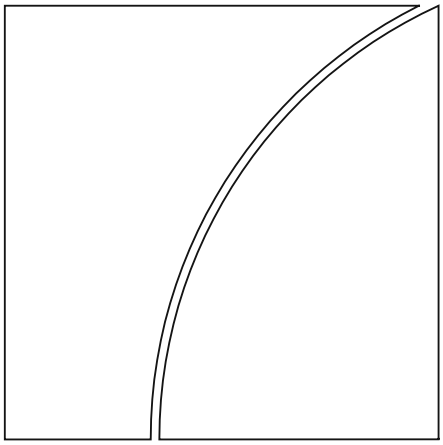
BANK FOR INTERNATIONAL SETTLEMENTS



BIS Working Papers

No 502

Comparative assessment of macroprudential policies

by Valentina Bruno, Ilhyock Shim and Hyun Song Shin

Monetary and Economic Department

June 2015

JEL classification: E52, E58, F32, F34, G28

Keywords: macroprudential policy, capital flow management policy, interest rate policy, complementarity, Asia-Pacific

BIS Working Papers are written by members of the Monetary and Economic Department of the Bank for International Settlements, and from time to time by other economists, and are published by the Bank. The papers are on subjects of topical interest and are technical in character. The views expressed in them are those of their authors and not necessarily the views of the BIS.

This publication is available on the BIS website (www.bis.org).

ISSN 1020-0959 (print)
ISSN 1682-7678 (online)

Comparative Assessment of Macroprudential Policies*

Valentina Bruno
American University

Ilhyock Shim
Bank for International Settlements

Hyun Song Shin
Bank for International Settlements

June 2, 2015

Abstract

This paper provides a comparative assessment of the effectiveness of macroprudential policies in 12 Asia-Pacific economies, using comprehensive databases of domestic macroprudential policies and capital flow management (CFM) policies. We find that banking sector CFM polices and bond market CFM policies are effective in slowing down banking inflows and bond inflows, respectively. We also find some evidence of spillover effects of these policies. Finally, regarding the interaction of monetary policy and macroprudential policies, our empirical findings suggest that macroprudential policies are more successful when they complement monetary policy by reinforcing monetary tightening, than when they act in opposite directions.

JEL codes. E52, E58, F32, F34, G28.

Keywords. macroprudential policy, capital flow management policy, interest rate policy, complementarity, Asia-Pacific.

*We are grateful for comments by seminar participants at the Bank for International Settlements, the Bank of Korea and the Monetary Authority of Singapore as well as by participants at the RBNZ–BIS conference on "Cross-border financial linkages in Asia and the Pacific" and the DNB–EBC conference on "Macroprudential regulation: from theory to implementation". We thank Claudio Borio, Woon Gyu Choi, Stijn Claessens, John Geanakoplos, San Ling Lam, Rob Nijskens, Frank Packer, Dirk Schoenmaker, Christie Smith and Philip Turner for helpful suggestions, Bilyana Bogdanova and Jimmy Shek for their excellent research assistance, and Emma Claggett for language editing. The views presented here are solely those of the authors and do not necessarily represent those of the Bank for International Settlements.

1 Introduction

Any assessment of the effectiveness of macroprudential policies faces the difficult task of setting the counterfactual scenario — that is, what would have happened in the absence of the macroprudential policy. Did the policy merely coincide with shifts in financial conditions, or did the policy have a material impact on financial conditions that bear on the vulnerability of the economy to shocks?

The objective of our paper is to give a comparative empirical assessment of the impact of macroprudential measures across countries. To the extent that the ebb and flow of global "supply push" factors exert similar effects across countries, we aim to filter out the impact of global factors through our panel estimates and examine the incremental effect of macroprudential policies on credit growth, bank capital flows and bond flows.

The impact of macroprudential policies is determined in large part by the external environment. Our findings reflect the shift in the pattern of financial intermediation from the banking sector to the capital market. Figure 1, based on Turner (2014), illustrates the shift in the centre of gravity in the pattern of cross-border financial intermediation from the banking sector to the capital market. The pink bars (both pale and deep pink) refer to borrowing by emerging market banks. The green bars refer to borrowing by non-banks. The numbers are net financing amounts each year, and hence denote increases in the amounts outstanding. Notice how the bottom pale pink bars shrink rapidly, indicating that the capital flows from global banks to emerging market banks have slowed to a trickle. In its place, emerging market banks have increased their debt securities issuance. For non-banks, the growth in net issuance of international debt securities has been even more dramatic.

Our focus is on the experience of 12 Asia-Pacific economies, and is a comprehensive study that examines the full complement of domestic macroprudential policies and capital flow management (CFM) policies that have been implemented over the period of 2004–2013. We draw on (and extend) the comprehensive database of macroprudential policies reported in the BIS Quarterly Review (Shim et al (2013)), and also use the comprehensive data set of CFM policies reported in Chantapacdepong and Shim (2014). We consider both macroprudential policies that have a domestic credit focus, such as loan-to-value and debt-service-to-income caps, as well as CFM policies that address the spillover of financial conditions through banking sector and bond market capital flows. Our policy data sets include 152 distinct CFM measures on banking inflows and bond inflows and 177 domestic macroprudential measures taken by 12 Asia-Pacific economies.

Our panel regression analysis finds the following main results. First, banking sector

CFM polices are associated with a reduction in the growth in banking inflows before 2007. Bond market CFM policies are associated with the slowing down of bond inflows before 2009, but not during the surge in bond issuances after 2009. Second, we find some evidence of spillover effects of bond market and banking sector CFM policies. In particular, banking sector CFM policies are positively associated with an increase in international debt securities before 2007, and bond market CFM policies are associated with an increase in cross-border bank lending after 2009 and an increase in domestic bank credit and total credit. Third, in countries with more stringent capital controls in place, the introduction of banking sector and bond market CFM policies reduces the growth in banking inflows and international bond issuances, respectively, during the surge of banking and bond inflows. By contrast, in countries with less stringent capital controls, they seem to work in periods of low growth in banking and bond inflows.

Our results are consistent with macroprudential policies having a causal impact on capital flows and domestic credit, but the confounding effect of the endogeneity of the policies themselves is an issue that we should bear in mind in interpreting our results. The introduction of macroprudential policies does not happen in a vacuum. They often reflect the external environment and the perception that surges in bank or bond capital flows may lead to destabilising capital outflows in any subsequent reversal of such flows. To the extent that new macroprudential policies happen only after a period of discussion within the government, central bank and other public authorities (such as financial regulators), the introduction of such policies often coincides with the late stages of the boom. To the extent that the boom subsides under its own weight, the introduction of the macroprudential policy and the subsequent slowdown of capital flows and credit growth would be a coincidence, not a causal effect. To this extent, the results reported below should be taken with some caution.

Nevertheless, summarising the empirical associations between macroprudential policies and financial outcomes would be a necessary first step, and our exercise is offered in that spirit. In this context, our comprehensive databases of macroprudential and CFM policies allow us to give conclusions based on comprehensive evidence. Furthermore, we attempt to address endogeneity concerns in several ways, including by using a dynamic GMM estimation as in Arellano and Bover (1995).

As well as allowing us to draw better grounded conclusions on the effectiveness of macroprudential policies, the comprehensive nature of our databases allows us to make headway on a key policy question — namely, how macroprudential policies interact with monetary policy. Much recent discussion of macroprudential policies in advanced

economies treat the two sets of policies as being substitutes — that is, monetary policy is kept loose but macroprudential policies are invoked to deal with the financial stability implications of such loose policy. However, a more detailed examination of our databases reveals that the most effective instances of the use of macroprudential policies are when they complement monetary policy, by reinforcing monetary tightening rather than acting in the opposite direction.

Our findings therefore highlight a fundamental question in the rationale for macroprudential policy. To the extent that monetary policy works by intertemporal allocation of spending, loose monetary policy encourages greater borrowing to bring spending forward from the future to the present. Macroprudential policies work by restraining borrowing. Our empirical findings suggest that the macroprudential policies have been employed so that they pull in the same direction as monetary policy — that is, macroprudential policies are introduced during periods of monetary tightening. First, the correlations are especially high between monetary policy (interest rate policy) and banking sector CFM and domestic macroprudential policies. The correlation is lower between monetary policy and bond market CFM policies, but this finding likely reflects structural shifts in the capital markets of the countries in our sample.

Second, when we measure the monetary policy stance with the Taylor rule gap (ie the difference between the actual policy rate and the Taylor rule rate), we find that non-interest rate monetary policy tools were used in a complementary way with monetary policy during the first phase of global liquidity (pre-2007) after controlling for global liquidity and country-level variables. Last, our study also suggests that when monetary policy and banking inflow measures are pulling in the same direction (opposite directions), banking inflow measures are successful (not successful) in slowing down foreign investment in domestic bonds. Such a conclusion is also consistent with the principle that when monetary policy and macroprudential policies pull in the opposite direction, economic agents are being told simultaneously to borrow more and borrow less.

The plan of the paper is as follows. Section 2 provides a literature review. Section 3 describes the data used in the analysis, focusing on the key characteristics of the policy action data sets of domestic macroprudential and CFM policies. Section 4 describes the econometric methods. Section 5 reports the empirical results on the effectiveness of domestic macroprudential and CFM policies on domestic and foreign sources of credit. Section 6 presents the hypothesis of complementarity between interest rate policy and macroprudential policies, and shows empirical evidence supporting the existence of the complementarity. Section 7 concludes with directions for further research.

2 Literature Review

This paper aims to assess the impact of capital flow measures (CFMs) (in particular, banking and bond inflow measures) and domestic macroprudential policies (MaPPs) (non-interest rate monetary policy measures and prudential measures on housing credit) on banking and bond inflows (including offshore bond issuance) and domestic credit in major Asia-Pacific economies, after controlling for global and local factors. Thus, it is directly related to the following five areas: (1) the determinants of capital flows, (2) data sets on CFMs and on MaPPs, (3) the effectiveness of CFMs, (4) the effectiveness of MaPPs, and (5) the joint and cross impacts of CFMs and MaPPs on capital flows and credit. The Appendix provides a more detailed review of related studies.

First, most papers on the potential determinants of banking and portfolio flows to emerging market economies (EMEs) consider both global and local factors. Before the 2008 financial crisis, several studies showed that global factors such as world interest rates (Calvo et al (1996) and Taylor and Sarno (1997)) and stresses in mature interbank markets (McGuire and Tarashev (2008)) are more important in explaining capital inflows to EMEs than local factors. More recently, some empirical studies find that global factors, especially the VIX as a measure of risk appetite of global investors, are key drivers of banking and bond inflows to EMEs (Forbes and Warnock (2012), Chung et al (2014) and Bruno and Shin (2014b)), while others find both global and local factors such as growth and interest rate differentials are important for portfolio and banking flows (Ahmed and Zlate (2013), Ghosh et al (2012), Fratzscher (2012), Tintchev (2013), Cerutti, Claessens and Ratnovski (2014) and Herrmann and Mihaljek (2013)). We use the VIX as the global factor in our regressions and six macroeconomic and financial variables as local factors.

Second, an important part of studies analysing policy effectiveness is the nature and coverage of data sets on CFMs and MaPPs. De jure indexes of capital account restrictions can be classified into four types: (1) aggregate indexes such as Chinn and Ito (2008), (2) disaggregated indexes such as Schindler (2009), (3) intensity-based indexes such as Quinn (1997), and (4) dummies for policy actions to tighten (ie reduce) or loosen (ie increase) flows (Pasricha (2012), Ahmed et al (2014), del Guidice Rodriguez and Wu (2013), Forbes et al (2014) and Chantapacdepong and Shim (2014)). For MaPPs, a few global-level databases were recently constructed. In particular, Lim et al (2011) construct a database of 10 types of macroprudential measures for 40 economies over 2000–2010. More recently, Shim et al (2013) provide a publicly available database on monetary policy measures (excluding policy rate changes) and prudential measures targeting housing credit for 60 economies over January 1990–June 2012. We use the Chantapacdepong and Shim (2014)

database of CFMs for 12 Asia-Pacific economies to derive a banking inflow policy index and bond inflow policy index, and a database on policy actions affecting housing markets presented in Shim et al (2013).

Third, this paper is part of a rapidly expanding literature on the effectiveness of CFMs on banking and bond flows. Cross-country studies for years before 2009 find limited effectiveness of CFMs on the total volume of net capital flows but some effects on the composition of capital flows (Magud et al (2011), Ostry et al (2010), Baba and Kokenyne (2011) and Gochoco-Bautista et al (2012)). Other papers consider the impact on inflows and outflows separately and find that capital inflow measures are not effective (Binici et al (2010), Forbes and Warnock (2012) and Zhang and Zoli (2014)). However, several recent papers find that CFMs are effective on banking inflows (Cerutti, Claessens and Ratnovski (2014), Ghosh et al (2014) and Bruno and Shin (2014a)) and portfolio inflows (Ahmed and Zlate (2013) and Forbes et al (2012)). In this paper, we find that banking inflow measures are associated with lower growth in banking inflows, and that bond inflow measures reduce foreign investment in domestic bonds.

Fourth, most cross-sectional studies investigating the impact of MaPPs on domestic credit find that certain types of measures have a measurable impact during booms (Borio and Shim (2007), Lim et al (2011) and Tovar et al (2012)). Other papers find a significant impact of specific types of MaPP on housing credit (Kuttner and Shim (2013)) and on bank asset growth (Claessens et al (2014)). We consider prudential measures directly targeting housing credit as well as monetary policy measures targeting bank credit to the private sector.

Finally, over the past few years, many studies have emerged that focus either on cross impacts (ie the impact of CFMs on domestic credit or the impact of MaPPs on capital flows) or on the joint impact of macroprudential and CFMs, partly driven by the availability of large-scale cross-country databases on MaPPs and those on disaggregated CFMs in recent years. Several papers show the existence of significant cross impacts. In particular, Habermeier et al (2011) and Forbes et al (2014) show that FX-related prudential measures and capital controls reduce credit growth, while Balakrishnan et al (2013) find that domestically-oriented prudential measures were effective in stemming net private capital inflows. Also, a few recent papers jointly consider the effects of CFMs and MaPPs on credit growth and capital flows (Ostry et al (2012), Zhang and Zoli (2014), Beirne and Friedrich (2014) and Forbes and Klein (2014)). We consider the direct and cross impacts of banking inflow measures, bond inflow measures, MaPPs and interest rate policy separately and jointly on banking inflows, bond inflows, international bond

issuances and domestic bank credit as well as total credit that encompasses all debt-related capital inflows and domestic credit.

This paper also aims to assess whether interest rate policy and macroprudential policies are complements or substitutes. Stein (2013) emphasises the advantage of interest rate policy relative to supervision and regulation since it "gets in all of the cracks". George (2015) stresses that policymakers should reassess the assumption that monetary policy and macroprudential policies can be used independently, and that the best approach to achieve a stable financial system is to view monetary and macroprudential policy as complements. A recent theoretical literature mostly using dynamic stochastic general equilibrium models suggests that monetary and macroprudential policies are mainly complements, not substitutes, although results vary by type of shock (IMF (2013)). Based on a database of macroprudential policies for a large sample of 119 countries over the 2000–2013 period, Cerutti, Claessens and Laeven (2014) find that both tighter macroprudential policies and higher interest rates reduce real credit growth, with stronger effects for less developed and closed economies. In economic terms, however, the dampening effects of higher interest rates are relatively small, which suggests that macroprudential policies have been on average more powerful than monetary policy. In this paper, we consider the correlation of interest rate policy actions and macroprudential policy actions, and also the effects of macroprudential policies on the Taylor rule gap as well as the effectiveness of macroprudential policies under different policy rate settings.

3 Data Description

In conducting our assessment of the impact of banking and bond inflow measures as well as domestic macroprudential policies on capital flows and domestic bank credit, our sample of countries includes the following 12 Asia-Pacific economies: Australia, China, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand. The sample period spans a decade from the first quarter of 2004 to the third quarter of 2013 (or a few quarters earlier for some economies). Table 1 gives the main summary statistics of our key variables for the sample of 12 economies.

3.1 Dependent Variables

We use panel regressions with the quarterly growth of bank capital flows, bond portfolio flows and credit used as left-hand side variables. Our panel regressions do not have country fixed effects, as several countries in our sample (notably Australia, Japan and Singapore) did not employ capital flow management policies or domestic macroprudential

policies during our sample period, so that there is no time series variation in macroprudential policies to identify the impact of such policies.

Among different types of capital flow, we consider cross-border borrowing by banks and non-banks residing in the 12 Asia-Pacific economies, non-resident holdings of domestic bonds issued by entities in the 12 economies, and the amount outstanding of international bonds issued by non-government entities residing in these economies. In particular, for banking flows we consider the quarterly growth (log difference) in external claims in US dollars of BIS reporting country banks on the Asia-Pacific economies by residency, as given by the BIS locational banking statistics (Table 7A - 7B) (*BIS Loans*).

For bond inflows, we consider the quarterly growth (log difference) in the amount outstanding of domestic debt securities in US dollars purchased by non-residents for the 12 Asia-Pacific economies (*BoP Bonds*). The data are obtained from the Balance of Payment (BoP) and International Investment Position (IIP) statistics of the IMF. Specifically, for Australia, China, Hong Kong SAR, Indonesia, Japan, Korea, New Zealand, the Philippines and Thailand, we construct a quarterly series of the amount outstanding of domestic bonds held by non-residents by using the end-2003 value of the US dollar amount outstanding of foreign investment in domestic bonds as the initial value and adding up the BoP bond inflow values every quarter over the sample period. Bond inflow data are not available in the BoP statistics for India, Malaysia and Singapore. Thus we linearly interpolate annual series of the amount outstanding of domestic bonds held by non-residents from the IIP statistics to generate quarterly series, and use them to calculate bond inflows as a percentage of the total stock of bonds held by non-residents.[1,2]

Finally, for offshore borrowing in the form of bonds, we consider the quarterly growth (log difference) in the US dollar amount outstanding of international debt securities issued by banks and corporations residing in the 12 economies, as given by the BIS international debt securities statistics (Table 11A -11E) (*BIS Bonds*). It should be noted that international debt securities data capture capital flows that matter from the global dimension, since they are issued by domestic entities in another jurisdiction and marketed mainly to

[1]The cumulative sum of the BoP bond inflows is "invested funds", while the IIP statistics show the value of bonds held. The difference between them is affected by capital gains and other valuation changes (see Chapter III of BIS (2011)). When we compare the time series of the amount outstanding of domestic bonds held by non-residents derived from quarterly BoP bond inflows with the corresponding quarterly or annual series in the IIP statistics, we find that that they are relatively close to each other and have similar dynamics. As Binici et al (2010) point out, capital account restrictions aim to directly affect actual transactions, and can indirectly affect valuation changes. Thus, the effects of CFMs may be underestimated when we use the IIP statistics to measure bond inflows. The estimates obtained therefore can be interpreted as lower bounds.

[2]The only missing observations are for Q3 and Q4 2013 for Malaysia, which were not available at the time of writing.

global investors. The proceeds from the issuance of these bonds could still find its way back to the issuing country.

In addition to capital flows, we also consider domestic bank credit and total credit. In particular, we use the quarterly growth (log difference) in bank credit in local currency value to private non-financial sectors, which is available for the 12 economies (*Bank Credit*)[3], and the quarterly growth (log difference) in credit in local currency value extended by domestic banks, all other sectors in the economy and non-residents, which is available for 10 economies (*Total Credit*)[4], as given by the BIS database for total credit to the private non-financial sector. All dependent variables are winsorised at the 2.5% level to reduce the effect of outliers.

3.2 Policy Measures

In this paper, we are interested in both domestic macroprudential measures and capital flow measures (CFMs). We can classify macroprudential tools into asset-side tools, liability-side tools and bank capital-oriented tools. We can also classify macroprudential tools into residency-based tools (so called capital controls), currency-based capital flow measures (also called FX-related prudential measures), and general prudential tools with domestic focus (possibly affecting capital flows indirectly). Table 2 provides a taxonomy of prudential measures in relation to capital flow measures. We also consider the capital flow measures directly targeting bond flows or bond investors. Not only are we interested in the role of (macro-)prudential measures and capital flow measures on banking and bond inflows, we also investigate the role of these measures in slowing down credit booms and asset price growth. Table 3 provides a taxonomy of capital flow measures affecting key asset markets.

We obtained information on capital flow measures taken by the 12 Asia-Pacific economies from 2004 to 2013 from the database included in Chantapacdepong and Shim (2014). In particular, they classify policy actions by direction (tightening inflows, loosening inflows, loosening outflows, tightening outflows), by target flow (bond inflows, equity inflows, banking inflows, real estate inflows, direct investment inflows, other inflows (such as remittances and export flows) and outflows), and by target group (non-residents, residents or both). Data sources for these policy actions include IMF Annual Reports on Exchange Arrangements and Exchange Restrictions (AREAERs), national sources, recent

[3]The series for the Philippines is from the IMF, and that for the New Zealand is from the Reserve Bank of New Zealand. Domestic bank credit to the private non-financial sectors is comparable to the sum of 22c and 22d of the IMF's International Financial Statistics (IFS) database, which are claims on the private sector and on the public non-financnial sector, respectively.

[4]The total credit series for New Zealand and the Philippines are not available.

publications of the BIS and the IMF, and other research papers containing lists of CFMs taken by multiple countries. The database contains 364 distinct CFMs taken by nine Asian economies over 2004–2013.[5] Among various types of capital flow measure, we use banking inflow measures and bond inflow measures in this paper. Table 4 provides the breakdown of banking and bond inflow measures by direction and economy.

In addition to capital flow measures, we also consider domestically-oriented macroprudential measures to see their impact on bank credit and banking/bond inflows. In particular, we use the database for policy actions on housing markets compiled by Shim et al (2013). The database contains three types of non-interest rate monetary policy action (reserve requirements, credit growth limits and liquidity requirements) which affect the amount of general credit to the private sector provided by banks, as well as five types of prudential measures (maximum loan-to-value ratios, maximum debt-service-to-income ratios, risk weights on housing loans, loan-loss provisioning on housing loans and exposure limits on the real estate sector) specifically targeting housing credit. The coverage of this database ends in June 2012, so we collected information on relevant policy actions taken by the 12 economies from July 2012 to December 2013. Table 5 summarises how frequently the Asia-Pacific economies used these macroprudential measures in a tightening or loosening manner.

3.3 Control Variables

We include several control variables – both global and local – as possible determinants of banking and bond inflows. Global factors are push factors explaining the incidence of a surge or withdrawal of capital flows to EMEs. By contrast, local (or domestic) factors work as pull factors on explaining capital flows to individual economies in Asia and the Pacific. In this paper, we consider as a global factor the log of the VIX.[6] The VIX can be a proxy for the leverage of global banks (see Bruno and Shin (2014b)) or

[5] The database also classifies all capital flow measures into the following four types in terms of the mechanism through which they affect capital flows: (1) quantitative limits such as a quota for foreign borrowing imposed on domestic banks and a quota for foreign investment in specific domestic asset markets; (2) qualitative changes such as allowing a new type of financial product or borrowing instrument, and relaxing conditions imposed on domestic banks' foreign borrowing or foreign investment in domestic bonds; (3) taxes, fees and additional capital requirements imposed on certain types of assets and liabilities of banks or on domestic bonds purchased by foreign investors; and (4) minimum holding periods of bonds purchased by foreign investors or minimum maturity restrictions imposed on bank borrowing to discourage short-term foreign borrowing.

[6] We also tried other global factors in the regressions such as (1) growth in global money supply measured by the sum of the M2 stock of the United States, Eurozone and Japan plus the M4 stock of the United Kingdom; (2) US, Eurozone and Japanese interest rates; (3) total book value of equity of the largest non-US international banks by assets; (4) growth in the interoffice assets of foreign banks in the United States; and (5) broker-dealer leverage of major international banks headquartered in the United States. But our main results are unchanged.

risk sentiment of global investors in bond markets (see Ahmed and Zlate (2013)). For local factors, we use the log real exchange rate (RER), where RER is computed as the log of bilateral nominal exchange rates (quarterly average) against the US dollar×(US CPI/local CPI) from national data, where CPI denotes consumer price index. For each of the 12 economies, we also consider real GDP growth (from CEIC), CPI inflation (from national data), M2 growth (from CEIC and IMF-IFS), interest rate differential between the three-month domestic interbank rate and US Libor (from Bloomberg and national data) and sovereign credit rating[7] (from Bloomberg).[8]

4 Empirical Specifications

We employ panel regressions without country fixed effects. Equivalently, we can view the exercise as pooled OLS regressions where the global factors are constrained to have identical coefficients in influencing the dependent variables. In particular, in Section 5 we regress *BIS Loans*, *BoP Bonds* and *BIS Bonds* on indicators of *Bank Controls* and *Bond Controls* that capture both tightening and loosening measures, tightening measures only or loosening measures only on banking inflows and bond inflows, respectively, and the various control variables. Also, *Bank Credit* and *Total Credit* are regressed on indicators of *Macro-pru* (the sum of non-interest rate monetary policy measures and prudential measures), *Prudential* (prudential measures on housing credit), *Monetary* (non-interest rate monetary policy measures), *Bank Controls* and *Bond Controls*, and the control variables. Finally, in Section 6 we regress *BIS Loans*, *BoP Bonds* and *BIS Bonds* on indicators of *MPChg* (for policy rate changes), *Bank Controls* and *Bond Controls*, and the control variables.

For each specification, we include time dummies (year or quarter dummies). When we calculate standard errors, we cluster them at the country level. Finally, we do not include country dummies because CFM indicators have little variation or are unchanged for some countries.

[7] We use the following ratings scale in the regression: AAA = 20; AA+ = 19; AA = 18; AA– = 17; A+ = 16; A = 15; A– = 14; BBB+ = 13; BBB = 12; BBB– = 11; BB+ = 10; BB = 9; BB– = 8; B+ = 7; B = 6; B– = 5; CCC+ = 4; CCC = 3; CCC– = 2; and CC = 1.

[8] We also considered as possible local factors (1) expected appreciation of local currency against the US dollar (3 months and 1 year horizons); (2) sovereign CDS spread; (3) foreign reserves; (4) total book value of equity of major local banks in each jurisdiction; (5) the weighted average of leverage of major local banks; (6) government gross debt to GDP; and (7) foreign bank presence, but they are not statistically significant.

5 Empirical Findings

5.1 Direct Effects of Capital Flow Management Policies

Table 6 shows regression results when the growth (log difference) of cross-border bank flows (*BIS Loans*) is the dependent variable. The VIX coefficient is negative and significant in every specification, which is consistent with earlier studies finding a decrease in cross-border lending during periods of high volatility, corresponding to global banks' deleveraging.

Bank inflow controls are also associated with lower growth in bank flows. The indicator for bank inflow controls *Bank Controls (T&L)* capturing the sum of tightening (+1) actions and loosening (–1) actions in a quarter is negative and significant, meaning that a greater tightening of bank flow controls reduces cross-border inflows (column 1). The indicator *Bank Controls (T)* consisting of tightening actions separately from loosening actions seems to drive the above evidence (column 3). The interaction term *Bank Controls (T&L)*VIX* is positive and significant, meaning that bank inflow controls at the margin alleviate the effect on the change in cross-border flows during periods of high volatility.

In columns 4 to 6 of Table 6, we interact the various *Bank Controls* indicators with a dummy variable equal to 1 in every quarter after 2007 and 0 otherwise (*post 07*), and with a dummy variable equal to 1 in every quarter in or before 2007 and 0 otherwise (*pre 07*). Results from each specification show that banking inflow controls, both tightening and loosening measures, are effective in reducing the growth in cross-border lending during the period before the 2007 financial crisis. The financial crisis reduced consistently the magnitude of the cross-border banking flows. In this sense, it is not surprising to see banking inflow controls effective during the booming period of cross-border lending.

In Table 7 we replicate the specifications used in Table 6 by using the growth (log difference) in the amount outstanding of domestic debt securities purchased by non-residents (*BoP Bonds*) as our dependent variable. Correspondingly, we use indicators for bond inflow controls. Columns 1 to 3 present results over the entire sample period. As in the case of bank inflow controls, bond inflow controls also statistically significantly reduce the growth in domestic debt securities purchased by non-residents. Again, tightening measures (column 3) appear to be more effective than loosening measures (column 2). The coefficient on the VIX is again statistically significant, as well as that on the interaction term between indicators of *Bond Controls* (*T&L* and *T* only) and the VIX, meaning that bond inflow controls attenuate the decrease in bond flows during periods of high

volatility.

Columns 4 to 6 of Table 7 interact the various *Bond Controls* indicators with a dummy variable equal to 1 in every quarter in or after 2009 and 0 otherwise (*post 09*), and with a dummy variable equal to 1 in every quarter before 2009 and 0 otherwise (*pre 09*). Results from each specification show that bond inflow controls, both tightening and loosening measures, are effective in reducing the growth in the amount outstanding of domestic debt securities purchased by non-residents before the surge in bond issuances occurred after 2009.

In Table 8 we replicate the specifications used in Table 7 by using the growth (log difference) in the amount outstanding of international debt securities issued by financial and non-financial corporations residing in the 12 economies (*BIS Bonds*) as our dependent variable. Columns 1 to 3 present results over the entire sample period. Differently from the case with *BoP Bonds*, the indicator *Bond Controls (T&L)* is statistically positively associated with the growth in international debt securities (column 1). The statistical significance is now driven by the introduction of loosening policies on bond inflows (column 2). This could be interpreted as a counter-reaction from corporations to the loosening of bond inflow policies as they may have lesser incentives to issue off-shore bonds. This effect is particularly relevant during the years of the surge in bond issuances (*post 09*, column 5).

5.2 Endogeneity

Table 9 shows our attempts to address endogeneity concerns in the absence of suitable instruments. Columns 1 to 3 include time dummies (quarter dummies) in an attempt to gauge the impact only of the *cross-sectional* differences. By controlling for time trends that are global (eg the surge in bond or bank inflows), we gauge the country-specific effects. We of course drop the VIX from our regression. Columns 1 to 3 confirm the main results shown in Tables 6 to 8: bank inflow controls introduced before 2007 reduce cross-border banking flows (*BIS Loans*), and bond inflow controls introduced before 2009 reduce the amount outstanding of domestic debt securities purchased by non-residents (*BoP Bonds*), while bond inflow controls introduced after 2009 increase issuance of international debt securities (*BIS Bonds*).

We also attempt to control for reverse causality by regressing bank and bond inflow policies on *BIS Loans*, *BoP Bonds* and *BIS Bonds*, respectively. Columns 4 to 6 show that the estimated coefficients are insignificant.

We further attempt to address endogeneity concerns by using the dynamic system

GMM estimation as in Arellano and Bover (1995) and Blundell and Bond (1998). The system GMM estimator combines the use of lagged levels of the series as instruments for the pre-determined and endogenous variables in equations in first differences, and the use of lagged differences of the dependent variable as instruments for equations in levels. Tests of overidentifying restrictions and of serial correlations for the error terms support the validity of the instruments. To avoid instrument proliferation, we adopt a parsimonious specification with only the VIX, ΔRER and GDP growth as control variables that uses just one lag and combines instruments into smaller sets yielding a total of 12 instrumental variables.

In Table 10 we see that the system GMM estimation confirms our earlier OLS results so that endogeneity does not seem to be a concern.[9] In this framework, we should find evidence for first- but not for second-order serial correlation. When we test the specification for the absence of serial correlation, the AR(1) and AR(2) statistics have p-values of 0.000 and greater than 0.10, respectively, in every specification. As a result, we cannot reject the null hypothesis of no second-order serial correlation but can do so for first-order serial correlation as required by the specification. The difference-in-Hansen test for the exogeneity of a subset of our instruments yields a J-statistic with a p-value greater than 0.10. As such, we cannot reject the hypothesis that the additional subset of instruments used in the system GMM estimation is exogenous as required by the system GMM specification.

5.3 Spillover Effects and the Impact on Bank and Total Credit

In Table 11, we try to gauge possible spillover effects from the introduction of capital control policies. For instance, does cross-border lending increase when bond inflow controls are introduced? Similarly, are bond inflows affected by more stringent bank inflow controls? Regression results show that controls on bond inflows are associated with an increase in cross-border bank lending after 2009 (column 1). Similarly, bank inflow controls are positively associated with an increase in international debt securities before 2007 (column 3).

These results could highlight possible spillover effects where controls on inflows into one sector lead to an increase in inflows to another sector. Such effects on bank and bond flows did not happen during the first or second phase of liquidity when bank and bond flows, respectively, were increasing dramatically. Hence, a "coincidence" of bank (bond)

[9] When we re-run the original OLS specification with the VIX, ΔRER and GDP growth as control variables, we obtain very comparable estimations, in terms of both coefficient magnitudes and statistical significance.

inflow controls jointly with increased bond (bank) inflows is less likely.

In addition to the capital flow measures considered in Tables 6 to 11, we also consider domestically-oriented macroprudential measures and investigate their impact on bank credit and bank or bond inflows. Table 12 shows regression results when prudential measures, monetary measures (other than policy rate changes) and the sum of these two measures (*Macro-pru*) are used in lieu of bank and bond inflow controls. The impact of such measures is more ambiguous as they tend to have a positive or insignificant impact on cross-border lending (columns 1 to 3) and on bank credit (columns 4 to 6). These results may indicate some limits of macroprudential policy measures or they may suggest that bank credit is slower moving than capital flows. We further investigate these issues below.

In Table 13 we regress the growth (log difference) of bank credit and total credit on all the policy measures so far considered (bank inflow controls, bond inflow controls and macroprudential measures). Results on one quarter growth (between t and t-1, columns 1 and 5), two quarters growth (between t+1 and t-1, columns 2 and 6), three quarters growth (between t+2 and t-1, columns 3 and 7) and four quarters growth (between t+3 and t-1, columns 4 and 8) are presented. Macroprudential policies continue to have an insignificant impact on bank credit and total credit. Also, bank inflow controls do not seem to significantly impact credit.

By contrast, bond controls appear to increase bank and total credit, with a statistical significance that varies from 10.5% to 4.7% The results are mostly consistent with Table 11's evidence on the existence of cross-flow substitution or spillover effects. In fact, the evidence that bond controls are positively correlated with growth in total credit indicates that the decrease in bond inflows due to bond inflow tightening measures is smaller than the increase in all other types of total credit (domestic bank credit, banking inflows, international bond issuances and others).

Furthermore, the result that bond controls are positively correlated with the growth in bank credit suggests that bond inflow tightening measures may have induced domestic banks to increase domestic bank credit to compensate for the lesser bond financing induced by bond tightening measures. In general, we see that GDP growth is highly significant in every specification, suggesting that domestic macroeconomic conditions are important conditions underlying the provision of credit.

5.4 Capital Account Openness

In Table 14, we investigate whether the efficacy of bank and bond inflow controls depends on the stringency of the countries' capital restrictions. According to the Schindler Index (2009), China, India, the Philippines and Thailand have a lower level of capital account openness relative to the other economies in the sample. We therefore create a dummy *High CC* equal to 1 in the case of China, India, the Philippines and Thailand and 0 otherwise. Similarly, we create a dummy *Low CC* equal to 1 in the case of all the other countries, and 0 otherwise. We then interact the dummies with *Bank Controls (T&L)* and *Bond Controls (T&L)*.

Columns 1 to 3 report results with *BIS Loans* as the dependent variable, columns 4 to 6 with *BoP Bonds* and columns 7 to 9 with *BIS Bonds*. We see that the effect of bank controls on banking flows and of bond controls on international debt issuances is statistically significant for the countries with stringent capital controls and during the surge of banking lending (column 2) and bond issuances (column 9). By contrast, during the bank lending bust and the period before the surge in bond issuances, the introduction of bank and bond controls seem to have a significant impact in more open countries (columns 3 and 5, respectively). Taken together, the above results suggest that capital flow policies have a heterogeneous impact across countries with varying capital controls.

6 Complementarity of Macroprudential Policies and Interest Rate Policy

This paper considers the effects of domestic macroprudential measures and capital flow measures at the same time. Thus, the complementarity of various types of policy action would be a key issue. It is also important to consider the complementarity of macroprudential policies and interest rate policy.

A general approach to understand this issue is to consider the impact of interest rate policy and macroprudential policies on borrowing. Monetary policy works by intertemporal allocation of spending, ie, by bringing forward spending from the future or pushing back spending into the future. One way to bring forward spending is to lower interest rates so that economic agents can borrow more. Macroprudential policy works by restraining borrowing. Therefore, most successful instances of macroprudential policies are those where macroprudential policies and interest rate policy are pulling in the same direction — that is, when macroprudential policies are introduced during periods of interest

rate tightening. By contrast, when interest rate policy and macroprudential policies are pulling in opposite directions, they should be far less effective since economic agents are being told simultaneously to borrow more and borrow less.[10]

We can see how much various types of policy are synchronised by comparing the policy rate cycle with the macroprudential policy cycle and the capital flow policy cycle. Figures 2–5 show four different policy cycles aggregated over 12 Asia-Pacific economies for each year during the period of 2004–2013. We find that the non-interest rate monetary policy cycle and the prudential policy cycle have similar dynamics until 2011 when they started to diverge. We also find that the banking inflow policy cycle and the policy rate cycle in Asia and the Pacific exhibit similar dynamics during the sample period, but bond inflow policy actions were predominantly loosening ones during the period.

6.1 Correlation of Macroprudential Policies and Policy Rates

One way to analyse the complementary is to calculate the pairwise correlation of various policy cycles (specifically, the policy rate cycle, the macroprudential policy cycle represented by cumulative variables for macroprudential policy tightenings/loosenings, and the CFM cycle represented by cumulative variables for capital inflow policy tightenings/loosenings). Tables 15 and 16 provide the pairwise correlation of various types of policy variables both in change and in level (cumulative change).[11] Table 15 shows that the correlations between policy rate changes and banking inflow and macroprudential measures are relatively strongly positive. By contrast, the correlation is relatively weakly positive between policy rate changes and bond inflow measures, but this finding likely reflects structural shifts in the capital markets of some countries in our sample. It is noteworthy that the correlation between changes in the banking inflow measures and changes in bond inflow measures in Table 15 is quite high (0.3945), implying that when we consider both of these variables in a regression, we need to be careful in interpreting their respective effectiveness. Also in Table 16, the correlation between the banking flow policy cycle and the macroprudential policy cycle is positive (0.5173), while the correlation between the bond inflow policy cycle and the macroprudential policy cycle is negative (–0.7359). These findings are consistent with what we find in Figures 2–4.

[10] For example, Borio and Shim (2007) argue that countries in Asia and Europe with inflation targeting in place in the 1990s and early 2000s are more likely to have policy rate cycle desynchronised from macroprudential policy cycle.

[11] Recent papers considering various types of policies also calculate cross-policy correlations. For example, Forbes and Warnock (2012) calculate correlations among various indices on capital flow restrictions. Forbes and Klein (2014) calculate the correlations among monetary, fiscal, macroprudential and capital flow measure indices. Finally, Kuttner and Shim (2013) also calculate the correlation of various types of macroprudential measure both in level and in change.

6.2 Impact of Macroprudential Policies on Taylor Rule Gap

Another way to analyse the issue of complementarity between macroprudential policy and interest rate policy is to directly test the impact of indicators for non-interest rate monetary policy tools on the gap between a Taylor rule rate and the actual policy rate. We define the variable *Taylor Gap* as the difference between the actual policy rate and the Taylor rule rate. The Taylor rule rate is computed as in Hofmann and Bogdanova (2012).[12] Positive values indicate that the actual rate is above the Taylor rule rate, hence tight monetary conditions. Conversely, negative values proxy for loose monetary conditions. If the correlation between monetary policy stance (*Taylor Gap*) and macroprudential policy stance is positive, we can infer that domestic macroprudential policies have been used in a complementary way with monetary policy.

We employ regressions where the Taylor rule gap is regressed on the cumulative changes of the indicator for non-interest rate monetary policy tools (*Monetary Cum*), country-level variables, such as the log of real exchange rate (RER), real GDP growth, inflation and M2 growth, and indicators of global liquidity, such as the VIX and the growth in the amount outstanding of domestic debt securities purchased by non-residents (*BoP Bonds*). Regressions are run with year fixed effects and robust standard errors clustered at the country level. We exclude from this investigation currency targeters (Hong Kong SAR and Singapore) and quantity targeters (China), for which the Taylor rule rate is not very relevant.

Table 17 shows the results. Columns 1 and 2 show that the coefficient on the monetary policy indicator *Monetary Cum* is not significant over the period of 2004–2013. However, after splitting the sample before 2007 and after 2009, we see that the coefficient on *Monetary Cum* is positive during the first phase of global liquidity (*pre 2007*, column 3), meaning that macroprudential policies have been used in a complementary way with monetary policy after controlling for global liquidity and country-level variables.

By contrast, macroprudential policies do not have a significant impact on monetary policy after 2009. It is noticeable how the variable *BoP Bonds* stands out in both periods as highly significant. Specifically, during the second phase of global liquidity (*Post 2009*) the variable seems to reduce the impact of macroprudential indicators to the point of

[12] A Taylor rule rate for an economy is calculated as $i = r^* + \pi^* + 1.5(\pi - \pi^*) + 0.5y$, where y is a measure of the output gap, π^* is the inflation target and r^* is the long-run level of the real interest rate. To compute a Taylor rule rate, we can use four measures of inflation (headline, core, GDP deflator and consensus headline forecasts) and three measures of output gap from three different statistical ways to calculate potential output (HP filter, segmented linear trend and unobserved components). We can calculate 12 different Taylor rule rates from all combinations of inflation and output gap measures. We calculate the average value of the Taylor rule rates and use it as the Taylor rule rate for each economy in our analysis.

insignificance. Such evidence points to the lack of impact of macroprudential policies during the second phase of global liquidity. This would suggest that the complementarity of the two sets of policies depends on the strength of global liquidity.

These results are consistent with earlier results showing that bank and bond CFM policies were mostly effective before 2007/2009, and less so after 2009. Shin (2013) shows that the bond market, especially the market for emerging market debt securities that are open to international investors, took the main stage after 2010. Taken together, the evidence suggests that the complementarity question and effectiveness of CFM policies may depend on the strength of global liquidity.

6.3 Effectiveness of Macroprudential Policies under Different Interest Rate Settings

In Table 18, we further consider the complementarity of bank and bond inflow measures with monetary policy actions (policy rate changes). We define a variable *MPChg* as the policy rate difference in basis points from the quarter before. We then interact *MPChg* with *post 07*(*post 09*) and *pre 07*(*pre 09*) dummies and run our benchmark regressions with *BIS Loans* (*BoP Bonds* and *BIS Bonds*) as dependent variables. The underlying hypothesis is that successful instances of CFM policies are those where CFM policies and monetary policy are pulling in the same direction, ie, when CFM tightenings complement monetary policy tightening in terms of reducing the overall borrowing. When a central bank raises its policy rate, long-term interest rates tend to increase. This will reduce domestic borrowing in the form of both loans and bonds. However, higher long-term interest rates may induce more banking and bond inflows. In particular, to the extent that higher interest rates increase interest rate differential between the domestic interest rate and the US rate and that the exchange rate does not adjust immediately, US dollar loans become more attractive, so domestic banks and firms may have greater incentives to increase their foreign borrowing in the form of cross-border loans. Also, higher bond yields make the economy's domestic bonds more attractive to global investors searching for yield, so they could induce more bond inflows.

Column 1 shows that changes in monetary policy do not affect cross-border banking flows before and after 2007. This result is in line with Bruno and Shin (2014b), who show that cross-border lending is supply-driven, ie, driven by global factors such as leveraging decisions of global banks (the VIX), and thus country-specific interest rate policy matters little. However, banking inflow measures effectively reduced banking inflows over the period of 2004–2007, during which the average policy rate in the 12 Asia-Pacific economies

increased in general. Therefore, we find that before 2007, banking inflow tightening measures complemented policy rate tightenings. By contrast, after 2007, the average policy rate in the region was in a slightly downward (loosening) trend, while banking inflow measures were slightly in the tightening mode. We find that during this period, banking inflow measures were not effective in reducing the growth of banking inflows.

By contrast, monetary policy does matter for bond inflows. Column 2 shows that a rise in interest rates increases the growth rate of the amount outstanding of domestic debt securities purchased by non-residents (*BoP Bonds*), both before and after 2009, and with a larger coefficient after 2009.[13] It also shows that, before 2009 bond inflow measures had a significant negative impact on bond inflows but not after 2009. Taken together, we find that before 2009, policy rate tightenings increase bond inflows but bond inflow tightening measures decrease them, so their net effect on bond inflows is ambiguous. After 2009, monetary policy changes are the drivers of the growth in the amount of domestic debt securities purchased by non-residents. In summary, interest rate tightenings can reduce domestic borrowing but also increase bond inflows, which weaken the effects of bond inflow measures.

Finally, column 3 shows that monetary policy does not affect the issuance amount of international debt securities but the VIX does. These results are similar to what we find in column 1 for banking inflows.

7 Conclusions and Directions for Further Research

In this paper, we conduct a comparative empirical assessment of the impact of broadly-defined macroprudential measures taken in 12 Asia-Pacific economies over 2004–2013, by using two comprehensive databases, one containing domestic macroprudential measures and the other recording capital flow management measures. Our panel regression analysis finds that banking sector CFM policies and bond market CFM policies were effective in reducing the growth in banking inflows before 2007 and slowing down bond inflows before 2009, respectively. In addition to the direct impact of CFM policies on targeted flows, we find some evidence of spillover effects: banking sector CFM policies seem to increase the issuance of international debt securities before 2007, and bond market CFM policies increase the growth of cross-border bank lending and also the growth of domestic bank

[13] We use, as one of local factors, the interest rate differential between the three-month domestic interbank rate and US Libor in the panel regression. Even though three-month domestic interbank rates tend to closely follow the short-term policy rate in many countries, this variable is different from policy rate changes in that the interest rate differential is also affected by changes in US Libor and that the interest rate differential is a level variable.

credit and total credit. Finally, we divide the countries in the sample into those with more and less open capital accounts, and see if there is any difference between the two groups. We find that in countries with more stringent capital controls, the introduction of CFM policies reduces the growth in capital inflows during the surge of banking and bond inflows. By contrast, in countries with less stringent capital controls, they seem to work in periods of low growth in capital inflows.

Using the comprehensive databases on broadly-defined macroprudential policies in the Asia-Pacific region, we also try to answer a key policy question — namely, how macroprudential policies interact with monetary policy. We find that macroprudential policies tend to be introduced during periods of monetary tightening. In particular, the correlations between interest rate policy and banking sector CFM policies and domestic macroprudential policies are especially high. Also, we find that when we measure the monetary policy stance with the Taylor rule gap, we find that non-interest rate monetary policy tools have been used in a complementary way with monetary policy before 2007. Moreover, our empirical analysis suggests that when monetary policy and bond market CFM policies are pulling in the same direction (opposite directions), banking inflow measures are effective (not effective) in slowing down cross-border lending. These findings suggest that macroprudential policies are more successful when they complement monetary policy. This is consistent with the principle that when monetary policy and macroprudential policies pull in opposite directions, economic agents are being told simultaneously to borrow more and borrow less.

There are a number of avenues for further research. First, we can divide bond inflow loosening measures into two types: policy actions taken as part of a long-term capital account liberalisation plan, and those introduced to reverse or lift existing bond inflow tightening measures with the goal of attracting more capital inflows. The policy actions in the former group are of a structural nature, while those in the latter group are of a cyclical nature. This distinction is especially important when EME financial authorities try to understand the effectiveness of capital flow loosening measures to mitigate the negative impact of capital outflows triggered by global shocks such as a sudden increase in advanced economies' interest rates.

Second, the CFM database used in our paper classifies each policy action into one of the following four types: (1) quantitative limits; (2) qualitative changes; (3) taxes, fees and additional capital requirements; and (4) minimum holding periods of bonds. This allows us to gauge the impact of four different types of action and see, for example, if price-based CFMs such as taxes and fees are generally more effective than quantity-based

CFMs such as prudential ratios on FX-related exposures.

Third, banking inflows (*BIS Loans*), bond inflows (*BoP Bonds*) and international bond issuance (*BIS Bonds*) are in US dollar terms. Thus, we can consider exchange rate effects to find out the net impact of policy actions.

Finally, to investigate whether only the instances where macroprudential policies were used in concert with monetary policy led to successful restraint of financial vulnerabilities, we can conduct more comprehensive empirical analysis and test the complementarity of interest rate policy and various types of macroprudential policy (non-interest rate monetary policy measures, prudential measures, banking inflow measures and bond inflow measures) on capital flows and aggregate credit such as domestic bank credit and total credit.

References

Ahmed, Shagil, Stephanie Curcuru, Frank Warnock and Andrei Zlate (2014): "Capital Flows, Reserve Accumulation and Capital Flow Management", unpublished results, March.

Ahmed, Shaghil and Andrei Zlate (2013): "Capital Flows to Emerging Market Economies: A Brave New World?", Board of Governors of the Federal Reserve System, *International Finance Discussion Papers* no 1081, June.

Arellano, Manuel and Olympia Bover (1995): "Another Look at the Instrumental Variable Estimation of Error-components Models", *Journal of Econometrics*, vol. 68, pp 29–51.

Avdjiev, Stefan, Zsolt Kuti and Elod Takats (2012): "The Euro Area Crisis and Cross-border Bank Lending to Emerging Countries", *BIS Quarterly Review*, December, pp 37–47.

Baba, Chikako and Annamaria Kokenyne (2011): "Effectiveness of Capital Controls in Selected Emerging Markets in the 2000s", *IMF Working Paper* 11/281, December.

Balakrishnan, Ravi, Sylwia Nowak, Sanjaya Panth and Yiqun Wu (2013): "Surging Capital Flows to Emerging Asia: Facts, Impacts and Responses", *Journal of International Commerce, Economics and Policy*, vol. 4, no. 2, pp 1350007-1 ~ 1350007-24.

Bank for International Settlements (2011): 81st Annual Report, June.

Beirne, John and Christian Friedrich (2014): "Capital Flows and Macroprudential Policies - A Multilateral Assessment of Effectiveness and Externalities", *Bank of Canada Working Paper* 2014-31 and also *ECB Working Paper* 1721.

Binici, Mahir, Michael Hutchison and Martin Schindler (2010): "Controlling Capital? Legal Restrictions and the Asset Composition of International Financial Flows", *Journal of International Money and Finance*, vol 29, no 4, pp 666–684.

Blundell, Richard and Stephen Bond (1998): "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Journal of Econometrics*, vol. 87, pp 115–143.

Borio, Claudio (2014): "Macroprudential Frameworks: (Too) Great Expectations?", contribution to the 25th Anniversary Edition of *Central Banking Journal*, published on 5 August 2014.

Borio, Claudio and Ilhyock Shim (2007): "What can (Macro-)prudential Policy do to Support Monetary Policy?", *BIS Working Paper* no 242.

Bruno, Valentina and Hyun Song Shin (2013): "Capital Flows and the Risk-taking Channel of Monetary Policy", *NBER Working Paper* no 18942, April.

Bruno, Valentina and Hyun Song Shin (2014a): "Assessing Macroprudential Policies: Case of South Korea", *Scandinavian Journal of Economics*, vol 111, no 1, pp 128–157.

Bruno, Valentina and Hyun Song Shin (2014b): "Cross-Border Banking and Global Liquidity", *Review of Economic Studies*, forthcoming.

Calvo, Guillermo, Leonardo Leiderman and Carmen Reinhart (1996): "Inflow of Capital to Developing Countries in the 1990s", *Journal of Economic Perspectives*, vol 10, no 2, pp 123–139.

Cerutti, Eugenio, Stijn Claessens and Luc Laeven (2014): "Macroprudential Policies: Analyzing a New Database", paper presented at the DNB–EBC conference on "Macroprudential regulation: from theory to implementation" on 29–30 January 2015, Amsterdam.

Cerutti, Eugenio, Stijn Claessens and Lev Ratnovski (2014): "Global Liquidity and Drivers of Cross-border Bank Flows", *IMF Working Paper* 14/69, April.

Chantapacdepong, Pornpinun and Ilhyock Shim (2014): "Correlations across Asia-Pacific Bond Markets and the Impact of Capital Flow Measures", *BIS Working Paper* no 472.

Chinn, Menzie D and Hiro Ito (2008): "A New Measure of Financial Openness", *Journal of Comparative Policy Analysis*, vol 10, no 3, pp 309–322.

Chung, Kyuil, Jong-Eun Lee, Elena Loukoianova, Hail Park and Hyun Song Shin (2014): "Global Liquidity through the Lens of Monetary Aggregates", *IMF Working Paper* 14/9, January.

Claessens, Stijn, Swati R Ghosh and Roxana Mihet (2014): "Macro-prudential Policies to Mitigate Financial System Vulnerabilities", *IMF Working Paper* 14/155, August.

del Guidice Rodriguez, Marius and Thomas Wu (2013): "The Effects of Capital Controls and Prudential FX Measures on Options-implied Exchange Rate Stability", *Federal Reserve Bank of San Francisco Working Paper* 2013-20.

Forbes, Kristin J, Marcel Fratzscher, Thomas Kostka and Roland Straub (2012): "Bubble Thy Neighbour: Portfolio Effects and Externalities from Capital Controls", *NBER Working Paper* no 18052.

Forbes, Kristin J, Marcel Fratzscher and Roland Straub (2014): "Capital Controls and Prudential Measures: What are they Good for?", *CEPR Discussion Paper* no 9798, January.

Forbes, Kristin J and Michael W Klein (2014): "Removing the Punch Bowl: Moderating Vulnerabilities from Global Economic Booms", unpublished results, June.

Forbes, Kristin J and Francis E Warnock (2012): "Capital Flow Waves: Surges, Stops, Flight and Retrenchment", *Journal of International Economics*, vol 88, no 2, pp 235–251.

Fratzscher, Marcel (2012): "Capital Flows, Push versus Pull Factors and the Global Financial Crisis", *Journal of International Economics*, vol 88, pp 341–356.

George, Esther L (2015): "Monetary and Macroprudential Policy: Complements, not Substitutes", speech at Financial Stability Institute–Bank for International Settlements Asia-Pacific High-level Meeting, Manila, Philippines, 10 February.

Ghosh, Atish R, Jun Kim, Mahvash Saeed Qureshi and Juan Zalduendo (2012): "Surges", *IMF Working Paper* 12/22, January.

Ghosh, Atish R, Mahvash S Qureshi and Naotaka Sugawara (2014): "Regulating Capital Flows at Both Ends: Does It Work?", unpublished results.

Gochoco-Bautista, Maria S, Juthathip Jongwanich and Jong-Wha Lee (2012): "How Effective are Capital Controls in Asia?", *Asian Economic Papers* vol 11, no 2, pp 122–143.

Habermeier, Karl, Annamaria Kokenyne and Chikako Baba (2011): "The Effectiveness of Capital Controls and Prudential Policies in Managing Large Inflows", *IMF Staff Discussion Note* SDN/11/14.

Herrmann, Sabine and Dubravko Mihaljek (2013): "The Determinants of Cross-border Bank Flows to Emerging Markets", *Economics of Transition*, vol 21, no 3 pp 479–508.

Hofmann, Boris and Bilyana Bogdanova (2012): "Taylor Rules and Monetary Policy: a Global "Great Deviation"?", *BIS Quarterly Review*, September, pp 37–49.

International Monetary Fund (2013): *The Interaction of Monetary and Macroprudential Policies*, Washington: International Monetary Fund.

Johnston, R Barry and Natalia T Tamirisa (1998) "Why do Countries Use Capital Controls?", *IMF Working Paper* 98/181.

Klein, Michael W (2012): "Capital Controls: Gates versus Walls", *Brookings Papers on Economic Activity* (2, Fall) pp 317–355.

Kuttner, Kenneth N and Ilhyock Shim (2013): "Can Non-interest Rate Policies Stabilise Housing Markets? Evidence from a Panel of 57 Economies", *BIS Working Paper* no 433.

Lim, Cheng Hoon, Francesco Columba, Alejo Costa, Piyabha Kongsamut, Akira Otani, Mustafa Saiyid, Torsten Wezel, and Xiaoyong Wu (2011): "Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences", *IMF Working Paper* 11/238.

Magud, Nicolas E, Carmen M Reinhart and Kenneth S Rogoff (2011): "Capital Controls: Myth and Reality — A Portfolio Balance Approach", *NBER Working Paper* no 16805. Also, *Peterson Institute for International Economics Working Paper* 11-7.

McGuire, Patrick and Nikola Tarashev (2008): "Bank Health and Lending to Emerging Markets", *BIS Quarterly Review*, December, pp 67–80.

Miniane, Jacques (2004): "A New Set of Measures on Capital Account Restrictions", *IMF Staff Papers*, vol 51, no 2, pp 276–308.

Mody, Ashoka and Antu Panini Murshid (2005): "Growing Up with Capital Flows", *Journal of International Economics*, vol 65, no 1, pp 249–266.

Ostry, Jonathan, Atish Ghosh, Karl Habermeier, Marcos Chamon, Mahvash S Qureshi and Dennis B S Reinhardt (2010): "Capital Inflows: The Role of Controls", *IMF Staff Position Note* SPN/10/04.

Ostry, Jonathan, Atish Ghosh, Karl Harbermeier, Luc Laeven, Marcos Chamon, Mahvash S Qureshi and Annamaria Kokenyne (2011): "Managing Capital Inflows: What Tools to Use?", *IMF Staff Discussion Note* SDN/11/06.

Ostry, Jonathan, Atish Ghosh, Marcos Chamon and Mahvash S Qureshi (2012): "Tools for Managing Financial Stability Risks from Capital Inflows", *Journal of International Economics*, vol 88, pp 407–421.

Pasricha, Gurnain Kaur (2012): "Recent Trends in Measures to Manage Capital Flows in Emerging Economies", *North American Journal of Economics and Finance*, vol 23, pp 286–309.

Quinn, Dennis P (1997): "The Correlates of Change in International Financial Regulation", *American Political Science Review*, vol 91, pp 531–551.

Quinn, Dennis P and A Maria Toyoda (2008): "Does Capital Account Liberalisation Lead to Growth?", *Review of Financial Studies*, vol 21, no 3, pp 1403–1449.

Quinn, Dennis P, Martin Schindler and A Maria Toyoda (2011): "Assessing Measures of Financial Openness and Integration", *IMF Economic Review*, vol 59, no 3, pp 488–522.

Schindler, Martin (2009): "Measuring Financial Integration: a New Data Set", *IMF Staff Papers*, vol 56, no 1, pp 222–238.

Shim, Ilhyock, Bilyana Bogdanova, Jimmy Shek and Agne Subelyte (2013): "Database for Policy Actions on Housing Markets", *BIS Quarterly Review*, September, pp 83–95.

Shin, Hyun Song (2013): "The Second Phase of Global Liquidity and its Impact on Emerging Economies", *Proceedings*, Federal Reserve Bank of San Francisco, issue November, pp 1–10.

Stein, Jeremy C (2013): "Overheating in Credit Markets: Origins, Measurement, and Policy Responses", speech at the research symposium on "Restoring Household Financial Stability after the Great Recession: Why Household Balance Sheets Matter" sponsored by the Federal Reserve Bank of St. Louis, St. Louis, Missouri, February 7, 2013.

Straetmans, Stefan TM, Roald J Versteeg and Christian CP Wolff (2013): "Are Capital Controls in the Foreign Exchange Market Effective?", *Journal of International Money and Finance*, vol 35, pp 36–53.

Taylor, Mark and Lucio Sarno (1997): "Capital Flows to Developing Countries: Long- and Short-term Determinants", *World Bank Economic Review*, vol 11, no 3, pp 451–470.

Tintchev, Kalin (2013): "Connected to Whom? International Interbank Borrowing During the Global Crisis", *IMF Working Paper* 13/14.

Tovar, Camilo, Mercedes Garcia-Escribano and Mercedes Vera Martin (2012): "Credit Growth and the Effectiveness of Reserve Requirements and Other Macroprudential Instruments in Latin America", *IMF Working Paper* 12/142.

Turner, Philip (2014): "The Global Long-term Interest Rate, Financial Risks and Policy Choices in EMEs", *BIS Working Paper* no 441. http://www.bis.org/publ/work441.pdf.

Vandenbussche, Jerome, Ursula Vogel and Enrica Detragiache (2012): "Macroprudential Policies and Housing Prices—A New Database and Empirical Evidence for Central, Eastern and Southeastern Europe", *IMF Working Paper* 12/303.

Zhang, Longmei and Edda Zoli (2014): "Leaning Against the Wind: Macroprudential Policy in Asia", *IMF Working Paper* 14/22.

Appendix: Review of Related Studies

This paper aims to measure the impact of capital flow measures (in particular, banking and bond inflow measures) and domestic macroprudential measures (non-interest rate monetary policy measures and prudential measures on housing credit) on banking and bond inflows (including offshore bond issuance) and domestic credit in all major Asia-Pacific economies, after controlling for global and local factors. Thus, this paper is related to literatures on (1) the determinants of capital flows to EMEs; (2) data sets on capital flow measures (or capital account openness indicators) and those on domestic macroprudential measures; (3) the effectiveness of capital flow measures; (4) the effectiveness of domestic macroprudential measures; and (5) joint and cross impacts of macroprudential and capital flow measures on capital flows and credit.

Determinants of Capital Flows to EMEs

Most papers in the literature consider both global and local factors as potential determinants of banking and portfolio flows. Global factors are push factors that are specific to the economies where capital flows originate from, and also called source-country factors. By contrast, local factors are pull factors that lie within the recipient economies.[14]

Before the 2008 global financial crisis, several studies showed that global factors such as world interest rates were more important in explaining capital inflows to EMEs than local factors. For example, before the Asian financial crisis occurred in 1997, Calvo et al (1996) observe that global factors, such as cyclical movements in interest rates, were more important in explaining widespread surges of capital inflows into Asian and Latin American countries in the late 1980s and early 1990s than local factors such as sound policies and stronger economic performance. Taylor and Sarno (1997) also find that global and country-specific factors are equally important in determining the long-run movements in equity flows from the United States to Asian and Latin American countries during 1988-92, while global factors, especially US interest rates, are much more important than domestic factors in explaining the short-run dynamics of bond flows. Using BIS consolidated banking statistics from the early 1990s to mid-2007, McGuire and Tarashev (2008) show that deterioration in banks' health and stresses in mature interbank markets consistently led to slower growth in international credit to emerging markets, while locally

[14] The question of the relative roles of push and pull factors is important, because policy conclusions heavily depend on the answer about which factors dominate. If the impetus for capital flows to a particular EME lies in the source economy, for instance monetary policy in the United States, then imposing controls in the recipient economy might be an appropriate policy response. However, if the reasons are domestic, for example strong growth performance and high yields in the recipient economy, then capital controls might not be able to deal with these capital inflows successfully in the long run.

extended credit was largely insensitive to changes in creditor banks' health.

More recently, many empirical studies focusing on capital flows to EMEs including the period after the global financial crisis find that global factors, especially the VIX as a measure of risk appetite of global investors, are key drivers of banking and bond inflows to EMEs. Focusing on gross flows, instead of net flows, to a large sample of advanced and emerging market economies, Forbes and Warnock (2012) find that global interest rates and global liquidity (measured by money supply of key advanced economies) have no significant effects on sharp increases or decreases in gross capital inflows and that global factors, especially global risk, are significantly associated with extreme capital flow episodes. Chung et al (2014) highlight that when global liquidity is ample, non-financial corporates easily obtain funding from international capital markets and bring the proceeds to the domestic banking system, influencing domestic credit availability. Specifically focusing on banking flows, Bruno and Shin (2014b) use a sample of 46 advanced and emerging economies with significant and open banking sectors over 1996–2011 and show that the leverage of market-based financial intermediaries and both the level of the VIX and the change in the VIX are strong determinants of banking flows. Using a VAR analysis, Bruno and Shin (2013) find that the expectations of lower short-term rates in AEs dampens measured risks and stimulate cross-border banking flows to EMEs. Avdjiev et al (2012) find that source country factors related to the health of advanced economy banks caused the lending decline in late 2011 and early 2012, and that euro area banks accounted for most of the explained contraction in cross-border credit during the second half of 2011.

Other papers find both global and local factors are important for portfolio and banking flows. In particular, Ahmed and Zlate (2013) investigate what factors determine net private capital inflows to 12 EMEs from Asia and Latin America over 2002:Q1 to 2012:Q2 and find that growth and interest rate differentials between EMEs and advanced economies (AEs) and global risk appetite measured by the VIX are statistically and economically significant determinants of net private capital inflows. They also find that net portfolio inflows became more sensitive to interest rate differentials and global risk aversion after the 2008 financial crisis than before the crisis. Focusing on surges in net capital flows to EMEs during 1980-2009, Ghosh et al (2012) show that global factors—including US interest rates and risk aversion—are key to determining whether a surge will occur, but domestic factors such as the country's external financing needs and structural characteristics also matter, which explains why not all EMEs experience surges. Moreover, they find that, conditional on a surge occurring, the magnitude of the capital inflow de-

pends largely on domestic factors including the country's external financing needs, and the exchange rate regime. By looking at EPFR fund flows, Fratzscher (2012) finds that (1) over the period of 2005-2010, global factors are as important as domestic factors as drivers of net portfolio flows; (2) global factors (TED spread, the VIX, US macro shock, US equity shock) were more important during the 2008 financial crisis; and (3) domestic factors have become particularly important for EMEs in Latin America and Asia in the 2009–2010 surge in net capital flows to EMEs.

Tintchev (2013) finds from a panel regression analysis in AE and EME banking systems over September 2007–September 2011 that a banking system's access to international credit is negatively affected by its domestic fragilities (borrowers) and exposure to distress foreign counterparties (lenders). Using BIS locational banking statistics, Cerutti, Claessens and Ratnovski (2014) consider both source and recipient country factors driving cross-border banking flows from BIS reporting banks to 77 recipient countries' banks and non-banks over 1990-2012. They find that, in addition to US financial conditions such as the VIX, term premia, bank leverage, domestic credit growth and M2 growth, similar variables for the United Kingdom, Eurozone and Japan are also important, sometimes even more so. As for recipient country characteristics, they find that more stringent bank capital regulation reduces cross-border flows to banks, and that more stringent bank capital regulation, more supervisory powers and more restrictions on foreign bank presence reduce the cyclical impact of global liquidity on flows to banks. Finally, Herrmann and Mihaljek (2013), using BIS banking statistics on cross-border loans from 17AEs to 28 EMEs over 1993–2008, run a gravity model of financial flows and find that (1) distance matters for cross-border lending; (2) cross-border lending responds positively to growth and interest rate differentials between borrower and lender countries; (3) borrower country risk factors strongly affect cross-border lending; and (4) in the 2007-2008 financial crisis, greater global risk aversion and expected global financial market volatility were the most important channels of transmission of the crisis from AEs to EMEs.

Data Sets on Capital Flow Measures and Domestic Macroprudential Measures

An important, but often not fully appreciated, part of studies analysing policy effectiveness is the nature and coverage of policy data sets. In this subsection, we provide a taxonomy of data sets on capital account restrictions or capital flow measures used in various papers, and also present a few comprehensive databases on macroprudential measures recently constructed for large-scale cross-country studies.

A majority of data sets on capital flow measures or capital account openness indicators used in the literature are fully or partly based on IMF Annual Reports on Exchange Arrangements and Exchange Restrictions (AREAERs). In the broadest sense, there are two types of capital control databases: indexes on the level of capital account restrictions and the change in capital account openness (ie policy actions of tightening or loosening certain types of capital inflow or outflow). We can classify de jure capital control indexes into four types: (1) aggregate indexes such as the Chinn-Ito index; (2) disaggregated indexes such as the Schindler index; (3) intensity-based indexes such as the Miniane index and the Quinn index; and (4) indexes of policy changes.

Prior to 1995, IMF AREAERs reported only the following four binary indicators: (1) the openness of a country's capital account; (2) the openness of the current account; (3) the stringency of requirements for the repatriation and/or surrender of export proceeds; and (4) the existence of multiple exchange rates for capital account transactions. Mody and Murshid (2005) calculate a financial integration index as the sum of the four binary variables ranging from 0 to 4, with 4 denoting the least restricted, covering the years 1966–2000 and 184 countries. Chinn and Ito (2008) create a composite measure from the same four dummy variables, using a principal component approach.[15]

Starting from 1996, IMF AREAERs have distinguished between a number of different types of transactions, which contribute to capital movements such as equities, bonds or other debt securities, money market instruments, credit operations, direct investment, real estate transactions, and personal capital movements. The new AREAER classification scheme also distinguished between capital inflows and outflows and between the different types of specific transactions. In addition, the new scheme covered a number of provisions specific to commercial banks and institutional investors. Johnston and Tamirisa (1998) create a time series of capital controls based on the new disaggregated components in the AREAERs. They use the total number of capital controls in each category described in AREAER 1996 as a measure the intensity of capital controls. Miniane (2004) extends the IMF's post-1996 disaggregated capital account indices back to 1983 for a representative sample of 34 countries based on the information from IMF AREAERs. In particular, he constructs a set of indices to measure the intensity of capital controls, based on an approach akin to Johnston and Tamirisa (1998).

Schindler (2009) constructs a new panel data set containing disaggregated measures of de jure restrictions on cross-border financial transactions for 91 countries from 1995 to 2005 on the annual frequency, which allows us to pair the various inflow and out-

[15] In the most recent update on 19 August 2014, the Chinn-Ito index covers 182 countries for 1970–2012.

flow asset subcategories with the corresponding capital control variables. In particular, he constructs various subindices for individual asset categories (equity, bonds and other debt securities, money market instruments, collective investments, financial credits and direct investment), for inflows vs outflows, and for residents vs non-residents. For each inflow/outflow subcategory, for each country and year, the indicator takes a value of zero if the country has no control in place (or merely registration or notification requirements are in place), and take a value of one otherwise (that is, if any control other than registration or notification requirements is present). This means that, when a country introduces a quantitative or price measure, the Schindler index for that year takes value one. Therefore, the Schindler index does not fully capture the level or degree of restrictions in place for a country at a point in time as the Quinn index does. Binici et al (2010) and Gochoco-Bautista et al (2012) use the Schindler index for de jure capital account restrictions. Straetmans et al (2013) use the Miniane index (2004) and the Schindler index (2009) as capital control proxies. Klein (2012) uses the data in Schindler (2009) for 1995-2005 and extends them to include 2006-2010 for 44 developed and emerging market economies. Finally, Fernandez et al (2013) use an updated Schindler's (2009) index of capital controls to calculate the cyclical component of capital controls.[16]

Unlike the Chinn-Ito index and the Schindler index, which use binary variables for the existence of capital controls, Quinn (1997) construct a data set that contains information on the intensity of controls and covers 64 countries during 1950–1999. This is a de jure index measuring capital account restrictions (or capital account openness). It is constructed from information contained in IMF AREAERs. He captures the intensity of controls by ranking different control instruments by their assumed economic importance. The Quinn index distinguishes between restrictions on residents and non-residents. The original scoring method of this index is as follows: for both of the two categories, transactions by residents and transactions by non-residents: 0 means payments are forbidden, 0.5 means that there are quantitative or other regulatory restrictions, 1 means that transactions are subject to heavy taxes, 1.5 means that there are less severe taxes, and 2 means that transactions are free of restrictions or taxes. The indicator is the sum of two categories of controls on capital transactions, those by residents and those by non-residents, each of which range from 0 to 2, to get an overall indicator that ranges from 0 to 4, with larger values indicating a lower level of restrictions. It should be noted that the Quinn index assumes that tax or price measures are less restrictive than quantity or other regulatory restrictions, and that the Quinn index does not distinguish between inflows and outflows,

[16] They find that capital controls are acyclical (that is, boom-bust episodes in output, current account or the real exchange rate are associated with virtually no movements in capital controls)

nor does it offer information on restrictions on separate categories of assets. Quinn et al (2011) update the Quinn index through 2007. When Quinn and Toyoda (2008) test whether capital account liberalisation led to higher economic growth, they use the 5-year moving average of the Quinn index for 94 nations from 1950 (or independence) onward.

More recently, researchers constructed a few databases recording tightening and loosening capital flow measures. Pasricha (2012) collects data on capital flows measures (both capital controls and currency-based prudential measures) for 21 EMEs that are in the MSCI Emerging Markets index and Argentina from IMF AREAERs (capital transactions section), central bank websites, news sources and other research papers over January 2004–February 2011.[17] Ahmed et al (2014) build a new CFM database at the quarterly frequency from 2000 to 2013 for 22 countries, following Ahmed and Zlate (2013), who compile capital control measures from local press releases and news bulletins. The capital control measures in their database are differentiated by flow type (portfolio equity, portfolio bond, FDI, banking/other). They count the number of actions taken, not measuring the overall level of capital account restrictions. Del Guidice Rodriguez and Wu (2013) use IMF AREAERs to construct a database of six types of capital control (quantity-based on non-residents, quantity-based on residents, time-based on non-residents, time-based on residents, price-based on non-residents, price-based on residents) and prudential FX measures (FX derivatives, other FX assets and liabilities) between 1 July 2009 and 30 June 2011 taken by 12 EMEs totalling 60 tightening and loosening actions. Forbes et al (2014) create a database of CFMs with detailed information on weekly changes in capital controls (only for non-residents) and (macro-)prudential measures related to foreign exchange and/or international exposure (applied to both residents and non-residents) from 2009 to 2011 for 60 countries[18] based on IMF AREAERs, selected investment bank reports, primary news sources and other papers such as Magud et al (2011). Finally, Chantapacdepong and Shim (2014) construct a database on policy actions targeting various types of capital flow on the daily frequency. In particular, they classify policy actions by direction (tightening inflows, loosening inflows, loosening outflows, tightening outflows), by target flow (bond inflows, equity inflows, banking inflows, real estate inflows, direct investment inflows, other inflows (such as remittances and export flows) and outflows), and by target group (non-residents, residents or both). Data sources for these policy

[17] These measures are classified as (1) net capital inflow (NKI) reducing measures (tightening of inflow controls or easing of outflow controls); and (2) net capital inflow (NKI) increasing measures (easing of inflow controls or tightening of outflow controls). Also, net NKI restricting measures are defined as the difference between NKI reducing measures and NKI increasing measures.

[18] They include advanced economies, emerging market economies and frontier economies, and exclude euro area countries, Japan, the United Kingdom and the United States).

actions include IMF AREAERs, national sources, recent publications of the BIS and the IMF, and other research papers containing lists of CFMs taken by multiple countries. The database contains 367 distinct CFMs taken by nine emerging Asian economies over 2004–2013.

For macroprudential policy measures, a few global-level databases were recently constructed. In particular, Lim et al (2011) construct a database of (broadly defined) macroprudential policy measures from a survey of 49 economies conducted by the IMF in 2010, which documents macroprudential measures taken by 40 economies over 2000–2010. Several papers mostly written by IMF authors (eg Beirne and Friedrich (2014), Claessens et al (2014) and Zhang and Zoli (2014)) use this database to conduct their empirical analysis on the effects of macroprudential measures. Vandenbussche et al (2012) also construct a data set on various types of macroprudential measures taken by central and eastern European countries. Shim et al (2013) provide a publicly available database on monetary policy measures (excluding policy rate changes) and prudential policy measures targeting housing credit for 60 economies over January 1990–June 2012. They construct the database not from surveys but from official documents from central banks, regulatory authorities and ministries of finance as well as secondary sources including other research papers.

A few recent papers use a capital control data set and a macroprudential policy data set together. Ostry et al (2012) consider four categories of broadly-defined prudential policy tools: (1) an index of domestic prudential regulation (obtained from a survey of IMF desk economists); (2) an index of foreign currency-related prudential measures (that is, the regulation of FX transactions in the domestic financial sector) (obtained from IMF AREAERs); (3) financial sector specific capital controls (obtained from IMF AREAERs); and (4) economy-wide capital controls (obtained from Schindler (2009)'s index of economy-wide controls on inflows for 51 emerging market economies over the period 1995–2008). Beirne and Friedrich (2014) use four types of prudential capital controls (capital controls specifically directed to the financial sector and those related to the use of foreign currency) constructed by using information from Ostry et al (2012) and four types of domestic macroprudential measure (restrictions on the use of foreign currency, lending-related policies, capital buffer-related policies and liquidity-related policies) based on the database in Lim et al (2011). Zhang and Zoli (2014) construct a policy action database from Lim et al (2013), central banks, regulators, AREAER database and several country/regional studies, which contains 353 episodes of policy tightenings and 125 policy loosenings for all countries, and 139 tightenings and 41 loosenings for Asian

economies. They classify policies into four groups: (1) housing-related macroprudential measures; (2) credit measures and reserve requirements on local currency deposits; (3) capital, provisioning and liquidity measures; and (4) other macroprudential and capital flow measures (both foreign currency-based and residency-based) summarised as the CFM index.[19] Finally, Forbes and Klein (2014) define a CFM index such that an increase in capital controls occurs when a country either adds any new controls on capital inflows based on the index compiled by Klein (2012), or increases regulations on foreign exchange or international exposures in the financial sector complied by Bierne and Friedrich (2014). They also construct a macroprudential regulation index such that an increase in macroprudential regulations is defined as any increase in monetary and prudential measures in Shim et al (2013).

We use Chantapacdepong and Shim (2014)'s database of capital flow management measures for 12 Asia-Pacific economies to derive the banking inflow policy index and bond inflow policy index. We also use a database on policy actions affecting housing markets presented in Shim et al (2013). Since the coverage of the Shim et al (2013) database ends in June 2012, we updated it to December 2013 for the 12 Asia-Pacific economies.

Effectiveness of Capital Flow Measures on Banking and Bond Flows

This paper is part of the rapidly expanding literature on the effectiveness of capital flow measures on banking and bond flows. We consider cross-country studies focusing on the impact on net capital flows, those focusing on gross flows, and single-country studies.

Cross-country studies covering the years before 2009 generally show limited effectiveness of CFMs on the total volume of net capital flows. As summarised by Magud et al (2011), capital controls have only limited effectiveness in altering the overall volume of *net capital inflows* but altered the composition of capital flows toward longer maturities. They find that the effectiveness of controls varies across time, country and type of measures used. Ostry et al (2010) also provide a survey on the effectiveness of capital controls prior to 2009 and summarise that capital controls were more successful in altering the composition of flows to a country than in changing the aggregate volume, except in the very short run. Baba and Kokenyne (2011) estimate the effectiveness of capital controls in response to inflow surges in Brazil, Colombia, Korea and Thailand in the 2000s and

[19] They also use a cumulative variable of macroprudential actions to measure the macroprudential policy stance and interact the variable with GDP growth to see if the macroprudential policy stance affects the sensitivity of credit growth to changes in GDP growth.

find that capital controls are generally associated with a decrease in inflows and a lengthening of maturities, but the relationship is not statistically significant in all cases, and the effects are temporary. Gochoco-Bautista et al (2012) find that capital controls on inflows in nine EM Asian economies taken over 1995–2007 are ineffective, with the exception of FDI inflows, and that tightening capital restrictions has a stronger effect on capital flows than loosening such restrictions in both EM Asia and the rest of the world. However, a recent study by Ahmed and Zlate (2013) shows that 37 capital control measures introduced between 2009 and 2012 by Brazil, Indonesia, Korea, Chinese Taipei and Thailand discouraged both *total net inflows* and *portfolio net inflows*.

Other papers considering the impact on inflows and outflows separately also find that capital inflow measures are not effective. Binici et al (2010), considering 74 countries during 1995–2005, find that both debt and equity controls can substantially reduce outflows with little effect on capital inflows, but that only high-income countries effectively impose debt (outflow) controls. Forbes and Warnock (2012) consider five different indexes (the Chinn-Ito index, financial integration index in Lane and Milesi-Ferretti (2007), the Schindler index, and financial sector-specific capital controls and foreign currency-related prudential controls in Ostry et al (2011)), and find that they have virtually no effect on cross-border *gross capital flows*. From event study without considering other factors, Zhang and Zoli (2014) find that a tightening of the CFM index reduce equity flows, but not bond flows.

However, recent papers on cross-border banking flows find that CFMs are effective. Cerutti, Claessens and Ratnovski (2014) differentiate cross-border bank claims on banks and non-banks. They find that capital controls measured by the Quinn index reduce cross-border flows to non-bank borrowers over 1990–2012, and that a more flexible exchange rate regime and stricter capital controls reduce the cyclical impact of global liquidity on flows to both banks and non-banks. Also, Ghosh et al (2014) examine the joint effect of capital flow measures on outflows adopted by the source country, and on inflows by the recipient country, while controlling for a range of global push and domestic pull factors over 1995–2012. They find that CFMs at either end can significantly influence the volume of cross-border banking flows, with restrictions at both ends associated with even larger reductions in banking flows.

Some researchers have recently examined the effectiveness of CFMs on capital flows of a country. For example, Forbes et al (2012) find that increases in Brazil's tax on foreign investment in bonds from 2006 to 2011 caused mutual fund investors to significantly decrease their portfolio allocations to Brazil in both bonds and equities. Bruno and Shin

(2014a) find that banking flows into Korea became less sensitive to global factors after Korea introduced a leverage cap on FX derivatives positions and the levy on the non-core liabilities of banks from June 2010, and show that Korea's experience is the opposite of other comparable countries in Asia.

Effectiveness of Domestic Macroprudential Measures on Bank Credit

Many cross-sectional studies, mostly after the 2008 financial crisis, investigate the impact of macroprudential policies on domestic credit and find that certain types of measures, but not all types, are effective during booms. Borio and Shim (2007) find that 12 types of macroprudential policy actions taken by 18 Asian and European economies before 2006 reduced the growth rate of bank credit to the private sector by 4 to 6 percentage points in the years immediately following their introduction. Using data from 49 countries, Lim et al (2011) find that reserve requirements, dynamic provisioning, maximum loan-to-value (LTV) ratios, maximum debt-service-to-income (DSTI) ratios and limits on foreign currency lending have measurable effects on the growth rate or cyclicality of private sector credit. Focusing on six countries in Latin America, Tovar et al (2012) show that macroprudential policy in general, and reserve requirements in particular, have a moderate but transitory impact on the growth rate of private bank credit in the region.

A few other papers looked at the impact of macroprudential measures on housing credit and bank asset growth. Kuttner and Shim (2013), using data from 57 economies over three decades, find that changes in the maximum DSTI ratio have the largest and most robust effects on housing credit growth, with a typical tightening action lowering the real growth rate by 4 to 7 percentage points over the subsequent four quarters. Using a sample of around 2,800 banks in 48 countries over 2000–2010, Claessens et al (2014) show that maximum LTV and DSTI ratios as well as limits on credit growth and foreign currency lending are effective in reducing bank leverage and asset growth during booms, and that few policies help stop declines in bank leverage and assets during downturns.

In his assessment on the effectiveness of macroprudential measures, Borio (2014) stressed that the experience so far indicates that it would be imprudent to rely solely on macroprudential frameworks when seeking to tame financial booms and busts. He also emphasised that financial cycles such as credit cycles were very powerful, so other policies such as monetary and fiscal policies should also play a role in addition to macroprudential policy.

Cross and Joint Impacts of Macroprudential and Capital Flow Measures on Capital Flows and Credit

Over the past few years, many studies have emerged that focus either on cross impacts (ie the impact of CFMs on domestic credit or the impact of domestic macroprudential measures on capital flows) or on the joint impact of macroprudential and capital flow measures, or both. We first consider papers on cross impacts and then those on joint impacts.

Several papers show the existence of significant cross impacts. Habermeier et al (2011) consider the effects of both capital controls and prudential measures targeting capital flows in 13 country cases with capital inflow surges and/or high credit growth covering the period of 2000–2008Q2. They show that targeted prudential measures are effective in reducing credit growth, and that prudential measures taken in a number of countries lengthened the maturity of capital flows. They point out that circumvention (ie targeted flows find other channels) confounds attempts to measure the effect of CFMs on the composition of flows. Klein (2012) distinguishes between long-standing capital controls and episodic capital controls and shows that during 1995–2010, the growth rate of certain financial variables (the ratio of private credit to GDP, the share of domestic credit provided by the banking sector, and the share of debt liabilities in total liabilities) is statistically significantly slower in countries with long-standing controls than in countries that have episodically imposed controls.[20] Balakrishnan et al (2013) first identify 32 episodes of large net private capital inflows[21] in 11 emerging Asian economies. They focus on macroprudential measures which include FX-related measures targeting foreign currency liabilities, housing-market prudential measures, and other prudential measures that do not target foreign liabilities. They use an event study methodology to measure the ability of three types of macroprudential policies to stem surges in net capital flows (total, portfolio investment, and bank loans/other investment). They find that domestically oriented prudential measures were effective in stemming net private capital inflows but FX-related prudential measures were generally not effective, and that the impact of these policies seems weaker in 2000–2011 than in 1996–1999. Forbes et al (2014) show that FX-related (macro-)prudential measures significantly reduce bank leverage and bank credit growth, that increased capital controls (non-residents only) reduce private credit growth, and that capital flow measures do not significantly affect aggregate portfolio flows. By

[20] But he also finds that countries with long-standing controls tend to have much lower GDP per capita than the other countries in the sample.

[21] These episodes are defined as a period of two or more quarters during which the ratio of net private capital flows to GDP is significantly larger (one standard deviation) than its historical trend or above the 75th percentile of its distribution over the whole sample

contrast, Zhang and Zoli (2014) find insignificant cross impacts. In particular, from event study analysis, they find that tightening macroprudential measures were not effective in reducing the ratio of equity or bond flows to GDP for Asian economies and that tightening CFMs did not reduce real credit growth.

Partly driven by the availability of large-scale cross-country databases on macroprudential measures and those on disaggregated capital flow measures in recent years, researchers started to consider both macroprudential and capital flow measures together. Ostry et al (2012) find that both capital controls (the Schindler index) and FX-related prudential measures are associated with a lower proportion of FX lending in total domestic bank credit and with a lower proportion of portfolio debt in total external liabilities, and that domestic macroprudential measures appear to help restrain the intensity of aggregate credit booms. From cross-country macro panel regressions, Zhang and Zoli (2014) find that housing-related macroprudential measures are marginally effective in slowing down real credit growth in Asia, but CFMs are not effective. They also find from bank-level micro panel regressions using data for 74 banks in 11 Asian economies that loan growth and bank leverage decline after macroprudential measures are taken but CFMs do not have significant effects on bank loan growth or bank leverage. Beirne and Friedrich (2014) investigate the impact of domestic macroprudential policies and CFMs on cross-border bank flows over 1999–2009. They find that a high share of non-resident bank loans (ie foreign bank presence) in the macroprudential policy-implementing country reduces the domestic effectiveness of most types of macroprudential policy, and that macroprudential policies targeted at credit growth, maturity mismatches and capital requirements are more effective in reducing cross-border banking flows when the country experiences a high real growth rate. Finally, Forbes and Klein (2014) consider six types of policy (interest rates, fiscal policy, exchange rate policy, reserve accumulation, capital inflow controls and macroprudential regulation) used by 50 advanced and emerging market economies during the boom period of 2002–2007, and examine if these policies were successful in tempering equity and bank credit booms and avoiding subsequent banking crises and increases in non-performing loans. They find that certain policies can temper some booms but aggravate other challenges, so no single policy can effectively address various risks related to booms and their aftermath.

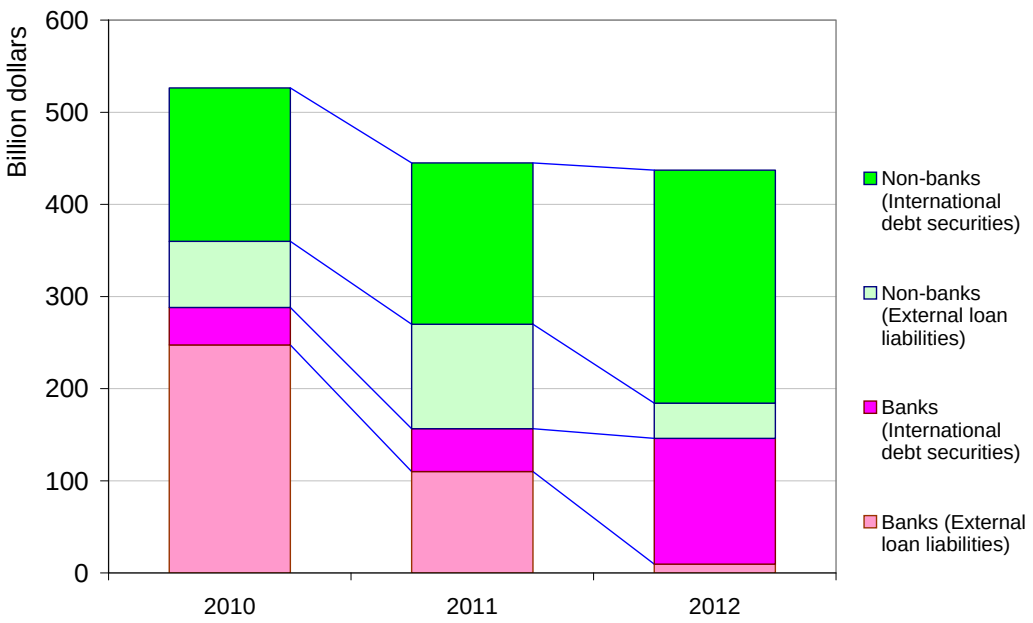


Figure 1. Net "external" financing of emerging market economies

Sources: Turner (2014), data from BIS international banking and debt securities statistics.

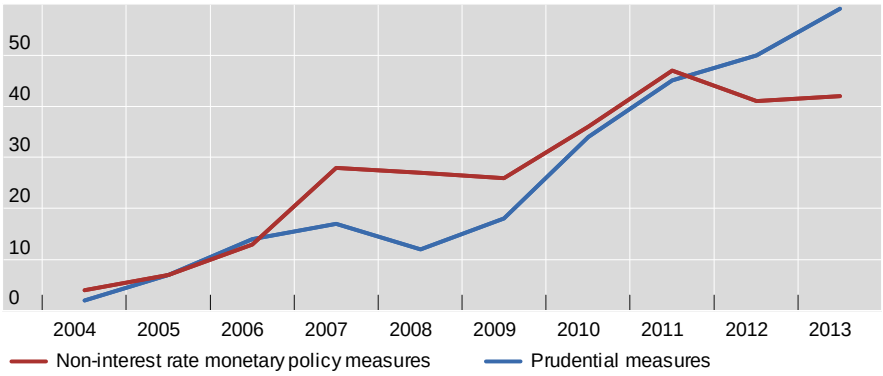


Figure 2. Macroprudential policy cycle in Asia-Pacific

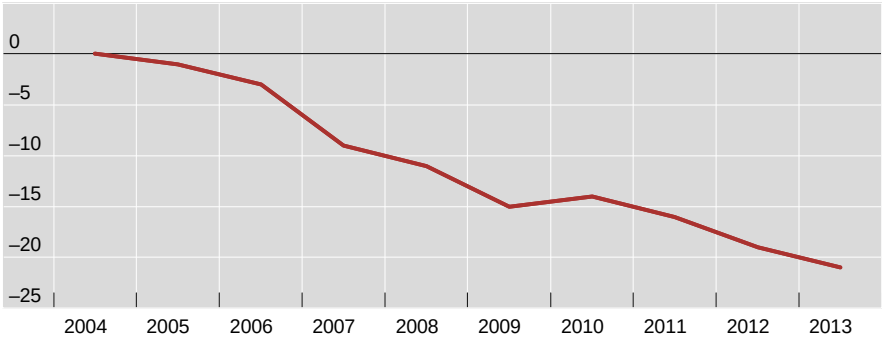


Figure 3. Bond inflow policy cycle in Asia-Pacific

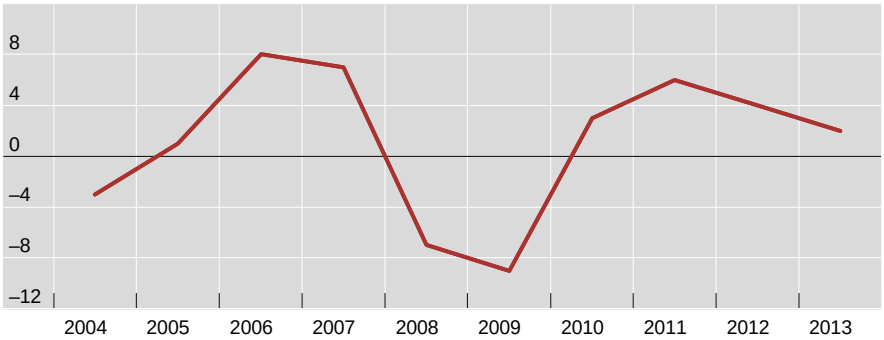


Figure 4. Banking inflow policy cycle in Asia-Pacific

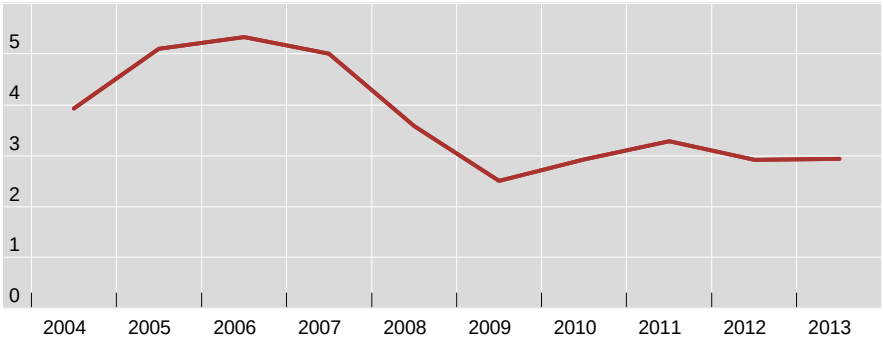


Figure 5. Policy rate cycle in Asia-Pacific

Table 1. **Summary statistics.** This table summarises our key variables in terms of their mean, standard deviation, minimum and maximum values.

	Obs	Mean	Std. Dev	Min	Max
ΔVIX	445	2.947	0.375	2.401	4.071
ΔRER	445	0.003	0.033	–0.213	0.191
GDP growth	445	4.947	3.950	–9.352	20.126
Inflation	445	3.433	2.747	–2.800	17.791
ΔMoney stock	445	11.117	6.073	–6.330	32.155
Credit rating	445	14.822	4.035	6.333	20.000
Interest rate differential	445	1.822	2.854	–5.024	9.789
Banking inflows growth	445	0.029	0.112	–0.227	0.275
Domestic bond inflows growth	445	0.040	0.064	–0.081	0.203
International bond growth	445	0.032	0.072	–0.103	0.256
Domestic bank credit growth	528	0.025	0.023	–0.020	0.086
Total credit growth	440	0.027	0.027	–0.046	0.150

Table 2. **Taxonomy of prudential measures.** This table shows how to classify prudential measures on banks in relation to capital flow measures.

	Capital controls (targeting non-residents including foreign bank branches)	Foreign currency-based policy measures (applied to both residents and non-residents)	General prudential tools with domestic focus
Asset-side tools	LTV cap for mortgage loans extended to non-residents; Reserve requirements on non-residents' liabilities	Reserve requirements on foreign-currency liabilities; Foreign currency liquidity ratio (eg LCR); Limits on net open position of banks' foreign currency holdings	LTV cap; DSTI cap; Loan-to-deposit cap; Reserve requirements on local currency liabilities; Local currency LCR
Liability-side tools	Levy on non-core bank liabilities	Levy on foreign currency-denominated bank liabilities; Limits on banks' short term foreign currency borrowing to a certain percentage of capital	
Bank capital-oriented tools		Higher risk weights on foreign currency denominated loans to borrowers whose income is in local currency; Leverage cap on FX derivatives positions of banks	Countercyclical buffers; Forward-looking provisioning

Table 3. **Taxonomy of capital flow measures.** This table shows how to classify capital flow measures affecting asset markets.

	Capital controls (targeting non-residents only)			Liberalising outflows (targeting residents)	General asset market measures (applied to both residents and non-residents)	
	Quantity	Price	Others	Quantity	Price	Others
Bond market	Quota/ceiling on foreign investors to invest in domestic bonds	Remove / introduce a withholding tax on interest income and trading income from bond holding	Minimum holding period for bond investments	Quota/ceiling on domestic investors (households, corporates) to invest in foreign fixed income products	Remove / introduce a withholding tax on interest income and trading income from bond holding	Minimum holding period
Equity market	Quota/ceiling on foreign investors to invest in domestic stocks		Minimum holding period for non-resident investors	Quota/ceiling on domestic investors to invest in foreign equities		
Real estate market	Quota for non-residents to purchase housing	Extra stamp duty on non-resident home-buyers	Minimum holding period for real estate investments	Ceiling on residents' purchase of real estate abroad	Stamp duties on buyers and sellers of real estate; Capital gains tax; Mortgage interest deductibility	

Table 4. **Capital flow measures.** This table summarises the banking and bond inflow measures taken by 8 Asia-Pacific economies over 2004-2013.

	Banking inflow measures			Bond inflow measures		
	Tightening	Loosening	Total	Tightening	Loosening	Total
China	15	3	18	0	9	9
Hong Kong SAR	0	1	1	0	0	0
India	9	24	33	0	12	12
Indonesia	5	2	7	3	0	3
Korea	19	9	28	1	3	4
Malaysia	1	7	8	0	3	3
Philippines	5	4	9	1	0	1
Thailand	5	7	12	2	2	4
Total	59	57	116	7	29	36

Table 5. **Macroprudential measures.** This table summarises the macroprudential measures taken by 11 Asia-Pacific economies over 2004-2013.

	Monetary measures			Prudential measures			All macroprudential measures		
	Tighten	Loosen	Total	Tighten	Loosen	Total	Tighten	Loosen	Total
Australia	0	0	0	1	0	1	1	0	1
China	34	7	41	21	2	23	55	9	64
Hong Kong SAR	0	0	0	11	2	13	11	2	13
India	17	7	24	11	2	13	28	9	37
Indonesia	2	1	3	1	0	1	3	1	4
Korea	1	0	1	12	6	18	13	6	19
Malaysia	2	3	5	4	0	4	6	3	9
New Zealand	2	0	2	1	0	1	3	0	3
Philippines	6	3	9	0	1	1	6	4	10
Singapore	0	0	0	9	1	10	9	1	10
Thailand	1	2	3	3	1	4	4	3	7
Total	65	23	88	74	15	89	139	38	177

Table 6. **Cross-border bank flows.** This table shows results from regressions with year dummies and robust-clustered standard errors at the country level. p-values are reported in brackets. The dependent variable, BIS Loans, is the growth in cross-border banking flows. Bank Controls (T+L) is the sum of tightening (+1) actions and loosening (–1) actions in a quarter. Bank Controls (T) is the sum of tightening actions only. Bank Controls (L) is the sum of loosening actions only. VIX is the Chicago Board Options Exchange Volatility Index. Post 07 (Pre 07) dummy variable equal to 1 in every quarter after (in or before) 2007 and 0 otherwise. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variables	BIS Loans	BIS Loans	BIS Loans	BIS Loans	BIS Loans	BIS Loans
VIX	–0.0804**	–0.0800**	–0.0883**	–0.0801**	–0.0801**	–0.0836**
	[0.027]	[0.033]	[0.017]	[0.019]	[0.027]	[0.016]
Bank Controls (T&L)	–0.0645*					
	[0.068]					
Bank Controls (T&L)*VIX	0.0186*					
	[0.068]					
Bank Controls (L)		0.0472				
		[0.136]				
Bank Controls (L)*VIX		–0.0135				
		[0.159]				
Bank Controls (T)			–0.1222*			
			[0.092]			
Bank Controls (T)*VIX			0.0387			
			[0.104]			
Bank Controls (T&L)*post 07				0.0054		
				[0.395]		
Bank Controls (T&L)*pre 07				–0.0241**		
				[0.025]		
Bank Controls (L)*post 07					–0.0066	
					[0.185]	
Bank Controls (L)*pre 07					0.0251*	
					[0.082]	
Bank Controls (T)*post 07						0.002
						[0.843]
Bank Controls (T)*pre 07						–0.0256*
						[0.066]
Constant	0.2367**	0.2348**	0.2644**	0.2340**	0.2346**	0.2485**
	[0.023]	[0.031]	[0.013]	[0.016]	[0.024]	[0.011]
Controls	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y
Observations	445	445	445	445	445	445
R-squared	0.119	0.115	0.119	0.123	0.118	0.119

Table 7. **Domestic debt securities.** This table shows results from regressions with year dummies and robust-clustered standard errors at the country level. p-values are reported in brackets. The dependent variable BoP Bonds is the growth in the amount outstanding of domestic debt securities purchased by non-residents. Bond Controls (T+L) is the sum of tightening (+1) actions and loosening (–1) actions in a quarter. Bond Controls (T) is the sum of tightening actions only. Bond Controls (L) is the sum of loosening actions only. VIX is the Chicago Board Options Exchange Volatility Index. Post 09 (Pre 09) is a dummy variable equal to 1 in every quarter in or after (before) 2009 and 0 otherwise. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variables	BoP Bonds	BoP Bonds	BoP Bonds	BoP Bonds	BoP Bonds	BoP Bonds
VIX	–0.0393**	–0.0393**	–0.0411**	–0.0435**	–0.0429**	–0.0406**
	[0.029]	[0.032]	[0.024]	[0.016]	[0.018]	[0.024]
Bond Controls (T&L)	–0.1121*					
	[0.099]					
Bond Controls (T&L)*VIX	0.0324*					
	[0.100]					
Bond Controls (L)		0.0933				
		[0.139]				
Bond Controls (L)*VIX		–0.026				
		[0.150]				
Bond Controls (T)			–0.2600***			
			[0.006]			
Bond Controls (T)*VIX			0.0884***			
			[0.004]			
Bond Controls (T&L)*post 09				0.0042		
				[0.740]		
Bond Controls (T&L)*pre 09				–0.0405***		
				[0.004]		
Bond Controls (L)*post 09					–0.0034	
					[0.839]	
Bond Controls (L)*pre 09					0.0335**	
					[0.012]	
Bond Controls (T)*post 09						0.0073
						[0.503]
Bond Controls (T)*pre 09						–0.0369***
						[0.004]
Constant	0.1539***	0.1530***	0.1611***	0.1667***	0.1651***	0.1590***
	[0.005]	[0.005]	[0.002]	[0.001]	[0.001]	[0.002]
Controls	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y
Observations	445	445	445	445	445	445
R-squared	0.153	0.150	0.146	0.160	0.153	0.145

Table 8. **International debt securities.** This table shows results from regressions with year dummies and robust-clustered standard errors at the country level. p-values are reported in brackets. The dependent variable BIS Bonds is the growth in the amount outstanding of international debt securities. Bond Controls (T+L) is the sum of tightening (+1) actions and loosening (–1) actions in a quarter. Bond Controls (T) is the sum of tightening actions only. Bond Controls (L) is the sum of loosening actions only. VIX is the Chicago Board Options Exchange Volatility Index. Post 09 (Pre 09) is a dummy variable equal to 1 in every quarter in or after (before) 2009 and 0 otherwise. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variables	BIS Bonds	BIS Bonds	BIS Bonds	BIS Bonds	BIS Bonds	BIS Bonds
VIX	–0.0511***	–0.0517***	–0.0497***	–0.0370***	–0.0493***	–0.0501***
	[0.006]	[0.005]	[0.007]	[0.000]	[0.008]	[0.007]
Bond Controls (T&L)	0.0968*					
	[0.092]					
Bond Controls (T&L)*VIX	–0.0279*					
	[0.095]					
Bond Controls (L)		–0.1113**				
		[0.038]				
Bond Controls (L)*VIX		0.0312**				
		[0.041]				
Bond Controls (T)			0.1488			
			[0.584]			
Bond Controls (T)*VIX			–0.0496			
			[0.568]			
Bond Controls (T&L)*post 09				0.0189		
				[0.134]		
Bond Controls (T&L)*pre 09				–0.0063		
				[0.703]		
Bond Controls (L)*post 09					–0.0295***	
					[0.003]	
Bond Controls (L)*pre 09					0.0098	
					[0.683]	
Bond Controls (T)*post 09						0.0034
						[0.773]
Bond Controls (T)*pre 09						–0.0125
						[0.365]
Constant	0.1961***	0.1991***	0.1901***	0.1200***	0.1892***	0.1918***
	[0.008]	[0.007]	[0.007]	[0.000]	[0.008]	[0.008]
Controls	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y
Observations	445	445	445	445	445	445
R-squared	0.143	0.144	0.139	0.108	0.147	0.138

Table 9. **Endogeneity.** Columns 1 to 3 report results from regressions with quarter dummies. The dependent variables are: BIS Loans, BoP Bonds and BIS Bonds. Columns 4 to 6 report results where capital controls (Bank controls T+L and Bond controls T+L) are the dependent variables. Robust-clustered standard errors are at the country level with p-values reported in brackets. BIS Loans is the growth in cross-border banking flows. BoP Bonds is the growth in the amount outstanding of domestic debt securities purchased by non-residents. BIS Bonds is the growth in the amount outstanding of international debt securities issued by non-financial corporations. Bond or Bank Controls (T+L) is the sum of tightening (+1) actions and loosening (–1) actions in a quarter. VIX is the Chicago Board Options Exchange Volatility Index. Post 07 (Pre 07) is a dummy variable equal to 1 in every quarter after (in or before) 2007 and 0 otherwise. Post 09 (Pre 09) is a dummy variable equal to 1 in every quarter in or after (before) 2009 and 0 otherwise. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variables	BIS Loans	BoP Bonds	BIS Bonds	Bank Controls (T&L)	Bond Controls (T&L)	Bond Controls (T&L)
Bank Controls (T&L)*post 07	–0.0055					
	[0.452]					
Bank Controls (T&L)*pre 07	–0.0201*					
	[0.057]					
Bond Controls (T&L)*post 09		0.001	0.0211*			
		[0.928]	[0.059]			
Bond Controls (T&L)*pre 09		–0.0457***	–0.0022			
		[0.003]	[0.926]			
BIS Loans				–0.2511		
				[0.482]		
BoP Bonds					–0.3508	
					[0.234]	
BIS Bonds						0.2384
						[0.197]
VIX				–0.4221	–0.1790*	–0.1528
				[0.226]	[0.082]	[0.146]
Constant	0.0436	0.0291	0.1128**	0.974	0.5900*	0.4886
	[0.215]	[0.563]	[0.027]	[0.332]	[0.092]	[0.166]
Controls	Y	Y	Y	Y	Y	Y
Year dummies	N	N	N	Y	Y	Y
Quarter dummies	Y	Y	Y	N	N	N
Observations	445	445	445	445	445	445
R-squared	0.255	0.217	0.224	0.078	0.07	0.069

Table 10. **Dynamic GMM estimations.** This table shows results from regressions using the system GMM estimation. Standard errors are robust-clustered at the country level and their p-values are reported in brackets. The dependent variables are the growth in cross-border banking flows (BIS Loans, columns 1 and 2), the growth in the amount outstanding of domestic debt securities purchased by non-residents (BoP Bonds, columns 3 and 4) and the growth in the amount outstanding of international debt securities (BIS Bonds, columns 5 and 6). Bond Controls (T+L) and Bank Controls (T+L) are the sum of tightening (+1) actions and loosening (-1) actions in a quarter. Post 09 (Post 07) is a dummy variable equal to 1 in every quarter in or after 2009 (2007) and 0 otherwise. VIX is the Chicago Board Options Exchange Volatility Index. Control variables include: the log of real exchange rate (RER), and GDP growth.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variables	BIS Loans	BIS Loans	BoP Bonds	BoP Bonds	BIS Bonds	BIS Bonds
VIX	–0.0814**	–0.0781**	–0.0594***	–0.0569***	–0.0839***	–0.0759***
	[0.042]	[0.044]	[0.004]	[0.002]	[0.000]	[0.000]
BIS Loans $t-1$	–0.0269	–0.0205				
	[0.495]	[0.611]				
Bank Controls (T&L)	–0.0741**					
	[0.010]					
Bank Controls (T&L)*VIX	0.0206**					
	[0.023]					
Bank Controls (T&L)*post 07		0.0068				
		[0.274]				
Bank Controls (T&L)*pre 07		–0.0350***				
		[0.000]				
BoP Bonds $t-1$			0.1677*	0.1665*		
			[0.077]	[0.075]		
BIS Bonds $t-1$					0.1699***	0.1693***
					[0.000]	[0.000]
Bond Controls (T&L)			–0.0556		0.1764***	
			[0.261]		[0.009]	
Bond Controls (T&L)*VIX			0.0151		–0.0578***	
			[0.308]		[0.006]	
Bond Controls (T&L)* post 09				0.0050		0.0009
				[0.574]		[0.905]
Bond Controls (T&L)* pre 09				–0.0255**		–0.0100
				[0.031]		[0.672]
Constant	0.2569**	0.2461**	0.2099***	0.2019***	0.2787***	0.2546***
	[0.042]	[0.044]	[0.002]	[0.001]	[0.000]	[0.000]
Additional controls	N	N	N	N	N	N
Observations	433	433	433	433	433	433
Number of countries	12	12	12	12	12	12
Number of instruments	12	12	12	12	12	12
AR(1)	0.001	0.001	0.005	0.005	0.017	0.017
AR(2)	0.547	0.504	0.245	0.228	0.435	0.403
Hansen J-test	0.189	0.373	0.136	0.132	0.288	0.349

Table 11. **Spillover effects.** This table shows results from regressions with year dummies and robust-clustered standard errors at the country level. p-values are reported in brackets. BIS Loans is the growth in cross-border banking flows. BoP Bonds is the growth in the amount outstanding of domestic debt securities purchased by non-residents. BIS Bonds is the growth in the amount outstanding of international debt securities issued by non-financial corporations. Bond or Bank Controls (T+L) is the sum of tightening (+1) actions and loosening (–1) actions in a quarter. VIX is the Chicago Board Options Exchange Volatility Index. Post 07 (Pre 07) is a dummy variable equal to 1 in every quarter after (in or before) 2007 and 0 otherwise. Post 09 (Pre 09) is a dummy variable equal to 1 in every quarter in or after (before) 2009 and 0 otherwise. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)
Dep. Variables	BIS Loans	BoP Bonds	BIS Bonds
VIX	–0.0842**	–0.0414**	–0.0498***
	[0.018]	[0.022]	[0.010]
Bond Controls (T&L)*post 09	0.0296**		
	[0.025]		
Bond Controls (T&L)*pre 09	–0.0336		
	[0.308]		
Bank Controls (T&L)*post 07		–0.001	0.0029
		[0.781]	[0.297]
Bank Controls (T&L)*pre 07		0.0064	0.0170**
		[0.430]	[0.033]
Constant	0.2482**	0.1626***	0.1945***
	[0.013]	[0.002]	[0.010]
Controls	Y	Y	Y
Year dummies	Y	Y	Y
Observations	445	445	445
R-squared	0.122	0.146	0.149

Table 12. **Domestic macroprudential policies.** This table shows results from regressions with year dummies and robust-clustered standard errors at the country level. p-values are reported in brackets. BIS Loans is the growth in cross-border banking flows. Bank Credit is the growth in bank credit to private non-financial sectors. Domestic macroprudential measures (Macro-pru T+L) consist of of non-interest rate monetary policy action which affect the amount of general credit to the private sector provided by banks (Monetary T+L), as well as five types of prudential measure specifically targeting housing (Prudential T+L). VIX is the Chicago Board Options Exchange Volatility Index. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variables	BIS Loans	BIS Loans	BIS Loans	Bank Credit	Bank Credit	Bank Credit
Macro-pru (T&L)	0.0227***			0.0015		
	[0.006]			[0.235]		
Prudential (T&L)		0.0214*			0.0054**	
		[0.070]			[0.011]	
Monetary (T&L)			0.0278***			–0.002
			[0.001]			[0.224]
VIX	–0.0609**	–0.0755**	–0.0667**	–0.0029	–0.0023	–0.0052
	[0.025]	[0.020]	[0.019]	[0.498]	[0.578]	[0.238]
Constant	0.1634**	0.1903**	0.1698**	0.0145	0.013	0.0212
	[0.026]	[0.019]	[0.024]	[0.402]	[0.455]	[0.244]
Controls	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y
Observations	480	480	480	528	528	528
R-squared	0.136	0.12	0.128	0.297	0.309	0.297

Table 13. **Bank credit and total credit.** This table shows results from regressions with year dummies and robust-clustered standard errors at the country level. p-values are reported in brackets. Domestic bank credit (Bank) is the growth in bank credit to private non-financial sectors. Total credit to private non-financial sectors (Total) is the growth in credit extended by domestic banks, all other sectors of the economy and non-residents. Domestic macroprudential measures (Macro-pru T+L) consist of non-interest rate monetary policy actions which affect the amount of general credit to the private sector provided by banks (Monetary T+L), as well as five types of prudential measure specifically targeting housing (Prudential T+L). Bond or Bank Controls (T+L) is the sum of tightening (+1) actions and loosening (–1) actions on bond and bank inflows, respectively. VIX is the Chicago Board Options Exchange Volatility Index. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Variables	Bank0	Bank1	Bank2	Bank3	Total0	Total1	Total2	Total3
Bank Controls (T&L)	–0.0016	–0.0023	–0.0023	–0.0022	–0.0009	–0.0018	–0.0015	–0.0023
	[0.204]	[0.169]	[0.420]	[0.609]	[0.465]	[0.178]	[0.579]	[0.509]
Bond Controls (T&L)	0.0032	0.0069*	0.0093	0.0142**	0.0023	0.0065	0.0087	0.0145*
	[0.190]	[0.078]	[0.105]	[0.047]	[0.101]	[0.128]	[0.190]	[0.077]
Macro-pru (T&L)	0.0018	0.0016	0.0006	0.0015	0.0023	0.0014	0.0016	0.0034
	[0.188]	[0.663]	[0.914]	[0.806]	[0.125]	[0.693]	[0.779]	[0.598]
VIX	–0.0028	–0.0086	–0.0117	–0.0098	–0.0021	–0.0075	–0.0102	–0.0070
	[0.564]	[0.426]	[0.358]	[0.480]	[0.777]	[0.520]	[0.427]	[0.676]
RER	–0.0862*	–0.0896	–0.0894	–0.0931	–0.1105	–0.0989	–0.0748	–0.0891
	[0.078]	[0.259]	[0.406]	[0.417]	[0.115]	[0.275]	[0.497]	[0.527]
GDP Growth	0.0012***	0.0028***	0.0045***	0.0057***	0.0014**	0.0029***	0.0046***	0.0059***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.011]	[0.004]	[0.002]	[0.004]
Inflation	0.0009	0.0012	0.0010	0.0007	0.0010	0.0012	0.0014	0.0008
	[0.393]	[0.608]	[0.749]	[0.852]	[0.386]	[0.626]	[0.691]	[0.870]
Money Stock	0.0009**	0.0015**	0.0022**	0.0031**	0.0012**	0.0023**	0.0034**	0.0045**
	[0.017]	[0.028]	[0.018]	[0.011]	[0.028]	[0.023]	[0.022]	[0.023]
Credit Rating	–0.0004	–0.0010	–0.0015	–0.0019	–0.0007	–0.0020	–0.0029	–0.0037
	[0.430]	[0.457]	[0.428]	[0.396]	[0.274]	[0.226]	[0.221]	[0.202]
Interest Rate	0.0010	0.0026	0.0040	0.0058*	0.0003	0.0008	0.0013	0.0029
	[0.309]	[0.157]	[0.130]	[0.087]	[0.749]	[0.682]	[0.652]	[0.421]
Constant	0.0227	0.0566	0.0808	0.0885	0.0165	0.0548	0.1071	0.0968
	[0.269]	[0.235]	[0.209]	[0.206]	[0.512]	[0.205]	[0.139]	[0.249]
Observations	445	445	443	439	373	373	371	367
R-squared	0.293	0.386	0.422	0.469	0.381	0.475	0.518	0.557

Table 14. **Degree of openness.** This table shows results from panel regressions with year dummies and robust-clustered standard errors at the country level. p-values are reported in brackets. BIS Loans is the growth in cross-border banking flows. BoP Bonds is the growth in the amount outstanding of domestic debt securities purchased by non-residents. BIS Bonds is the growth in the amount outstanding of international debt securities issued by non-financial corporations. Bond or Bank Controls (T+L) is the sum of tightening (+1) actions and loosening (–1) actions in a quarter. High CC (Low CC) is a dummy variable equal to 1 in countries with a high (low) degree of restrictions on cross-border financial transactions. VIX is the Chicago Board Options Exchange Volatility Index. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dep. Variables	BIS Loans	BIS Loans	BIS Loans	BoP Bonds	BoP Bonds	BoP Bonds	BIS Bonds	BIS Bonds	BIS Bonds
Period	All periods	Pre 2007	Post 2007	All Periods	Pre 2009	Post 2009	All Periods	Pre 2009	Post 2009
Bank Controls (T&L)*	–0.0051	–0.0340***	0.0078						
High CC	[0.649]	[0.000]	[0.404]						
Bank Controls (T&L)*	–0.0061*	–0.0055	–0.0095*						
Low CC	[0.056]	[0.311]	[0.069]						
Bond Controls (T&L)*				–0.0032	–0.0226	0.0014	0.0089	–0.0210	0.0180*
High CC				[0.728]	[0.209]	[0.891]	[0.259]	[0.337]	[0.074]
Bond Controls (T&L)*				–0.0324	–0.0708***	0.0114	0.0141	0.0156	0.0111
Low CC				[0.171]	[0.000]	[0.354]	[0.368]	[0.357]	[0.362]
Constant	0.2546**	-0.1340	0.3398***	0.1619***	0.1843**	0.1920*	0.1869***	0.0820	0.3569***
	[0.012]	[0.330]	[0.005]	[0.002]	[0.039]	[0.080]	[0.008]	[0.176]	[0.003]
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	445	192	253	445	240	205	445	240	205
R-squared	0.115	0.089	0.198	0.152	0.191	0.156	0.141	0.197	0.153

Table 15. **Correlation among policy change variables and policy rate changes.** This table provides pairwise correlation of policy changes made by 12 Asia-Pacific economies over 2004–2013.

	Policy rate change	Bank Controls (T&L)	Bond Controls (T&L)	Macro-pru (T&L)	Monetary (T&L)	Prudential (T&L)
Policy rate change	1					
Bank Controls (T&L)	0.2018	1				
Bond Controls (T&L)	0.0644	0.3945	1			
Macro-pru (T&L)	0.2489	0.2605	–0.0027	1		
Monetary (T&L)	0.2214	0.2997	–0.0109	0.7958	1	
Prudential (T&L)	0.1599	0.0925	0.0076	0.7454	0.1896	1

Table 16. **Correlation of policy levels (measured by cumulative changes) with the policy rate.** This table provides pairwise correlation of policy cycles in 12 Asia-Pacific economies over 2004–2013.

	Policy rate	Bank Controls Cumulative	Bond Controls Cumulative	Macro-pru Cumulative	Monetary Cumulative	Prudential Cumulative
Policy rate	1					
Bank Controls Cum	–0.1297	1				
Bond Controls Cum	–0.0759	0.0539	1			
Macro-pru Cum	0.0398	0.5173	–0.7359	1		
Monetary Cum	0.0808	0.4933	–0.6549	0.9576	1	
Prudential Cum	–0.0255	0.4734	–0.7413	0.9093	0.7509	1

Table 17. **Taylor rule gap and non-interest rate monetary policies.** This table shows results from regressions with year dummies and robust-clustered standard errors at the country level. p-values are reported in brackets. The dependent variable Taylor Gap is defined as the difference between the actual policy rate and the Taylor rule rate. Monetary Cum is the cumulative indicator of non-interest rate monetary policy tools. BoP Bonds is the growth in the amount outstanding of domestic debt securities purchased by non-residents. VIX is the Chicago Board Options Exchange Volatility Index. Additional control variables include: the log of real exchange rate (RER), real GDP growth, inflation and M2 growth.

	(1)	(2)	(3)	(4)
Dep. Variables	Taylor Gap	Taylor Gap	Taylor Gap	Taylor Gap
Period	2004–2013	2004–2013	Pre 2007	Post 2009
Monetary Cum	–0.1825	0.2256	0.6565*	0.1775
	[0.410]	[0.178]	[0.067]	[0.133]
ΔRER	–7.7358*	0.7971	–3.0494	0.4517
	[0.093]	[0.814]	[0.668]	[0.879]
VIX		–0.4799	–0.8653	0.1361
		[0.162]	[0.433]	[0.793]
BoP Bonds		–6.0718**	–7.2099**	–5.0191**
		[0.035]	[0.046]	[0.015]
GDP Growth		–0.3419***	–0.4522**	–0.2454***
		[0.001]	[0.037]	[0.002]
ΔMoney Stock		–0.0439	–0.0269	–0.0779**
		[0.386]	[0.736]	[0.049]
Inflation		–0.6131***	–0.4280***	–0.7497***
		[0.000]	[0.002]	[0.000]
Constant	–3.3193***	1.9334	3.0494	0.2336
	[0.002]	[0.189]	[0.318]	[0.891]
Observations	360	358	144	178
R-squared	0.147	0.645	0.575	0.769

Table 18. **Policy rates and macroprudential policies.** This table shows results from panel regressions with year dummies and robust-clustered standard errors at the country level. P-values are reported in brackets. BIS Loans is the growth in cross-border banking flows. BoP Bonds is the growth in the amount outstanding of domestic debt securities purchased by non-residents. BIS Bonds is the growth in the amount outstanding of international debt securities issued by non-financial corporations. Bond or Bank Controls (T+L) is the sum of tightening (+1) actions and loosening (–1) actions in a quarter. Post 07 (Pre 07) is a dummy variable equal to 1 in every quarter after (in or before) 2007 and 0 otherwise. Post 09 (Pre 09) is a dummy variable equal to 1 in every quarter in or after (before) 2009 and 0 otherwise. MPChg is the policy rate difference in basis points from the quarter before. VIX is the Chicago Board Options Exchange Volatility Index. Control variables include: the log of real exchange rate (RER), real GDP growth, inflation, M2 growth, interest rate differential between the three-month domestic interbank rate and US Libor, and sovereign credit ratings.

	(1)	(2)	(3)
Dep. Variables	BIS Loans	BoP Bonds	BIS Bonds
VIX	–0.0792**	–0.0229	–0.0543***
	[0.027]	[0.245]	[0.010]
MPChg*post07	0.0011		
	[0.954]		
MPChg*pre07	0.0075		
	[0.662]		
Bank Controls (T&L)*post 07	0.0053		
	[0.433]		
Bank Controls (T&L)*pre 07	–0.0245**		
	[0.030]		
MPChg*post09		0.0344*	–0.0081
		[0.087]	[0.423]
MPChg*pre09		0.0197***	–0.0052
		[0.009]	[0.535]
Bond Controls (T&L)*post 09		0.0042	0.0221**
		[0.722]	[0.013]
Bond Controls (T&L)*pre 09		–0.0412***	–0.0100
		[0.008]	[0.616]
Constant	0.2333**	0.1150**	0.2003**
	[0.016]	[0.028]	[0.012]
Controls	Y	Y	Y
Year dummies	Y	Y	Y
Observations	445	445	445
R-squared	0.123	0.183	0.147