

# Global Liquidity and Drivers of Cross-Border Bank Flows

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## Abstract

This paper identifies global factors associated with cross-border bank flows, using a longer time series and broader country sample than previous studies, and analyzing conditions not just in the US, but in all four global financial centers (G4: US, euro area, UK, and Japan). We identify key G4 factors to be uncertainty (VIX), US monetary policy (term spread), and UK and euro area bank conditions (leverage and TED spread). The importance of European banks' conditions, a novel result, is consistent with their dominant role in global financial intermediation. We further show that borrowing countries can partially limit their exposures to fluctuations in flows related to global factors by adjusting their macroeconomic frameworks, capital flow management tools, and bank regulations.

JEL Classification: F21, F34, G15, G18, G21, G28.

Keywords: Global Liquidity, International Banking, European Banks, Capital Flows

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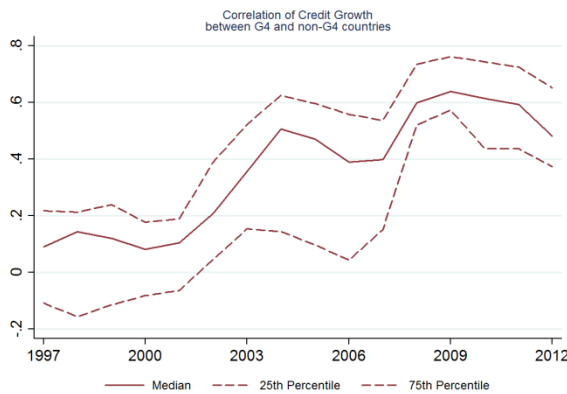
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## 1. Introduction

The financial cycle has become increasingly global (Rey, 2013; Obstfeld, 2014). This phenomenon is evident from the correlations of credit growth across countries, which have increased markedly since the mid-90s (Figure 1). This increase reflects the deeper real economic integration among countries, as illustrated by the expansion of international trade, and the increased integration of countries into the global financial system, as illustrated by the expansion of cross-border bank claims, at least until before the global financial crisis (Figure 2). The set of global factors associated with world-wide financial conditions is often called “global liquidity”.

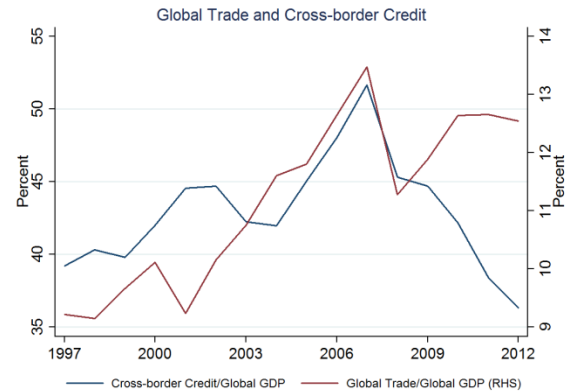
An important feature of global financial intermediation is that a large amount of banking flows from and through key ‘financial center’ economies (“G4”: US, euro area, UK, Japan) to the rest of the world. As of December 2014, based on the Bank of International Settlements (BIS) Locational Banking Statistics, the cross-border claims of G4 banks were more than twice the claims of non-G4 banks. Since G4 financial systems are so central to cross-border finance, the global factors of financial conditions are thought to be related in large part to funding and other financial conditions within the G4, and more specifically to how the G4 conditions are associated with global cross-border financial flows.

**Figure 1: Financial cycle more correlated**



Rolling 5-year average correlations between total credit growth in the US, UK, Eurozone and Japan and the rest of the world. Source: BIS and authors' calculations.

**Figure 2: Deeper financial integration**



The share of trade and cross-border claims relative to GDP. Source: BIS, IMF, and authors' calculations.

Recent research on identifying these global factors has predominantly focused on US-related factors. Forbes and Warnock (2012) and Rey (2013) analyze investors' uncertainty and risk aversion, proxied by US VIX. Bruno and Shin (2015a) highlight global banks' funding conditions and risk attitudes, proxied by US dealer bank leverage. Bruno and Shin (2015b) emphasize US monetary conditions, proxied by the Fed Funds rate.<sup>2</sup>

<sup>2</sup> Calvo et al. (1996) were the first to articulate the importance of global “push” factors, as opposed to country-specific “pull” factors, for cross-border flows, focusing on the US interest rate as an important driver.

The primary aim of this paper is to investigate the importance of factors associated with cross-border flows that relate not only to the US but also to other ‘financial center’ economies – the UK, euro area and Japan. To put it differently, we want to investigate whether factors in non-US G4 economies may also be important for global liquidity. A secondary objective is to assess whether borrower countries can limit their exposures to variations in global factors associated with cross-border flows by adjusting domestic policies.

To address these issues, we study the relationship between a set of G4 financial and monetary conditions indicators (candidate “global factors”) and changes in cross-border bank claims. We use BIS Locational Banking Statistics which provide not only a long time series of cross-border banking claims, but also offer exchange rate adjusted series. The latter allows us to better capture actual lending choices (there were sharp exchange rate movements during the period studied, and more than half of total cross-border claims were not denominated in US dollars) and distinguishes our analysis from related recent work (e.g., Bruno and Shin 2015a, Rey 2013, etc.) that uses unadjusted claims in US dollars. We also take advantage of the fact that the dataset distinguishes cross-border claims on banks from those on non-banks (usually, non-financial corporations), allowing us to compare the sensitivity of factors for different types of borrowers.

We start by estimating baseline regressions based on the US variables typically used in the cross-border banking flow literature (e.g., McGuire and Tarashev, 2008; Avdjiev et al., 2012; Turner 2014; Bruno and Shin, 2015a; Cerutti, 2015; McCauley et al., 2015). We then expand the universe of candidate global factors associated with cross-border bank flows to include conditions in non-US G4 economies. Our key results are as follows:

In terms of *uncertainty and risk aversion* as factors associated with cross-border flows, we confirm the importance of the US VIX. We also find that the various VIX indicators are almost indistinguishable across G4 countries, suggesting that VIX is a genuinely global factor.<sup>3</sup>

In terms of *monetary conditions*, we confirm for many specifications that short-term interest rates in G4 economies matter for cross-border bank flows. But we also find that the term spreads in G4 (including non-US) are more robust factors in explaining cross-border flows than the levels of short-term interest rates.<sup>4</sup> Consistent with the emphasis of earlier literature,

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<sup>3</sup> VIX is an options-based measure of expected financial markets volatility. The literature suggests that VIX is partly endogenous to macroeconomic fundamentals, investors’ risk attitudes, and the monetary policy stance (Bekaert et al., 2013). In principle, VIX can be decomposed into uncertainty and risk aversion components (Bollerslev et al., 2009), but this decomposition is not done in most studies and similarly not in ours.

<sup>4</sup> Although the notion of low interest rates increasing bank risk taking is supported by some empirical literature (Altunbas et al., 2014; Borio and Zhu, 2012; Jimenez et al., 2014; Bruno and Shin, 2015a,b), its economic significance and precise causal channels remain the subject of much debate. The importance of term spreads for cross-border flows is consistent with a theoretical channel where banks borrow short-term and lend long-term, making their domestic investment opportunities less profitable when the yield curve is flatter. This in turn may trigger banks’ search for yield, including in the form of cross-border lending.

we verify that US monetary conditions are most important compared to non-US G4 monetary conditions for cross-border flows (in terms of statistical significance and economic importance).

In terms of *bank conditions*, we extend the Bruno and Shin (2015a) focus on only US dealer bank leverage to include the TED spreads (the difference between short-term interbank lending and government bond rates), bank leverage, and credit growth for all G4 economies. Using also the credit growth variable relates our analysis as well to the literature on domestic financial cycles (Borio et al 1994; Claessens et al. 2012). We confirm that bank conditions relate in expected ways to cross-border bank flows (except for Japan). In comparing the importance for cross-border bank flows of US versus non-US G4 bank conditions we obtain a striking new result: UK and euro area bank conditions are often more important global factors for cross-border flows than US bank conditions are (in terms of statistical and economic importance). This new finding is consistent though with the major roles of European banks in global financial intermediation (Shin, 2012; Rey, 2013).

Our analysis also covers the changes in G4 economies' real effective exchange rates (REER) and M2 monetary aggregates. We find, even after controlling for the valuation effects of exchange rate changes on claims that changes in the US REER negatively relate to cross-border bank flows, as also shown by Bruno and Shin (2015a). With a large part of cross-border credit denominated in US dollars (especially outside Europe) and the use of the US dollar as a numeraire currency for financial transactions and statements, this suggests that exchange rate fluctuations can affect the foreign borrowers' (perceived) ability to repay credit in US dollars, thereby driving cross-border flows (McCauley et al., 2015). The UK REER was also a significant factor, but the euro REER was not. We found opposing impacts on cross-border banking claims of changes in US and Japan M2 vs. in euro and UK M2. Increases in euro and UK M2 are associated with more cross-border lending, which seems to reflect the effects of increases in bank deposits (part of M2) and corresponding larger bank balance sheets, consistent with the greater importance of banks in financial intermediation for the UK and euro area. Increases in the US and Japan M2 have the opposite effect, however, perhaps because growth in M2 there reflects in part flight to safety (i.e., occurs during periods of deleveraging and reduction in cross-border lending).

Our results are subject to the usual caveats faced by aggregate studies (e.g., in addition to ours, Bruno and Shin 2015a, Avdjiev et al., 2012, etc.). While it is natural to think of global factors originating in 'financial center' economies as exogenous drivers of cross-border flows, our analysis cannot formally reject reverse causation.<sup>5</sup> Yet, additional regression results provide indications that causation is indeed behind some key correlations that we

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<sup>5</sup> With the type of aggregate data that we are working with, better identification could still be achieved through a difference-in-difference estimation using bilateral data (e.g., taking advantage of differences among multiple lenders operating vis-à-vis various borrowing countries, as in Cetorelli and Goldberg 2012, and Cerutti and Claessens 2014 using BIS Consolidated Statistics), but such BIS Locational data is not public.

identify. For example, we find that US term spread relates to cross-border bank flows to Asia and Latin America only. Since it seems unlikely that the US term spread is endogenous to cross-border bank flows to Asia or Latin America, particularly since we control for economic growth in Asia and Latin America (which can be a common driving factor), we can be more assured on the direction of causation. Similarly, we show that European bank conditions (TED spreads and leverage) relate to cross-border bank flows to Asia and Latin America.

We verify that our results hold not only for cross-border flows to banks, but mostly also (novel for the literature) for flows to non-banks. We also show that most of the relations appear in the 2000s, i.e., the major financial globalization period.

We also study how borrower countries can limit their exposures to variations in cross-border bank lending associated with these global factors. We find that borrowing countries can reduce their exposures by adapting their macroeconomic frameworks (pursuing a more flexible exchange rate regime), using capital flow management tools, and applying more stringent bank supervision and regulation. The economic effects of adopting such policies are substantial: an increase from the 25<sup>th</sup> to 75<sup>th</sup> percentile in the policy indexes for any of these dimensions reduces the exposures to variations in the global factors by at least half. These results are broadly consistent with those in Fratzscher (2012) and Ahmed et al. (2015).

The paper proceeds as follows. Section 2 describes the data and the empirical methodology, discussing also causality. Section 3 presents the results and robustness tests. Section 4 concludes with outstanding issues.

## 2. Data and Empirical Strategy

This section documents which data on cross-border bank claims on banks and non-banks we use over the period 1990-2012. It also explains the factors, for the US and other G4 countries, we use to help explain the evolution of cross-border bank claims. In addition, it documents which borrower countries' policies and characteristics (e.g., exchange rate regime, capital flow management, bank regulation, etc.) we use to investigate their role in dampening or amplifying the impact of global liquidity on cross-border bank flows. And it documents the empirical methodology we use.

### *Data*

We use data on cross-border bank exposures from the BIS International Banking Statistics (IBS), which provides a comprehensive picture of cross-border banking activities across countries. The BIS IBS comprises two datasets, the Locational and the Consolidated banking

statistics.<sup>6</sup> These datasets capture the exposures (i.e., loans, securities, and other claims) of the most important banking systems to all their foreign borrowers. Our analysis is based on the BIS Locational data (BIS IBS Table 6) since those data conform closer to the notion that conditions in specific ‘financial center’ countries affect flows. This data has three other advantages: (i) the BIS Locational data provide a long time span (BIS Consolidated data is often only consistently available from the mid-2000s on); (ii) it provides exchange rate adjusted series; and (iii) it has the sectoral breakdown of lending to banks and non-banks. Even though the stock of claims at each given quarter are reported by BIS in unadjusted US dollars, IBS also offers an exchange rate adjusted aggregated flow (based on its exclusive access to the currency breakdown of the underlying bilateral claims). We use these exchange rate adjusted flows (i.e., changes in claims) and the last reported stock of claims to backfill the corresponding historical stock of exchange rate adjusted claims.<sup>7</sup> Our final data then covers 77 borrowing countries over the period 1990-2012.

We collect data for the measures suggested by theoretical and empirical studies to affect cross-border bank flows. Specifically, we use the stock option market derived implied volatility (CBOE VIX), US dealer bank leverage, TED spread (3 month Libor minus 3 month government bond yield), slope of yield curve (10 year government bond yield minus 3 month government bond yield), real policy rate (deflated with CPI), and monetary aggregates. These measures are compiled separately for each of the G4, that is, for the US, UK, euro area, and Japan (see Figures in the Annex). In addition to these measures that are often compiled for the US but not yet for other G4s, we explore two new measures of credit conditions – bank leverage and credit growth in G4 countries, which complement the US dealer bank leverage measure used by Bruno and Shin (2015a).

In terms of borrower countries’ conditions and characteristics, we control for credit demand and country riskiness using lagged GDP growth rate and inflation, and for the price determinants of cross-border credit using the (change in the) differential between local and international interest rates. We also use country fixed effects, thus controlling for any time-invariant factors that may drive capital flows. And we explore how a number of additional borrower country characteristics, specifically indexes of exchange rate flexibility, capital controls, overall institutional environment, and bank regulation (the strength of capital adequacy requirements, supervisory powers, and limits on foreign bank presence), influence the effects of our G4 factors on countries’ cross-border bank flows.

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<sup>6</sup> BIS Locational Banking Statistics are residence-based data (i.e., they follow balance-of-payments accounting) that track the cross-border positions of banks located in a particular reporting country. Both domestically-owned and foreign-owned banking offices in the reporting country record their positions on a gross (unconsolidated) basis, including positions vis-à-vis their own affiliates in other countries. BIS Consolidated Banking Statistics track banks’ worldwide consolidated gross claims and other exposures to individual countries and sectors, where banks net out intergroup positions and consolidate positions across offices worldwide. See Cerutti, Claessens, and McGuire (2014) for more details.

<sup>7</sup> The exchange rate adjusted claims of the BIS Locational Banking Statistics have been used in some previous BIS studies (e.g., Avdjiev et al 2010).

Table 1 provides the definitions and sources of all these variables; Tables 2 and 3 provide summary statistics and correlation matrixes. Table 3 Panel B provides the correlations of global liquidity factors across the G4, showing high correlations in most cases, but relatively low or negative for some (e.g., Japan M2 with other G4 M2).

### *Empirical specifications*

The base estimation consists of a panel regression with country fixed effects and standard errors clustered at the borrower country level:

$$\Delta L_{jt} = \beta_0 + \beta_1 DomesticFactor_{jt} + \beta_2 \Delta InterestSpread_{jt} + \beta_3 GlobalLiquidity_t + \gamma_j + \varepsilon_{jt}$$

where the dependent variable  $\Delta L_{jt}$  is the quarterly difference in the log of the exchange rate adjusted stock of bank claims in borrower country  $j$  at time  $t$ ;  $DomesticFactor_{jt}$  are the proxies for country  $j$  demand and risk at  $t$ ;  $\Delta InterestSpread_{jt}$  is the change (current quarter minus 4 quarter lag) in the spread between local lending rates and US Fed Funds Rate for country  $j$  at time  $t$ ;  $GlobalFactor_t$  is the set of G4 factors at time  $t$ ;  $\gamma_j$  are country fixed effects and  $\varepsilon_{jt}$  is the error term. Two different dependent variables are used: (i) the change in the (log of the) stock of BIS Locational cross-border claims on the banking sector of borrower country  $j$ , and (ii) the change in the (log of the) stock of BIS Locational cross-border claims on the non-bank sector of borrower country  $j$ . Note we sometimes use the terms “flows” and “lending” as a short hand for the changes in (exchange rate adjusted) stocks.

We then introduce country characteristics and interaction variables to analyze how they vary with borrower country exposures to the level and cyclical variation in global factors. We do so as follows:

$$\Delta L_{jt} = \beta_0 + \beta_1 DomesticFactor_{jt} + \beta_2 \Delta InterestSpread_{jt} + \beta_3 GlobalLiquidity_t + \beta_4 BorrowerCharacteristics_{jt} + \beta_5 GlobalLiquidity_t * BorrowerCharacteristics_{jt} + \gamma_j + \varepsilon_{jt}$$

where  $BorrowerCharacteristics_{jt}$  includes: (i) type of exchange rate regime, (ii) use of capital controls; (iii) bank regulatory variables; and (iv) general institutional development (rule of law, investment risks, etc.).

### **3. Results**

In this section, we present our empirical results. We first present the results for the US factors associated with cross-border flows. We follow here the existing literature, but also introduce more granularity by considering different time periods and distinguishing flows to banks from those to non-banks. We then present the results for UK, euro area and Japan-related global factors that are possibly associated with cross-border flows. We show that UK and euro area bank conditions are often more important factors for cross-border flows than US

bank conditions are. We lastly analyze the roles of borrowing country characteristics in affecting the sensitivity of individual country inflows to fluctuations in global factors of cross-border flows.

*US factors associated with cross-border bank flows*

Table 4 presents the results for US factors typically associated with cross-border bank flows, with Panel A presenting the results for cross-border flows to banks, and Panel B for non-banks. The dependent variable is the (exchange rate adjusted) change in the log of cross-border claims on a borrowing country. The panel covers 77 countries over 27 years. All regressions control for “pull” factors – country characteristics that proxy for demand for cross border loans. Lagged GDP growth, positive, and inflation, negative, are almost always statistically significant in explaining cross-border flows to banks (Table 4, Panel A); lagged GDP growth is, but inflation is not significant in explaining flows to non-banks (Panel B). The change in the interest rate differential is most often positive and statistically significant in the full sample in the case of cross-border flows to banks (a result similar to Bruno and Shin 2015a), but not in the case of cross-border flows to non-banks.

As the existing literature has highlighted, US uncertainty and monetary and financial conditions have statistically significant relationships with cross-border bank flows. Columns 2 to 8 consider the US factors individually. VIX has a negative sign, indicating that cross-border flows decrease during periods of uncertainty. TED spread has a negative sign and US dealer bank leverage a positive sign, suggesting that banks expand more cross-border when bank funding conditions are more accommodative. Also real credit growth has a positive sign, possibly as it captures as well the general leverage and financial cycle in the US.

The US (real) interest rate has a positive sign, indicating that during less favorable economic conditions – when interest rates are lower – global banks lend less cross-border. This suggests that the view that low rates may increase bank risk-taking does not apply to cross-border bank flows over this longer period. The US term spread has a negative coefficient, however, suggesting the presence of ‘search for yield’ incentives in globally active banks: when US domestic investment opportunities are more attractive, cross-border flows decline.

We also find that changes in US M2 and REER are negatively associated with cross-border bank flows. This may represent effects of flight to quality to the US in case of both M2 and REER, e.g., as global risk increases, the dollar appreciates and demand for US safe assets rises, while cross-border flows decline. For the REER, this may also reflect weaker demand and greater concerns about creditworthiness since, when the dollar is stronger, borrowers’ balance sheets measured in dollars are weaker. While this REER result is similar to Bruno and Shin (2015a) and McCauley et al. (2015), we show that it is robust to using exchange-rate adjusted claims, important given that exchange rates movements can drive much of the changes in unadjusted cross-border bank claims.



Since the correlations among most individual US factors are moderate (except for those between dealer bank leverage and real credit growth, and between the policy rate and the term premium, see Table 2), we can run regressions that include most drivers simultaneously (columns 10-14 in Table 4, Panels A and B). The results confirm that US VIX, dealer bank leverage, the term spread, US REER, and US M2 mostly remain significantly associated with changes in cross-border claims on banks and non-banks. A comparison of columns 12 and 13 furthermore shows that the results for the full sample are largely driven by the 2001-2012 period, consistent with a greater degree of financial integration and globalization in the 2000s. Column 14 shows that the results for the pre-global financial crisis period (2001-2006) are broadly similar, although less significant, to those for 2001-2012 (column 13), suggesting that the crisis and its aftermath do not drive the main results.<sup>8</sup>

The economic effects implied by the regression results highlight the role of VIX and US dealer bank leverage in driving cross-border bank flows. A change in the VIX from the 25<sup>th</sup> to the 75<sup>th</sup> percentile is associated with a reduction in cross-border claims on banks by 5¾ percent (3½ percent for non-banks). A similar change in US dealer bank leverage increases cross-border claims on banks by 5½ percent (4½ percent for non-banks). The economic effects of monetary conditions are smaller. For example, an increase in the term premium from its 25<sup>th</sup> to 75<sup>th</sup> percentile decreases cross-border claims banks by 1¾ percent (¼% for non-banks). This suggests that US monetary policy stance is a less important factor for cross-border flows than market uncertainty or the funding conditions of banks.

#### *Euro area, UK and Japan factors of cross-border bank flows*

So far we have followed the existing literature by considering US related factors of cross-border flows. An interesting and so far unexplored question is whether factors related to other ‘financial center’ economies might also be important in terms of their associations with cross-border flows. Indeed, in recent decades, the share of cross-border credit originating from the UK and euro area has increased substantially, suggesting growing importance of those jurisdictions for global cross-border flows.

To answer this question, we compiled series for the UK, euro area, and Japan that are similar to the US series used in Table 4. (Instead of dealer bank leverage we use commercial bank leverage for countries other than US.) The evolution of all these indicators is graphically summarized in Annex A. It shows that many of the non-US series are highly correlated with the equivalent US series (see also Table 3, panel B). Also, since some of the drivers are highly correlated among each other, we cannot include them all simultaneously. We therefore compare the explanatory power of various G4 factors individually. We also use a reduced sample of borrower countries, which excludes the US, UK, Japan and the euro area countries

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<sup>8</sup> As an additional test, we ran all regressions with the explanatory variables lagged at 4 quarters, and found results to remain.

themselves, to capture cross-border impacts and so as to not to bias the results in favor of euro area drivers (the euro area represents 16 borrower countries in the dataset).

Table 5 displays the regression results for the various global factors related to monetary and financial conditions in US, UK, euro area (EA), and Japan. Each row reports the coefficients for various regressions using the one specific factor for that G4 country. The table also reports  $R^2$ s. Panel A reports the results for flows to banks and Panel B for flows to non-banks. The regressions control (not reported) for lagged recipient country GDP growth, inflation, and the change in interest rate differentials. The estimations cover the period 2001-2012, as the results in Table 4 were mostly driven by that period and because the data on many UK and euro area indicators are consistently available for that period only. Since regression results show a generally, but not uniformly, greater role of global factors for flows to banks than those for flows to non-banks, we discuss the results for flows to banks only.

The significance of the various G4 VIX indicators for cross-border flows is similar, with the US VIX having slightly higher explanatory power, as captured by  $R^2$ . For the various bank conditions, however, non-US variables often have the same or higher explanatory power than equivalent US variables. For example, the US TED spread is statistically not significant in this sample, whereas the other three TED spreads are. Also the UK bank leverage has a larger coefficient than US bank leverage does, while euro area credit growth has a larger coefficient than US (and UK) credit growth. This is a strong indication from our analysis that European bank conditions may matter more than US bank conditions for global cross-border flows.

For monetary policy, the US and UK policy rates both have positive and statistically significant coefficients. Also, the US, UK and euro area slopes of the yield curve have similar negative coefficients with comparable explanatory powers. Japan is an exception in several ways: the policy rate is not significant, and while the slope of the yield curve is significant, it has a positive sign. The fact that the interest rate in Japan has been very stable and low over the period (Table 2 and Annex A) may be behind this.

In terms of the REER variable, we find some heterogeneity across the G4 countries. Similar to that for the US, changes in Japan REER are negatively correlated with cross-border bank flows, which could be associated with Japan also being a ‘flight to safety’ destination. Changes in UK and euro REERs are, however, positively correlated with cross-border bank flows. This might reflect the negative correlation between the US dollar and UK pound/the euro REERs, coupled with the fact that the largest share of cross-border claims is still in dollars, even when intermediated outside the US. Once we control for the US REER and/or the fact that the UK REER sharply depreciated at the peak of the global financial crisis, for example, the UK and euro REERs are no longer significant.

Some of these differences among the G4 also show up in the regression results for M2 growth. As for the US, M2 growth in Japan is negatively related to cross-border credit. This

may be because the expansion of M2 in those economies is linked to flight to quality episodes during this period. This is not the case for the UK and euro area, however, possibly because increases in M2 imply increases in bank deposits, hence stronger bank balance sheets and more cross-border lending. As such, the different signs may reflect the varying importance of ‘financial center’ economies as ‘flight to safety’ destinations (US and Japan more important) and differences in how well bank balance sheets proxy for overall economy-wide risk-taking (more so in bank-dominated UK and euro area).

### *Robustness*

In principle, the differences in the explanatory powers of the various G4 conditions in Table 5 could reflect regional effects, since individual G4 lenders tend to have dominant market shares for (groups of) borrower countries. For example, euro area factors could be particularly relevant for non-euro Eastern European borrower countries. The regional effects of G4 conditions could be further amplified by regional macroeconomic feedback effects (e.g., through trade channels), thus confounding directions of causality. Therefore, we also explore whether our results hold beyond regions. We do this by running the flow regressions for borrowing countries in regions that are geographically remote from the specific ‘financial center’ economies.

This analysis is reported in Table 6. We focus on cross-border bank claims on Asian and Western Hemisphere borrowing countries, to identify the importance of US, UK and euro area factors beyond their own regions. We do not report regression results for the country-specific VIXs (because of their high correlations across G4 countries) or for the Japan factors (for which results are often insignificant or not robust, in part as we only can consider flows from Japan to the Western Hemisphere). The table reports in each row the coefficient for the specific regression using that factor for that G4 country.

Results confirm that UK and euro area bank conditions have explanatory power beyond their own region and often more so than the corresponding US factors. In particular, UK and Euro area TED spreads have higher coefficients (and explanatory power) for cross-border bank lending to Asia and Western Hemisphere countries than the US TED spread does. Also, UK bank leverage has a much higher and more often significant coefficient than US bank leverage does.

Interestingly, even when excluding intra-regional flows, US monetary policy factors remain important. For example, the US real policy rate is the only rate statistically significant for claims on non-banks and the US term premium is the only term premium that has explanatory power for cross-border lending to both banks and non-banks in Asia. Only for cross-border lending to the Western Hemisphere do US, UK and euro area term premia have similar significance. The results with respect to REER are similar to earlier, with US REER variable having a consistent negative role, the UK REER largely a positive one, and the euro

zone mostly insignificant. US M2 growth is again mostly negative, but UK and euro zone M2 are largely not significant. Overall, regression results suggest again that the global financial cycle is driven in large part by US monetary policy and UK and euro area bank conditions, consistent with the dominant role of European banks in intermediating (dollar- and other denominated) funds to the rest of the world (cf. Shin, 2012).

### *Borrower country characteristics*

We also study how borrower country policies and characteristics may affect the variation of country-specific cross-border bank flows in response to changes in global factors. Table 7 presents the coefficients for the country characteristics themselves and the interactions of the characteristics with key global factors, where the selection of the global factors used for this analysis is based on their explanatory power in Table 5. Panel A reports the regression results for banks and Panel B for non-banks.

We find that a flexible exchange rate regime reduces the borrower country's exposures to variation with respect to many key factors (US dealer bank leverage, UK real policy rate and term premium, US REER, and G4 M2), thus making inflows less cyclical.<sup>9</sup> Capital controls and more stringent capital requirements and bank supervision also make cross-border flows to banks less sensitive to many of these global factors. In addition, more stringent capital requirements help to reduce the level of inflows. Better institutional quality decreases both the level and the sensitivity of inflows to banks to several of these cyclical factors. And more limits on foreign bank presence decreases the sensitivity of inflows to banks to most global factors. Overall, these results suggest that more flexible foreign exchange regimes, the use of capital flow management tools, more stringent bank regulation and supervision, and better institutions can reduce a country's exposures to variations in global financial conditions.

Even though recipient country characteristics and regulations do not fully insulate the country from variations in global factors affecting cross-border flows, their estimated economic effects are substantial. For example, when US dealer bank leverage increases from its 25<sup>th</sup> to the 75<sup>th</sup> percentile, a country with a level of capital controls at the 25<sup>th</sup> percentile would experience a growth in cross-border claims of about 19%, while a country with capital controls at the 75<sup>th</sup> percentile would experience only about a 10% pick-up (7% and 5% respectively for flows to non-banks). Effects of similar magnitudes are present for the degree of exchange rate flexibility, and the stringency of bank capital regulation and supervision; and for other global liquidity drivers.<sup>10</sup>

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<sup>9</sup> The role of flexible exchange rates in reducing vulnerabilities has been studied by among others Gagnon (1993) and Ghosh et al. (2014).

<sup>10</sup> The fact that multiple recipient country characteristics can affect the exposure to variations in global liquidity expands on the suggestion of Rey (2013) who focuses predominantly on the role of capital controls. See also IMF (2013b).

#### 4. **Conclusions and Policy Implications**

Using a long time series and a broad set of countries, this paper confirms that a number of ‘global factors’ associated with monetary and financial conditions in key financial center economies relate to cross-border bank flows (alongside country-specific factors). Cross-border bank flows appear to decrease in G4 financial markets’ volatility (VIX) and the slope of the US yield curve, and increase in US dealer bank leverage and real short-term interest rates. These findings are consistent with an earlier literature on push and pull factors (cf. Calvo et al., 1996 and Chuhan et al., 1998) and recent work on the common drivers of capital flows (cf. Rey, 2013 and Bruno and Shin, 2015a, 2015b). An important new finding is that bank conditions in ‘financial center’ countries other than the US, notably the UK and euro area, captured here by commercial banks’ leverage and TED spreads, also relate to cross-border bank flows, sometimes more significantly than the equivalent US conditions. Taken together, our results suggest that the global financial cycle is to a large extent driven by uncertainty (VIX), US monetary policy, and UK and euro area bank conditions.

The fact that domestic financial conditions in several ‘financial center’ economies, not just the US, affect the global financial cycle has important implications for current policy debates on global liquidity, crisis management, and monetary policy normalization. For example, ignoring the fact that European bank conditions are key for global cross-border credit might lead observers to understate the global implications of European financial stability policies. At the same time, because US rather than European monetary policy conditions dominate global liquidity conditions, the spillovers from ECB’s unconventional monetary accommodation might be smaller than some observers anticipate. Furthermore, recognizing that the level and cyclicity of cross-border flows depend on borrower country policies and characteristics (such as a flexible exchange rate, capital flow management tools, and stricter bank regulation and supervision) implies that borrowing economies have means to somewhat limit the spillovers from the global financial cycle.

Our findings also add to the broader lessons from the literature that reveals both benefits and risks from global financial integration. Besides the ability to augment local savings through capital inflows, global cyclical swings can add a welcome impetus and support local activity during times of stress. But they can also have undesirable procyclical effects. In the face of volatile global conditions, domestic monetary and fiscal policies can become less effective. Favorable global financial conditions can add to the build-up of local vulnerabilities (e.g., asset price booms and related financial fragility), especially in the presence of weaker macroeconomic and prudential policies in borrower countries. Overall, there may be a need to adapt policy responses, not just domestically but also internationally since the global financial cycle appears to be importantly driven by systemic financial institutions, whose distress can propagate widely. Monitoring liquidity, funding, and credit conditions in these institutions, and global financial markets more generally, is therefore critically important for both capital flow originating and receiving countries.

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**Table 1 – Variable Definitions and Sources**

Variables	Definition	Sources
<b>Dependent variables</b>		
Log cross-border claims on banks	Log changes in BIS locational cross-border claims on banks (exchange rate adjusted)	BIS locational statistics (Table 6)
Log cross-border claims on non-banks	Log changes in BIS locational cross-border claims on non-banks (exchange rate adjusted)	BIS locational statistics (Table 6)
<b>Global drivers</b>		
US VIX	CBOE S&P500 Volatility VIX	Datastream
UK —	FTSE 100 volatility index	Datastream
EA —	VDAX volatility index (new)	Datastream
JP —	NIKKEI stock average volatility index	Datastream
US TED spread	3-month TED spread (LIBOR - Treasury bill)	Datastream
UK —	3-month GBP LIBOR spread (LIBOR - Gilt)	Datastream
EA —	3-month Euro LIBOR spread (LIBOR - Govt. AAA bill) 1/	Datastream
JP —	3-month JPN LIBOR spread (LIBOR - Treasury bill)	Datastream and Haver
US real policy rate	Federal funds target rate minus inflation	Haver
UK —	UK base rate (Repo rate)	Haver
EA —	Euro Area deposit facility rate	Haver
JP —	Japan deposit facility rate	Haver
US slope of yield curve	10 year/3 month US Treasury yield spread	Datastream
UK —	10 year/3 month UK government securities yield spread	Datastream
EA —	10 year/3 month EA AAA Sovereign yield spread 1/	Datastream
JP —	10 year/3 month Japan Treasury yield spread	Datastream and Haver
US growth rate of M2	Growth rate of M2 in national currency	IFTSTSUB
UK —	—	IFTSTSUB
EA —	—	IFTSTSUB
JP —	—	IFTSTSUB
US credit-to-GDP ratio	Private credit/GDP	IFTSTSUB and MBRF2
UK —	—	IFTSTSUB
EA —	—	IFTSTSUB
JP —	—	IFTSTSUB and MBRF2
US growth rate of real credit	Real private credit	IFTSTSUB and MBRF2
UK —	—	IFTSTSUB
EA —	—	IFTSTSUB
JP —	—	IFTSTSUB and MBRF2
US REER	US real effective exchange rate (CPI based)	IFTSTSUB
UK —	—	IFTSTSUB
EA —	—	IFTSTSUB
JP —	—	IFTSTSUB
US dealer bank leverage	(Equity+Total Liabilities)/Equity	US Flow of Funds
UK bank leverage	Total Assets/Equity	Bank of England
EA —	—	European Central Bank
JP —	—	Bank of Japan
<b>Country Characteristics</b>		
Real GDP Growth	Growth rate of real GDP	WEO
Inflation	Inflation	IFTSTSUB and GDS
Interest rate Differential	Difference between domestic rate and Fed funds rate	IFTSTSUB
Exchange rate flexibility	Ranges from 1-4, with higher values indicating more flexibility.	Ilzetzi, Reinhart and Rogoff (2008)
Capital controls	Higher values of the index represent more restrictions.	Quinn (2011)
Institution quality	The average of the following four indices: bureaucracy quality; law and order; corruption; investment profile. Higher values indicate lower quality	International Country Risk Guide
Capital stringency	Whether capital requirement reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined. Higher values indicate greater stringency.	World Bank surveys on bank regulation
Supervisory power	Whether the supervisory authorities have the authority to take specific actions to prevent and correct problems. Higher values indicate greater power.	World Bank surveys on bank regulation
Limits on foreign banks	Whether foreign banks may own domestic banks and whether foreign banks may enter a country's banking industry. Higher values indicate great restriction.	World Bank surveys on bank regulation

Note: 1/ Data on Euro Government AAA 3-month bill is available since 2007, so the period 2001-2006 is based on the 3 month French treasury bill rate.

**Table 2- Summary Statistics, Correlations over Full Sample (1990Q1–2012Q4) and Regional Distribution****Panel A - Summary Statistics**

Variable	Obs.	Mean	Median	Std. Dev.	P25	P75	Min	Max
Log cross-border claims on banks	5467	1.60	1.30	10.41	-3.09	6.18	-42.62	43.83
Log cross-border claims on non-banks	5439	1.44	1.12	6.87	-1.96	4.55	-22.21	27.15
GDP Growth (lag)	5467	3.88	3.80	4.81	1.58	6.29	-20.34	24.50
Inflation (lag)	5467	5.09	3.29	6.22	1.83	6.34	-2.80	70.59
Change in Interest Rate Differential	5467	-0.27	-0.04	4.77	-1.40	1.11	-31.65	40.13
CBOE VIX	5467	21.21	20.18	9.00	14.91	24.97	11.11	68.51
US TED Spread	5467	0.53	0.45	0.41	0.23	0.62	0.12	2.15
US Bank Leverage	5467	19.11	19.80	4.90	14.60	22.14	8.91	30.62
Growth of Real US Credit	5467	2.31	3.58	4.29	0.31	5.45	-8.52	7.74
Real US Federal Fund Rate	5467	0.63	0.50	2.04	-1.05	2.58	-3.67	4.04
US Slope of Yield Curve	5467	1.84	1.91	1.15	0.88	2.79	-0.48	3.63
Growth rate of US M2	5467	5.67	5.88	2.43	4.16	7.29	0.18	10.54
Change in US REER	5467	-0.42	-0.54	5.14	-4.01	3.39	-9.74	11.82

**Panel B - Correlation Matrix**

	GDP Growth (lag)	Inflation (lag)	Change in Interest Rate	CBOE VIX	US TED Spread	US Bank Leverage	Growth of Real US Credit	Real US Federal Fund Rate	US Slope of Yield Curve	Growth Rate of US M2	Change in US REER
GDP Growth (lag)	1.00										
Inflation (lag)	0.01	1.00									
Change in Interest Rate	0.02	-0.15	1.00								
CBOE VIX	-0.08	0.04	0.16	1.00							
US TED Spread	0.11	0.08	0.12	0.41	1.00						
US Bank Leverage	0.18	-0.03	0.03	-0.23	0.25	1.00					
Growth of Real US Credit	0.09	-0.04	-0.11	-0.17	0.16	0.66	1.00				
Real US Federal Fund Rate	0.08	0.07	-0.06	-0.09	0.25	0.32	0.43	1.00			
US Slope of Yield Curve	-0.17	-0.02	0.06	0.19	-0.29	-0.51	-0.56	-0.63	1.00		
Growth rate of US M2	0.09	0.00	0.17	0.52	0.20	0.19	0.03	-0.08	-0.18	1.00	
Change in US REER	0.03	0.05	0.05	0.34	0.09	-0.13	0.02	0.43	-0.26	0.31	1.00

**Panel C - Regional distribution of countries included in the Sample ( 1/ if G4 country member)**

Asia	Europe	Western Hemisphere	Other regions
Australia	Austria 1/	Argentina	Algeria
China	Belgium 1/	Bolivia	Bahrain, Kingdom of
Hong Kong	Bulgaria	Brazil	Côte d'Ivoire
India	Croatia	Canada	Ghana
Indonesia	Cyprus 1/	Chile	Israel
Japan 1/	Czech Republic	Colombia	Jordan
Malaysia	Denmark	Guatemala	Kuwait
New Zealand	Estonia 1/	Jamaica	Libya
Pakistan	Finland 1/	Mexico	Mauritius
Philippines	France 1/	Panama	Morocco
Singapore	Germany 1/	Paraguay	Oman
South Korea	Greece 1/	Peru	Qatar
Sri Lanka	Hungary	United States 1/	Saudi Arabia
Thailand	Iceland	Venezuela, Rep. Bol.	Senegal
	Ireland 1/		South Africa
	Italy 1/		Tunisia
	Latvia		
	Lithuania		
	Luxembourg 1/		
	Norway		
	Poland		
	Portugal 1/		
	Romania		
	Russia		
	Slovak Republic 1/		
	Slovenia 1/		
	Sweden		
	Switzerland		
	Turkey		
	Ukraine		
	United Kingdom 1/		

**Table 3 - Summary Statistics and Correlations over the Period 2001Q1-2012Q4 for Individual G4 Variables****Panel A - Summary Statistics**

Variable	Obs.	Mean	Std. Dev.	Min	Max
US VIX	2503	22.22	10.38	11.24	68.51
UK VIX	2503	21.13	8.40	10.12	49.57
EA VIX	2503	25.36	9.75	12.70	57.94
JP VIX	2503	26.26	9.07	15.48	65.49
US TED spread	2503	0.48	0.48	0.12	2.15
UK TED spread	2503	0.37	0.36	0.03	1.73
EA TED spread	2503	0.35	0.38	-0.02	1.80
JP TED spread	2503	0.13	0.13	-0.03	0.59
US real policy rate	2503	-0.47	1.71	-3.63	3.32
UK real policy rate	2503	0.75	2.72	-4.28	4.90
EA real policy rate	2503	-0.71	1.05	-2.54	1.59
JP real policy rate	2503	0.53	0.68	-1.40	2.53
US slope of yield curve	2503	2.08	1.14	-0.32	3.59
UK slope of yield curve	2503	1.07	1.31	-0.63	3.56
EA slope of yield curve	2503	2.00	1.15	0.25	4.06
JP slope of yield curve	2503	1.16	0.26	0.46	1.56
US dealer bank leverage	2503	20.00	5.50	12.43	30.62
UK bank leverage	2503	15.39	2.00	11.81	19.52
EA bank leverage	2503	16.99	1.15	13.95	18.08
JP bank leverage	2503	23.96	2.19	20.97	28.79
US growth rate of real credit	2503	2.47	4.10	-8.52	7.71
UK growth rate of real credit	2503	4.40	7.16	-10.86	13.32
EA growth rate of real credit	2503	3.59	3.92	-4.05	9.81
JP growth rate of real credit	2503	-0.96	2.77	-8.34	4.27
US REER (Change)	2503	-1.60	5.35	-9.74	11.82
UK REER (Change)	2503	-0.80	6.67	-21.81	7.39
EAREER (Change)	2503	0.68	5.67	-11.36	14.21
JP REER (Change)	2503	-1.53	8.15	-13.38	20.81
US growth rate of M2	2503	6.35	2.26	1.27	10.54
UK growth rate of M2	2503	7.86	5.48	-3.66	17.04
EA growth rate of M2	2503	6.41	2.80	1.43	10.51
JP growth rate of M2	2503	2.19	0.73	0.47	3.56

**Panel B - Correlation Matrix (selected cases)**

US	UK	EA	JP
1.00			
0.94	1.00		
0.87	0.93	1.00	
0.89	0.86	0.78	1.00
1.00			
0.84	1.00		
0.72	0.89	1.00	
0.83	0.87	0.75	1.00
1.00			
0.58	1.00		
0.78	0.58	1.00	
0.27	-0.16	0.22	1.00
1.00			
0.71	1.00		
0.65	0.92	1.00	
-0.06	-0.20	-0.17	1.00
1.00			
0.82	1.00		
0.72	0.75	1.00	
0.33	0.32	0.56	1.00
1.00			
0.79	1.00		
0.64	0.87	1.00	
-0.08	-0.18	0.12	1.00
1.00			
-0.29	1.00		
-0.41	-0.21	1.00	
0.12	-0.57	0.01	1.00
1.00			
-0.26	1.00		
0.17	0.63	1.00	
0.19	-0.43	-0.56	1.00

**Table 4 - Regression Results for Cross-Border Claims to Banks and Non-Banks, for period 1990Q1-2012Q4**

*Panel A - Dependent Variable: Log Changes in BIS Locational Cross-Border Claims on Banks (in %)*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	1990-2012							1990-2000 2001-2012 2001-2006						
GDP Growth (lag)	0.294*** (0.0551)	0.259*** (0.0515)	0.304*** (0.0561)	0.249*** (0.0559)	0.278*** (0.0546)	0.265*** (0.0566)	0.285*** (0.0550)	0.303*** (0.0551)	0.296*** (0.0507)	0.233*** (0.0487)	0.250*** (0.0484)	0.229*** (0.0754)	0.260*** (0.0655)	0.0295 (0.0868)
Inflation (lag)	-0.0628** (0.0278)	-0.0711*** (0.0265)	-0.0528* (0.0289)	-0.0507* (0.0301)	-0.0527* (0.0288)	-0.0714** (0.0271)	-0.0725** (0.0283)	-0.0822*** (0.0270)	-0.0518* (0.0285)	-0.0646** (0.0275)	-0.0718*** (0.0264)	-0.00818 (0.0409)	-0.0231 (0.0657)	-0.0983 (0.0795)
Change in Interest Rate Differential (Domestic rate - Fed Fund Rate)	0.0162 (0.0298)	0.0723** (0.0297)	0.0267 (0.0308)	0.00711 (0.0289)	0.0346 (0.0291)	0.0211 (0.0290)	0.0199 (0.0291)	0.0614** (0.0305)	0.0272 (0.0305)	0.0744** (0.0306)	0.0877*** (0.0318)	0.0673 (0.0486)	0.0740* (0.0399)	0.0776 (0.0560)
CBOE VIX		-0.185*** (0.0233)								-0.0470* (0.0268)	-0.121*** (0.0247)	0.0878 (0.0757)	-0.0834** (0.0321)	-0.0892** (0.0426)
TED Spread			-0.924** (0.432)							-1.054** (0.507)	-0.0925 (0.525)	-2.210** (0.891)	-0.443 (0.672)	-5.620 (4.423)
US Bank Leverage				0.274*** (0.0490)						0.258*** (0.0487)		0.266*** (0.105)	0.173*** (0.0597)	-0.0569 (0.142)
Growth of Real US Credit					0.187*** (0.0445)						0.116*** (0.0435)			
US Slope of Yield Curve						-0.597*** (0.156)				-0.458*** (0.148)		-0.267 (0.332)	-0.515** (0.220)	-1.022*** (0.343)
US Real Federal Fund Rate							0.172** (0.0824)				0.271** (0.115)			
US M2 (Annual growth rate)								-0.458*** (0.0902)		-0.353*** (0.0788)	-0.0733 (0.0843)	-0.451** (0.185)	-0.361*** (0.104)	-0.329* (0.180)
US REER (Annual growth rate)									-0.249*** (0.0320)	-0.155*** (0.0268)	-0.211*** (0.0359)	-0.0475 (0.0498)	-0.183*** (0.0396)	-0.0743 (0.0719)
Country Fixed Effect	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	5,467	5,467	5,467	5,467	5,467	5,467	5,467	5,467	5,331	5,331	5,331	1,960	3,371	1,672
R-squared	0.017	0.042	0.019	0.033	0.023	0.022	0.019	0.028	0.032	0.062	0.054	0.026	0.076	0.021
Number of countries	77	77	77	77	77	77	77	77	77	77	77	65	77	74

Notes: The table reports the estimates of panel regressions with country fixed effects and clustered standard errors at the borrower country level. The dependent variables are the change in cross-border claims on banks (Panel A) and non-banks (Panel B). \*\*\* indicate significance at 1 percent, \*\* at 5 percent, and \* at 10 percent, respectively.

**Table 4 Cont. - Regression Results for Cross-Border Claims to Banks and Non-Banks, for period 1990Q1-2012Q4***Panel B - Dependent Variable: Log Changes in BIS Locational Cross-Border Claims on Non-Banks (in %)*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	1990-2012							1990-2000 2001-2012 2001-2006						
GDP Growth (lag)	0.173*** (0.0315)	0.150*** (0.0296)	0.176*** (0.0317)	0.136*** (0.0272)	0.157*** (0.0291)	0.141*** (0.0300)	0.163*** (0.0309)	0.177*** (0.0321)	0.180*** (0.0312)	0.121*** (0.0268)	0.133*** (0.0285)	0.135*** (0.0286)	0.129*** (0.0456)	-0.0715 (0.0510)
Inflation (lag)	-0.0125 (0.0200)	-0.0175 (0.0186)	-0.0100 (0.0203)	-0.00312 (0.0218)	-0.00201 (0.0217)	-0.0224 (0.0204)	-0.0249 (0.0205)	-0.0198 (0.0191)	-0.00755 (0.0200)	-0.0177 (0.0199)	-0.0193 (0.0203)	-0.00984 (0.0227)	0.0305 (0.0338)	-0.0276 (0.0378)
Change in Interest Rate Differential (Domestic rate - Fed Fund Rate)	0.00109 (0.0275)	0.0374 (0.0265)	0.00372 (0.0277)	-0.00589 (0.0266)	0.0195 (0.0264)	0.00667 (0.0263)	0.00557 (0.0270)	0.0185 (0.0281)	0.00542 (0.0273)	0.0300 (0.0273)	0.0403 (0.0271)	0.0351 (0.0357)	0.0257 (0.0375)	0.00483 (0.0306)
CBOE VIX		-0.120*** (0.0146)								-0.0587*** (0.0199)	-0.109*** (0.0175)	-0.0158 (0.0425)	-0.0890*** (0.0242)	-0.132*** (0.0308)
TED Spread			-0.229 (0.276)							-0.282 (0.341)	0.356 (0.336)	-0.454 (0.694)	0.296 (0.408)	-4.003 (2.789)
US Bank Leverage				0.223*** (0.0313)						0.169*** (0.0376)		0.225** (0.0852)	0.118*** (0.0437)	0.0463 (0.0586)
Growth of Real US Credit					0.191*** (0.0290)						0.118*** (0.0299)			
US Slope of Yield Curve						-0.672*** (0.0911)				-0.408*** (0.113)		-0.0954 (0.174)	-0.450** (0.195)	-1.023*** (0.335)
US Real Federal Fund Rate							0.223*** (0.0543)				0.183*** (0.0677)			
US M2 (Annual growth rate)								-0.179*** (0.0429)		-0.112** (0.0499)	0.0793* (0.0416)	-0.0445 (0.115)	-0.235*** (0.0710)	-0.129 (0.113)
US REER (Annual growth rate)									-0.111*** (0.0196)	-0.0588*** (0.0177)	-0.0915*** (0.0195)	-0.0815* (0.0413)	-0.00480 (0.0291)	-0.0183 (0.0532)
Country Fixed Effect	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	5,439	5,439	5,439	5,439	5,439	5,439	5,439	5,439	5,303	5,303	5,303	1,936	3,367	1,668
R-squared	0.013	0.038	0.013	0.038	0.027	0.026	0.017	0.017	0.020	0.058	0.052	0.022	0.073	0.044
Number of countries	77	77	77	77	77	77	77	77	77	77	77	65	77	74

Notes: The table reports the estimates of panel regressions with country fixed effects and clustered standard errors at the borrower country level. The dependent variables are the change in cross-border claims on banks (Panel A) and non-banks (Panel B). \*\*\* indicate significance at 1 percent, \*\* at 5 percent, and \* at 10 percent, respectively.

**Table 5 - Regression Results for Cross-Border Claims to Banks and Non-Banks, Individual G4 variables**

*Panel A - Dependent Variable: Log Changes in BIS Locational Cross-Border Claims on Banks (in %)*

G4 Economy		VIX	TED	Bank Leverage	Real Credit Growth	Real Policy Rate	Slope of yield curve	Change in real effective exchange rate	M2 growth (national currency)
US	Coefficient	-0.251***	-0.433	0.364***	0.284***	0.446***	-1.309***	-0.384***	-0.879***
	Standard error	(0.0294)	(0.668)	(0.0652)	(0.0791)	(0.138)	(0.242)	(0.0473)	(0.139)
	R2	0.051	0.010	0.035	0.019	0.014	0.024	0.037	0.032
UK	Coefficient	-0.258***	-4.455***	0.930***	0.127**	0.454***	-1.214***	0.279***	0.110**
	Standard error	(0.0337)	(0.861)	(0.159)	(0.0481)	(0.129)	(0.294)	(0.0457)	(0.0458)
	R2	0.039	0.025	0.031	0.015	0.019	0.025	0.030	0.012
EA	Coefficient	-0.243***	-3.213***	0.624**	0.393***	0.0815	-1.338***	0.0175	0.401***
	Standard error	(0.0291)	(0.764)	(0.285)	(0.0864)	(0.224)	(0.303)	(0.0497)	(0.130)
	R2	0.046	0.019	0.013	0.025	0.010	0.025	0.010	0.017
JP	Coefficient	-0.271***	-8.463***	0.0617	0.0548	-0.250	1.941**	-0.223***	-1.580***
	Standard error	(0.0315)	(2.021)	(0.123)	(0.0916)	(0.435)	(0.878)	(0.0350)	(0.348)
	R2	0.045	0.017	0.010	0.010	0.010	0.012	0.032	0.018

*Panel B - Dependent Variable: Log Changes in BIS Locational Cross-Border Claims on Non-Banks (in %)*

G4 Economy		VIX	TED	Bank Leverage	Real Credit Growth	Real Policy Rate	Slope of yield curve	Change in real effective exchange rate	M2 growth (national currency)
US	Coefficient	-0.163***	0.113	0.264***	0.288***	0.636***	-1.234***	-0.161***	-0.523***
	Standard error	(0.0184)	(0.377)	(0.0438)	(0.0580)	(0.108)	(0.170)	(0.0278)	(0.0832)
	R2	0.052	0.013	0.043	0.033	0.031	0.041	0.024	0.031
UK	Coefficient	-0.163***	-2.617***	0.734***	0.119***	0.382***	-0.935***	0.162***	0.146***
	Standard error	(0.0203)	(0.526)	(0.109)	(0.0330)	(0.0889)	(0.183)	(0.0266)	(0.0350)
	R2	0.039	0.025	0.043	0.024	0.029	0.034	0.029	0.023
EA	Coefficient	-0.162***	-2.392***	0.623***	0.337***	0.381**	-1.049***	-0.0219	0.361***
	Standard error	(0.0174)	(0.498)	(0.200)	(0.0569)	(0.157)	(0.197)	(0.0270)	(0.0859)
	R2	0.049	0.024	0.021	0.037	0.016	0.034	0.014	0.027
JP	Coefficient	-0.157***	-3.677***	0.0957	0.253***	0.114	2.172***	-0.155***	-1.358***
	Standard error	(0.0198)	(1.199)	(0.0878)	(0.0580)	(0.270)	(0.791)	(0.0240)	(0.250)
	R2	0.040	0.017	0.014	0.021	0.014	0.018	0.037	0.027

Notes: The table reports the estimates of panel regressions with country fixed effects and clustered standard errors at the borrower country level. Only non-G4 countries are included in the estimations, which reduces the sample to 58 countries (2,503 observations). The dependent variables are the change in cross-border claims on banks and non banks. The variables reported in the table were introduced individually (not all simultaneously). All regressions also include lag GDP growth, lag CPI inflation, and change in interest rate differentials for the borrowing countries, but they are not reported. \*\*\* indicate significance at 1 percent, \*\* at 5 percent, and \* at 10 percent, respectively.

**Table 6 - Regression results for cross-border claims on banks and non-banks, individual G4 country factors, by region**

G4 Variables	Claims on Banks		Claims on Non-banks	
	Asia	West Hemisphere	Asia	West Hemisphere
US TED spreads	-2.817** (0.973)	-0.908 (1.070)	-1.031 (0.641)	-0.299 (0.332)
UK TED spreads	-5.640*** (1.618)	-5.006*** (1.372)	-3.845*** (1.061)	-2.142** (0.832)
EA TED spreads	-5.091*** (1.403)	-1.698** (0.779)	-3.384*** (0.864)	-0.692 (0.804)
US bank leverage	0.0827 (0.0878)	0.251** (0.101)	0.114 (0.0767)	0.116*** (0.0368)
UK bank leverage	0.409* (0.207)	0.667** (0.290)	0.412* (0.191)	0.489*** (0.0984)
EA bank leverage	-0.569 (0.391)	-0.803 (0.453)	-0.251 (0.312)	-0.0645 (0.144)
US real credit growth	0.0641 (0.0832)	-0.0733 (0.0888)	0.166* (0.0911)	0.0264 (0.0415)
UK real credit growth	-0.0755 (0.0677)	-0.0470 (0.0646)	-0.0195 (0.0481)	0.00488 (0.0250)
EA real credit growth	0.0566 (0.104)	0.199 (0.126)	0.139 (0.0955)	0.190*** (0.0434)
US real policy rate	-0.00835 (0.202)	0.339 (0.257)	0.505* (0.232)	0.284* (0.141)
UK real policy rate	-0.0204 (0.163)	0.00279 (0.146)	0.0589 (0.145)	0.0319 (0.0886)
EA real policy rate	-0.986** (0.384)	-0.154 (0.568)	-0.218 (0.301)	0.0247 (0.156)
US slope of yield curve	-0.712* (0.389)	-1.234** (0.426)	-1.161*** (0.314)	-1.027** (0.361)
UK slope of yield curve	-0.126 (0.385)	-0.493 (0.360)	-0.241 (0.286)	-0.407** (0.145)
EA slope of yield curve	-0.0889 (0.416)	-0.739** (0.330)	-0.273 (0.305)	-0.556*** (0.122)
Change of US REER	-0.358*** (0.0889)	-0.457** (0.150)	-0.216** (0.0740)	-0.120** (0.0440)
Change of UK REER	0.271*** (0.0725)	0.431*** (0.110)	0.245*** (0.0496)	0.0979 (0.0571)
Change of EA REER	-0.0883 (0.107)	-0.103 (0.173)	-0.185*** (0.0472)	-0.0648 (0.0589)
US growth of M2	-0.841** (0.278)	-0.744* (0.370)	-0.794*** (0.118)	-0.198 (0.127)
UK growth of M2	-0.0672 (0.0638)	-0.0575 (0.0691)	0.0545 (0.0608)	0.0217 (0.0322)
EA growth of M2	-0.135 (0.191)	-0.0424 (0.251)	-0.0663 (0.120)	0.144** (0.0612)

Notes: The table reports the estimates of panel regressions with country fixed effects and clustered standard errors at the borrower country level. Each region is estimated separately, with only non-G4 countries being included. The dependent variables are the change in cross-border claims on banks and non-banks. The variables reported in each row of the table were introduced individually (not all simultaneously). All regressions also include lag GDP growth, lag CPI inflation, and change in interest rate differentials for the borrowing countries, but they are not reported. \*\*\* indicate significance at 1 percent, \*\* at 5 percent, and \* at 10 percent, respectively.

**Table 7 - Interaction Effects of Country Characteristics with Global Liquidity Variables***Panel A - Dependent Variable: Log Changes in BIS Locational Cross-Border Claims on Banks (in %)*

		X Variables						
		US VIX	UK TED	US Dealer Bank Leverage	UK real policy rate	UK slope of yield curve	Change in real effective exchange rate	G4 Countries M2 (Annual growth rate)
Exchange rate flexibility	1.237 (1.032)	1.634 (1.007)	1.382 (0.841)	4.180*** (1.130)	1.969** (0.765)	0.915 (0.769)	1.248 (1.158)	1.610 (0.998)
Exchange rate flexibility * X		-0.0134 (0.0113)	-0.541 (0.475)	-0.132*** (0.0400)	-0.270*** (0.0915)	0.802*** (0.176)	0.0521*** (0.0193)	-0.0689*** (0.0164)
Capital controls	0.0108 (0.0284)	-0.00284 (0.0307)	-0.0270 (0.0320)	0.0840 (0.0563)	-0.00390 (0.0316)	-0.0324 (0.0251)	0.00985 (0.0270)	0.0274 (0.0294)
Capital controls * X		-0.000415 (0.000802)	-0.0158 (0.0228)	-0.00518** (0.00232)	-0.0139*** (0.00457)	0.0301*** (0.00971)	0.00170 (0.00127)	-0.00346** (0.00138)
Capital stringency	-0.805** (0.369)	-0.403 (0.285)	-0.392 (0.288)	1.233** (0.561)	-0.427 (0.296)	-0.967*** (0.269)	-0.657** (0.329)	-0.411 (0.366)
Capital stringency * X		-0.00629 (0.00434)	-0.263 (0.178)	-0.0809*** (0.0254)	-0.0785 (0.0590)	0.423*** (0.0946)	0.0244** (0.0122)	-0.0442*** (0.0123)
Supervisory power	-0.108 (0.345)	-0.0620 (0.305)	-0.0212 (0.322)	0.420 (0.366)	0.0155 (0.312)	-0.316 (0.311)	-0.0912 (0.328)	0.0230 (0.336)
Supervisory power * X		-0.00364* (0.00215)	-0.176* (0.0896)	-0.0250** (0.0110)	-0.0599** (0.0281)	0.258*** (0.0511)	0.00955** (0.00459)	-0.0160*** (0.00424)
Institution quality 1/	-3.834*** (1.043)	-3.130*** (1.026)	-3.545*** (1.071)	-1.064 (1.231)	-2.761*** (1.002)	-3.734*** (0.967)	-3.124*** (0.996)	-2.956*** (1.075)
Institution quality * X		-0.0155 (0.0109)	-0.645 (0.390)	-0.0735** (0.0367)	-0.237*** (0.0778)	0.606*** (0.159)	0.0175 (0.0183)	-0.0484** (0.0197)
Limits on foreign banks	-0.406 (0.638)	1.213 (1.014)	1.533 (1.047)	5.303** (2.107)	0.207 (0.602)	-1.187** (0.483)	-0.532 (0.734)	0.0106 (1.230)
Limits on foreign banks * X		-0.0561 (0.0351)	-3.488** (1.440)	-0.257*** (0.0858)	-0.404** (0.158)	1.091*** (0.385)	-0.156 (0.0996)	-0.0336 (0.105)

*Panel B - Dependent Variable: Log Changes in BIS Locational Cross-Border Claims on Non-Banks (in %)*

		X Variables						
		US VIX	UK TED	US Dealer Bank Leverage	UK real policy rate	UK slope of yield curve	Change in real effective exchange rate	G4 Countries M2 (Annual growth rate)
Exchange rate flexibility	-0.890 (0.612)	-0.710 (0.537)	-0.854 (0.857)	1.297 (0.948)	-0.398 (0.995)	-1.050 (0.768)	-0.963* (0.570)	-0.649 (0.671)
Exchange rate flexibility * X		-0.00676 (0.00623)	-0.0649 (0.190)	-0.0988*** (0.0268)	-0.171*** (0.0602)	0.450*** (0.110)	0.0521*** (0.0138)	-0.0517*** (0.0135)
Capital controls	-0.0243 (0.0269)	-0.0369 (0.0267)	-0.0507* (0.0277)	0.0331 (0.0357)	-0.0358 (0.0272)	-0.0573** (0.0244)	-0.0248 (0.0261)	-0.0152 (0.0269)
Capital controls * X		-0.000143 (0.000496)	0.00216 (0.0144)	-0.00395*** (0.00131)	-0.0107*** (0.00278)	0.0218*** (0.00569)	0.000603 (0.000876)	-0.00166* (0.000892)
Capital stringency	-0.504 (0.319)	-0.377 (0.283)	-0.416 (0.293)	1.020** (0.490)	-0.183 (0.261)	-0.535** (0.258)	-0.426 (0.309)	-0.324 (0.333)
Capital stringency * X		0.000804 (0.00294)	0.101 (0.111)	-0.0612*** (0.0206)	-0.0624 (0.0441)	0.207*** (0.0697)	0.0232*** (0.00736)	-0.0229** (0.00941)
Supervisory power	0.101 (0.166)	0.135 (0.145)	0.125 (0.157)	0.492** (0.243)	0.151 (0.151)	0.0432 (0.143)	0.117 (0.161)	0.162 (0.171)
Supervisory power * X		-0.00250 (0.00156)	-0.0146 (0.0578)	-0.0185** (0.00888)	-0.0182 (0.0204)	0.0695* (0.0355)	0.00841** (0.00328)	-0.00769* (0.00411)
Institution quality 1/	-3.197*** (0.542)	-2.901*** (0.472)	-3.233*** (0.536)	-1.330* (0.723)	-2.555*** (0.531)	-3.010*** (0.485)	-2.939*** (0.523)	-2.981*** (0.549)
Institution quality * X		-0.00392 (0.00621)	0.151 (0.199)	-0.0491** (0.0220)	-0.110** (0.0442)	0.249** (0.0962)	0.0180 (0.0140)	-0.0182 (0.0136)
Limits on foreign banks	-0.950 (0.590)	-0.664* (0.371)	-0.723 (0.462)	1.783 (1.415)	-0.540 (0.586)	-1.099** (0.427)	-0.907 (0.641)	-0.731 (0.845)
Limits on foreign banks * X		-0.00263 (0.0197)	-0.174 (0.518)	-0.114** (0.0496)	-0.241** (0.116)	0.451** (0.194)	-0.00475 (0.0490)	-0.0264 (0.0445)

Notes: The table reports the estimates of panel regressions with country fixed effects and clustered standard errors at the borrower country level. The dependent variables are the change in cross-border claims on banks and non banks. The variables reported in the table were introduced individually (not all simultaneously). All regressions also include lag GDP growth, lag CPI inflation, change in interest rate differentials, and, in the respected interacted variable.

\*\*\* indicate significance at 1 percent, \*\* at 5 percent, and \* at 10 percent, respectively. 1/High values indicate lower institutional quality.



# Annex A. Time series charts of the drivers of global liquidity

