>0.148***</td>
<td>-0.015</td>
<td>0.058***</td>
<td>0.110***</td>
<td>0.082**</td>
</tr>
<tr>
<td>*CreditDev_t-1</td>
<td>0.029</td>
<td>0.030</td>
<td>(0.013)</td>
<td>(0.018)</td>
<td>(0.021)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>VIX_t-1</td>
<td>-2.293***</td>
<td>0.581***</td>
<td>-1.131***</td>
<td>-1.131***</td>
<td>-1.131***</td>
<td>-0.383**</td>
</tr>
<tr>
<td></td>
<td>(0.520)</td>
<td>(0.198)</td>
<td>(0.339)</td>
<td>(0.476)</td>
<td>(0.347)</td>
<td>(0.175)</td>
</tr>
<tr>
<td>ΔGDP_t-1</td>
<td>0.367***</td>
<td>0.329***</td>
<td>0.076***</td>
<td>0.087</td>
<td>0.215***</td>
<td>0.169***</td>
</tr>
<tr>
<td></td>
<td>(0.101)</td>
<td>(0.094)</td>
<td>(0.019)</td>
<td>(0.065)</td>
<td>(0.064)</td>
<td>(0.064)</td>
</tr>
<tr>
<td>Inflation_t-1</td>
<td>-0.097</td>
<td>-0.050</td>
<td>0.006</td>
<td>-0.041</td>
<td>-0.059</td>
<td>-0.103*</td>
</tr>
<tr>
<td></td>
<td>(0.120)</td>
<td>(0.019)</td>
<td>(0.058)</td>
<td>(0.065)</td>
<td>(0.065)</td>
<td>(0.057)</td>
</tr>
<tr>
<td>ΔREER_t-1</td>
<td>0.034</td>
<td>0.033</td>
<td>0.001</td>
<td>-0.009</td>
<td>0.044**</td>
<td>0.044**</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.023)</td>
<td>(0.011)</td>
<td>(0.013)</td>
<td>(0.019)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>ΔDebt/GDP&lt;sub&gt;t-4&lt;/sub&gt;</td>
<td>-0.023</td>
<td>-0.024</td>
<td>0.011</td>
<td>-0.001</td>
<td>-0.030</td>
<td>-0.036</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td>(0.024)</td>
<td>(0.009)</td>
<td>(0.011)</td>
<td>(0.022)</td>
<td>(0.020)</td>
</tr>
<tr>
<td></td>
<td>(4.379)</td>
<td>(5.093)</td>
<td>(1.820)</td>
<td>(1.984)</td>
<td>(3.106)</td>
<td>(2.601)</td>
</tr>
<tr>
<td>Fixed Effect</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>R²</td>
<td>0.095</td>
<td>0.107</td>
<td>0.042</td>
<td>0.018</td>
<td>0.060</td>
<td>0.061</td>
</tr>
<tr>
<td>Observation</td>
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<td>2677</td>
<td>2701</td>
<td>2701</td>
<td>2677</td>
<td>2800</td>
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<tr>
<td>#Country</td>
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<td>39</td>
<td>39</td>
<td>39</td>
<td>39</td>
</tr>
</tbody>
</table>

Note: Standard errors clustering at the country level are reported in parentheses. ***, **, and * denote significance at 1, 5, and 10 percent levels, respectively.
Table 4. Panel GMM Results (Arellano–Bond procedure)

<table>
<thead>
<tr>
<th></th>
<th>Total Inflow</th>
<th>Direct Investment</th>
<th>Portfolio Investment</th>
<th>Other Investment</th>
<th>Bank-to-bank (BIS)</th>
<th>Bank-to-non-bank (BIS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>Leverage&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>4.773***</td>
<td>4.524***</td>
<td>1.509***</td>
<td>1.608***</td>
<td>1.343***</td>
<td>1.051***</td>
</tr>
<tr>
<td></td>
<td>(1.136)</td>
<td>(1.147)</td>
<td>(0.422)</td>
<td>(0.439)</td>
<td>(0.436)</td>
<td>(0.436)</td>
</tr>
<tr>
<td>Leverage&lt;sub&gt;t-1&lt;/sub&gt; *CreditDev&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.151***</td>
<td>0.154***</td>
<td>-0.017</td>
<td>-0.018</td>
<td>0.040***</td>
<td>0.045***</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.029)</td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.015)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>VIX&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>-1.500***</td>
<td>0.550***</td>
<td>-1.875***</td>
<td>-0.161</td>
<td>-0.638**</td>
<td>-0.516***</td>
</tr>
<tr>
<td></td>
<td>(0.457)</td>
<td>(0.164)</td>
<td>(0.340)</td>
<td>(0.962)</td>
<td>(0.286)</td>
<td>(0.212)</td>
</tr>
<tr>
<td>ΔGDP&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.380***</td>
<td>0.360***</td>
<td>0.052***</td>
<td>0.060***</td>
<td>0.093*</td>
<td>0.388***</td>
</tr>
<tr>
<td></td>
<td>(0.078)</td>
<td>(0.073)</td>
<td>(0.013)</td>
<td>(0.014)</td>
<td>(0.055)</td>
<td>(0.054)</td>
</tr>
<tr>
<td>Inflation&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>-0.046</td>
<td>-0.015</td>
<td>0.023</td>
<td>0.012</td>
<td>-0.043</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(0.117)</td>
<td>(0.118)</td>
<td>(0.048)</td>
<td>(0.045)</td>
<td>(0.035)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>ΔREER&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.053**</td>
<td>0.052**</td>
<td>-0.006</td>
<td>-0.006</td>
<td>0.035**</td>
<td>0.035***</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.022)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.013)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>ΔDebt/GDP&lt;sub&gt;t-4&lt;/sub&gt;</td>
<td>-0.543</td>
<td>-0.485</td>
<td>0.030</td>
<td>0.006</td>
<td>0.246</td>
<td>0.340</td>
</tr>
<tr>
<td></td>
<td>(0.797)</td>
<td>(0.780)</td>
<td>(0.277)</td>
<td>(0.268)</td>
<td>(0.434)</td>
<td>(0.377)</td>
</tr>
<tr>
<td>AR(2) test</td>
<td>3.139</td>
<td>3.165</td>
<td>2.276</td>
<td>2.316</td>
<td>1.383</td>
<td>1.405</td>
</tr>
<tr>
<td>(p-value)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.022)</td>
<td>(0.020)</td>
<td>(0.166)</td>
<td>(0.159)</td>
</tr>
<tr>
<td>Sargan test</td>
<td>2614.2</td>
<td>2606.23</td>
<td>2608.39</td>
<td>2608.96</td>
<td>2643.21</td>
<td>2665.75</td>
</tr>
<tr>
<td>(p-value)</td>
<td>(0.473)</td>
<td>(0.511)</td>
<td>(0.613)</td>
<td>(0.616)</td>
<td>(0.413)</td>
<td>(0.303)</td>
</tr>
<tr>
<td>Observation</td>
<td>2650</td>
<td>2650</td>
<td>2674</td>
<td>2674</td>
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<td>2674</td>
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<td>39</td>
<td>39</td>
<td>39</td>
<td>39</td>
<td>39</td>
</tr>
</tbody>
</table>

Note: Specifications treat all the regressors as endogenous and include one lag of the dependent variable. Robust standard errors are reported in parentheses. ***, **, and * denote significance at 1, 5, and 10 percent levels, respectively.
Table 5. Panel Regression Results (using deviation of credit-to-GDP ratio from its trend estimated by HP filter)

<table>
<thead>
<tr>
<th></th>
<th>Total Inflow</th>
<th>Direct Investment</th>
<th>Portfolio Investment</th>
<th>Other Investment</th>
<th>Bank-to-bank (BIS)</th>
<th>Bank-to-non-bank (BIS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>Leverage</td>
<td>6.245***</td>
<td>5.763***</td>
<td>1.878***</td>
<td>1.975***</td>
<td>1.700***</td>
<td>1.483***</td>
</tr>
<tr>
<td></td>
<td>(1.339)</td>
<td>(1.322)</td>
<td>(0.460)</td>
<td>(0.469)</td>
<td>(0.575)</td>
<td>(0.572)</td>
</tr>
<tr>
<td>*CreditHP</td>
<td>0.023***</td>
<td>0.025***</td>
<td>0.000***</td>
<td>0.000***</td>
<td>0.009***</td>
<td>0.010***</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.005)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>VIX</td>
<td>-2.485***</td>
<td>0.527***</td>
<td>-1.177***</td>
<td>-1.832***</td>
<td>-1.260***</td>
<td>-0.426***</td>
</tr>
<tr>
<td></td>
<td>(0.547)</td>
<td>(0.213)</td>
<td>(0.342)</td>
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<tr>
<td>ΔGDP</td>
<td>0.392***</td>
<td>0.353***</td>
<td>0.095***</td>
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<td>0.220***</td>
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<td>(0.115)</td>
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<td>(0.020)</td>
<td>(0.021)</td>
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<tr>
<td>Inflation</td>
<td>-0.110</td>
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<td>0.011</td>
<td>0.002</td>
<td>-0.063</td>
<td>-0.043</td>
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<tr>
<td>ΔREER</td>
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<td>0.035</td>
<td>0.000</td>
<td>0.000</td>
<td>-0.006</td>
<td>-0.006</td>
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<tr>
<td>ΔDebt/GDP</td>
<td>-0.057*</td>
<td>-0.059***</td>
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<td>-0.009</td>
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<tr>
<td>constant</td>
<td>-15.265***</td>
<td>-6.327</td>
<td>-4.336***</td>
<td>-6.213***</td>
<td>-3.302*</td>
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<td>(4.266)</td>
<td>(4.842)</td>
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<td>(1.942)</td>
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<td>Y</td>
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<td>R²</td>
<td>0.116</td>
<td>0.130</td>
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Note: Standard errors clustering at the country level are reported in parentheses. ***, **, and * denote significance at 1, 5, and 10 percent levels, respectively.
Table 6. Panel Regression Results (using growth rate of bank credit-to-GDP ratio)

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<tr>
<th></th>
<th>Total Inflow</th>
<th>Direct Investment</th>
<th>Portfolio Investment</th>
<th>Other Investment</th>
<th>Bank-to-bank (BIS)</th>
<th>Bank-to-non-bank (BIS)</th>
</tr>
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<tr>
<td></td>
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<td>(2)</td>
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<td>(6)</td>
</tr>
<tr>
<td>Leverage_{t-1}</td>
<td>6.135***</td>
<td>5.711***</td>
<td>1.985***</td>
<td>2.091***</td>
<td>1.587***</td>
<td>1.384***</td>
</tr>
<tr>
<td></td>
<td>(1.451)</td>
<td>(1.458)</td>
<td>(0.534)</td>
<td>(0.544)</td>
<td>(0.588)</td>
<td>(0.586)</td>
</tr>
<tr>
<td>Leverage_{t-1}</td>
<td>0.061*</td>
<td>0.064**</td>
<td>-0.012</td>
<td>-0.013</td>
<td>0.025</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>(0.030)</td>
<td>(0.031)</td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.016)</td>
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</tr>
<tr>
<td>ΔCredit/GDP_{t-1}</td>
<td>-2.263***</td>
<td>0.583***</td>
<td>-1.123***</td>
<td>-1.723***</td>
<td>-1.123***</td>
<td>-1.123***</td>
</tr>
<tr>
<td></td>
<td>(0.547)</td>
<td>(0.197)</td>
<td>(0.342)</td>
<td>(0.491)</td>
<td>(0.357)</td>
<td>(0.176)</td>
</tr>
<tr>
<td>VIX_{t-1}</td>
<td>0.325***</td>
<td>0.287***</td>
<td>0.080***</td>
<td>0.089***</td>
<td>0.070</td>
<td>0.052</td>
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<td>(0.099)</td>
<td>(0.099)</td>
<td>(0.019)</td>
<td>(0.020)</td>
<td>(0.065)</td>
<td>(0.066)</td>
</tr>
<tr>
<td>Inflation_{t-1}</td>
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<td>-0.032</td>
<td>0.000</td>
<td>-0.011</td>
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<td>-0.010</td>
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<tr>
<td></td>
<td>(0.128)</td>
<td>(0.127)</td>
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<td>(0.059)</td>
<td>(0.040)</td>
<td>(0.036)</td>
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<tr>
<td>ΔREER_{t-1}</td>
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<td>0.026</td>
<td>0.001</td>
<td>0.002</td>
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<td>(0.024)</td>
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<td>(0.011)</td>
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<td>(0.012)</td>
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<tr>
<td>ΔDebt/GDP_{t-4}</td>
<td>-0.033</td>
<td>-0.034</td>
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<td>0.011</td>
<td>-0.005</td>
<td>-0.005</td>
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<tr>
<td></td>
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<td>(0.025)</td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
<tr>
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<td>-6.573***</td>
<td>-2.974</td>
<td>-1.006</td>
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<td>(4.645)</td>
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<td>(1.792)</td>
<td>(2.077)</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>R²</td>
<td>0.083</td>
<td>0.095</td>
<td>0.040</td>
<td>0.043</td>
<td>0.013</td>
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<td>2679</td>
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Note: Standard errors clustering at the country level are reported in parentheses. ***, **, and * denote significance at 1, 5, and 10 percent levels, respectively.
Table 7. Panel Regression Results (advanced countries)

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<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
</tr>
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<tbody>
<tr>
<td>Leverage&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>6.237***</td>
<td>5.932***</td>
<td>1.382***</td>
<td>1.501***</td>
<td>1.930**</td>
<td>1.770**</td>
<td>2.924***</td>
<td>2.660**</td>
<td>2.414***</td>
<td>2.237***</td>
<td>0.782**</td>
<td>0.739**</td>
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<td>(1.244)</td>
<td>(1.239)</td>
<td>(0.405)</td>
<td>(0.410)</td>
<td>(0.721)</td>
<td>(0.712)</td>
<td>(1.012)</td>
<td>(0.996)</td>
<td>(0.670)</td>
<td>(0.674)</td>
<td>(0.282)</td>
<td>(0.298)</td>
</tr>
<tr>
<td>Leverage&lt;sub&gt;*CreditDev&lt;/sub&gt;&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.129***</td>
<td>0.131***</td>
<td>-0.017*</td>
<td>-0.018*</td>
<td>0.053***</td>
<td>0.055***</td>
<td>0.093***</td>
<td>0.095***</td>
<td>0.087***</td>
<td>0.088***</td>
<td>0.008</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.029)</td>
<td>(0.010)</td>
<td>(0.009)</td>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.027)</td>
<td>(0.027)</td>
<td>(0.022)</td>
<td>(0.023)</td>
<td>(0.011)</td>
<td>(0.011)</td>
</tr>
<tr>
<td>VIX&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>-1.741***</td>
<td>0.675**</td>
<td>-0.910**</td>
<td>-1.506**</td>
<td>-1.038**</td>
<td>-0.247</td>
<td>0.008</td>
<td>0.008</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.535)</td>
<td>(0.253)</td>
<td>(0.430)</td>
<td>(0.610)</td>
<td>(0.475)</td>
<td>(0.232)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔGDP&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.586***</td>
<td>0.547***</td>
<td>0.097***</td>
<td>0.113***</td>
<td>0.214**</td>
<td>0.193*</td>
<td>0.274*</td>
<td>0.240*</td>
<td>0.253***</td>
<td>0.230***</td>
<td>0.132**</td>
<td>0.126*</td>
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<td>(0.090)</td>
<td>(0.083)</td>
<td>(0.027)</td>
<td>(0.030)</td>
<td>(0.101)</td>
<td>(0.107)</td>
<td>(0.133)</td>
<td>(0.131)</td>
<td>(0.046)</td>
<td>(0.044)</td>
<td>(0.060)</td>
<td>(0.063)</td>
</tr>
<tr>
<td>Inflation&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.117</td>
<td>0.150</td>
<td>0.045</td>
<td>0.032</td>
<td>0.045</td>
<td>0.062</td>
<td>0.027</td>
<td>0.054</td>
<td>-0.064</td>
<td>-0.051</td>
<td>0.009</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>(0.158)</td>
<td>(0.155)</td>
<td>(0.064)</td>
<td>(0.064)</td>
<td>(0.081)</td>
<td>(0.080)</td>
<td>(0.113)</td>
<td>(0.108)</td>
<td>(0.091)</td>
<td>(0.088)</td>
<td>(0.036)</td>
<td>(0.037)</td>
</tr>
<tr>
<td>ΔREER&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.003</td>
<td>0.004</td>
<td>-0.006</td>
<td>-0.006</td>
<td>-0.017</td>
<td>-0.016</td>
<td>0.027</td>
<td>0.028</td>
<td>0.051</td>
<td>0.051</td>
<td>-0.008</td>
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<td>(0.034)</td>
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<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.022)</td>
<td>(0.021)</td>
<td>(0.030)</td>
<td>(0.028)</td>
<td>(0.034)</td>
<td>(0.033)</td>
<td>(0.016)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>ΔDebt/GDP&lt;sub&gt;t-4&lt;/sub&gt;</td>
<td>-0.006</td>
<td>-0.010</td>
<td>-0.004</td>
<td>-0.003</td>
<td>0.004</td>
<td>0.002</td>
<td>-0.005</td>
<td>-0.008</td>
<td>-0.005</td>
<td>-0.008</td>
<td>-0.017*</td>
<td>-0.018**</td>
</tr>
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<td>(0.025)</td>
<td>(0.025)</td>
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<td>(0.017)</td>
<td>(0.017)</td>
<td>(0.017)</td>
<td>(0.017)</td>
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<td>(3.366)</td>
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<td>(1.478)</td>
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</table>

Note: Standard errors clustering at the country level are reported in parentheses. ***, **, and * denote significance at 1, 5, and 10 percent levels, respectively.
Table 8. Panel Regression Results (emerging countries)

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<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leverage(_{t-1})</td>
<td>2.851</td>
<td>2.179</td>
<td>3.120***</td>
<td>3.174***</td>
<td>-0.490</td>
<td>-0.763</td>
<td>-0.353</td>
<td>-0.772</td>
<td>-0.325</td>
<td>-0.520</td>
<td>1.423*</td>
<td>1.310*</td>
</tr>
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<td>(2.948)</td>
<td>(1.103)</td>
<td>(1.353)</td>
<td>(1.394)</td>
<td>(0.638)</td>
<td>(0.628)</td>
<td>(1.601)</td>
<td>(1.627)</td>
<td>(1.575)</td>
<td>(1.595)</td>
<td>(0.695)</td>
<td>(0.691)</td>
<td></td>
</tr>
<tr>
<td>Leverage(_{t-1})</td>
<td>0.191***</td>
<td>0.189**</td>
<td>0.002</td>
<td>0.002</td>
<td>0.056*</td>
<td>0.054*</td>
<td>0.150***</td>
<td>0.150***</td>
<td>0.063**</td>
<td>0.062**</td>
<td>0.047***</td>
<td>0.046**</td>
</tr>
<tr>
<td>*CreditDev(_{t-1})</td>
<td>(0.062)</td>
<td>(0.071)</td>
<td>(0.041)</td>
<td>(0.040)</td>
<td>(0.030)</td>
<td>(0.030)</td>
<td>(0.020)</td>
<td>(0.028)</td>
<td>(0.021)</td>
<td>(0.023)</td>
<td>(0.015)</td>
<td>(0.016)</td>
</tr>
<tr>
<td>VIX(_{t-1})</td>
<td>-3.379***</td>
<td>0.308</td>
<td>-1.541***</td>
<td>-2.110**</td>
<td>-1.114***</td>
<td>-0.648***</td>
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<tr>
<td>(1.103)</td>
<td>(0.305)</td>
<td>(0.464)</td>
<td>(0.730)</td>
<td>(0.283)</td>
<td>(0.236)</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>ΔGDP(_{t-1})</td>
<td>0.203*</td>
<td>0.166*</td>
<td>0.057*</td>
<td>0.060**</td>
<td>-0.003</td>
<td>-0.020</td>
<td>0.171***</td>
<td>0.148***</td>
<td>0.116*</td>
<td>0.105*</td>
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<td>0.020</td>
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<td>(0.101)</td>
<td>(0.093)</td>
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<td>(0.024)</td>
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<td>(0.038)</td>
<td>(0.042)</td>
<td>(0.034)</td>
<td>(0.056)</td>
<td>(0.052)</td>
<td>(0.021)</td>
<td>(0.018)</td>
<td></td>
</tr>
<tr>
<td>Inflation(_{t-1})</td>
<td>-0.122</td>
<td>-0.056</td>
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<td>(0.134)</td>
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<td>(0.075)</td>
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<td>(0.082)</td>
<td>(0.080)</td>
<td>(0.074)</td>
<td>(0.020)</td>
<td>(0.022)</td>
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<tr>
<td>ΔREER(_{t-1})</td>
<td>0.097***</td>
<td>0.093**</td>
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<td>0.013</td>
<td>0.019</td>
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<td>0.033*</td>
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<td>0.019***</td>
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<td>(0.031)</td>
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<td>(0.018)</td>
<td>(0.011)</td>
<td>(0.011)</td>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.006)</td>
<td>(0.006)</td>
<td>(0.004)</td>
<td>(0.004)</td>
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<tr>
<td>ΔDebt/GDP(_{t-4})</td>
<td>-0.019</td>
<td>-0.013</td>
<td>0.040**</td>
<td>0.039**</td>
<td>0.006</td>
<td>0.010</td>
<td>-0.059</td>
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<td>-0.007</td>
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<td>(0.012)</td>
<td>(0.012)</td>
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<td>(0.038)</td>
<td>(0.063)</td>
<td>(0.064)</td>
<td>(0.004)</td>
<td>(0.004)</td>
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<tr>
<td>Fixed Effect</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>R²</td>
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<td>0.091</td>
<td>0.059</td>
<td>0.059</td>
<td>0.017</td>
<td>0.039</td>
<td>0.125</td>
<td>0.146</td>
<td>0.100</td>
<td>0.110</td>
<td>0.078</td>
<td>0.089</td>
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<tr>
<td>Observation</td>
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<td>775</td>
<td>799</td>
<td>799</td>
<td>799</td>
<td>799</td>
<td>755</td>
<td>775</td>
<td>811</td>
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<tr>
<td>#Country</td>
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</tbody>
</table>

Note: Standard errors clustering at the country level are reported in parentheses. \***, \**, and \* denote significance at 1, 5, and 10 percent levels, respectively.
Investigating further, columns 3–8 consider specifications in which total capital inflows split into direct investment flows, portfolio investment flows, and other investment flows. In these analyses, coefficients for the U.S. broker–dealer leverage are positively significant in all specifications. Coefficients for the interaction term of the U.S. broker–dealer leverage are also positively significant when we use portfolio investment and other investment flows as dependent variables (columns 5–8). Moreover, the exchange rate coefficient is positively significant in columns 7–8. Considering that other investment flows include cross-border bank flows, this result is consistent with Bruno and Shin (2015a). This result also corroborates the financial channel of exchange rates (Hofmann et al., 2017; Kearns and Patel, 2016; Shin, 2016).

Furthermore, to explore cross-border bank flow dynamics, columns 9–10 and 11–12 use bank-to-bank flows and bank-to-non-bank flows, respectively, as dependent variables. Again, coefficients for the U.S. broker–dealer leverage are positively significant in any specification. Conversely, coefficients for the interaction term for leverage, with a deviation of the bank credit-to-GDP ratio from its trend, are positively significant only when bank-to-bank flows are used as a dependent variable (columns 9–10). In addition, the results generally hold when (1) we perform the dynamic panel generalized method of moments (GMM) analysis, (2) models use the deviation of the credit-to-GDP ratio from its trend estimated by an HP filter instead of moving average, and (3) models use the growth rate of the bank credit-to-GDP ratio instead of deviations of the ratio from its trend (Table 4, 5, and 6, respectively).

Finally, when we split the sample into developed and emerging countries, results indicate heterogeneity between the two country groups as shown in Tables 7 and 8. The result on the U.S. broker–dealer leverage and its interaction term holds only when we use sub-sample only containing developed countries (Table 7). Moreover, the exchange rate coefficients are positively significant with sub-sample only containing emerging countries (Table 8), while they never become significant in Table 7. This result implies that the financial channel of exchange rates works mainly in emerging countries.

In sum, the following key results are obtained: (1) dynamics of gross capital inflows are closely associated with the U.S. broker–dealer leverage and (2) the sensitivity of capital inflows, in particular portfolio investment, other investment, and bank-to-bank flows, to leverage is higher in economies that experience larger deviations of the bank credit-to-GDP ratio from its trend. Result (2) indicates that the degree of linkage between capital inflows and the U.S. financial and monetary conditions, measured by the U.S. broker–dealer leverage, can vary, depending non-linearly on the phase of local financial cycle, even though previous literature stressed the dominant role of global “push” factors in explaining capital inflows into each country.

One explanation for this is that the bank credit-to-GDP ratio may contain information on levels of leverage or risk taking in each country. Gourinchas and Obstfeld (2012) and Jordà et al. (2016a) regarded the ratio as one measure of leverage. Moreover, Gourinchas and Obstfeld (2012) and Jordà et al. (2016b) revealed that the ratio performs as a reliable “early warning indicator” that informs us of excess risk taking by local agents. In general, economies or agents with higher leverage or risk taking are more vulnerable to external shocks. Thus, capital inflows into economies with higher bank credit-to-GDP ratios (compared with their trends) may be more sensitive to shocks in financial and monetary conditions in core countries.

4. Conclusion

This article explored the interaction between capital inflows and global factors. Empirical analysis revealed that capital inflows into each country are closely associated with the U.S. broker–dealer leverage, and more importantly, the effects of this leverage on capital
inflows are non-linear: they are stronger in economies with larger deviations of the bank credit-to-GDP ratio from its trend. Therefore, the results suggest that economies that are further in the expansionary phase of the financial cycle are more strongly exposed to spillover effects of the U.S. monetary policies because the U.S. broker–dealer leverage is closely tied with federal fund rate shocks. Interpreting the results with a degree of causality, countercyclical macroprudential policies regarding a bank’s balance sheet may partly insulate local countries from shocks in financial and monetary conditions in center countries. However, conservatively speaking, we need further research on causal inference.

**References**


