U.S. monetary policy and fluctuations of international bank lending[☆]

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Abstract

There is no consensus in the empirical literature on the direction in which U.S. monetary policy affects cross-border bank lending. We find robust evidence that the impact of the U.S. federal funds rate on cross-border bank lending in a given period depends on the prevailing international capital flows regime and on the level of the two main components of the federal funds rate: macro fundamentals and monetary policy stance. During episodes in which bank lending from advanced to emerging economies is booming, the relationship between the federal funds rate and cross-border bank lending is positive and mostly driven by the macro fundamentals component, which is consistent with a search-for-yield behavior by internationally-active banks. In contrast, during episodes of stagnant growth in bank lending from advanced to emerging economies, the relationship between the federal funds rate and bank lending is negative, mainly due to the monetary policy stance component of the federal funds rate. The latter set of results is driven by the lending to emerging markets, which is consistent with the international bank-lending channel and flight-to-quality behavior by internationally-active banks.

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1. Introduction

The business cycle that followed the global financial crisis demonstrated how sensitive the world economy is to changes in U.S. monetary policy. Most countries, regardless of the exchange rate regime, are susceptible to changes in U.S. monetary policy, unless their borders are completely closed to international capital flows (Miranda-Agrippino and Rey, 2015). The discussion left the purely academic domain and entered the realm of policymaking.[3] Two sets of events illustrated this quite clearly. The first one occurred in 2013, when Chairman Bernanke's announcement of a potential tapering of the Fed's quantitative easing program led to sudden stops in capital flows to emerging market economies — the episode dubbed the "taper tantrum."[4] The second set of events took place in 2015, when a number of emerging economies raised interest rate either preemptively or immediately following Fed's lift–off of interest rates. Is this heightened post–crisis sensitivity to U.S. monetary policy an anomaly, a new normal, or an old story? In this paper, we address this question by studying the time-varying response of international bank lending to changes in U.S. macroeconomic fundamentals and Fed's monetary policy stance.

Our analysis differs from the large literature on U.S. monetary policy spillovers along a number of dimensions. First, using the most comprehensive bilateral data on international bank lending available, we observe that the correlation between the federal funds rate and international bank lending fluctuates dramatically, from highly negative to highly positive, over time.[5] Using a Markov switching regression, we identify two distinct regimes in international bank lending: (i) a boom regime, characterized by high growth rates of lending from advanced to emerging economies ("North–South flows") and (ii) a stagnation regime, characterized by low or negative growth rates of lending from advanced to emerging economies. We conduct separate sets of analyses for these two regimes and find substantial differences between them in terms of the relationship between international bank flows and the federal funds rate. Second, we recognize that the federal funds rate has two distinct components — a component driven by macroeconomic fundamentals and a component determined by the Fed's discretionary decisions. Thus, in addition to the effects of the federal funds rate, we analyze the effects of a Taylor rule-implied rate (the "macro fundamentals component") and the difference between the federal funds rate and the one implied by the Taylor rule (the "monetary policy stance component"). Third, taking advantage of the bilateral nature of the BIS international banking statistics, we allow for cross-border lending originating from banks located in the U.S. to be affected differently than lending originating from outside the U.S. Fourth, we attempt to maximize the data sample by not relying on "pull factors" — country-specific fun-

[3] See, for example, Powell (2013).

[4] See Bernanke (2013) for the full text of Chairman Bernanke testimony, and Nechio (2014); Eichengreen and Gupta (2015) for the discussion of its effects on international capital flows.

[5] In a paper complementary to ours, Friedrich and Guérin (2016) evaluate regime switching for equity and bond flows using EPFR data, but only going back to 2000.

damentals that affect capital inflows. Instead, we show that our results hold if we control for borrower-lender fixed effects and total borrowing and total lending to each country in our sample in each quarter.

There exists a large literature that examines the importance of global factors in driving international capital flows in general and cross-border bank flows in particular.[6] It is also well-established that these capital flows transmit global shocks to real performance of individual economies.[7] The literature tends to distinguish global (push) factors from borrowing country-specific (pull) factors that drive international bank lending (Spiegel, 2009; Fratzscher, 2012; Forbes and Warnock, 2012; Burger et al., 2015).[8] Two global factors have consistently emerged across empirical studies as being important drivers: (i) global risk aversion, typically approximated by the VIX (Forbes and Warnock, 2012; Miranda-Agrippino and Rey, 2015; Bruno and Shin, 2015b), and (ii) monetary policy in developed countries, usually measured using policy rates in advanced economies (Milesi-Ferretti and Tille, 2011; Shin, 2012; Rey, 2015).

The direction of the impact of global risk aversion on cross-border bank flows is generally clear: there is abundant evidence that increases in global risk aversion lead to declines in cross-border bank flows. Virtually all papers on the subject in the existing literature have documented that the impact of the VIX on cross-border bank flows is negative and statistically significant.[9] In our analysis, we also find that lower risk appetite, measured by higher credit spreads or higher realized stock market volatility, are associated with lower cross-border lending overall, and especially to emerging markets.

In contrast to risk aversion, there is no conclusive empirical evidence regarding the direction of the effect that advanced economies' monetary policies have on cross-border bank flows, as documented in the survey by Koepke (2015). Several studies have found a negative and statistically significant relationship between the two variables. For example, using data from the BIS locational banking statistics for the 1995-2007 period, Bruno and Shin (2015a), find that U.S. interest rates have a negative impact on cross-border bank lending. They argue that banks financing costs are closely tied to central bank policy rates, and hence affect banks willingness to lend internationally, including to banks in emerging economies. Ghosh et al. (2014) also use the BIS locational banking statistics and find similar results for a larger sample of 76 advanced and emerging countries.

Several other studies, however, find the opposite, or at least mixed, results. Jeanneau and Micu (2002) find a positive relationship between higher global interest rates and banking flows to emerging markets, using semi-annual data from the BIS consolidated banking statistics for

[6]Recent papers include Fratzscher (2012); Cerutti et al. (2015); Miranda-Agrippino and Rey (2015); Byrne and Fiess (2016); **?**); Avdjiev et al. (2017b); Ha et al. (2017).

[7]See, for example, Chen and Tsang (2016); Avdjiev et al. (2017a).

[8]For the most recent analysis of push and pull factors, see Cerutti et al. (2017b); Avdjiev et al. (2017c).

[9]See, for example, Jeanneau and Micu (2002); Ferrucci et al. (2004); Takats (2010); Herrmann and Mihaljek (2013); Bruno and Shin (2015a,b); Baskayay et al. (2017).

the 1985-2000 period. The authors argue that higher interest rates in mature economies reflect stronger economic conditions that result in improved confidence of international lenders, which ends up stimulating cross-border bank lending. Using micro-level U.S. banking data for the 1984-2000 period, Goldberg (2002) obtains mixed results, with the sign of the coefficient depending on the model specification and with different results for U.S. bank lending to Latin America compared to emerging Asia. Cerutti et al. (2017a) also present mixed evidence for a sample of 77 (advanced and emerging) countries. They find that cross-border bank flows are positively related to short-term U.S. real interest rates, but are negatively affected by the U.S. term premium.

One possible explanation for the lack of conclusive empirical evidence in the above empirical literature is that the relationship between the U.S. monetary policy and international bank lending is time–varying. We find evidence that this is indeed the case. Figure 1 shows a rolling correlation between the federal funds rate and the quarterly growth rate of cross-border bank lending going back to the early 1980s. It is clear that this simple correlation fluctuates from roughly -0.8 to approximately 0.8 and is not always synchronized for advanced and emerging market borrowers. This suggests that there might be different regimes in cross-border bank lending and that the impact of U.S. monetary policy varies across these regimes. Another possibility is that changes in the federal funds rate have different informational content, depending on whether they reflect changes in U.S. macroeconomic fundamentals (approximated by a Taylor rule) or changes in the Fed's monetary policy stance (conditional on a given set of macroeconomic fundamentals).

We conjecture that the above time-variation may be related to the existence of different regimes in the behavior of "North–South flows."[10] Using a Markov switching regression, we identify two regimes that are quite distinct from each other — one regime in which bank lending from advanced to emerging economies is growing, and a second regime in which bank lending from advanced to emerging economies is either stagnant or declining. We call these two regimes "boom" and "stagnation," respectively.

Our results indicate that there is a positive relationship between the macro fundamentals component of federal funds rate and bank flows (to both, advanced and emerging economies) in the "boom" regime. In the "stagnation" regime, we find that the impact of the federal funds rate is negative on bank lending to emerging economies (driven by the monetary policy stance component of the federal funds rate) and positive or insignificant on bank lending to advanced economies. In other words, during international lending booms, improvement in macro fundamentals that lead to increases in the federal funds rate are associate with further increase in bank lending to all economies, including emerging markets. During stagnation regimes, improvements in fundamen-

[10]We have tested a number of alternative variables along which the two regimes could be defined. Our results indicate that the growth rate of bank lending from AEs to EMEs ("North–South flows") generates regimes with the most distinct impact of the federal funds rate across them. That is why, we use this regime definition in our benchmark estimates.

tals have a similar, albeit weaker effect, whereas a tightening of the monetary policy stance leads to a decline in bank lending to emerging markets, sometimes accompanied by an increase in lending to advanced economies. Thus, the impact of macroeconomic fundamentals on cross-borer bank lending is not regime-dependent — improvement in macro fundamentals are always associated with higher growth in cross-border bank flows, regardless of the regime. In contrast, the impact of the U.S. monetary policy stance on bank lending to emerging market borrowers is regime-dependent - it is insignificant during the boom regime, but negative (and statistically significant) during the stagnation regime.

To understand the intuition behind these results, it is useful to focus on two types of investors' behavior. The first one, described as "return chasing," is a high-risk-tolerance behavior characterized by a propensity to allocate funds across assets primarily based on expected returns, while paying only secondary attention to the associated risk. Classical carry trades are a good example of such behavior. The other type of investor behavior, frequently referred to as "flight to quality," is a low-risk-tolerance behavior that involves moving funds into safe assets even if they offer very low returns. During the global financial crisis, we saw a number of flight-to-quality examples. Similarly, flight-to-quality describes well the aforementioned 2013 taper tantrum episode. If investors' risk tolerance is time-varying, as Miranda-Agrippino and Rey (2015) has shown to be the case, we might see time-varying response of investors to the same shock, such as a change in U.S. monetary policy.

The story is complicated by two additional factors. First, a standard bank-lending channel of monetary policy would also imply that an increase in cost of funds may lead to reduced risk-taking of financial institutions and the effect of this channel can be more or less pronounced depending on the degree of risk appetite in markets. Second, balance sheet effects create time-varying creditworthiness of borrowers with currency mismatches on their balance sheets depending on whether the U.S. dollar is on the up- or down-swing, as shown by Bruno and Shin (2015a), Bruno and Shin (2015b), Avdjiev et al. (2016), and Cesa-Bianchi et al. (2017).[11]

During periods of low risk tolerance or appreciating U.S. dollar, the flight-to-quality effect and the bank lending channel are likely to dominate. During these periods, a tightening monetary policy stance is likely to exacerbate flight-to-quality dynamics and lead to a reduction in capital flows to emerging economies. The effect on flows to advanced economies is ambiguous and depends on whether these countries are viewed as safe or risky and on the degree of currency mismatches in these countries. Macroeconomic fundamentals, reflected in the Taylor rule-implied federal funds rate, are likely to have a smaller negative effect, as improving fundamentals themselves are likely

[11]Of course there are other aspects of investors' behavior that might affect their reaction to changes in U.S. monetary policy. Among those brought forth by recent literature: diversification motives, risk aversion, balance sheet costs, portfolio composition, as well as a variety of other financial frictions. We abstract from these to keep our story tractable.

to increase risk tolerance.

During periods of high risk tolerance or a depreciating U.S. dollar, search-for-yield behavior is likely to dominate. An increase in the federal funds rate, especially when driven by fundamentals, is likely to be read by the markets as a signal of an ongoing global economic expansion. This will improve the balance sheets of borrowers with currency mismatches, fuel market exuberance, and intensify return-chasing, leading to increased capital flows to emerging economies despite rising cost of funds.

One potential concern is that we use the same data to identify the regimes as the series that are the focus of our analysis. To alleviate this concern, we construct a predicted measure of the growth rate of bank flows from advanced to emerging economies. The explanatory variables used for the prediction regression include global push factors as well as emerging-market-specific indicators. The regression explains over 40 percent of the variation in the growth rate of these "north-south" banking flows. We then construct our regimes on the basis of these predicted flows and repeat our analysis. We find that the results are qualitatively the same as with our benchmark analysis.

Taken together, our results paint the following picture. A higher federal funds rate tends to be associated with higher growth of cross-border bank lending to advanced economies. This, seemingly counter-intuitive, effect is driven by two factors: a) an improvement in U.S. macroeconomic fundamentals leads to an increase in federal funds rate (via its Taylor rule component) and at the same time increases cross-border lending worldwide; b) a tightening of the U.S. monetary policy stance, for a given level of macro fundamentals, is associated with a re-balancing of bank lending away from emerging markets and towards advanced economies.

The relationship between the federal funds rate and cross-border bank lending to emerging markets is regime-dependent. During booms, a higher Taylor rule-implied federal funds rate signals an improvement in U.S. macroeconomic fundamentals, and, all else the same, better growth prospects for emerging markets (whose growth is positively correlated with U.S. growth). This leads to increases in cross-border bank lending to both AEs and EMEs. Meanwhile, the pure monetary policy stance component of the federal funds rate only has a small effect during booms. During stagnation periods, the effect of the U.S. macroeconomic fundamentals component is small. Conversely, a higher monetary policy stance component of the federal funds rate is associated with a decline in bank lending to emerging markets.

Despite the fact that the question we address is not new, we believe our results make an important step towards improving our understanding of international monetary policy spillovers. For emerging market especially, cross-border bank lending flows play a very important role in economic fluctuations. Being able to predict their response to policy changes in the U.S. is crucial for policymakers in these countries. Until now, making such a prediction was difficult, because of the lack of consensus in the existing literature even on the sign of the effect. Understanding that the impact of U.S. monetary policy on bank lending varies over time across two well–defined regimes

and critically depends on the drivers of the changes in the US federal funds rate, makes the above response much more predictable. Moreover, we show evidence that supports what might seem like contradictory or unrelated mechanisms: lending booms, cost-of-funding effects, bank-lending channel effects, balance sheet effects, and flight-to-quality effects. All these are observed in the data, but not at all times and not across all regions. Understanding these distinctions is crucial for reconciling the seemingly contradicting findings of the existing literature.

The rest of this paper is organized as follows. Section 2 describes our data. Section 3 goes over the overall trends and regime changes in the data. Section 4 presents our empirical analysis. Section 5 concludes.

2. Data

Our data on cross-border bank lending flows is obtained from the International Banking Statistics (IBS) of the Bank for International Settlements (BIS). In addition, we obtain effective federal funds rate from FRED. [12] The Taylor rule-implied federal funds rate is obtained from Hofmann and Bogdanova (2012). We supplement these data with broad U.S. dollar index from FRED, S&P 500 from Bloomberg, and BAA spreads from Moody's.

Since our analysis spans almost 40 years, we do not explicitly analyze the effects of unconventional monetary policy actions, which is a more recent phenomenon.[13] We do, however, use the shadow policy rate from Wu and Xia (2016), which incorporates the effects of unconventional monetary policy on the term structure of interest rates. We do not explicitly account for any announcement affects that were not accompanied by either a change in the federal funds rate or the change in the shadow rate. Nevertheless, events such as the "taper tantrum" testimony are captured in our empirical analysis via their impact on the shadow policy rate, which reflects fluctuations in long-term interest rates.

Countries are grouped into "advanced" and "developing" according to the definitions used in the BIS International Banking Statistics.[14]

We construct our bank flows series by using data from the BIS Locational Banking Statistics by Residence (LBSR), which is the most comprehensive cross-border bank lending dataset. It contains quarterly series from Q1 1978 to Q1 2015, which include free, restricted and confidential observations. The data points in the latter category can only be accessed on BIS premises.

The LBSR capture the outstanding claims and liabilities of internationally active banks located in reporting countries against counterparties residing in more than 200 countries. Banks record their positions on an unconsolidated basis, including intragroup positions between offices of the same banking group. The data are compiled following principles that are consistent with balance

[12] Publicly available at https://research.stlouisfed.org/fred2/series/FEDFUNDS.
[13] For such analysis, see recent papers by Ammer et al. (2016); Forbes et al. (2016).
[14] The complete lists are publicly available at http://www.bis.org/statistics/bankstats.htm.

of payments statistics and capture around 95 percent of all cross-border interbank business (Bank for International Settlements, 2015).

In addition to providing a geographical breakdown of reporting banks' cross-border claims and liabilities, the LBSR also provide information about the currency composition and the counterparty sector of banks' cross-border positions. The availability of a currency breakdown in the LBSR, coupled with the reporting of breaks in series arising from changes in methodology, reporting practices or reporting population, enables the BIS to calculate break- and exchange rate- adjusted changes in amounts outstanding. Such adjusted changes approximate underlying flows during a quarter.[15]

On the borrowing side, we focus on a set of 114 countries, including both, Advanced Economies (AEs) and Emerging Market Economies (EMEs).[16] We use quarterly data which cover the period from Q1 1978 to Q1 2015.

3. Overall trends and regime changes

At the global level, the growth rate of cross-border bank flows varies quite a bit over time. Figure 2 shows the quarterly growth rate of global cross-border bank claims from the LBSR. It displays a clear cyclical pattern at low and medium frequencies. Over the past several decades, cross-border bank lending has switched back and forth between high-growth periods and episodes characterized by slow-downs or even outright contractions. On balance, however, we observe mostly positive growth rates prior to 2008, reflecting a steady globalization trend.

3.1. Correlation with federal funds rate

We next turn to the analysis of the relationship between the federal funds rate and cross-border bank flows. More specifically, we compute 12-quarter rolling correlations between the level of the federal funds rate in quarter t and the average growth rate of several types of international bank flows between t and $t + 7$.

For the full sample of borrowers, the correlation between cross-border bank flows and the federal funds rate exhibits a very high degree of time variation (Figure 1). It repeatedly fluctuates from very negative values (reaching -0.8) to very positive values (reaching 0.8) over the entire time window that we examine. Furthermore, these fluctuations do not follow a uniform pattern across borrowing regions. Most notably, in several instances the correlation for cross-border bank flows to EMEs deviates considerably from the respective correlation for flows to advanced economies.

[15] Adjusted changes may over- or underestimate underlying flows because adjusted changes may also be affected by changes in valuations, writedowns, the underreporting of breaks, and differences between the exchange rate on the transaction date and the quarterly average exchange rate used by the BIS to convert non-dollar amounts into US dollars.

[16] The complete country lists are available in Appendix A.

3.2. Regime changes

The cyclical pattern observed in overall cross-border flows as well as the fluctuating correlations with federal funds rate suggest that there might be different regimes of international bank lending. We are not the first to notice this. In a recent paper, Amiti et al. (2017) identify boom and bust patterns in international banking and analyze demand and supply drivers of these cycles. This cyclical pattern underscores the importance of using long time series for the analysis. The BIS LBSR allow us to work with series that go as far back as 1978, giving us close 150 quarters of data.[17]

We consider specifically changes in flows from advanced economies (AEs) to emerging market economies (EMEs), so-called North-South flows. For these flows we observe periods of general high growth and high volatility that are distinct from periods of either stagnation, or outright retrenchment, and low volatility. To formally identify these regimes, we estimate a simple Markov switching regression for quarterly growth rate of overall flows of bank lending from advanced to emerging economies, where we allow both average level and volatility of capital flows to vary by regime.[18] For this analysis, we use the LBSR data because they provide us with the longest time series and the cleanest growth rates, which, as discussed above, are adjusted for exchange rate valuation effects and breaks in series. Our measure of growth rate is valuation–adjusted flows from all advanced to all emerging economies in quarter t divided by the stock of such claims in quarter $t-1$.

Two regimes are clearly identified. In the high-growth rate regime, the growth rate of AE banks' claims on EMEs is 3.4 percent on average and the volatility of the series is high. In the complementary regime, the growth rate is negative on average (not statistically different from zero) and the volatility of the series is less than half of that in the high-growth regime. Figure 3 shows both the growth rate of aggregate lending from AEs to EMEs and the probability of the high-growth regime. We refer to the high-growth regime as "boom" and the complementary regime as "stagnation" and create a binary indicator of these regimes. We select a cut–off point of 50% probability for the stagnation regime — a median probability, which results in our observations being classified roughly equally across regimes.

Next, we check whether regime changes are in any way connected with monetary policy cycles in the U.S. We find that this is not the case: Figure 4 shows that there is no direct association between the dynamics of the federal funds rate and the probability of retrenchment regime.

[17] As mentioned above, we use the confidential version of LBSR, which can only be accessed on the premises of the BIS.

[18] Estimation results are reported in Appendix Table B1.

3.3. Decomposing the federal funds rate

We use the Taylor rule estimates of Hofmann and Bogdanova (2012) to decompose the federal funds rate into a business cycle component (TR) and a monetary policy stance component (MP). More concretely, we set the business cycle component of the federal funds rate equal to the median estimated Taylor rule-implied policy rate from Hofmann and Bogdanova (2012). We then obtain the monetary policy stance component as the difference between the actual federal funds rate and its business cycles component. The decomposition is displayed in Figure 5.[19]

We can show that this decomposition is also uncorrelated with boom/stagnation regimes in the North-South bank lending. As shown in Table 1, the number of quarters with increases and decreases in both TR and MP is roughly the same across regimes.

In terms of linking our results to the literature, we can think of Taylor rule-implied policy rate as effectively capturing "good" and "bad" times as discussed in Almeida et al. (2016).

4. Empirical analysis

We split the discussion of our empirical analysis in two parts. We start by going over the empirical setup that we use to examine the main questions in which we are interested. We then present the key results generated by the above empirical framework and discuss the intuition behind them.

4.1. Empirical strategy

We begin our analysis with a set of simple time-series regressions of cross-border bank lending flows to advanced and emerging economies on the federal funds rate:

$$FLOW_t^R = \alpha_0 + \alpha_1 t + \beta FF_t + \varepsilon_t, \tag{1}$$

where $FLOW_t^R$ is the quarterly growth rate of cross-border bank lending flows from AEs to region $R = AE, EME$, and FF is the Federal Funds rate (level) in quarter t. We estimate this equation separately for boom and stagnation regimes and include additional controls to evaluate the robustness of the estimated relationships. Because we observe trends in the decomposition of the federal funds rate, we include a trend in all regressions.

As discussed previously, we investigate the effects of two components of the Federal Funds rate — the rate implied by the Taylor Rule, TR, and the monetary policy stance, defined as the difference between the observed federal funds rate and the rate implied by the Taylor Rule, $MP = FF - TR$. We include TR and MP together in the same regression:

$$FLOW_t^R = \alpha_0 + \alpha_1 t + \beta_1 TR_t + \beta_2 MP_t + \varepsilon_t. \tag{2}$$

[19] Hofmann and Bogdanova (2012) calculate Taylor rule with 1.5 coefficient on inflation gap and 0.5 coefficient on output gap. r^* is proxied by real trend output growth.

Of course, the time series regressions do not reflect important compositional changes. That is why, we estimate panel regressions as well. Our initial approach to the panel regression analysis is agnostic, apart from the reliance on the regimes we identified.

While we focus on a specific global push factor, the federal funds rate, we do not include borrower-specific pull factors or lender-specific push factors. We have two reasons for doing that. First, the (lack of) availability of reliable quarterly macroeconomic series for many borrowing countries would necessarily limit the sample used in our analysis. Second, pull and push factors and their effects on capital flows might vary by country or country group and might be correlated with the federal funds rate or with capital inflows, which would potentially create bias in our estimate of the effect of U.S. monetary policy. Instead, in our benchmark specifications, we include the contemporaneous growth rate of total lending and total borrowing by each country in each year to capture any lender-specific push factors and any borrower-specific pull factors. To prevent time series fluctuations in the growth rates of total lending and total borrowing from absorbing the effects of our global push factors, we subtract the respective quarterly averages from each of those series.

First, we examine the overall effect of the federal funds rate by estimating the following regression:

$$FLOW_{ijt} = \alpha_{ij} + \alpha_1 t + \beta FF_t + \gamma_1 TL_{it} + \gamma_2 TB_{jt} + \varepsilon_{ijt}, \tag{3}$$

where $FLOW_{ijt}$ is the growth rate of bank lending from country i to country j in quarter t, α_{ij} is a set of lender-borrower country pair fixed effects. To control for country-specific push and pull factors we also include the quarterly growth rate of total lending of country i in quarter t (TL_{it}) and the quarterly growth rate of total borrowing of country j in quarter t (TB_{jt}) in deviations from their respective quarterly means across countries.

As in the time-series regressions, we also investigate the effects of the two main components of the Federal Funds rate — the rate implied by the Taylor Rule TR and the monetary policy stance, defined as the difference between the observed federal funds rate and the rate implied by the Taylor Rule $MP = FF - TR$. We include TR and MP simultaneously in the same regression:

$$FLOW_{ijt} = \alpha_{ij} + \alpha_1 t + \beta_1\ TR_t + \beta_2\ MP_t + \gamma_1 TL_{it} + \gamma_2 TB_{jt} + \varepsilon_{ijt}. \tag{4}$$

We approach the heterogeneity between regimes and borrowers in two ways — we begin by estimating separate regressions for AE and EME borrowers and for each regime Z: boom, B, and stagnation, S. We then proceed, as a benchmark, to estimate regressions, separately for AE and EME borrowers, where the federal funds rate, FF, or its two main components, TR and MP, are interacted with the regime.

$$FLOW_{ijt} = \alpha_{ij} + \alpha_1 t + \beta_1\ FF_t * B + \beta_2\ FF_t * S + \gamma_1 TL_{it} + \gamma_2 TB_{jt} + \varepsilon_{ijt}, \tag{5}$$

$$FLOW_{ijt} = \alpha_{ij} + \alpha_1 t + \beta_0 Z + \beta_1\ TR_t * B + \beta_2\ TR_t * S + \beta_3\ MP_t * B + \beta_4\ MP_t * S + \gamma_1 TL_{it} + \gamma_2 TB_{jt} + \varepsilon_{ijt}. \tag{6}$$

4.2. Results

As we saw in Figure 1, the correlation between the federal funds rate and cross-border bank lending flows is quite different, depending on whether the borrowers reside in advanced or emerging economies. That is why, we conduct our analysis separately for bank lending flows into these two groups of borrowing countries. We also estimate separate regressions for boom and stagnation regimes, as well as for interactions of our push factors with regimes.

We begin by reporting the results of the time-series regressions, summarized in Table 2.[20] The table reports β coefficients from two sets of regressions corresponding to equations 1 and 2. All regressions are estimated by borrower type (AE, EME) and regime (Boom, Stagnation). Controlling for a linear trend, we find that during booms episodes, a higher federal funds rate is associated with greater flows to emerging markets, but not to advanced economies. During stagnation regimes, a higher federal funds rate is associated with a lower growth rate of cross-border bank lending to EMEs and a higher growth rate of cross-border bank lending to AEs. Thus, during stagnation regimes, banks appear to be reallocating their cross-border lending away from EME borrowers, who tend to be relatively riskier, and towards AEs borrowers, who tend to be relatively safer. This is a classic manifestation of a flight-to-quality behavior and may also result from the standard bank lending channel, which suggests that risky lending is reduced when the cost of funds rises.

One possible explanation for those results is that the federal funds rate tends to be high during upswings in the U.S. business cycle, which, in turn, tend to coincide with upswings in the global business cycle. The higher pace of global economic growth is naturally tied to higher returns associated with cross-border bank lending (to both, AEs and EMEs). All else the same, this tends to induce lenders, whose risk tolerance tends to be relatively high during boom periods to chase the higher returns associated with cross-border bank lending, regardless of whether the borrowers are from advanced or emerging economies.

To further understand these dynamics, we decompose the federal funds rate into the portion driven by fundamentals as measured by Taylor rule (TR) and the residual, which we refer to as monetary policy stance (MP). We find that the retrenchment effect out of emerging markets (EMEs) and into advanced economies (AEs) is mostly due to the MP component — tighter monetary policy for a given set of fundamentals during stagnation regimes leads to retrenchment of bank lending from emerging to advanced economies. During stagnation regimes, we also observe some reduction in lending to EMEs that is due to improving fundamentals in the U.S. In contrast, during boom regimes, we only observe a significant effect of improving fundamentals — they further accelerate the boom in lending not only to emerging markets, but also to advanced economies.

Acknowledging that there is a lot heterogeneity among our lenders and borrowers and that this heterogeneity varies over time, we also estimate a set of panel regressions. In these regressions,

[20] Full regression results are reported in Appendix Table B2.

because of the bilateral structure of the BIS cross-border bank lending data that we use, we are able to control for country-pair fixed effects, linear trend, as well as total lending and total borrowing by each country in each quarter, which reflects all country-specific push and pull factors. In order for total lending and borrowing to not absorb the effects of global push factors that we study — we measure these as deviations from average lending and borrowing in a given quarter.

The results of the panel regressions are summarized in Table 3.[21]

We begin by estimating the overall effects of the federal funds rate in regressions corresponding to equations 3 and 4. In all regressions we control for trend and country-pair fixed effect. The first row reports regressions that do not have any additional controls and are estimated by borrower type and by regime. That is, every coefficient in this row comes from a separate regression. We find effects that are consistent with the ones estimated in our time series analysis, but larger in magnitude. In particular, during booms, a higher federal funds rate leads to even more bank lending to both emerging and advanced economies. During stagnation regimes, there is a reallocation of bank lending away from emerging and into advanced economies.

As row 2 of the table shows, our results hold when we control for the total borrowing growth and lending growth of each country in each quarter (relative to total lending growth in that quarter). One exception is that an increase in the lending to AEs during stagnation regime is no longer statistically significant. Finally, when we estimate just two regressions, one for each borrower type, by interacting regimes with the federal funds rate, we find very similar results (as shown in row 3 of the table).

To understand what drives these results, we look at the decomposition of federal funds rate into the portion that is driven by fundamentals (TR) and the residual (MP). The results are reported in rows 4-9, following the same pattern as in the first three rows, but with two rows per set of regressions (since the coefficients on MP and TR are reported in separate rows). These correspond to equations 5 and 6.

Consistent with the results from our time-series regressions, we find that in all three specifications, there is a decline in lending to EMEs in the stagnation regime. As with the overall federal funds rate, a corresponding increase in lending to AEs is no longer statistically significant once we control for total lending and borrowing. During the boom regime, there is always an increase in flows to AEs when the federal funds rate is higher, whether this is due to fundamentals (TR) or the monetary policy stance (MP). An increase in lending to EMEs during a boom, however, only occur as a result of improved macroeconomic fundamentals. During the stagnation regime, improvement in fundamentals increases bank lending to advanced economies. The corresponding effect for emerging economies is not robust.

Coefficients on our control variables are not reported in Table 3 but can be found in Appendix

[21] Full regression results are reported in Appendix Table B3.

Table B3. As expected, we find a positive trend, which is more pronounced during boom regimes. In addition, consistent with recent results by (Amiti et al., 2017), we find that during stagnation episodes, push factors (TL) have a smaller impact on banking flows than during booms.

The estimated impact of the federal funds rate on cross-border bank lending is economically meaningful. Our coefficients imply that during boom regimes a one-percentage point increase in the federal funds rate is associated with a 67 basis points increase in the quarterly growth rate of cross-border bank lending to EMEs and a 1.1 percentage points increase in the quarterly growth rate of cross-border bank lending to AEs. The retrenchment in bank lending to EMEs during stagnation episodes that is associated a one-percentage point increase in the federal funds rate not due to fundamentals is substantial — a 1.6 percentage point reduction in the quarterly growth rate. Given that during stagnation regimes the average growth rate of bank lending to EMEs is zero, this implies quarterly outflows of roughly 0.4 percent resulting from just a 25 bps. increase in the federal fund rate not accompanied by improved fundamentals.

To summarize, we find evidence of all commonly discussed driving forces resulting from an increase in the federal funds rate. The cross-border lending booms are amplified by search-for-yield effects that are driven by improving fundamentals and dominate for all borrowers during the boom periods and only for advanced economies during the stagnation periods. The cost-of-funds and flight-to-quality effects dominate during the stagnation periods only for flows to emerging economies and only in cases when the increase in the federal funds rate is due to a tightening of the U.S. monetary policy stance.

4.3. Potential endogeneity of regimes

We have demonstrated that the effects of U.S. macroeconomic fundamentals and monetary policy stance on cross-border bank lending to advanced and emerging economies are regime-dependent. However, we identified regimes based on fluctuations in the growth rate of cross-border bank lending from advanced to emerging economies. It is possible, therefore, that changes in the U.S. macroeconomic fundamentals or monetary policy stance affect the regimes themselves. While our results on the marginal effect of changes in U.S. fundamentals or monetary policy stance *within a given regime* are still valid, we would like to investigate this question further.

One approach is to find variables that explain the growth rate of bank lending from advanced to emerging economies, construct the predicted, or instrumented, growth rate of flows and use that to identify regimes. We draw on the existing literature on capital flows to identify variables that are likely to affect lending from advanced to emerging economies: changing risk tolerance, changing amount of risk in other markets, and changing creditworthiness of the borrowers.

In terms of risk tolerance, it is useful to focus on two types of investors' behavior. The first one, often called "return chasing," is a high-risk-tolerance behavior that involves movement of funds into higher-return assets regardless of the risk involved. Carry trade activity is a good example of such behavior. The other, frequently referred to as "flight-to-quality," is a low-risk-tolerance

behavior that involves moving funds into safe assets even if they offer lower return. During the global financial crisis we saw a number of flight-to-quality examples. Similarly, "flight-to-quality" describes well the aforementioned taper tantrum episode. If investors' risk tolerance is time-varying, as **?** has shown to be the case, we might see a time-varying response of investors to the same shock, such as a change in U.S. monetary policy. In the context of our main empirical exercise, in which we focus on credit flows, the best measure of risk tolerance in credit markets are credit spreads. In addition, we include a dummy for the global financial crisis, which is equal to 1 between 2007:Q3 and 2009:Q2, due to the unusually high levels of risk aversion observed during that period.

Another closely related explanation could be that risk tolerance remains constant (or does not affect bank lending flows), but there is risk-shifting across asset classes. Suppose a bank has appetite for a certain amount of overall risk due to either value-at-risk or economic capital constraints. An increase in the riskiness of one set of assets will induce the bank to reduce exposures to other risky assets. The easiest way to measure this channel and link it to the analysis of equity markets in **?** is by computing quarterly realized volatility of weekly returns on the S&P 500 index. When this volatility measure is high, there is a lot of risk in equity markets and banks might want to reduce their exposures to emerging markets (a risky asset class).

A final channel is related to the creditworthiness of borrowers. A global factor affecting it is the strength of the US dollar through the financial channel of exchange rate fluctuations described in Bruno and Shin (2015a), Bruno and Shin (2015b), and Avdjiev et al. (2016). Many emerging market borrowers tend to have relatively high levels of dollar liabilities that are not matched by dollar assets. As a consequence, a dollar appreciation has a negative impact on the balance sheets of such borrowers, reducing their net worth and increasing their riskiness. For a given amount of risk appetite, then, we would expect to see a retrenchment from emerging market borrowers when the dollar appreciates. In addition, the GDP growth rates for middle income economies and the incidence of sovereign and currency crises are other likely determinants of emerging market borrowers' ability to obtain loans.[22]

Of course, these three channels are not mutually exclusive — credit spreads tend to rise when equity volatility is high, and flight-to-quality tends to induce dollar appreciation. Nevertheless, the these three sets of measures are not so highly correlated so as to prevent us from being able to identify their separate effects on bank lending by banks in advanced economies to borrowers in emerging markets. Thus, we estimate a simple time series regression of the quarterly growth rate of LBSR flows from advanced to emerging economies on the stock market realized volatility, credit spreads, a global financial crisis dummy, the count of sovereign and currency crises in the

[22]GDP growth rate for middle income economies is from the World Bank and is our proxy for emerging economies business cycle. We use Laeven and Valencia (2013) data to obtain the count of sovereign and currency crises in emerging markets. We update the data through the end of 2016 on the basis of exchange rate data from the IFS and the S&P report on Sovereign Defaults and Rating Transitions.

emerging markets, the median EME GDP growth rate, and the quarterly change in the broad U.S. dollar index. The results are reported in Table 4. We can see that all three channels are present: all variables have statistically significant effects on the bank lending from advanced to emerging economies.

Using the results of this regression, we construct the predicted growth rate of bank lending from advanced to emerging economies and subject it to the same Markov switching regression analysis as we did with raw data. Again, we identify two distinct regimes: the high-growth rate regime, which has an average growth rate of AE banks' claims on EMEs of 2.7 percent and high volatility; and the complementary regime, which has an average growth rate of 1.2 percent and volatility that is less than half of that in the high-growth regime. We refer to the above high-growth regime as "predicted boom" and the above complementary regime as "predicted stagnation" and create a binary indicator of these regimes. As before, we select a cut–off point of 50% probability for the predicted stagnation regime — a median probability, which results in our observations being split roughly equally across regimes.

Finally, we repeat our benchmark regression analysis using these predicted regimes and the same specification as in rows 8 and 9 of Table 3. The results are summarized in the Table 5 with full regressions reported in Appendix Table B4. We find the same pattern as in our benchmark analysis — during both regimes, improvements in U.S. fundamentals are associated with increases in all cross-border bank lending, more so in booms than in stagnation periods. The impact of a tightening in the U.S. monetary policy stance, varies considerably across regimes. During booms, it is associated with higher bank lending to both AEs and EMEs. By contrast, during stagnation, it redirects bank lending flows away from emerging and towards advanced economies.

4.4. Robustness tests

We subject all our benchmark regressions to a variety of robustness tests and decompositions. Here we emphasize just the most important ones.

Even though we control for country-pair fixed effects, country-specific total lending and borrowing, as well as for a time trend, our main specifications do not include bilateral control variables. In a recent paper, Obstfeld et al. (2017) show that exchange rate flexibility affects the response of banking flows to global financial conditions. To account for this as well as for potential carry trade flows, we include as a control variable changes in the bilateral exchange rate between the currencies of the lending and borrowing countries or between the currencies of the borrowing countries and the U.S. Dollar. In rows 1-4 of Table 6, we show the results of benchmark regression defined by equation 6, where we add controls for quarterly changes in the (lender-borrower) bilateral exchange rate or in the bilateral exchange rate of the borrowing country's currency vis-a-vis the U.S. dollar.[23]

[23]Full regressions are reported in Appendix Table B5.

We find that our main effects remain essentially unchanged. The coefficients on the (lender-borrower) bilateral exchange rate changes are never significant, while the coefficient on the change of the exchange rate vs. U.S. dollar is negative and statistically significant for lending to advanced economies. The latter result implies that a depreciation of the borrowing country's currency versus the U.S. dollar is associated with a decline in cross-border lending to that country (in line with the predictions of Bruno and Shin (2015a)).

Next we test whether there is a lagged response of bank lending to changes in monetary policy. To do so, we lag both MP and TR by one quarter and re-estimate our benchmark regression, interacting these lagged values with dummies for boom and expansion regimes. The results are reported in rows 5 and 6 of Table 6. We find that the main results are essentially unchanged. The only exception is that now we find a statistically significant (albeit small) decline in lending to EMEs during boom episodes as a result of an increase in MP. This is consistent with our discussion — since the increase in MP increases the cost of funds without a simultaneous improvement in fundamentals, it is reasonable to expect some retrenchment from risky assets even during boom episodes.

The data allows us to split our sample into lending to banks and lending to non-banks. We take advantage of this to test whether our results are driven by borrowers in a specific sector. As we observed in Figure 2, cross-border interbank lending is much more volatile than cross-border lending to non-banks. Even though the two series have grown at roughly the same average quarterly pace since 1978 (2.3 percent for claims on non-banks and 2.1 percent for interbank claims), the standard deviation of the cross-border interbank lending (3.2%) is nearly 50 percent higher than that of cross-border lending to non-banks (2.2%). Thus, we might expect that the sensitivity of cross-border bank lending to changes in the federal funds rate is higher for lending to banks than to non-banks.

The results are reported in rows 7-10 of Table 6. We find that for most part there is no substantial difference between lending to banks and non-banks — in both cases we observe the same pattern as in our benchmark regressions. Nevertheless, that set of results does reveal that the insignificant impact of MP on lending to (all sectors in) EMEs during boom regimes is the outcome of its offsetting (statistically significant) impacts on lending to banks (negative) and lending to non-banks (positive). Thus, it appears that lending to banks is more sensitive to fluctuations in the cost of funds, while lending to non-banks is affected more by search-for-yield dynamics.

While we control for individual countries' total borrowing and lending and for global push factors, it is possible that borrowing is also affected by factors common to emerging economies. In particular, since we find a sharp distinction between EMEs and AEs when it comes to the estimated responses of bank lending to push factors in the stagnation period, we would like to test whether these might be due to business cycle or crisis cycle dynamics in the emerging economies. That is why we include controls for GDP growth rates in middle income economies, commodity indices, as

well as for the count of sovereign and currency crises in EME economies.[24]

The results are reported in rows 11-12 of Table 6. We find that our main story remains the same. The only substantial difference relative to the benchmark results is that now we find a negative effect of a tighter monetary policy stance on bank lending to EMEs during boom periods. That said, this negative effect is five times smaller than in the stagnation period and is only borderline statistically significant.

In the interest of space we don't present all other robustness tests, but we enumerate them briefly here.

1. The dynamics of lending to advanced economies is not driven by "safe haven" countries. When we isolate safe havens from AEs, we find that there is no difference in the regression results for AEs that are commonly viewed as safe havens and the remaining AEs in our sample.[25]
2. Our results are driven by banks' loans and deposits rather than by banks' holdings of debt securities. Since our data cover exclusively lending by banks, only a small portion of overall bond flows are captured by our empirical analysis. As a consequence, we cannot say much about the response of portfolio debt flows to changes in the federal funds rate.
3. Our results are robust to excluding the Global Financial Crisis period: 2007:Q3 through 2009:Q2. Our results are also robust to excluding the Volker era: 1979-1992.
4. Our key results are also robust to allowing for three (rather than two) regimes. In an alternative set of estimations, we identify three regimes in cross-border bank lending: (i) normal regime, (ii) boom regime, and (iii) bust regime. The estimated impacts of U.S. macroeconomic fundamentals and the U.S. monetary policy stance in the three-state boom regime are the same as in the two-state boom regime. The effects of these variables are not statistically different from each other for the (three-state) bust and normal regimes and are the same as in the two-state stagnation regime.
5. Controlling for the duration of the regime (the number of quarters since the last regime change) does not alter our results.
6. Our results remain essentially unchanged if we include borrower- and lender-specific trends.
7. Our main results also remain intact if we include interactions of TR and MP with credit spreads, realized volatility, and dollar appreciation.

5. Conclusion

In this paper, we take a new approach to the old question on the impact of U.S. monetary policy on cross-border bank lending in order to reconcile the contradictory findings of the existing empirical

[24] Reinhart et al. (2017) show that capital flow cycles interact with commodity price cycle and both are related to sovereign defaults and other financial crises.

[25] We define the following countries as safe havens: United States, Germany, Switzerland, Japan, United Kingdom and the Netherlands.

literature on the topic. More concretely, we present robust evidence that the relationship between the federal funds rate and cross-border bank lending is time-varying and depends on whether the main drivers of fluctuations in the federal funds rate are related to changes in U.S. macroeconomic fundamentals or to changes in the U.S. monetary policy stance.

In order to arrive to the above conclusions, we depart from the existing literature along two key dimensions. First, we use a Markov switching regression to identify two distinct regimes in international bank lending: (i) a boom regime, characterized by high growth rates and high volatility of lending from AEs to EMEs and (ii) a stagnation regime, characterized by low or negative growth rates and low volatility of lending from AEs to EMEs. Second, we decompose the federal funds rate into two distinct components — a macroeconomic fundamentals component (approximated by the Taylor rule-implied federal funds rate) and a monetary policy stance component (approximated by the difference between actual federal funds rate and its Taylor rule-implied counterpart).

Our results indicate that during booms, the relationship between the federal funds rate and cross-border bank lending is positive and mostly driven by the macro fundamentals component of the federal funds rate. This set of results is indicative of a search-for-yield behavior on the part of internationally-active banks. Conversely, during stagnation regimes, the relationship between the federal funds rate and bank lending is negative and mainly due to the monetary policy stance component of the federal funds rate. The latter set of results is most pronounced for lending to emerging markets, which is consistent with the international bank-lending channel and flight-to-quality behavior by internationally-active banks. These results hold if we repeat the analysis on the basis of instrumented growth rate of bank lending from advanced to emerging economies.

These findings help us understand the considerable time variation in the raw correlation between the federal funds rate and the growth rate of banking claims presented in Figure 1. We tend to observe positive correlation between the federal funds rate and the growth rate of banking flows to both advanced and emerging economies during boom episodes. In contrast, during stagnation periods, the federal funds rate has a negative correlation with bank flows to emerging markets, but a positive correlation with bank flows to advanced economies. This is exactly what we find in our regression analysis.

The significance of our findings extends along several dimensions. First, they improve our overall understanding of the effects of U.S. monetary policy on cross-border bank flows. Second, they point to the reasons other studies in the existing empirical literature on the topic may have found conflicting results. Third, our results help place in a coherent conceptual framework seemingly contradictory or unrelated mechanisms, such as lending booms, cost-of-funding effects, bank-lending channel effects, balance sheet effects, and flight-to-quality effects. Last but not least, our analysis has important policy implications. Namely, it suggests that conditioning on the two regimes we uncover and on the two main components of the federal funds rate could make the impact of U.S. monetary policy on cross-border bank lending flows to any country or region much more predictable.

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Figure 1: Rolling correlation between federal funds rate and quarterly growth rate of LBSR claims.

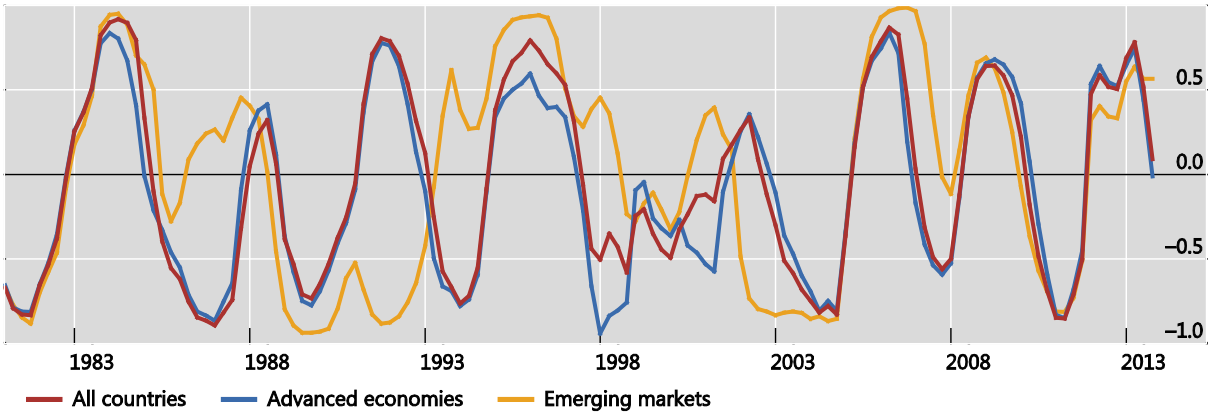

Figure 2: Quarterly growth rate of LBSR claims.

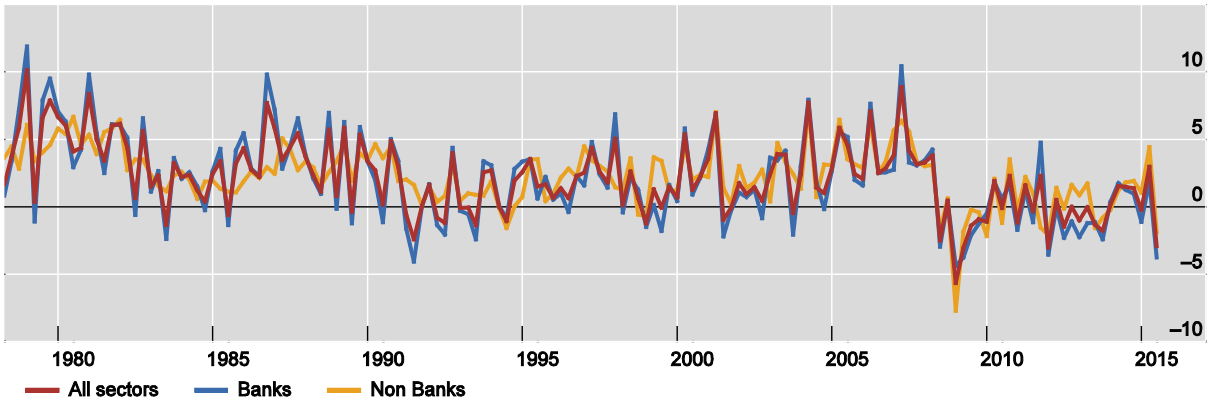

Figure 3: Quarterly growth rate of LBSR claims of AEs on EMEs and probability of a boom regime.

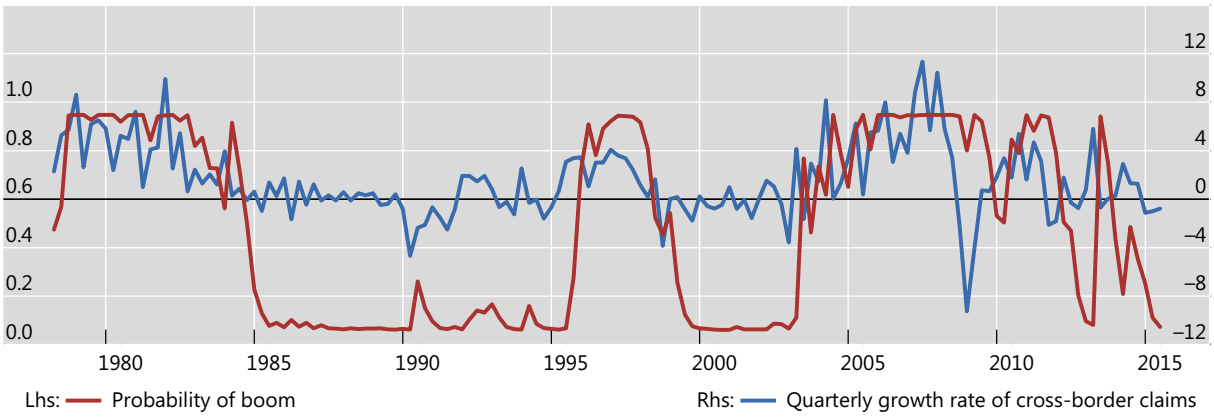

Figure 4: Federal funds rate and probability of a boom regime.

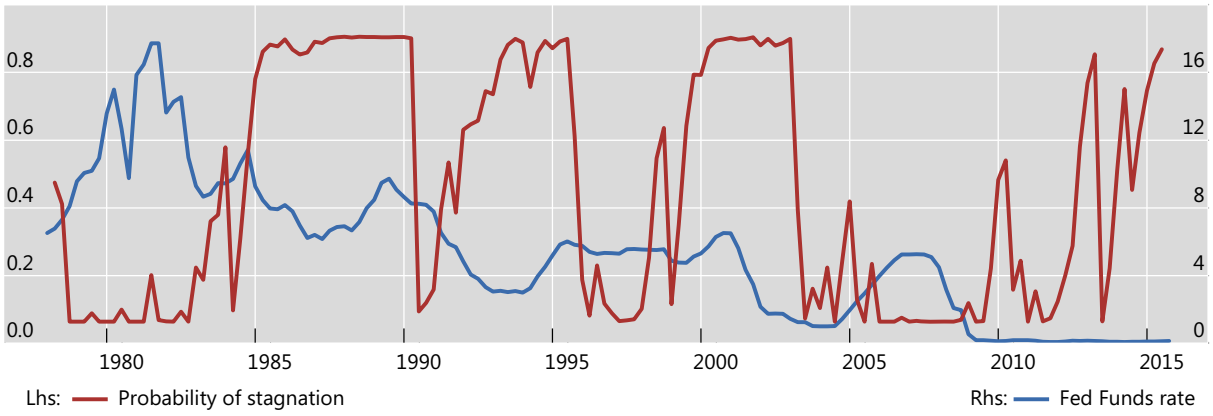

Figure 5: Decomposition of the federal funds rate.

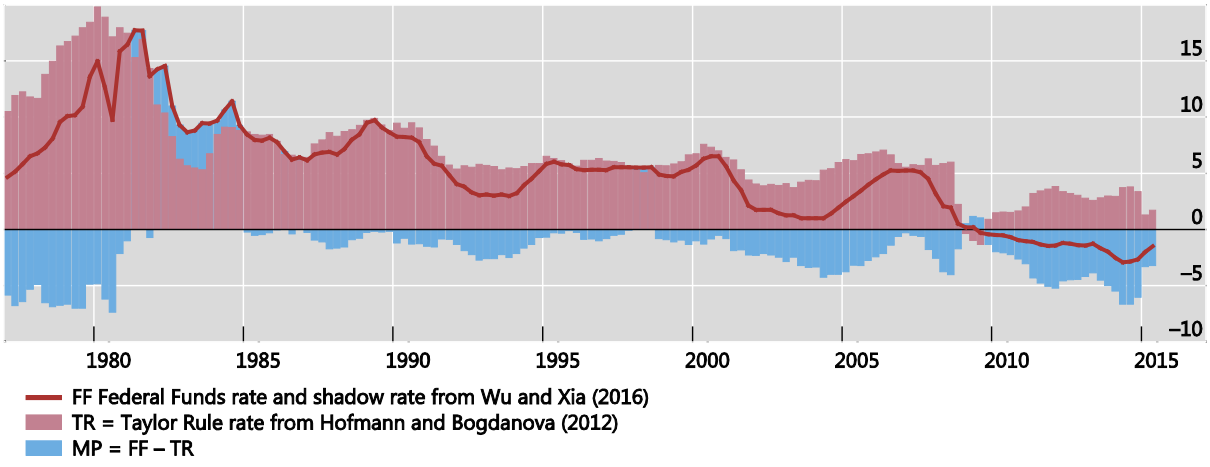

Table 1: Number of quarters with changes in monetary policy by regime

	boom	stagnation
FF goes up	32	35
FF goes down	43	40
TR goes up	37	36
TR goes down	38	39
MP goes up	36	39
MP goes down	39	36

Note : FF is federal funds rate, TR is Taylor rule-implied interest rate, $MP = FF - TR$.

Table 2: Summary of time series regressions

	Emerging economies		Advanced economies	
	Boom	Stagnation	Boom	Stagnation
Regression 1				
FF	0.40**	-0.34**	0.19	0.48**
Regression 2				
MP	0.17	-0.37*	-0.063	1.20***
TR	0.55***	-0.31*	0.36**	-0.015

Note: Dependent variable is quarterly growth rate of LBSR lending flows. FF is federal funds rate, TR is Taylor rule-implied interest rate, $MP = FF - TR$. All regressions include a control for time trend. *significant at 10% level, **significant at 5% level, ***significant at 1% level. Full regression are reported in Appendix Table B2.

Table 3: Summary of panel regressions

Row		Emerging economies Boom	Stagnation	Advanced economies Boom	Stagnation	Controls
1	FF	0.67***	-0.86***	1.11***	0.59**	Borr*Lender, Trend
2	FF	0.38**	-0.73***	1.09***	0.38	Borr*Lender, Trend, TL, TB
	Interactions with regime					
3	FF	0.31**	-0.60***	0.94***	0.57***	Borr*Lender, Trend, TL, TB
4	MP	0.18	-1.63***	0.85***	0.77**	Borr*Lender, Trend
5	TR	0.99***	-0.17	1.28***	0.43	
6	MP	-0.20	-1.58***	0.95***	0.25	Borr*Lender, Trend, TL, TB
7	TR	0.74***	0.04	1.18***	0.49	
	Interactions with regime					
8	MP	-0.25	-1.59***	0.80***	0.37	Borr*Lender, Trend, TL, TB
9	TR	0.58***	0.44*	1.01***	0.80***	

Dependent variable is quarterly growth rate of LBSR lending flows. FF is federal funds rate, TR is Taylor rule-implied interest rate, $MP = FF - TR$. TL and TB are total lending and total borrowing by a given country in a given quarter, in deviations from quarterly mean. *significant at 10% level, **significant at 5% level, ***significant at 1% level. Full regression are reported in Appendix Table B3.

Table 4: Determinants of the growth rate of N-S bank lending

Variable	coefficient	Std. Err.
Realized volatility	-72.3***	22.9
BAA spread	-1.83***	0.34
Global financial crisis	2.73***	0.99
Number of EM sovereign crises	0.54***	0.095
Number of EM currency crises	-0.20***	0.057
Median GDP growth rate	0.41***	0.13
USD appreciation	-16.1**	6.92
Constant	5.72	1.20

Note: Dependent variable is quarterly growth rate of LBSR lending flows. Adjusted $R^2 = 0.43$, F-statistic= 16.9, 150 observations. Realized volatility is quarterly volatility of weekly returns on S&P500. BAA spreads are from Moody's. Global financial crisis is an indicator equal to 1 in the quarters from 2007:Q3 through 2009:Q2. EM sovereign and currency crises count is from Laeven and Valencia (2013). Median GDP growth rate is a median year-on-year growth rate of real GDP across all emerging economies in the sample. USD is a broad USD index. *significant at 10% level, **significant at 5% level, ***significant at 1% level.

Table 5: Summary of panel regressions with predicted regimes

Row		Emerging economies		Advanced economies	
	Predicted Boom	Predicted stagnation	Predicted Boom	Predicted stagnation	
1	MP	0.58***	-0.64***	0.59***	0.82**
2	TR	0.99***	0.28*	0.96***	0.61***

Dependent variable is quarterly growth rate of LBSR lending flows. TR is Taylor rule-implied interest rate, $MP = FF - TR$. Estimated is the same specification as in rows 8 and 9 of Table 3. *significant at 10% level, **significant at 5% level, ***significant at 1% level. Full regression are reported in Appendix Table B4.

Table 6: Summary of panel regressions with alternative controls

Row		Emerging economies		Advanced economies	
	Controlling for (lender-borrower) bilateral exchange rate				
1	MP	-0.16	-1.66***	0.72***	1.12***
2	TR	0.67***	0.70***	1.01***	0.60*
	Controlling for borrower exchange rate vis-a-vis USD				
3	MP	-0.24	-1.57***	0.90***	0.61*
4	TR	0.62***	0.47**	1.10***	0.67**
	Lagging MP and TR				
5	L1.MP	-0.31**	-1.34***	0.70***	0.42
6	L1.TR	0.41***	0.13	0.94***	0.60**
	Splitting lending to banks and non-banks				
	Banks				
7	MP	-0.49**	-2.14***	0.73***	0.62
8	TR	1.16***	0.33	0.97***	-0.14
	Non-banks				
9	MP	0.52***	-1.07***	0.66***	0.06
10	TR	1.05***	1.24***	1.00***	1.33***
	Controlling for EME business cycle and crises				
11	MP	-0.34*	-1.54***	0.48**	-0.50
12	TR	0.27*	-0.3	0.77***	0.72**

Dependent variable is quarterly growth rate of LBSR lending flows. FF is federal funds rate, TR is Taylor rule-implied interest rate, $MP = FF - TR$. All regressions include borrower*lender fixed effects, time trend, TL and TB. TL and TB are total lending and total borrowing by a given country in a given quarter, in deviations from quarterly mean. *significant at 10% level, **significant at 5% level, ***significant at 1% level. Full regression are reported in Appendix Table B5.

Appendix A: Country Lists

Lenders

Australia, Austria, Bahamas, Bahrain, Belgium, Bermuda, Brazil, Canada, Cayman Islands, Chile, Chinese Taipei, Curaçao, Cyprus, Denmark, Finland, France, Germany, Greece, Guernsey, Hong Kong SAR, India, Indonesia, Ireland, Isle of Man, Italy, Japan, Jersey, Luxembourg, Macao SAR, Malaysia, Mexico, Netherlands, Netherlands Antilles, Norway, Panama, Portugal, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

Advanced economy borrowers

Andorra, Australia, Austria, Belgium, Canada, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom and United States.

Emerging market economy borrowers

Algeria, Angola, Argentina, Azerbaijan, Bangladesh, Belarus, Belize, Brazil, Bulgaria, Cambodia, Chile, China, Chinese Taipei, Colombia, Costa Rica, Croatia, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Ghana, Guatemala, Honduras, Hungary, India, Indonesia, Iran, Israel, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Liberia, Malaysia, Marshall Islands, Mexico, Morocco, Mozambique, New Caledonia, Nigeria, Oman, Pakistan, Paraguay, Peru, Philippines, Poland, Qatar, Romania, Russia, Saudi Arabia, Serbia, Seychelles, South Africa, South Korea, Sri Lanka, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Arab Emirates, Uruguay, Venezuela, Vietnam and Zambia.

Appendix B. Complete regression tables

Table B1: Markov-switching regressions

Regime variable:	LBSR flows	BAA spread	Realized volatility	USD appreciation
Alpha 1	-0.039	1.75***	0.016***	-0.110**
	(0.194)	(0.101)	(0.001)	(0.004)
Alpha 2	3.399***	2.822***	0.0297***	0.0168***
	(0.464)	(0.171)	(0.002)	(0.004)
Sigma 1	1.42	0.312	0.0049	0.018
	(0.159)	(0.059)	(0.0004)	(0.0029)
Sigma 2	3.34	0.657	0.0127	0.028
	(0.293)	(0.056)	(0.001)	(0.002)
P11	0.952	0.948	0.935	0.894
	(0.027)	(0.026)	(0.0327)	(0.061)
P21	0.053	0.057	0.166	0.05
	(0.030)	(0.036)	(0.083)	(0.038)
Number of states	2	2	2	2
Observations Log	150	150	150	150
likelihood Regime	343.7	111.5	520.1	327.7
threshold	0.5	0.5	0.5	0.5

Standard errors are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table B2: Time-series regressions

	EMEs		AEs	
	Boom	Stagnation	Boom	Stagnation
Fed funds rate				
Time trend	0.0215	-0.0176*	-0.0134	0.0133
FF	0.396**	-0.335**	0.187	0.481**
Constant	-0.936	3.038**	2.608	-1.073
Observations	75	75	75	75
R-squared	0.111	0.096	0.194	0.139
Taylor rule and MP				
Time trend	0.0347*	-0.0170	0.00108	0.000227
MP	0.166	-0.367*	-0.0639	1.203***
TR	0.553***	-0.312*	0.359*	-0.0145
Constant	-3.5	2.805	-0.192	4.086
Observations	75	75	75	75
R-squared	0.207	0.096	0.298	0.24

Dependent variable is quarterly growth rate of LBSR lending flows. *FF* is federal funds rate, *TR* is Taylor rule-implied interest rate, $MP = FF - TR$. *TL* and *TB* are total lending and total borrowing by a given country in a given quarter, in deviations from quarterly mean. *** p<0.01, ** p<0.05, * p<0.1

Table B3: Panel regressions

	EMEs		AEs		EMEs		AEs		EMEs	AEs
	Boom	Stagnation	Boom	Stagnation	Boom	Stagnation	Boom	Stagnation		
Fed funds rate										
Time trend	0.0765***	-0.00189	0.0565**	0.0533**	0.0372**	0.00706	0.0567**	0.0298	0.0298**	0.0444***
Boom regime									-1.87***	-0.818
FF (Boom)									0.309**	0.939***
FF (Stagnation)									-0.597***	0.572***
TL					21.9***	8.90***	80.9***	65.8***	14.7***	74.9***
TB					74.2***	54.9***	68.3***	51.2***	64***	60.7***
FF	0.667***	-0.862***	1.11***	0.594**	0.378**	-0.731***	1.09***	0.375		
Observations	90,041	87,773	54,923	51,147	90,041	87,773	54,923	51,147	177,884	106,085
R-squared	0.046	0.065	0.052	0.061	0.056	0.071	0.064	0.069	0.042	0.051
Taylor rule and MP										
Time trend	0.0961***	0.00296	0.0672***	0.0520**	0.0588***	0.0121	0.0625***	0.0306	0.0436***	0.0480***
Boom regime									3.55**	0.251
MP (Boom)									-0.249	0.802***
MP (Stagnation)									-1.59***	0.365
TR (Boom)									0.582***	1.01***
TR (Stagnation)									0.442*	0.800***
TL					22.7***	9.42***	80.9***	65.9***	15.4***	74.9***
TB					74.1***	54.8***	68***	51.2***	64***	60.6***
MP	0.175	-1.63***	0.845***	0.770**	-0.199	-1.58***	0.948***	0.251		
TR	0.986***	-0.166	1.28***	0.432	0.738***	0.0407	1.18***	0.489		
Observations	90,041	87,773	54,923	51,147	90,041	87,773	54,923	51,147	177,884	106,085
R-squared	0.046	0.065	0.052	0.061	0.057	0.071	0.064	0.069	0.042	0.051

Dependent variable is quarterly growth rate of LBSR lending flows. *FF* is federal funds rate, *TR* is Taylor rule-implied interest rate, $MP = FF - TR$. All regressions include borrower*lender fixed effects. *TL* and *TB* are total lending and total borrowing by a given country in a given quarter, in deviations from quarterly mean.

*** p<0.01, ** p<0.05, * p<0.1

Table B4: Panel regressions with regimes based on predicted flows

	EMEs	AEs	EMEs	AEs
Time trend	0.0432***	0.0438***	0.0567***	0.0471***
Boom regime	0.681	0.81	7.09***	-3.87
FF (Boom)	0.122	0.806***		
FF (Stagnation)	-0.312*	0.569***		
MP (Boom)			-0.575***	0.576***
MP (Stagnation)			-1.78***	1.17**
TR (Boom)			0.522***	0.926***
TR (Stagnation)			0.934***	0.173
TL	14.6***	74.9***	15.3***	74.8***
TB	64.1***	60.9***	64***	60.8***
Observations	177,884	106,085	177,884	106,085
R-squared	0.042	0.051	0.042	0.051

Dependent variable is quarterly growth rate of LBSR lending flows. *FF* is federal funds rate, *TR* is Taylor rule-implied interest rate, $MP = FF - TR$. For *MP* and *TR* coefficients. All regressions include borrower*lender fixed effects. *TL* and *TB* are total lending and total borrowing by a given country in a given quarter, in deviations from quarterly mean.
*** p<0.01, ** p<0.05, * p<0.1

Table B5: Panel regressions with alternative controls

	With bilateral XR		With borrower XR vav USD		Lagging MP and TR		Lending to banks		Lending to non-banks		With EME controls	
	EMEs	AEs	EMEs	AEs	EMEs	AEs	EMEs	AEs	EMEs	AEs	EMEs	AEs
Time trend	0.0524***	0.0416**	0.0447***	0.0562***	0.0315**	0.0394**	0.145***	0.0627***	0.0893***	0.0598***	-0.0349*	0.0441*
Boom regime	4.71**	-2.87	3.52**	-1.37	2.21	-0.673	0.566	-6.33**	5.28***	3.31	0.493	3.3
MP (Boom)	-0.164	0.716***	-0.237	0.899***			-0.492**	0.734***	0.516***	0.664***	-0.344*	0.482**
MP (Stagnation)	-1.66***	1.12***	-1.57***	0.607*			-2.14***	0.624	-1.07***	0.0574	-1.54***	-0.499
TR (Boom)	0.665***	1.01***	0.615***	1.10***			1.16***	0.966***	1.05***	0.995***	0.265*	0.774***
TR (Stagnation)	0.698***	0.600*	0.472**	0.669**			0.330	-0.135	1.24***	1.33***	-0.301	0.719**
L1.MP (Boom)					-0.305**	0.701***						
L1.MP (Stagnation)					-1.34***	0.415						
L1.TR (Boom)					0.409***	0.940***						
L1.TR (Stagnation)					0.130	0.602**						
Bilateral exchange rate	0.0000697	0.00071										
Borrower exchange rate vav USD			-0.184	-14.4**								
TL	13.9***	75.0***	15.4***	75.4***	15.2***	75***	28.8***	85.3***	7.49***	16.4***	16.1***	74.8***
TB	70.6***	59.4***	70***	60.4***	64.3***	60.8***	13.1***	8.19***	34.1***	51.5***	63.4***	61.4***
Growth of middle income economies											0.582***	0.593***
Commodities: Metal											0.0201***	0.00777**
Commodities: Textile											-0.00746	-0.0164
Commodities: Food											-0.0233**	-0.0313**
Commodities: Oil											-0.056**	-0.0407
Sovereign debt crises											-0.214	-0.0703
Currency crises											0.0833	0.154*
Observations	148,851	89,484	175,949	105,926	177,884	106,085	139,509	98,923	157,172	97,721	177,884	106,085
R-squared	0.044	0.053	0.043	0.051	0.042	0.051	0.042	0.052	0.036	0.037	0.043	0.051

Dependent variable is quarterly growth rate of LBSR lending flows. *XR* is exchange rate, *FF* is federal funds rate, *TR* is Taylor rule-implied interest rate, $MP = FF - TR$. All regressions include borrower*lender fixed effects. *TL* and *TB* are total lending and total borrowing by a given country in a given quarter, in deviations from quarterly mean. *Growth of middle income economies* indicates the World Bank's growth rate for middle income economies. *Sovereign debt crises* and *currency crises* are dummies, equal to one when there is a sovereign debt or currency crisis, respecitvely, in an EME. *** p<0.01, ** p<0.05, * p<0.1