# The effects of ratings-contingent regulation on international bank lending behavior:

# Evidence from the Basel 2 Accord

Iftekhar Hasan
Fordham University and Bank of Finland
5 Columbus Circle, 11th Floor, New York, NY 10019
E-mail: ihasan@fordham.edu

Suk-Joong Kim[1]
*University of Sydney*
sukjoong.kim@sydney.edu.au

Eliza Wu
*University of Technology Sydney*
eliza.wu@uts.edu.au

[1] Send all correspondence to Suk-Joong Kim. We acknowledge financial support from the Centre for International Finance and Regulation (CIFR) for this research. We are grateful to the Bank for International Settlements (BIS) for providing historical data on bilateral cross-border exposures at the sector level. We thank Eugenio Cerutti, Stijn Claessens, Mark Flannery, Patrick McGuire, Yihui Wang and participants in the CIFR Symposium on Financial Market Developments and the 2014 Financial Engineering and Banking Society conference as well as seminar participants at Bangor University, Fordham University, University of Sydney, University of Technology Sydney and the International Monetary Fund for useful comments that have improved this paper. All errors remain our own.

**The effects of ratings-contingent regulation on international bank lending behavior:**

**Evidence from the Basel 2 Accord**


## ABSTRACT

We investigate the effects of credit ratings-contingent financial regulation on foreign bank lending behavior. We examine the sensitivity of international bank flows to debtor countries' sovereign credit rating changes before and after the implementation of the Basel 2 risk-based capital regulatory rules. We study the quarterly bilateral flows from G-10 creditor banking systems to 77 recipient countries over the period Q4:1999 to Q2:2013. We find direct evidence that sovereign credit re-ratings that lead to changes in risk-weights for capital adequacy requirements have become more significant since the implementation of Basel 2 rules for assessing banks' credit risk under the standardized approach. This evidence is consistent with global banks acting via their international lending decisions to minimize required capital charges associated with the use of ratings-contingent regulation. We find evidence that banking regulation induced foreign lending has also heightened the perceived sovereign risk levels of recipient countries, especially those with investment grade status.



JEL: E44, F34, G21, H63.

Keywords: cross-border banking, sovereign credit ratings, Basel 2, rating-contingent financial regulation.

## 1. Introduction

The 2007-2008 Global Financial Crisis (GFC) highlighted the inadequacies of the financial regulatory architecture that had been in place and sparked a renewed interest in reforming banking regulation worldwide. This interest motivates a need to better understand the effects of the ratings contingent regulatory environment on global banks' lending behavior as credit rating agencies have been used increasingly by regulators as delegated information intermediaries for regulatory purposes (Opp, Opp and Harris, 2013). Credit ratings are most visibly used in determining minimum bank capital requirements under the Standardized Approach to Credit Risk (Pillar 1) within the Basel 2 Accord, agreed to in 2004 by the regulators of the world's most active banks in G-10 countries.[2] The growth of international banks' foreign claims climbed to a peak of 34 trillion dollars in 2007 before the GFC and became an important source of financing as banks became increasingly globalized and risks became more readily transmitted across borders (Cetorelli and Goldberg, 2014). Thus, it is critical to examine the effects of the regulatory environment on this credit channel in preparation for on-going regulatory reforms with regards to assessing minimum bank capital requirements.

In this study, we use the implementation of the Basel 2 capital rules by G-10 countries as a natural experiment to investigate the effects of ratings-contingent banking regulation on international lending behavior.[3] From a regulatory perspective, we are interested in the channel through which exogenous changes in risk-weights induced by sovereign credit rating changes under the Basel 2 accord may affect sovereign credit risk levels. We study the bilateral flows from the 11 major creditor banking systems (in the G-10) to borrowers in 77 recipient countries over the period from Q4:1999 to Q2:2013. Our study is important and timely given the debates surrounding the reliance on ratings-

[2] The revised Basel 2 accord was an attempt to level the playing field and push convergence in capital standards for banking systems around the world as internationally active banks became more complex in their activities. The Basel Committee on Banking Supervision (BCBS) published a recommended regulatory framework consisting of three pillars of banking regulation. Pillar 1 specifically developed guidelines for the measurement of regulatory capital and risk-weighted assets. However, Basel 2 serves only as a recommended framework and national prudential regulators could choose *when* to implement the rules within their domestic banking systems. Furthermore, larger banks also had the option of utilising their own internal rating based (IRB) approaches for calculating capital requirements.

[3] The Group of 10 (G-10) countries represent the most advanced and economically developed countries in the world and was formed post-World War 2. The original 10 members of this group are Canada, France, Germany, Italy, Japan, United Kingdom, United States, Belgium, Netherlands and Sweden. The group was subsequently expanded in 1964 to include Switzerland as the 11th member but retained the 'G-10' name.

contingent risk-weightings for assessing credit risk and the continued need to risk-weight bank assets in the revised but as yet to be implemented Basel 3 guidelines which require a higher capital charge of 10.5% of risk-weighted assets and place new emphasis on a bank's capital adequacy in times of financial crises (Acharya et al., 2012; Flannery, 2014). Hence, credit ratings hold the utmost importance for a global bank's capital management and affect banks' lending decisions and ultimately the credit supply in the international financial system. Hence, in this study we examine the effect of sovereign credit re-ratings on international bank flows before and after the ratings contingent banking regulation came into effect under the reforms made in the Basel 2 Accord.

It is important to understand the behavior induced by ratings-contingent regulation as it can potentially create perverse incentives for banks to engage in correlated asset choices ex ante and thus hold little equity capital (Acharya et al., 2012). Specifically, there is a risk that ratings-contingent regulation can induce banks to over-weight their lending portfolios to sovereign borrowers with relatively low risk weights for regulatory capital charge purposes. Consistent with this idea, Acharya and Steffen (2014) show that the under-capitalized European banks had engaged in regulatory arbitrage and exploited the low risk weighting of peripheral European sovereigns under Basel 2 and also the Capital Requirements Directive within the European Union. They revealed that European banks strategically borrowed from wholesale short-term funding markets to fund purchases of higher yielding sovereign bonds issued by GIIPS governments in the lead up to the European Debt Crisis. Our study is timely and necessary given that international banks' exposures to the public sector via holdings of sovereign bonds have created global instability in recent years.

Under the current financial regulatory structure, credit rating agencies (CRAs) serve a public function. They play a crucial regulatory role in the international financial system due to the reliance on their credit ratings for regulatory purposes. The role of CRAs in financial regulatory frameworks has expanded in recent decades, especially as a result of an international agreement initiated by the G-10 countries to assess the riskiness of bank portfolios and to set capital requirements accordingly. This formed the basis of the Basel 2 Accord and sought to better align regulatory capital standards

with actual risks taken by banks. A key justification for the incorporation of rating agencies' credit assessments was the belief that they offered a more dynamic approach that better linked capital adequacy to credit risks than did the simpler regulatory practices of basing capital requirements on either a fixed percentage of total assets or the economic development of countries proxied by OECD membership — the approaches in the earlier Basel 1 Accord, which allowed for much less differentiation in the credit risk of financial institutions. The benefits of using ratings-contingent regulation include the reduction in regulation costs and greater efficiency and objectivity. On the other hand, there are potential costs in terms of the well-known deficiencies of agency credit ratings, such as the pro-cyclical and backward looking nature of the ratings assessments. The amount of economic capital that institutions are required to hold to guard against insolvency would change as the credit assessments made by rating agencies on their asset holdings are updated.

This study addresses four key research questions. (1) Have sovereign credit rating revisions become more important since the implementation of Basel 2 capital rules? (2) Did the introduction of risk-weights for minimum capital measurement under Basel 2 directly increase the sensitivity of international bank flows to recipient countries' sovereign credit rating changes? (3) Are international bank flows to sectors in which risk-weights are explicitly based on sovereign credit ratings relatively more sensitive to sovereign credit rating changes than other sectors? (4) Did regulatory-induced lending impact market views on debtor countries' sovereign credit risks?

This study contributes to the extant literature on the role and transmission of bank regulation in cross-border lending. However, it presents a significant departure from the prior research that focuses only on the pulling forces of recipient countries' less stringent domestic financial regulations in attracting aggregate international bank flows (Houston, Lin and Ma, 2012). It also deviates from the country-specific study on UK banks by Aiyar et al. (2014) that examines how changes in capital requirements in the creditor banking system can spillover to affect other countries by restricting their access to foreign credit supply. Similarly, Adelino and Ferreira (2014) show that sovereign rating downgrades in the creditor system can also curb bank lending abroad. In contrast, this study highlights

the changes in international credit supply brought on by the explicit use of credit ratings in global banking regulation introduced under the Basel 2 regulatory framework and assesses the ramifications of the adoption of this regulatory regime for international lending decisions around the world. One of the consequences is the risk of fiscal profligacy as regulatory capital incentives can potentially increase both the demand for and the supply of sovereign debt. To date, there has been a dearth of attention paid to understanding how the financial regulatory environment has influenced sovereign risk levels through the foreign credit supply channel despite a growing awareness of the adverse feedbacks between banks and sovereigns (Acharya, Drechsler and Schnabl, 2014; Gennaioli, Martin and Rossi, 2014) .

The bank-sovereign nexus became alarmingly clear during the onset of the European Debt Crisis. In April 2012, German and French banks together held over 66% of cross border bank claims against Italy (the figures are 60%, 45%, 31% and 31% for Greece, Spain, Portugal and Ireland, respectively, based on the BIS' consolidated banking statistics). It has been evident that when there are significant sovereign credit rating downgrades there can be considerable negative cross-border spillovers of sovereign credit risk as the lending international banks' capital adequacy ratios deteriorate. The two most recent financial crises have illustrated only too well the intricate relationship between the government and financial sectors and the significant amplification effects of the two during periods of financial instability (Bolton and Jeanne, 2011). In light of the European sovereign debt crisis caused by European banks' carry trade risk taking behavior (Acharya and Steffen, 2014), understanding the feedback between banks' and governments' actions is of vital importance in resolving the current debt crisis and in avoiding future ones; as Reinhart and Rogoff (2011) show, there are adverse consequences from debt accumulation for economic growth.

We find that the influence of sovereign credit ratings has increased for all borrowing countries since the implementation of Basel 2 capital rules. Credit rating movements leading to risk-weight changes now exert a more significant effect on international lending decisions by global banks post-Basel 2, consistent with creditor banks responding to the incremental regulatory capital charges

resulting from credit rating revisions. Furthermore, bank flows to the banking sector borrowers in investment grade countries are shown to be more sensitive to rating changes during creditor country-specific post-Basel 2 periods. In addition, we report a significant increase in sovereign credit risk, as measured by sovereign CDS spreads, as a result of bank flows moving in response to risk-weight changes during post-Basel 2 periods for investment grade borrowers.

In general, we find evidence to suggest that ratings-contingent regulation has: (1) worked to increase bank lending to sovereigns in response to favorable rating changes; and (2) heightened market perception of sovereign risks in recipient countries consistent with the "bailout view". That is, governments are likely to provide costly bailouts for their own troubled banks as they become more indebted from foreign interbank lending and their own weakened financial strength from government borrowing. Furthermore, the reduction in the value of sovereign debt held by the lending banks further amplifies sovereign risks. Overall, we find that ratings-contingent regulation may have indirectly contributed to higher sovereign risks via the foreign bank financing channel to debtor countries. Hence, there is evidence that banks failed to provide a market disciplining role for sovereign fiscal governance as sovereign credit risks have increased in response to regulation-induced international bank flows. Overall, this study advances current knowledge on recent banking sector developments in the global financial system and on the use of credit ratings in financial regulation. There are clear implications arising from our findings to guide policy makers on how the international financial architecture should be reformed going forward without denying borrowers access to international bank financing.

The paper is organized as follows. Section 2 will detail the related literature. Section 3 will discuss the data used and Section 4 will detail the empirical models used. Section 5 will provide a discussion of the key results. Finally, Section 6 concludes.

## 2. Related literature

Our paper contributes directly to the extant literatures on the use of ratings-contingent financial regulation and the determinants of cross-border bank lending. We briefly review these two strands of literature related to our study.

*Use of Credit Rating Agencies (CRAs)*

The use of credit ratings in banking regulation has received much interest since the GFC. Whilst the literature generally finds that CRAs are active monitors and the credit ratings they provide serve important functions as information anchors within financial systems (Boot et al., 2009) there are also arguments suggesting conflicts of interest when CRAs serve as delegated monitors of regulators due to their incentive to inflate ratings (Bolton et al., 2012; Opp, Opp and Harris, 2013). Hence, CRAs and their ratings inflation behavior have been criticized as having exacerbated the GFC. In addition, herding behavior among the CRAs would act to magnify the pro-cyclical nature of their ratings assessments.

Strahan and Kisgen (2009) have shown that a AAA rating label is economically valuable due to the regulatory investment restrictions imposed by risk-weights. In this way, banks are faced with regulatory constraints that are contingent upon the ratings of the assets (loans) that they generate. Opp, Opp and Harris (2013) demonstrate theoretically that the regulatory benefits of high ratings leads CRAs to reduce their information acquisition efforts and to simply inflate ratings, leading to the provision of uninformative ratings.

Specific to the effects of Basel 2, Van Roy (2005) provided evidence from simulated bank portfolios to show that there are minor regulatory capital incentives for banks to strategically select credit ratings that are used in calculating risk-weights for capital adequacy assessments. Under Basel 2, the value of all bank assets are risk-weighted according to their credit quality and there is a

minimum 8% capital requirement on the total risk-weighted asset value of a given bank.[4],[5] Although most banks meet the minimum regulatory requirements, this ratings contingent regulation will induce strategic behavior in profit maximizing banking institutions given there is a significant opportunity cost in having to hold regulatory capital.

Much has been discussed on the pro-cyclical effects of using credit ratings provided by CRAs (Altman, Bharath and Saunders, 2002; Lowe, 2002). CRAs are shown to be slow in updating their credit assessments and employ a rating through the cycle approach meaning that they will not revise credit ratings until they are convinced that there is a permanent change in the credit quality of a borrower. This slow response of the CRAs to changing conditions results in tardy rating changes given market perceptions. This is understood to amplify the boom-bust cycle as CRAs usually provide downgrades (upgrades) late in the piece during economic downturns (booms) and this works to prolong the periods of bust (boom). However, to date there has been little empirical evidence on the effects of ratings contingent banking regulation and the special zero risk status given to sovereign debt holdings of high credit quality. Hence, we contribute new knowledge to this literature by examining whether there has been a structural shift in how banks have conducted cross-border lending since the official implementation of the Basel 2 standardized framework in their home countries.

*Determinants of cross-border bank lending*

There is a well-established literature documenting the drivers of international bank flows. Geographical distance between countries, the size of countries and/or economies, common culture and institutional arrangements are typically shown to influence cross-border lending activities (e.g., Buch, 2003, Buch et al. 2011, Buch et al. 2013, Kleimeier, Sander and Heuchemer, 2013,

[4] The exception to the Basel rules applies to the US in which only the largest banks have to comply. In all creditor banking systems, banks can choose either to use their own internal rating based (IRB) models or the standardized approach to assess credit risk. By assuming that all lenders choose to use the standardized approach, our results represent a lower bound on the significance of sovereign credit rating (and consequential risk-weight) changes when alternative approaches are used in practice.

[5] Furthermore, minimum tier 1 capital is set at 4% of risk weighted assets. Nonetheless, prior to the actual implementation of Basel 2, Van Roy (2005) found the dispersion in the resulting capital requirement from various combinations of CRAs' credit assessments to be small. For related details in quantifying and explaining parameter heterogeneity in the capital regulation as it relates to bank risk taking, see, Delis et al. (2012).

Papaioannou, 2009, DeHaas and Van Horen, 2013). However, recently Houston, Lin and Ma (2012) have reported that there is much incentive for international banks to engage in regulatory arbitrage when they are based in countries where banks are more tightly regulated whereas Aiyar et al. (2014) have shown that changes in capital requirements can affect the supply of foreign lending abroad.

In an extension of earlier works that show that sovereign credit ratings and the regulatory environment have significant influences on foreign bank financing, Acharya and Steffen (2014) demonstrate that European banks exploited the low risk weights on sovereign debt holdings in both the lead up to and during the European Debt Crisis and borrowed from wholesale money market funds to lend increasing amounts to governments in peripheral Eurozone countries (Greece, Italy, Ireland, Portugal and Spain: the GIIPS) in a carry-trade strategy. They suggested that regulatory capital arbitrage by European banks was at the heart of the European Debt Crisis. On the other hand, Gianetti and Laeven (2012) showed that there was a global flight home effect during the GFC when global risk appetite waned.

In this study we provide comprehensive international evidence, especially from G-10 creditor countries, on the impact of the ratings-contingent regulation on the sensitivity of banks international lending behavior across investment grade thresholds to sovereign credit ratings information provided by independent credit rating agencies. Furthermore, we address whether regulatory induced lending to investment grade debtor countries has worked to increase sovereign credit risks.

## 3. Data

We employ the consolidated international banking statistics collated by the Bank for International Settlements (Table 9B, consolidated banking statistics, BIS) on the immediate borrower basis. To date, this is the most comprehensive dataset on international banking claims as it covers the largest number of countries and is available on a sectorial and bilateral level. This data captures the claims of banks located in source countries against all major sectors within a recipient country at a quarterly frequency. We study the sample period from December quarter 1999 to June quarter 2013 (Q4:1999 - Q2:2013) as this is the longest period for which banks' quarterly holdings are available for our

sample of G-10 creditor countries. We closely examine a panel data set on cross-border bank flows from G-10 creditor countries to 77 debtor countries from all major geographical regions around the world as shown in Table 1. For robustness estimations, we also use propriety BIS data on foreign exposures with sectorial disaggregation of borrowers for a smaller sample of Q1:2005 to Q2:2013 (Table 9E consolidated banking statistics, BIS) and only for 5 lender countries (Italy, Japan, the U.K., the U.S. and Sweden).

Our first dependent variable is the bilateral bank flows calculated as 100 times the log difference in total foreign claims in a recipient country for a given source country, between quarter *t-1* to *t*. Foreign claims is the broadest definition for cross-border lending and incorporates both loans from banks' headquarters to borrowing countries and the local currency loans made by bank subsidiaries in foreign jurisdictions (see BIS, 2003). To the best of our knowledge, this is the longest time period over which international bank flows have been studied on a quarterly basis.

The dates from which the Basel 2 standardized approach came into effect in each G-10 country varied widely. Hence, we exploit the differences in the timing of the adoption of the Basel 2 rules across creditor countries in our empirical strategy to identify changes in these banks' cross-border lending behavior before and after credit ratings regulation came into play. We dated the implementation of Basel 2 capital rules in each creditor country using various Internet sources including national news reports and prudential regulatory authority and central bank websites. The post-Basel 2 periods in our sample start with Q1:2008 for EU lenders in the G-10, Q4:2007 for Canada, Q1:2007 for Japan, Q1:2007 for Switzerland, and Q1:2009 for the U.S.

We use long-term sovereign credit ratings on foreign currency denominated debt from the 3 major CRAs - Standard and Poor's, Moody's and Fitch as the credit ratings provided by these external information intermediaries are all allowed to be used for determining risk weights under Basel 2. As alternative proxies for sovereign credit risk, we use sovereign credit default swap (CDS) spreads from

the Markit Group, as they represent the market price (risk premia) for sovereign default risk. We use sovereign CDS spreads for the 5 year maturity segment.[6]

We also include various country- and country-pair-specific and global variables to account for the degrees of economic development, economic and financial openness, as well as the quality of domestic regulations. We source measures on liquid asset ratios within recipient banking systems, and GDP per capita for both source and recipient countries to compute the cross-product of their combined economic size. These are all sourced from the World Development Indicators (WDI) database. We incorporate the Regulatory Quality Indicator from the World Bank's Governance Indicators dataset to capture the general effectiveness of government regulations in the recipient country (Kaufmann et al. 2009). This country-specific governance indicator has been previously used in studies like Bekaert et al. (2011) and Houston et al. (2010) and measures the ability of the government to formulate and implement sound policies and regulations that permit and promote market competition and private-sector development. To capture specific economic links between source-recipient country pairs, we use bilateral trade and portfolio flows from the International Monetary Fund. We also account for well-known proxies for transaction costs in international capital flows (Portes and Rey, 2005). Hence, we also control for the geographical distance between source and recipient countries to account for greater information asymmetry between countries that are operating in different time-zones and regions around the world.[7]

Lastly, we also consider the effects of global factors in driving sovereign credit risk levels. We use the VIX from Bloomberg, measuring the implied volatility on S&P 500 index options to proxy global risk appetite. More importantly, we use the change in global cross-border foreign credit claims provided by the BIS to account for time-varying global liquidity levels. Bruno and Shin (2014) illustrate that financial conditions are internationally transmitted via cross-border lending. However,

[6] We use the 5-year maturity as it is known to be the most liquid in the sovereign CDS market (Longstaff et al., 2011).

[7] Unlike other studies, we did not overwhelm our estimations with too many country-level governance and information asymmetry variables as many are highly correlated with our governance (WBREGQLTY) and information (DIST) proxies. Additionally, we use quarterly bank flows to improve the identification of rating effects so we do not find other proxies to be as significant in explaining our dependent variable as evidenced in studies using annual frequency data.

as these two global proxies are clearly correlated, we do not control for them simultaneously in our regression analyses.

## 4. Empirical Modelling

### *4.1 The effects of sovereign ratings and associated risk weight changes on bank flows*

First, we examine the influence of debtor countries' sovereign credit rating revisions on aggregate bilateral bank flows from each G-10 creditor banking system.

$$\Delta BankClaims^{i}_{j,t} = \alpha_0 \cdot \Delta BankClaims^{i}_{j,t-1} + \alpha_1 \cdot B2DUM^{i}_{j,t} + \alpha_2 \cdot \Delta Rating^{PreB2}_{j,t-1} + \alpha_3 \cdot \Delta Rating^{PostB2}_{j,t-1} + \sum_k \beta_k \cdot Controls^{k}_{j,t} + \varepsilon_{j,t} \quad (1)$$

Our key country-specific variables of interest are lagged sovereign credit ratings changes and their interactions with the time indicator variables for before and after the Basel 2 implementation dates (*preB2* and *postB2*, respectively).[8] Our measure of bank flows, $\Delta BankClaims^{i}_{j,t}$, is defined as 100 times the log change in quarterly bank claims of all banks in country *i* (G-10 countries) reporting to the BIS against 77 (*j*) debtor countries (listed in Table 1). We first consider total bilateral bank flows from each G-10 creditor banking system (*i*) to the 77 borrower countries. The bilateral data is sourced from Table 9B: Foreign claims by nationality of reporting banks, immediate borrower basis, provided by the BIS. These have previously been used in other studies on international bank flows (e.g., Houston, Lin and Ma, 2012).

Changes in sovereign credit ratings in the past quarter are shown as $\Delta Rating^{PreB2}_{j,t-1}$ and $\Delta Rating^{PostB2}_{j,t-1}$ for pre- and post-Basel 2 (B2) periods, respectively.[9] We obtained sovereign credit ratings for the 77 borrower countries from the three major credit rating agencies, Standard and Poor's, Moody's and

[8] We use lagged sovereign rating changes as preliminary Granger-causality tests indicate that sovereign ratings information cause changes in cross-border bank claims (i.e., bank flows) from BIS reporting banks from all lender countries (except Canada) to the 77 borrower countries in aggregate and against sectorial borrowers. There is no evidence of reverse causality. We also check the robustness of our results using two quarters' lagged rating changes to account for slow convergence across credit rating agencies. Results are qualitatively similar but much weaker.

[9] We also tested an OECD indicator variable for countries that are members of the Organization for Economic Cooperation and Development, as lending to OECD sovereigns was given zero risk weightings under earlier Basel 1 standards. The OECD indicator variable takes a value of 1 for countries that are part of the OECD group and zero otherwise. The results are not qualitatively different from the full sample estimations given that an overwhelming number of our 77 recipient countries are members of the OECD throughout the entire sample period studied.

Fitch, and converted them into numerical scores ranging from 20 for the highest grade (AAA, Aaa and AAA from the three agencies, respectively) to 0 for defaults (SD, C, and D, respectively, see Table 2) at the daily frequency. We then calculated cross-agency average ratings for each quarter using the daily rating numbers for each of the three agencies within a quarter. For Standard and Poor's and Moody's, all 77 countries are rated whereas for Fitch only 70 countries are rated. For the 6 countries not rated by Fitch, the cross-agency average ratings are calculated using only the other two rating agencies.

To specifically examine the effects of Basel 2 ratings-contingent capital requirements, we directly investigate the effects of sovereign credit rating changes that lead to risk-weight changes (RWC) and those that do not (NRWC). To do so, we interact Rating changes with two indicator variables for risk-weight changes. RWC takes a value of 1 when the rating movement leads to crossing of risk buckets and zero otherwise whilst NRWC is equal to (1-RWC). The resulting variables are shown as $\Delta Rating\_NRWC_{j,t-1}^{\text{PreB2}}$ and $\Delta Rating\_RWC_{j,t-1}^{\text{PreB2}}$ for preB2 periods and $\Delta Rating\_NRWC_{j,t-1}^{\text{PostB2}}$ and $\Delta Rating\_RWC_{j,t-1}^{PostB2}$ for postB2 periods in equation (2) below. Under the standardized approach to credit risk in Basel 2, risk-weights used for the purpose of calculating capital charges are directly mapped to credit ratings and so rating changes across rating categories will lead to changes in the risk-weights applied. For sovereign credit ratings, 0%, 20%, 50% and 100% risk weights apply on sovereign debt for the ratings from AA- and above, between A+ and A-, between BBB+ and BBB-, and BB+ and below, respectively.[10] As shown in Table 2, in our sample we identify 91 risk weight changes in total, resulting from 48 rating upgrades and 43 rating downgrades out of a total of 757 rating upgrades and 399 rating downgrades, respectively.

We estimate the following regression to ascertain the importance of ratings induced RWCs on international bank flows.[11]

[10] For bank debt, Option 1 under Basel 2 is to benchmark off sovereign credit ratings and to apply risk-weights one category below that for sovereigns (BCBS, 2004).

[11] A difference-in-difference approach yielded qualitatively similar results for the significance of risk weight changes relative to all sovereign credit rating changes. Differences-in-differences results are available upon request.

$$\begin{aligned}\Delta BankClaims^{i}_{j,t} &= \alpha_0 \cdot \Delta BankClaims^{i}_{j,t-1} + \alpha_1 \cdot B2DUM^{i}_{j,t} \\ &+ \alpha_2 \cdot \Delta Rating\_NRWC^{\text{PreB2}}_{j,t-1} + \alpha_3 \cdot \Delta Rating\_RWC^{\text{PreB2}}_{j,t-1} \\ &+ \alpha_4 \cdot \Delta Rating\_NRWC^{\text{PostB2}}_{j,t-1} + \alpha_5 \cdot \Delta Rating\_RWC^{PostB2}_{j,t-1} + \sum_k \beta_k \cdot Controls^{k}_{j,t} + \varepsilon_{j,t}\end{aligned} \quad (2)$$

The list of control variables used in the above models include: (1) borrower country economic and financial development measures such as GDP per capita, stock market capitalization to GDP and liquid asset ratio sourced from the WDI database; (2) a regulatory quality index extracted from the World Bank's Governance Indicators dataset; and 3) bilateral variables specific to each pair of G-10 lender and 77 borrower countries such as geographical distance in (natural log) kilometers, total trades (export plus import), and long term portfolio flows. Appendix Table 1 provides descriptions of all variables employed in the analyses.

We include borrower country fixed effects to control for unobservable borrower demand and/or quality at the debtor country level. Furthermore, the past quarter's change in bank flows are also incorporated to account for serial dependence in international bank flows. GDP per capita is included to proxy economic development, as there is much evidence in the extant literature showing that economic size and development exerts a major pulling force for international bank lending, especially in the context of gravity models used (Kleimeier, Sander and Heuchemer, 2013). We use stock market capitalization to GDP (SMCAPGDP) as a proxy for financial market development, as this can influence international bank lending in two ways: it can either reduce the need for international bank lending as there are alternative market-based avenues for potential borrowers to raise the capital required for their investments or financial development can increase lender confidence with credit protection and the development of infrastructure to support financial intermediation. We also consider the liquidity to asset ratio of the borrower country's banking sector. The higher is this ratio the lower is the liquidity risk of the borrower country's banking system, which is attractive for international bank flows. Furthermore, portfolio flows and total trade activity between countries have also been used to better capture financial and economic linkages between lender and borrower countries. Bekaert et al. (2011) have shown the importance of financial openness for financial market integration

and globalization.[12] To control for the importance of regulatory quality in protecting creditor rights, we employ the regulatory quality index from the World Bank's governance indicators dataset (WBGVI) (Kaufmann, Kraay and Mastruzzi, 2009).

### *4.2 The effects of bank flows on sovereign credit risks*

To investigate whether and how the use of ratings-contingent banking regulation contributes to sovereign risks around the world, we examine the effects of past bank flows induced by risk-weight changes on borrowing countries' sovereign credit default swap (CDS) spreads. CDS spreads capture the forward-looking assessment of market participants on the default risk of sovereigns.

We test two competing views on how international bank flows arising from regulatory risk weight changes might affect sovereign credit risk. First, we consider the "bailout view" which would predict an *increase* in sovereign risk from the bank flows. It is likely that as the banking sectors in debtor countries become more leveraged via cross-border interbank lending, there is a greater likelihood that they will have to be bailed out by their national governments thereby weakening the perceived financial strength of their governments, which is consistent with Acharya, Drechsler and Schnabl (2014). Furthermore, as the sovereign obligors become more indebted from issuing sovereign paper to feed the increased demand from international banks, their capacity to repay their debt is hampered and the risk of defaulting on their own sovereign debt also becomes more likely. Second, we consider the "costly default view" which would predict a *reduction* in sovereign risk from bank flows. Based on the theoretical predictions of Gennaioli, Martin and Rossi (2014) it is also possible that as the banks (in both the creditor and domestic debtor banking systems) become more leveraged the long-term costs of sovereign default for the real economy becomes too great for governments, and they would then be perceived as being less likely to selectively default. We empirically test these two opposing perspectives.

[12] We also considered the openness to foreign investment as proxied by the amount of foreign direct investment to GDP (FDIGDP) but we do not include FDI in our reported results, as it is highly collinear with other linkage variables. However, results are available upon request.

$$\Delta CDS_{j,t} = \alpha_0 \cdot \Delta CDS_{j,t-1} + \alpha_1 \cdot B2DUM^{i}_{j,t} + \alpha_2 \cdot \Delta BankClaims\_NRWC^{i,PreB2}_{j,t-1} + \alpha_3 \cdot \Delta BankClaims\_RWC^{i,PreB2}_{j,t-1} \quad (3)$$
$$+ \alpha_4 \cdot \Delta BankClaims\_NRWC^{i,PostB2}_{j,t-1} + \alpha_5 \cdot \Delta BankClaims\_RWC^{i,PostB2}_{j,t-1} + \sum_k \beta_k \cdot Controls^{k}_{j,t} + \varepsilon_{j,t}$$

Quarterly changes in CDS spreads are calculated from converting daily sovereign CDS spreads for each borrower country to quarterly averages and then computing quarterly log differences multiplied by 100. The bank flows are as previously defined but we use the first lags to ameliorate endogeneity concerns. These are then multiplied by NRWC and RWC dummies to separately account for the bank flows associated with changes (or non changes) in risk weights. The control variables employed are: (1) bilateral variables specific to each of the G10 lender and 77 borrower country pairs as previously defined and (2) borrower specific variables also defined above and two additional variables that measure global conditions. Global liquidity is captured using the total value of global cross border credits extended (see Appendix Table 1).[13] The past quarter's change in CDS spreads are also incorporated to account for serial dependence in spread revisions.

## 5. Results

### *5.1 Ratings sensitivity of bank flows pre- and post-Basel 2*

The panel regression results for aggregate bilateral flows from G-10 countries to sub-samples of investment-grade and non-investment grade debtor countries as represented in Eq. (1) are reported in Table 3. It can be seen in Panel A of Table 3 that sovereign credit ratings information is only significant for explaining bank flows in the post Basel 2 implementation (post-B2) period as indicated by the significant ratings change term for post-Basel 2, $\Delta Rating^{Post\text{-}B2}_{j,t-1}$. There is a positive relationship between past ratings information and bank flows only in the post-Basel 2 period for Germany, Japan, UK, and Sweden. This result supports our first hypothesis and indicates that Basel 2 has exerted a profound effect on international lending. On the other hand, the results in Panel B of Table 3 are in stark contrast as ratings changes were mostly significant in the period before Basel 2 rules were

[13] The VIX was also used as an alternative control variable for global risk appetite as there are extant studies indicating that the VIX is a significant determinant of sovereign CDS spreads (e.g., Longstaff et al., 2010). We report the results for global liquidity as these not only capture elements of global risk aversion and also the supply of credit in the global financial system over time.

implemented (as shown by $\Delta Rating^{PreB2}_{j,t-1}$). Bank flows from most G-10 lenders (all except for Canada, UK and Sweden) during pre-B2 period to non-investment grade borrower countries, were significantly (with a positive sign) influenced by debtor credit ratings changes. This suggests that banks were wary of the additional risks associated with lending to borrowers in non-investment grade countries. The effects of ratings changes were economically important, as a single notch rating improvement would increase bank flows by 3.85 to 12.0 percent in the pre-B2 period. However, in the post-B2 sub-period ratings are only considered by German and UK banks in foreign lending to non-investment grade countries and are largely ignored in cross-border lending decisions by other G-10 countries.

*5.2. Risk-weight sensitivity of bank flows pre- and post- Basel 2*

The results on the influence of rating movements associated with risk-weight changes (RWC) and without (NRWC) on bank flows to borrowers in investment grade and non-investment grade countries are reported in Table 4. It can be seen in both Panels A and B of Table 4 that since Basel capital rules were implemented in creditor banking systems (post-Basel 2 period), only those sovereign rating changes in debtor countries that lead to material risk-weight changes (RWC) for calculating capital adequacy in lending banks have exerted significant effects on bilateral bank flows. This is the case for cross-border lending to both investment and non-investment grade debtor countries but the effects are statistically stronger in the latter as Italy, UK, US and Switzerland all present positive and significant relations between debtor rating changes associated with RWC and their subsequent bank lending decisions to those debtor countries. The effects are economically significant with a single notch increase (decrease) in sovereign ratings that reduces (increases) risk-weights resulting in a 4.0-13.7 per cent increase (decrease) in bank flows in the next quarter. This suggests that the larger risk-weight changes in the non-investment grade spectrum have the most significant influence on international lending behavior.

We do not test the relative effects of different risk-weight increments, as there are too few RWCs to warrant this level of comparison. Nonetheless, when we focused specifically on the effect

of risk weight changes across the investment grade boundary (risk weight change from 50 to 100 percent), we did not find that our results across all risk-weight changes are driven by the investment grade demarcation.

*5.3 Risk-weight sensitivity across sectors*

To further improve our identification strategy, we next examine the direct bilateral cross-border lending to borrowers in specifically public and banking sectors using proprietary historical data provided by the Bank for International Settlements (BIS) for a sub-period from Q1:2005 to Q2:2013 and for a subset of five of the G-10 creditor countries for which there are complete historical data. The results are provided in Table 5.

The sectorial analysis afforded at the bilateral level using this unique data from the BIS supports our third hypothesis regarding the greater importance of sovereign ratings for international lending to the two sectors for which risk-weight calculations are directly dependent on sovereign credit ratings. We find that cross-border lending to investment-grade borrowers in both public and banking sectors are more sensitive to sovereign credit ratings revisions than the lending made to non-investment grade borrowers. However, interestingly it is foreign interbank lending which has been most significantly influenced by Basel 2.[14] Specifically, interbank lending from international banks in Japan, UK and Sweden to investment-grade banks worldwide have become more significantly affected by ratings-induced risk weight changes since Basel 2 was implemented in the creditor nations. To a smaller degree, interbank lending from international banks in Sweden to non-investment grade borrowers also became more significantly driven by ratings induced risk weight changes post-Basel 2. However, the effect of Basel 2's rating contingent capital rules on foreign lending to the public sector is also evident with banks in Italy and UK becoming more influenced by sovereign credit rating induced risk weight changes in their lending to investment grade governments in the post-Basel 2 era

[14] We also tested the sensitivity of foreign lending into the non-bank private sector to sovereign credit rating changes and not surprisingly, we find this sector is not responsive to sovereign rating revisions in either pre- or post-Basel 2 implementation periods. It is beyond the scope of our study to investigate the role of corporate credit ratings under different regulatory regimes.

relative to the total insignificance in the pre-Basel 2 period. The sensitivity of US banks' lending to the public sectors of non-investment grade countries also increased post Basel 2.

We attempt to contextualize the profound effect of the implementation of Basel 2 rules on the increased sensitivity of international bank flows to investment-grade sovereign credit ratings revisions revealed in in our regression analyses. In Figure 1, the fluctuations in total cross-border claims for each G-10 creditor country is shown in the first column and the proportions of the total claims going into investment grade and non-investment grade borrowers over time are shown in the second and third columns respectively. Figure 1 clearly illustrates that international banks outside of the Eurozone (Canada, Japan, US, Sweden and UK) have either increasingly concentrated or maintained relatively high exposures to investment grade countries in the shaded post-Basel 2 periods. Consequently, the proportions of foreign claims in non-investment grade countries have fallen in recent years. Taken together with the regression results, it is evident that international banks have been enticed to pay more attention to investment grade sovereign borrowers and hence information conveyed by their credit ratings under Basel 2. Figure 1 also reveals that the Eurozone is unique in that during most of the post-Basel 2 period banks have become increasingly exposed to peripheral European countries that steadily were downgraded to non-investment grade status during the European Debt Crisis. A comparison of bank flows from Eurozone lenders to Eurozone vs non-Eurozone borrowers (reported in Table 6) further supports this perspective. This development is in line with Acharya and Steffen's (2014) findings of carry-trade strategies being used by European banks as they borrowed wholesale funds from US money markets and lent heavily to borrowers in weakening countries like Portugal and Greece.

The evidence taken together, supports our main hypothesis that international banks have been induced by capital rules to lend to those countries with investment grade sovereign credit ratings that covert to relatively lower risk-weights for capital adequacy requirements.

*5.4 Effect of bank flows on sovereign risk*

The results from Eq. (3) for sovereign CDS spreads in investment grade and non-investment grade debtor countries are reported in Table 7. Consistent with our ex-ante expectations, we find that sovereign credit risk levels (proxied by sovereign CDS spreads) do increase with regulation-induced bank flows (during post-Basel 2 periods), especially those into investment grade countries as shown in Panel A of Table 7. The positive relationship is significant in all instances in the post-Basel 2 sub-period except for US lending. On the other hand, we find that there is a more dominant negative relationship between regulation induced bank flows and sovereign credit risk levels in non-investment grade recipient countries post Basel 2 implementation as shown in Panel B of Table 7. This result is consistent with Acharya and Rajan's (2013) prediction that governments are myopic and will do what is necessary to repay their cumulating debts and not choose to default for as long as they can keep borrowing to service their debts. Similarly, Gennaioli, Martin and Rossi (2014) also argue that it is costly for governments to default when banking systems become more levered with foreign bank financing. However, in the case of international lending to investment grade countries, the "bailout view" presented by Acharya et al. (2014) seems to be better supported by the empirical evidence. As the indebtedness of the domestic banking sector increases from the additional foreign credit supply the perceived likelihood of a government bailout that would weaken fiscal strength and feed back to amplify vulnerabilities in the banking system becomes greater, leading to an increase in sovereign CDS spreads (a forward looking market assessment on sovereign default risk). On the other hand, we find that market participants are convinced that the credit risk of non-investment grade recipient countries are actually lowered when they can signal the ability to access international bank financing. If non-investment grade countries choose to default as they become more leveraged, the long-term economic consequences in being cut off from international lenders are even more severe than for investment grade countries. Taken together, there is some evidence to suggest that capital requirement measurement introduced into advanced G-10 banking systems that are based on sovereign credit

ratings has contributed to increasing sovereign credit risk levels in investment grade debtor countries by increasing potential bailout costs for their national governments.

## 6. Conclusions

In this study, we investigate the effects of credit ratings-contingent financial regulation on bank lending behavior by examining the sensitivity of international bank flows to changes in sovereign credit ratings of debtor countries before and after the implementation of the Basel 2 risk-based capital regulatory rules in G-10 creditor banking systems. We study the bilateral flows from the major creditor banking systems to borrowers in 77 recipient countries over the period from Q4:1999 to Q2:2013. Specifically, we investigated four key research questions. (1) whether sovereign credit rating revisions have become more important since the implementation of Basel 2 capital rules; (2) whether the introduction of risk-weighting guidelines for minimum capital measurement under Basel 2 increased the sensitivity of international bank flows to recipient countries' sovereign credit rating changes; (3) whether international bank flows to sectors in which risk-weights are explicitly based on sovereign credit ratings are relatively more sensitive to sovereign credit rating changes than other sectors; 4) whether increasing international bank flows induced by Basel 2 risk-weighted capital rules influenced market views on debtor countries' sovereign credit risks.

We find that the influence of sovereign credit ratings has indeed increased for all borrowing countries since the implementation of Basel 2, which introduced regulatory capital charges based on credit ratings for assessing credit risk under the standardized approach. Risk weight changes mapped to sovereign credit rating revisions now exert a more significant effect on international lending decisions by global banks to public and banking sectors consistent with creditor banks responding to the regulatory capital rules and increasing demand for exposures to banking and public sectors. We also find evidence to indicate that the practice of increasing lending to investment grade sovereigns when they present a risk-weight reduction has increased recipient countries' sovereign risk levels suggesting that bailout risks have also become a major concern in advanced economies. There is also some evidence to suggest that bank flows to banking sector borrowers in the investment grade

borrower countries are shown to be more sensitive to sovereign rating changes during the post-Basel 2 era. Furthermore, we report that there is a positive (negative) link between bank inflows and sovereign credit risk, as proxied by CDS spreads, for investment (non-investment) grade borrower countries during post-Basel 2 period.

These results have clear implications for the incoming Basel 3 rules that are being phased in from 2011. With an increase in the minimum risk-based capital ratio under Basel 3, as well as narrower definitions for regulatory capital, the link between bank lending decisions and risk weight changes will become even more important. Whilst references to credit ratings have been discouraged in some creditor countries like the US, for the majority of other countries there will be a continual reliance on the use of external credit ratings as measures of credit risk for the purpose of calculating risk-weights in determining minimum regulatory capital.

Whilst we find evidence that ratings-contingent banking regulation has had the effect of concentrating bank credit allocation to particular investment grade countries experiencing sovereign rating upgrades that lead to lower risk-weights, we leave the effects of ratings contingent regulation on bank portfolio diversification and aggregate systemic risk for future research.

**References**


Acharya, V., Drechsler, I., Schnabl, P., (2014). A Pyrrhic Victory? - Bank Bailouts and Sovereign Credit Risk, *Journal of Finance*, forthcoming.

Acharya, V., Mehran, H., Schuermann, T., Thakor A., (2012). Robust Capital Regulation, *Current Issues in Economics and Finance*, Federal Reserve Bank of New York, May issue.

Acharya, V., Rajan, R., (2013). Sovereign Debt, Government Myopia and the Financial Sector, *Review of Financial Studies* 26(6), 1526-1560.

Acharya, V., Steffen, S., (2014). The "greatest" carry trade ever? Understanding Eurozone bank risks, *Journal of Financial Economics*, forthcoming.

Adelino, M., Ferreira, M., (2014). Bank ratings and lending supply: Evidence from sovereign downgrades, working paper, Duke University.

Aiyar, S., Calomiris, C., Hooley, J., (2014). The international transmission of bank capital requirements, *Journal of Financial Economics*, forthcoming.

Altman, E.I., Bharath, S.T., Saunders, A., (2002). Credit ratings and the BIS capital adequacy reform agenda, *Journal of Banking and Finance* 26 (5), 909-921.

Bank for International Settlements (2003). Guide to the International Financial Statistics. *BIS papers no. 14*, Monetary and Economics Department February 2003.

Basel Committee on Banking Supervision (BCBS), (2004). International convergence of capital measurement and capital standards: a revised framework. *Basel Committee Publications No. 107*.

Bekaert, G., Harvey, C., Lundblad, C., Siegel, S., (2011). What segments equity markets?, *Review of Financial Studies* 24, 3847-3890.

Bolton, P., Freixas, X., Shapiro, J., (2012). The credit ratings game, *Journal of Finance* 67, 85-111.

Bolton, P., Jeanne, O., (2011). Sovereign default risk and bank fragility in financially integrated economies, *IMF Economic Review* 59, 162-194.

Boot, A., Milbourn, T., Schmeits, A., (2006). Credit ratings as coordination mechanisms. *Review of Financial Studies* 19, 81-118.

Bruno, V., Shin H.S., (2014). Cross-border banking and global liquidity. Working paper, Princeton University.

Buch, C., (2003). Information or regulation: What drives the international activities of commercial banks? *Journal of Money, Credit and Banking* 35, 851-869.

Buch, C., Koch, C., Koetter, M., (2011). Size, Productivity, and International Banking, *Journal of International Economics*, 85, 329-334.

Buch, C., Koch, C., Koetter, M., (2013). Do banks benefit from internationalization?: Revisiting the market power-risk nexus, *Review of Finance*, 17, 1401-1435.

Cetorelli, N., Goldberg, L., (2014). Banking globalization and monetary policy transmission. *Journal of Finance*, forthcoming.

De Haas, R., van Horen, N., (2013). Running for the exit? International bank lending during a financial crisis, *Review of Financial Studies* 26, 244-285.

Delis, M. D., Tran, K. C., Tsionas, E. G., (2012). Quantifying and explaining parameter heterogeneity in the capital regulation-bank risk nexus. *Journal of Financial Stability*, 8, 57-68.

Flannery, M., (2014). Maintaining Adequate Bank Capital, *Journal of Money, Credit and Banking*, forthcoming.

Gennaioli, N., Martin, A., Rossi, S., (2014). Sovereign default, domestic banks, and financial Institutions, *Journal of Finance* 69, 819-866.

Gianetti, M., Laeven, L., (2012). The flight home effect: Evidence from the syndicated loan market during the financial crises, *Journal of Financial Economics* 104, 23-43.

Houston, J., Lin, C., Lin, P., Ma, Y., (2010). Creditor rights, information sharing and bank risk taking, *Journal of Financial Economics* 96, 485-512.

Houston, J., Lin, C., Ma, Y., (2012). Regulatory Arbitrage and International Bank Flows, *Journal of Finance* 67, 1845-1895.

Kaufmann, D., Kraay, A., Mastruzzi, M., (2009). Governance Matters VII: Governance Indicators for 1996-2008, *World Bank Policy Research Working Paper 4978*, World Bank, Washington, D.C.

Kleimeier, S., Sander, H., Heuchemer, S., (2013). Financial Crises and Cross-Border Banking: New Evidence, *Journal of International Money and Finance* 32, 884-915.

Longstaff, F., Pan, J., Pedersen, L., Singleton, K., (2011). How sovereign is sovereign credit risk? American Economic Journal: Macroeconomics 3, 75-103.

Lowe, P., (2002). Credit risk measurement and procyclicality. BIS working paper No. 116.

Opp, C., Opp, M., Harris, M., (2013). Rating agencies in the face of regulation, *Journal of Financial Economics* 108, 46-61.

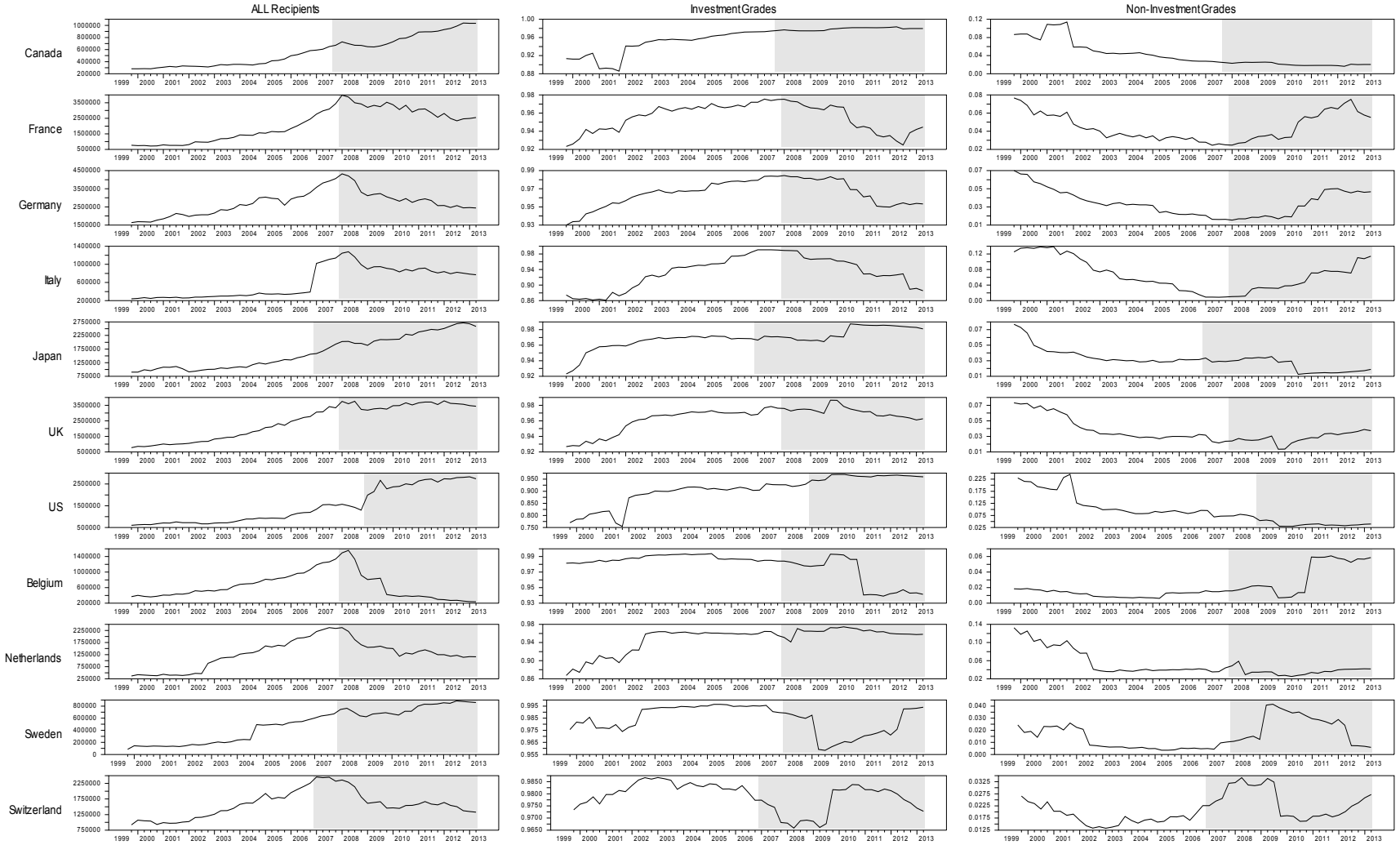
Papaioannou, E., (2009). What Drives International Bank Flows? Politics, Institutions and other Determinants. *Journal of Development Economics* 88, 269-281.

Portes, R., Rey, H., (2005). The determinants of cross-border equity flows, *Journal of International Economics* 65, 269-296.

Reinhart, C. M., Rogoff, K.S., (2011). From Financial Crash to Debt Crisis, *American Economic Review* 101, 1676–1706.

Van Roy, P., (2005). Credit ratings and the standardized approach to credit risk in Basel 2. ECB working paper series no. 517, European Central Bank, Frankfurt-am-Main.

**Figure 1. G-10 countries' total cross border claims and proportions to Investment and Non-Investment grade debtor countries**



## Table 1. List of borrower countries

This table lists the 77 borrower countries examined in this study. The sample covers 7 regional groups and both OECD and non-OECD countries.

| East Asia & Pacific | Europe & Central Asia | | Latin America & Caribbean | Middle East & North Africa | North America | South Asia | Sub-Saharan Africa |
|---|---|---|---|---|---|---|---|
| Australia | Austria | Latvia | Argentina | Egypt | Canada | India | South Africa |
| China | Belgium | Lithuania | Barbados | Israel | United States | Pakistan | |
| Hong Kong | Bulgaria | Luxembourg | Bolivia | Jordan | | | |
| Indonesia | Croatia | Netherlands | Brazil | Lebanon | | | |
| Japan | Cyprus | Norway | Chile | Malta | | | |
| Korea | Czech Republic | Poland | Colombia | Morocco | | | |
| Malaysia | Denmark | Portugal | CostaRica | Oman | | | |
| New Zealand | Estonia | Romania | Dominican Republic | Qatar | | | |
| Philippines | Finland | Russia | Ecuador | Tunisia | | | |
| Thailand | France | Slovakia | El Salvador | | | | |
| | Germany | Slovenia | Guatemala | | | | |
| | Greece | Spain | Jamaica | | | | |
| | Hungary | Sweden | Mexico | | | | |
| | Iceland | Switzerland | Panama | | | | |
| | Ireland | Turkey | Paraguay | | | | |
| | Italy | Ukraine | Peru | | | | |
| | Kazakhstan | United kingdom | Trinidad & Tobago | | | | |
| | | | Uruguay | | | | |
| | | | Venezuela | | | | |
| 10 | 34 | | 19 | 9 | 2 | 2 | 1 |

## Table 2. Descriptive statistics on sovereign re-ratings and risk weight changes

Sovereign credit rating assessments from three credit rating agencies and their numerical conversions are summarized below. Investment grade is between the scores 11 to 20, while non-investment grade is 10 or below. Within investment grade, the scores of 17 and above are classified as high quality ratings and the scores between 11 and 16 as medium quality ratings.

| S&P | Moodys | Fitch | Ratings Score | Basel 2 Risk Weight (RW) | Number of RW Changes on Average Ratings | | Number of Rating changes on Average Ratings within each RW | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Upgrade | Downgrade | Upgrade | Downgrade |
| **Investment Grade** | | | | | | | | |
| AAA | Aaa | AAA | 20 | 0 | | | 84 | 57 |
| AA+ | Aa1 | AA+ | 19 | 0 | | | | |
| AA | Aa2 | AA | 18 | 0 | | | | |
| AA- | Aa3 | AA- | 17 | 0 | 4 | | | |
| A+ | A1 | A+ | 16 | 20 | | 7 | 143 | 48 |
| A | A2 | A | 15 | 20 | | | | |
| A- | A3 | A- | 14 | 20 | 14 | | | |
| BBB+ | Baa1 | BBB+ | 13 | 50 | | 11 | 170 | 73 |
| BBB | Baa2 | BBB | 12 | 50 | | | | |
| BBB- | Baa3 | BBB- | 11 | 50 | 18 | | | |
| **Non-Investment Grade** | | | | | | | | |
| BB+ | Ba1 | BB+ | 10 | 100 | | 11 | 323 | 173 |
| BB | Ba2 | BB | 9 | 100 | | | | |
| BB- | Ba3 | BB- | 8 | 100 | | | | |
| B+ | B1 | B+ | 7 | 100 | | | | |
| B | B2 | B | 6 | 100 | | | | |
| B- | B3 | B- | 5 | 100 | 12 | | | |
| CCC+ | Caa1 | CCC | 4 | 150 | | 14 | 37 | 48 |
| CCC | Caa2 | CC | 3 | 150 | | | | |
| CCC- | Caa3 | C | 2 | 150 | | | | |
| CC | Ca | RD | 1 | 150 | | | | |
| SD | C | D | 0 | 150 | | | | |
| | | | | | 48 | 43 | 757 | 399 |

*Source: Authors' compilations from the respective web sites of each rating agency and Bloomberg.*

## Table 3. The effects of sovereign rating changes on bilateral bank claims

The table below reports the results of the panel estimations (with country fixed-effects) of quarterly percentage changes in bilateral foreign claims of G10 countries against 77 borrower countries. The subscript *j* represent the 77 borrower countries and the superscript *i* represent G10 lender countries. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

$$\Delta BankClaims^{i}_{j,t} = \alpha_0 \cdot \Delta BankClaims^{i}_{j,t-1} + \alpha_1 \cdot B2DUM^{i}_{j,t} + \alpha_2 \cdot \Delta Rating^{PreB2}_{j,t-1} + \alpha_3 \cdot \Delta Rating^{PostB2}_{j,t-1}$$
$$+ \beta_1 \cdot DIST^{i}_{j,t} + \beta_2 \cdot DOTXM^{i}_{j,t} + \beta_3 \cdot LTPORT^{i}_{j,t} + \beta_4 \cdot GDP^{i}_{j,t}$$
$$+ \beta_5 \cdot SMCAPGDP_{j,t} + \beta_6 \cdot LIQTOASSET_{j,t} + \beta_7 \cdot WBREGQLTY_{j,t} + \varepsilon_{j,t}$$

### Panel A: Investment grade countries

| | CAD | FRA | GER | ITA | JPN | UK | US | BEL | NLD | SWE | SWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\Delta BankClaims^{i}_{j,t-1}$ | -0.1948 *** | -0.2213 *** | -0.0938 *** | -0.2369 *** | -0.0537 | -0.1998 *** | -0.2734 *** | -0.1405 *** | -0.2046 *** | -0.1309 *** | -0.2058 *** |
| | {0.0000} | {0.0000} | {0.0028} | {0.0000} | {0.2765} | {0.0019} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} |
| $B2DUM^{i}_{j,t}$ | -2.2024 ** | -8.5193 *** | -4.8854 *** | -8.8643 *** | 0.1630 | -3.2998 ** | 2.9134 ** | -16.3795 *** | -9.2011 *** | -4.8299 *** | -5.9534 *** |
| | {0.0347} | {0.0000} | {0.0000} | {0.0000} | {0.8150} | {0.0109} | {0.0106} | {0.0000} | {0.0000} | {0.0025} | {0.0000} |
| $\Delta Rating^{PreB2}_{t-1}$ | -1.2307 | -8.3396 | 0.2502 | 0.1355 | -1.4923 | -1.7400 | -0.4949 | 6.6242 | 7.2985 | 9.6844 | -5.9762 |
| | {0.7410} | {0.1528} | {0.9342} | {0.9840} | {0.6956} | {0.7605} | {0.9141} | {0.3915} | {0.1312} | {0.2616} | {0.5219} |
| $\Delta Rating^{PostB2}_{j,t-1}$ | 9.1934 | 1.0115 | 4.0116 *** | 2.0124 | 5.1284 ** | 9.6268 *** | 3.1509 | -0.3197 | 1.4777 | 5.9408 * | -0.6843 |
| | {0.1403} | {0.6758} | {0.0053} | {0.3907} | {0.0226} | {0.0004} | {0.3408} | {0.8852} | {0.4926} | {0.0713} | {0.8256} |
| $DIST^{i}_{j,t}$ | -0.0004 *** | -0.0007 *** | -0.0002 * | -0.0009 *** | 0.0006 * | -0.0002 * | -0.0002 | -0.0003 * | -0.0001 | -0.0002 | -0.0003 |
| | {0.0034} | {0.0000} | {0.0658} | {0.0001} | {0.0775} | {0.0808} | {0.1058} | {0.0920} | {0.5064} | {0.4846} | {0.1204} |
| $DOTXM^{i}_{j,t}$ | 0.2116 | -0.6383 * | 0.1383 | -0.4004 | 1.1365 *** | 0.0488 | -0.7159 *** | -0.0663 | 0.1964 | 0.3717 | -0.3153 |
| | {0.3559} | {0.0922} | {0.5627} | {0.1295} | {0.0000} | {0.8409} | {0.0022} | {0.8424} | {0.4896} | {0.2160} | {0.2840} |
| $LTPORT^{i}_{j,t}$ | -0.0902 | -0.0752 | 0.0769 | 0.1337 | 0.2349 | -0.0074 | 0.3715 *** | -0.0220 | -0.0789 | -0.2002 | 0.1776 |
| | {0.5425} | {0.7496} | {0.5906} | {0.2629} | {0.1411} | {0.9437} | {0.0075} | {0.9276} | {0.6118} | {0.1083} | {0.1903} |
| $GDP^{i}_{j,t}$ | -0.0902 | 1.6683 ** | -0.3382 | 1.0520 * | -2.9642 *** | 0.3410 | 1.3020 *** | 0.4393 | -0.1685 | -0.2009 | 0.5622 |
| | {0.7841} | {0.0232} | {0.4494} | {0.0548} | {0.0000} | {0.4752} | {0.0046} | {0.4561} | {0.7773} | {0.7288} | {0.3009} |
| $SMCAPGDP_{j,t}$ | 0.0283 *** | 0.0517 *** | 0.0510 *** | 0.0744 *** | 0.0543 *** | 0.0153 * | 0.0617 *** | 0.0274 * | 0.0091 | 0.0151 | 0.0639 *** |
| | {0.0060} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0620} | {0.0000} | {0.0998} | {0.4136} | {0.2131} | {0.0000} |
| $LIQTOASSET_{j,t}$ | -0.0128 | 0.1171 | 0.2192 * | 0.2348 ** | 0.1702 ** | -0.0292 | -0.0010 | 0.1248 | 0.1373 * | 0.0805 | 0.1500 |
| | {0.9159} | {0.2362} | {0.0519} | {0.0459} | {0.0198} | {0.8187} | {0.9916} | {0.1941} | {0.0506} | {0.7168} | {0.2354} |
| $WBREGQLTY_{j,t}$ | -1.5694 | -0.5215 | -1.1271 | -3.4964 * | 2.9425 * | -3.2370 ** | -4.1749 *** | -1.2648 | 1.6893 | -1.3693 | -1.1112 |
| | {0.2476} | {0.8591} | {0.4202} | {0.0608} | {0.0909} | {0.0120} | {0.0051} | {0.5877} | {0.3889} | {0.4584} | {0.5748} |

### Panel B: Non-Investment grade countries

| | CAD | FRA | GER | ITA | JPN | UK | US | BEL | NLD | SWE | SWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\Delta BankClaims^{i}_{j,t-1}$ | -0.0173 | -0.1729 *** | -0.1171 *** | -0.0901 *** | -0.0274 | -0.1480 ** | -0.3354 *** | -0.1691 *** | -0.2611 *** | -0.0605 * | -0.1928 *** |
| | {0.6871} | {0.0064} | {0.0018} | {0.0031} | {0.4555} | {0.0401} | {0.0026} | {0.0000} | {0.0056} | {0.0793} | {0.0003} |
| $B2DUM^{i}_{j,t}$ | 4.3778 *** | -4.0765 ** | -2.3575 * | -2.4293 | -0.9149 | 1.8401 | 2.0813 | -17.1403 *** | -9.7879 *** | -6.7202 ** | -6.3487 *** |
| | {0.0020} | {0.0317} | {0.0884} | {0.3374} | {0.5484} | {0.3426} | {0.1063} | {0.0000} | {0.0058} | {0.0149} | {0.0007} |
| $\Delta Rating^{PreB2}_{t-1}$ | -1.0829 | 4.0844 * | 6.2001 *** | 4.6685 * | 5.8782 ** | 4.1943 | 3.8492 * | 7.0193 * | 5.9446 *** | 0.8250 | 11.9987 *** |
| | {0.5061} | {0.0934} | {0.0003} | {0.0670} | {0.0143} | {0.1845} | {0.0658} | {0.0767} | {0.0044} | {0.7934} | {0.0008} |
| $\Delta Rating^{PostB2}_{j,t-1}$ | 1.6599 | -1.3464 | 3.7537 ** | 3.4409 | 2.9932 | 5.1136 * | 6.0674 | 6.1240 | -1.5718 | 4.0703 | 3.3341 |
| | {0.1127} | {0.7726} | {0.0290} | {0.1512} | {0.2323} | {0.0518} | {0.1705} | {0.2233} | {0.5021} | {0.3269} | {0.1243} |
| $DIST^{i}_{j,t}$ | -0.0005 | -0.0004 | -0.0002 | -0.0008 * | 0.0002 | -0.0002 | -0.0001 | -0.0003 | -0.0003 | -0.0004 | -0.0003 |
| | {0.2881} | {0.2952} | {0.2282} | {0.0727} | {0.5081} | {0.3984} | {0.5121} | {0.4687} | {0.4677} | {0.3369} | {0.2573} |
| $DOTXM^{i}_{j,t}$ | 0.6965 | -0.5154 | -0.0831 | 0.1549 | 0.3229 | 0.0623 | -0.2582 | 0.1249 | 0.3890 | 0.8328 * | -0.6531 * |
| | {0.2058} | {0.3838} | {0.6261} | {0.7917} | {0.3757} | {0.8073} | {0.3351} | {0.8097} | {0.4702} | {0.0842} | {0.0597} |
| $LTPORT^{i}_{j,t}$ | -0.0083 | 0.1883 | 0.0457 | 0.2225 | 0.2138 | 0.0895 | 0.1038 | 0.3305 | 0.3823 | -0.0368 | 0.1539 |
| | {0.9369} | {0.1188} | {0.4335} | {0.1413} | {0.2853} | {0.3630} | {0.5375} | {0.1243} | {0.2345} | {0.8386} | {0.2207} |
| $GDP^{i}_{j,t}$ | -1.2555 | 0.8348 | 0.2233 | -0.3230 | -1.1035 | -0.1244 | 0.4175 | -0.2367 | -0.9359 | -1.2138 | 1.2808 ** |
| | {0.1550} | {0.4833} | {0.5798} | {0.7931} | {0.1588} | {0.8084} | {0.4695} | {0.8197} | {0.4276} | {0.1849} | {0.0498} |
| $SMCAPGDP_{j,t}$ | 0.0253 | 0.0974 * | -0.0013 | 0.1082 ** | 0.0905 *** | 0.0413 | 0.0656 *** | 0.0789 * | 0.0070 | 0.0613 * | 0.0691 *** |
| | {0.6326} | {0.0508} | {0.9332} | {0.0243} | {0.0006} | {0.1370} | {0.0034} | {0.0682} | {0.9174} | {0.0884} | {0.0031} |
| $LIQTOASSET_{j,t}$ | 0.0033 | 0.1224 | 0.0272 | 0.0671 | 0.1445 * | 0.0094 | 0.1176 ** | -0.0832 | 0.0188 | 0.0278 | 0.1300 |
| | {0.9674} | {0.1545} | {0.5692} | {0.5112} | {0.0576} | {0.8913} | {0.0187} | {0.4659} | {0.7881} | {0.7602} | {0.2192} |
| $WBREGQLTY_{j,t}$ | 1.3588 | -4.9279 ** | -0.3207 | 0.8755 | -0.1379 | 1.2316 | -0.6912 | -3.7095 | 4.2163 | -1.0191 | -3.4141 |
| | {0.5310} | {0.0498} | {0.7933} | {0.7379} | {0.9493} | {0.5412} | {0.7359} | {0.2875} | {0.1996} | {0.7092} | {0.1227} |

## Table 4. The effects of sovereign rating and risk weight changes on bilateral bank claims

The table below reports the results of the panel estimations (with country fixed-effects) of quarterly percentage changes in bilateral foreign claims of G10 countries against 77 borrower countries. The subscript *j* represent the 77 borrower countries and the superscript *i* represent G10 lender countries. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

$$\Delta BankClaims^{i}_{j,t} = \alpha_0 \cdot \Delta BankClaims^{i}_{j,t-1} + \alpha_1 \cdot B2DUM^{i}_{j,t} + \alpha_2 \cdot \Delta Rating\_NRWC^{\mathrm{PreB2}}_{j,t-1} \cdot + \alpha_3 \cdot \Delta Rating\_RWC^{\mathrm{Pr}\,eB2}_{j,t-1} \cdot$$
$$+ \alpha_4 \cdot \Delta Rating\_NRWC^{\mathrm{PostB2}}_{j,t-1} \cdot + \alpha_5 \cdot \Delta Rating\_RWC^{PostB2}_{j,t-1} + \beta_1 \cdot DIST^{i}_{j,t} + \beta_2 \cdot DOTXM^{i}_{j,t}$$
$$+ \beta_3 \cdot LTPORT^{i}_{j,t} + \beta_4 \cdot GDP^{i}_{j,t} + \beta_5 \cdot SMCAPGDP_{j,t} + \beta_6 \cdot LIQTOASSET_{j,t} + \beta_7 \cdot WBREGQLTY_{j,t} + \varepsilon_{j,t}$$

### Panel A: Investment grade countries

| | CAD | FRA | GER | ITA | JPN | UK | US | BEL | NLD | SWE | SWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\Delta BankClaims^{i}_{j,t-1}$ | -0.1948 *** | -0.2218 *** | -0.0949 *** | -0.2373 *** | -0.1948 *** | -0.1990 *** | -0.2735 *** | -0.1406 *** | -0.1948 *** | -0.2062 *** | -0.1301 *** |
| | {0.0000} | {0.0000} | {0.0024} | {0.0000} | {0.0000} | {0.0020} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} |
| $B2DUM^{i}_{j,t}$ | -2.2306 ** | -8.5675 *** | -4.9052 *** | -8.8328 *** | -2.2306 ** | -3.3138 ** | 2.9659 *** | -16.3831 *** | -2.2306 ** | -5.9530 *** | -4.8327 *** |
| | {0.0321} | {0.0000} | {0.0000} | {0.0000} | {0.0321} | {0.0106} | {0.0097} | {0.0000} | {0.0321} | {0.0000} | {0.0024} |
| $\Delta Rating\_NRWC^{PreB2}_{j,t-1}$ | -2.1446 | -11.3465 * | -1.0054 | 3.1543 | -2.1446 | -4.8361 | 1.2629 | 5.8878 | -2.1446 | -5.3152 | 4.4627 |
| | {0.6112} | {0.0518} | {0.7704} | {0.6870} | {0.6112} | {0.4526} | {0.8575} | {0.5071} | {0.6112} | {0.6179} | {0.6108} |
| $\Delta Rating\_RWC^{PreB2}_{j,t-1}$ | 3.2633 | 5.3925 | 5.9498 | -13.2038 | 3.2633 | 13.0778 * | -2.8395 | 9.9323 | 3.2633 | -9.1248 | 31.3476 |
| | {0.5539} | {0.7250} | {0.2608} | {0.2038} | {0.5539} | {0.0968} | {0.5953} | {0.4086} | {0.5539} | {0.5828} | {0.1337} |
| $\Delta Rating\_NRWC^{PostB2}_{j,t-1}$ | 6.2725 | -0.3170 | 2.5552 | 3.7119 | 6.2725 | 8.8109 | 2.8347 | -0.1212 | 6.2725 | -4.7826 | 9.7429 |
| | {0.2343} | {0.2253} | {0.0011} | {0.7184} | {0.2343} | {0.0029} | {0.4301} | {0.8072} | {0.2343} | {0.3582} | {0.5321} |
| $\Delta Rating\_RWC^{PostB2}_{j,t-1}$ | 11.6393 | 2.2791 | 5.4010 *** | 0.6051 | 11.6393 | 10.3670 *** | 3.6676 | -0.5074 | 11.6393 | 3.5415 | 2.4662 |
| | {0.2343} | {0.2253} | {0.0011} | {0.7184} | {0.2343} | {0.0029} | {0.4301} | {0.8072} | {0.2343} | {0.3582} | {0.5321} |
| $DIST^{i}_{j,t}$ | -0.0004 *** | -0.0007 *** | -0.0002 * | -0.0009 *** | -0.0004 *** | -0.0002 * | -0.0002 | -0.0003 * | -0.0004 *** | -0.0003 | -0.0002 |
| | {0.0036} | {0.0000} | {0.0715} | {0.0001} | {0.0036} | {0.0874} | {0.1045} | {0.0917} | {0.0036} | {0.1321} | {0.4797} |
| $DOTXM^{i}_{j,t}$ | 0.2067 | -0.6575 * | 0.1442 | -0.4073 | 0.2067 | 0.0496 | -0.7205 *** | -0.0660 | 0.2067 | -0.3153 | 0.3782 |
| | {0.3687} | {0.0839} | {0.5478} | {0.1222} | {0.3687} | {0.8392} | {0.0021} | {0.8431} | {0.3687} | {0.2810} | {0.2090} |
| $LTPORT^{i}_{j,t}$ | -0.0887 | -0.0745 | 0.0761 | 0.1432 | -0.0887 | -0.0123 | 0.3746 *** | -0.0225 | -0.0887 | 0.1723 | -0.2023 |
| | {0.5494} | {0.7543} | {0.5968} | {0.2323} | {0.5494} | {0.9075} | {0.0070} | {0.9259} | {0.5494} | {0.2007} | {0.1057} |
| $GDP^{i}_{j,t}$ | -0.0816 | 1.7040 ** | -0.3522 | 1.0593 * | -0.0816 | 0.3462 | 1.3057 *** | 0.4392 | -0.0816 | 0.5630 | -0.2086 |
| | {0.8049} | {0.0208} | {0.4322} | {0.0526} | {0.8049} | {0.4706} | {0.0046} | {0.4566} | {0.8049} | {0.2975} | {0.7192} |
| $SMCAPGDP_{j,t}$ | 0.0286 *** | 0.0518 *** | 0.0511 *** | 0.0743 *** | 0.0286 *** | 0.0153 * | 0.0620 *** | 0.0274 * | 0.0286 *** | 0.0637 *** | 0.0155 |
| | {0.0057} | {0.0000} | {0.0000} | {0.0000} | {0.0057} | {0.0607} | {0.0000} | {0.0995} | {0.0057} | {0.0000} | {0.2013} |
| $LIQTOASSET_{j,t}$ | -0.0124 | 0.1157 | 0.2195 * | 0.2370 ** | -0.0124 | -0.0355 | -0.0022 | 0.1243 | -0.0124 | 0.1503 | 0.0777 |
| | {0.9189} | {0.2450} | {0.0519} | {0.0440} | {0.9189} | {0.7823} | {0.9815} | {0.1950} | {0.9189} | {0.2329} | {0.7272} |
| $WBREGQLTY_{j,t}$ | -1.5914 | -0.4523 | -1.0757 | -3.5436 * | -1.5914 | -3.2407 ** | -4.1722 *** | -1.2594 | -1.5914 | -1.0789 | -1.4049 |
| | {0.2418} | {0.8786} | {0.4447} | {0.0570} | {0.2418} | {0.0118} | {0.0053} | {0.5892} | {0.2418} | {0.5839} | {0.4493} |

### Panel B: Non-Investment grade countries

| | CAD | FRA | GER | ITA | JPN | UK | US | BEL | NLD | SWE | SWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\Delta BankClaims^{i}_{j,t-1}$ | -0.0176 | -0.1729 *** | -0.1187 *** | -0.0904 *** | -0.0176 | -0.1479 ** | -0.3322 *** | -0.1674 *** | -0.0176 | -0.1927 *** | -0.0613 * |
| | {0.6821} | {0.0062} | {0.0015} | {0.0030} | {0.6821} | {0.0400} | {0.0023} | {0.0000} | {0.6821} | {0.0003} | {0.0749} |
| $B2DUM^{i}_{j,t}$ | 4.3500 *** | -4.1653 ** | -2.4292 * | -2.4248 | 4.3500 *** | 1.8058 | 2.2360 * | -17.0816 *** | 4.3500 *** | -6.3412 *** | -6.6279 ** |
| | {0.0022} | {0.0292} | {0.0790} | {0.3382} | {0.0022} | {0.3496} | {0.0839} | {0.0000} | {0.0022} | {0.0008} | {0.0160} |
| $\Delta Rating\_NRWC^{PreB2}_{j,t-1}$ | -0.7867 | 5.2952 * | 7.6348 *** | 6.7787 * | -0.7867 | 2.4679 | 4.9430 ** | 3.7746 | -0.7867 | 13.0196 *** | 1.4678 |
| | {0.7208} | {0.0520} | {0.0002} | {0.0501} | {0.7208} | {0.5082} | {0.0473} | {0.3771} | {0.7208} | {0.0043} | {0.6811} |
| $\Delta Rating\_RWC^{PreB2}_{j,t-1}$ | -1.7462 | 0.8071 | 2.2976 | -1.0925 | -1.7462 | 8.9551 | 1.0808 | 16.0883 * | -1.7462 | 9.3146 ** | -2.3959 |
| | {0.2429} | {0.8615} | {0.2086} | {0.5016} | {0.2429} | {0.1647} | {0.7259} | {0.0784} | {0.2429} | {0.0358} | {0.6660} |
| $\Delta Rating\_NRWC^{PostB2}_{j,t-1}$ | 3.3580 | 1.5760 | 5.6431 | 2.2833 | 3.3580 | 6.2975 | -2.0271 | 5.0291 | 3.3580 | 2.7213 | 0.5331 |
| | {0.9941} | {0.1936} | {0.1237} | {0.0644} | {0.9941} | {0.0571} | {0.0036} | {0.2571} | {0.9941} | {0.1757} | {0.0877} |
| $\Delta Rating\_RWC^{PostB2}_{j,t-1}$ | 0.0042 | -4.3065 | 1.8231 | 4.5323 * | 0.0042 | 4.0228 * | 13.6724 *** | 7.4259 | 0.0042 | 3.9090 | 6.6897 * |
| | {0.9941} | {0.1936} | {0.1237} | {0.0644} | {0.9941} | {0.0571} | {0.0036} | {0.2571} | {0.9941} | {0.1757} | {0.0877} |
| $DIST^{i}_{j,t}$ | -0.0005 | -0.0004 | -0.0002 | -0.0008 * | -0.0005 | -0.0002 | -0.0001 | -0.0004 | -0.0005 | -0.0003 | -0.0003 |
| | {0.2883} | {0.3000} | {0.2369} | {0.0791} | {0.2883} | {0.3629} | {0.4948} | {0.4298} | {0.2883} | {0.2732} | {0.3634} |
| $DOTXM^{i}_{j,t}$ | 0.6977 | -0.5216 | -0.0927 | 0.1583 | 0.6977 | 0.0596 | -0.2355 | 0.1186 | 0.6977 | -0.6531 * | 0.8471 * |
| | {0.2054} | {0.3779} | {0.5856} | {0.7857} | {0.2054} | {0.8158} | {0.3603} | {0.8180} | {0.2054} | {0.0593} | {0.0797} |
| $LTPORT^{i}_{j,t}$ | -0.0091 | 0.1823 | 0.0448 | 0.2148 | -0.0091 | 0.0888 | 0.1201 | 0.3256 | -0.0091 | 0.1540 | -0.0349 |
| | {0.9316} | {0.1286} | {0.4452} | {0.1536} | {0.9316} | {0.3700} | {0.4316} | {0.1289} | {0.9316} | {0.2189} | {0.8467} |
| $GDP^{i}_{j,t}$ | -1.2560 | 0.8537 | 0.2437 | -0.3311 | -1.2560 | -0.1110 | 0.3506 | -0.2150 | -1.2560 | 1.2773 * | -1.2522 |
| | {0.1546} | {0.4744} | {0.5449} | {0.7868} | {0.1546} | {0.8293} | {0.5241} | {0.8349} | {0.1546} | {0.0501} | {0.1723} |
| $SMCAPGDP_{j,t}$ | 0.0242 | 0.0962 * | -0.0020 | 0.1075 ** | 0.0242 | 0.0415 | 0.0665 *** | 0.0798 * | 0.0242 | 0.0689 *** | 0.0625 * |
| | {0.6472} | {0.0526} | {0.8945} | {0.0249} | {0.6472} | {0.1372} | {0.0027} | {0.0645} | {0.6472} | {0.0031} | {0.0831} |
| $LIQTOASSET_{j,t}$ | 0.0032 | 0.1201 | 0.0262 | 0.0674 | 0.0032 | 0.0083 | 0.1179 ** | -0.0793 | 0.0032 | 0.1293 | 0.0301 |
| | {0.9689} | {0.1631} | {0.5809} | {0.5081} | {0.9689} | {0.9038} | {0.0149} | {0.4859} | {0.9689} | {0.2188} | {0.7412} |
| $WBREGQLTY_{j,t}$ | 1.3238 | -4.9859 ** | -0.3668 | 0.8514 | 1.3238 | 1.2226 | -0.6473 | -3.5860 | 1.3238 | -3.4007 | -1.0930 |
| | {0.5447} | {0.0460} | {0.7627} | {0.7429} | {0.5447} | {0.5460} | {0.7473} | {0.3012} | {0.5447} | {0.1231} | {0.6913} |

## Table 5. The effects of risk weights on bilateral bank claims against banking sector and public sector borrowers

This appendix presents the effects of sovereign ratings changes on each of the lender country's foreign claims (measured on an ultimate risk basis) on the target countries' public and banking sector borrowers as reported in Table 9E in the BIS's consolidated international banking statistics for the period Q1:2005 to Q2:2013. Out of the G10 country lenders only five countries have consistently reported their banking sector's sectorial breakdown in cross-border positions and these are Italy, Japan, the U.K., the U.S. and Sweden. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

| | Investment-Grade | | | | | Non-Investment-Grade | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Italy | Japan | UK | US | Sweden | Italy | Japan | UK | US | Sweden |
| *Panel A: Public Sector* | | | | | | | | | | |
| $\Delta BankClaims^{i}_{j,t-1}$ | -0.2341 *** | -0.2464 *** | -0.2778 *** | -0.2062 *** | -0.2703 *** | -0.2349 *** | -0.0296 | -0.2181 *** | -0.2226 *** | -0.3569 *** |
| | {0.0000} | {0.0005} | {0.0000} | {0.0000} | {0.0000} | {0.0071} | {0.6461} | {0.0001} | {0.0026} | {0.0001} |
| $B2DUM^{i}_{j,t}$ | 120.5302 | -2.6350 | -0.7934 | 7.3927 ** | 0.6818 | -184.7531 | -17.6173 *** | -10.9520 | -3.5033 | -3.4883 |
| | {0.4628} | {0.3435} | {0.8318} | {0.0162} | {0.8899} | {0.5358} | {0.0000} | {0.1048} | {0.3546} | {0.7696} |
| $\Delta Rating\_NRWC^{PreB2}_{j,t-1}$ | -116.6399 | 24.5921 | 10.0899 | 51.1040 * | 60.6589 * | 25.4758 | 19.6499 | -24.8788 | -12.2674 | -30.9194 |
| | {0.2209} | {0.4548} | {0.6913} | {0.0738} | {0.0659} | {0.7961} | {0.2584} | {0.1354} | {0.5614} | {0.6214} |
| $\Delta Rating\_RWC^{PreB2}_{j,t-1}$ | | 51.7441 | 133.1119 | 5.8020 | 80.3491 | | | | 3.0060 | |
| | | {0.1026} | {0.2626} | {0.4795} | {0.1202} | | | | {0.6869} | |
| $\Delta Rating\_NRWC^{PostB2}_{j,t-1}$ | 9.0480 | -6.3865 | 2.4076 | -0.8156 | 17.4654 | -2.1565 | -9.7642 | 15.5817 | 2.4386 | -15.9038 |
| | {0.2389} | {0.2832} | {0.7461} | {0.9240} | {0.4174} | {0.7322} | {0.1492} | {0.1554} | {0.8354} | {0.2258} |
| $\Delta Rating\_RWC^{PostB2}_{j,t-1}$ | 7.3859 ** | -1.8800 | 17.2469 *** | 8.0131 | 1.1102 | 5.5457 | -1.0028 | -4.0158 | 22.3751 *** | 7.5460 |
| | {0.0352} | {0.8408} | {0.0024} | {0.3740} | {0.9179} | {0.1771} | {0.9046} | {0.5744} | {0.0000} | {0.3503} |
| Controls included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Panel B: Banking Sector* | | | | | | | | | | |
| $\Delta BankClaims^{i}_{j,t-1}$ | -0.2631 *** | -0.1391 ** | -0.2921 *** | -0.2958 *** | -0.3299 *** | -0.2779 *** | -0.1737 *** | -0.2524 *** | -0.1813 *** | -0.3431 *** |
| | {0.0000} | {0.0242} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0034} | {0.0007} | {0.0000} | {0.0001} |
| $B2DUM^{i}_{j,t}$ | 75.6679 | -3.4669 | -10.2185 *** | -1.0438 | -13.9593 *** | 104.9776 | 12.1717 | -2.7127 | -5.0431 | -15.9106 |
| | {0.5605} | {0.1867} | {0.0001} | {0.7278} | {0.0006} | {0.7844} | {0.1227} | {0.5842} | {0.1862} | {0.2426} |
| $\Delta Rating\_NRWC^{PreB2}_{j,t-1}$ | 127.8898 ** | -25.1075 | 1.9290 | 3.5130 | -22.0645 | -10.8800 | 81.8904 ** | -4.0675 | 14.6110 | 39.2369 |
| | {0.0148} | {0.3002} | {0.8729} | {0.8234} | {0.3778} | {0.8087} | {0.0244} | {0.7939} | {0.1049} | {0.3249} |
| $\Delta Rating\_RWC^{PreB2}_{j,t-1}$ | | -34.5370 | 29.8382 | -6.5062 ** | -88.4071 * | | | | -8.4744 | |
| | | {0.2395} | {0.5335} | {0.0497} | {0.0927} | | | | {0.3176} | |
| $\Delta Rating\_NRWC^{PostB2}_{j,t-1}$ | 19.4521 | 7.1374 | 17.4617 | -4.6450 | 28.4135 ** | 12.9688 | 15.8834 | 8.8793 | 14.7486 * | 21.1989 |
| | {0.1095} | {0.2588} | {0.1527} | {0.6253} | {0.0387} | {0.1565} | {0.2355} | {0.1834} | {0.0859} | {0.3557} |
| $\Delta Rating\_RWC^{PostB2}_{j,t-1}$ | -1.5089 | 6.6294 ** | 18.1354 * | 35.9339 | 11.4507 * | 8.1807 | -7.0732 | -1.2565 | 6.5948 | 38.0346 *** |
| | {0.8196} | {0.0167} | {0.0683} | {0.2483} | {0.0723} | {0.3720} | {0.4641} | {0.7792} | {0.4149} | {0.0081} |
| Controls included | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

## Table 6. Ratings sensitivity for Eurozone lenders to Eurozone vs Non-Eurozone debtor countries

This table reports the effects of sovereign rating changes for Eurozone creditors' cross-border lending to borrowers within the Eurozone vs. outside of the Eurozone.

| | FRA | GER | ITA | BEL | NLD |
|---|---|---|---|---|---|
| $\Delta BankClaims^{i}_{j,t-1}$ | -0.1945 *** | -0.1002 *** | -0.1720 *** | -0.1517 *** | -0.2321 *** |
| | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} |
| $B2DUM^{i}_{j,t}$ | -7.0753 *** | -4.1828 *** | -6.5343 *** | -16.3293 *** | -9.0152 *** |
| | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} |
| $\Delta Rating\_NEuro^{PreB2}_{j,t-1}$ | 1.5742 | 4.9544 *** | 3.8268 | 5.8225 | 5.6543 *** |
| | {0.4737} | {0.0024} | {0.1420} | {0.1113} | {0.0030} |
| $\Delta Rating\_Euro^{PreB2}_{j,t-1}$ | -4.6192 | 5.6211 | -1.5847 | 18.5059 ** | 12.1551 |
| | {0.7396} | {0.1283} | {0.8468} | {0.0326} | {0.1893} |
| $\Delta Rating\_NEuro^{PostB2}_{j,t-1}$ | 1.7748 | 6.8055 | -0.0360 | 3.7239 | -1.7066 |
| | {0.6194} | {0.0068} | {0.0003} | {0.0585} | {0.6960} |
| $\Delta Rating\_Euro^{PostB2}_{j,t-1}$ | 1.0002 | 2.2386 *** | 5.4539 *** | 6.7463 * | 0.5180 |
| | {0.6194} | {0.0068} | {0.0003} | {0.0585} | {0.6960} |
| $DIST^{i}_{j,t}$ | -0.0008 *** | -0.0003 *** | -0.0009 *** | -0.0004 ** | -0.0001 |
| | {0.0000} | {0.0045} | {0.0000} | {0.0500} | {0.4168} |
| $DOTXM^{i}_{j,t}$ | -0.7969 *** | -0.0874 | -0.3335 | -0.1440 | 0.0633 |
| | {0.0017} | {0.4837} | {0.1779} | {0.6606} | {0.8184} |
| $LTPORT^{i}_{j,t}$ | 0.1380 | 0.0809 | 0.1299 | 0.1453 | 0.1661 |
| | {0.3836} | {0.1873} | {0.1913} | {0.4754} | {0.3830} |
| $GDP^{i}_{j,t}$ | 1.7608 *** | 0.1841 | 0.8491 * | 0.4220 | -0.2421 |
| | {0.0003} | {0.4565} | {0.0872} | {0.4765} | {0.6598} |
| $SMCAPGDP_{j,t}$ | 0.0623 *** | 0.0339 *** | 0.0724 *** | 0.0414 ** | 0.0123 |
| | {0.0000} | {0.0000} | {0.0000} | {0.0131} | {0.2291} |
| $LIQTOASSET_{j,t}$ | 0.1161 * | 0.0643 | 0.0626 | -0.0029 | 0.0823 |
| | {0.0866} | {0.1858} | {0.4097} | {0.9715} | {0.1119} |
| $WBREGQLTY_{j,t}$ | -1.5704 | -0.7552 | -2.2825 * | -0.5537 | 3.3722 ** |
| | {0.3626} | {0.3227} | {0.0798} | {0.7789} | {0.0240} |

## Table 7. The effects of bank claims and risk weight changes on sovereign CDS spreads

This table reports the panel estimation results of percentage quarterly CDS spread changes of 77 borrower countries modelled on lagged CDS changes Basel 2 intercept dummy, pre- and post-Basel 2 period changes in bank claims, bilateral control variables, borrower specific control variables and proxies for global volatility and liquidity. Instrument variable panel regression model is adopted due to bi-directional causal flows detected (reported in Table 4) between CDS changes and bank claim changes. The subscript *j* represent the 77 borrower countries and the superscript *i* represent the G10 lender countries. ***, **, * denote significance at the 1, 5, and 10% level, respectively.

$$\Delta CDS_{j,t} = \alpha_0 \cdot \Delta CDS_{j,t-1} + \alpha_1 \cdot B2DUM^{i}_{j,t} + \alpha_2 \cdot \Delta BankClaims\_NRWC^{i,PreB2}_{j,t-1} + \alpha_3 \cdot \Delta BankClaims\_RWC^{i,PreB2}_{j,t-1}$$
$$+ \alpha_4 \cdot \Delta BankClaims\_NRWC^{i,PostB2}_{j,t-1} + \alpha_5 \cdot \Delta BankClaims\_RWC^{i,PostB2}_{j,t-1} + \sum_k \beta_k \cdot Controls^{k}_{j,t} + \varepsilon_{j,t}$$

### Panel A: Investment grade countries

| | CAD | FRA | GER | ITA | JPN | UK | US | BEL | NLD | SWE | SWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\Delta CDS_{j,t-1}$ | 0.2817 *** | 0.2660 *** | 0.2689 *** | 0.2704 *** | 0.2320 *** | 0.2696 *** | 0.2359 *** | 0.2723 *** | 0.2425 *** | 0.2609 *** | 0.2453 |
| | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.6089} |
| $B2DUM^{i}_{j,t}$ | -9.1165 ** | 13.5604 *** | 16.1993 *** | 17.5874 *** | 38.8877 *** | 10.1688 * | -15.5415 *** | 14.1436 *** | 12.0960 ** | 32.2325 *** | 4.4829 |
| | {0.0275} | {0.0056} | {0.0016} | {0.0003} | {0.0000} | {0.0646} | {0.0019} | {0.0017} | {0.0275} | {0.0000} | {0.9812} |
| $\Delta Rating\_NRWC^{PreB2}_{j,t-1}$ | -0.2986 | 0.0855 | 0.2911 | -0.2822 | -0.2946 | -0.0392 | 0.0104 | -0.1347 | -0.1585 | 0.0545 | -3.3431 |
| | {0.1236} | {0.4448} | {0.4663} | {0.1979} | {0.8560} | {0.8491} | {0.9727} | {0.3727} | {0.3079} | {0.8251} | {0.9629} |
| $\Delta Rating\_RWC^{PreB2}_{j,t-1}$ | -4.5590 | -0.0075 | 0.2003 | -3.9575 | 7.3456 | 0.0745 | -2.1141 | 2.5972 | 0.0986 | -5.5825 | 31.0712 |
| | {0.3777} | {0.9980} | {0.7858} | {0.2059} | {0.4656} | {0.9879} | {0.6388} | {0.5766} | {0.9784} | {0.6363} | {0.9663} |
| $\Delta Rating\_NRWC^{PostB2}_{j,t-1}$ | -0.1395 *** | -0.1439 ** | -0.1355 * | -0.0736 ** | -0.1419 | 0.0466 | -0.1803 *** | -0.0715 ** | -0.1608 ** | -0.0524 | -0.0594 |
| | {0.0040} | {0.0325} | {0.0849} | {0.0468} | {0.1109} | {0.2813} | {0.0004} | {0.0346} | {0.0129} | {0.1458} | {0.9054} |
| $\Delta Rating\_RWC^{PostB2}_{j,t-1}$ | 0.0195 | 0.3394 ** | 0.8790 *** | 0.2001 | -0.0696 | 0.3132 ** | -0.2582 *** | 0.0110 | 0.1904 * | 0.0100 | 0.0074 |
| | {0.4474} | {0.0334} | {0.0006} | {0.2904} | {0.8133} | {0.0116} | {0.0032} | {0.9291} | {0.0516} | {0.9530} | {0.9983} |
| $DIST^{i}_{j,t}$ | -0.0026 *** | -0.0008 ** | -0.0010 ** | -0.0012 *** | 0.0116 *** | -0.0007 *** | -0.0029 *** | -0.0005 ** | -0.0012 *** | 0.0005 ** | -0.0035 |
| | {0.0000} | {0.0149} | {0.0334} | {0.0002} | {0.0000} | {0.0002} | {0.0000} | {0.0487} | {0.0038} | {0.0231} | {0.9547} |
| $DOTXM^{i}_{j,t}$ | -1.1334 | 0.1306 | 0.8878 | 0.6427 | 12.1378 *** | -1.2716 | -0.8955 | 0.0890 | 0.7105 | 1.6220 *** | -6.5530 |
| | {0.1591} | {0.8869} | {0.3107} | {0.3594} | {0.0001} | {0.1932} | {0.1820} | {0.8917} | {0.6187} | {0.0000} | {0.9674} |
| $LTPORT^{i}_{j,t}$ | 0.1674 | -0.0957 | -0.2718 | -0.2030 | -0.1376 | 0.2285 | -0.2582 | 0.2876 | -0.2463 | -0.4479 *** | 0.9737 |
| | {0.5606} | {0.6789} | {0.2364} | {0.4451} | {0.8728} | {0.4052} | {0.4232} | {0.1892} | {0.4850} | {0.0032} | {0.9591} |
| $GDP^{i}_{j,t}$ | 3.7820 ** | -0.2558 | -1.6437 | -1.5976 | -30.8951 *** | 2.3773 | 4.2826 *** | -0.6381 | -0.8177 | -4.2045 *** | 10.1731 |
| | {0.0145} | {0.9025} | {0.4148} | {0.2755} | {0.0000} | {0.1859} | {0.0042} | {0.6237} | {0.7863} | {0.0000} | {0.9682} |
| $SMCAPGDP_{j,t}$ | 0.0587 * | -0.0014 | -0.0093 | 0.0526 | -0.1047 * | 0.0081 | 0.0520 * | 0.0142 | 0.0051 | -0.0667 ** | 0.0715 |
| | {0.0753} | {0.9632} | {0.7833} | {0.1304} | {0.0720} | {0.7643} | {0.0658} | {0.6340} | {0.8841} | {0.0150} | {0.9536} |
| $LIQTOASSET_{j,t}$ | -0.4877 ** | -0.5634 *** | -0.6051 *** | -0.1465 | -0.5124 ** | -0.5447 *** | -0.5315 *** | -0.5207 *** | -0.6180 *** | -0.1439 | 1.4787 |
| | {0.0270} | {0.0001} | {0.0002} | {0.6841} | {0.0217} | {0.0000} | {0.0011} | {0.0010} | {0.0035} | {0.7612} | {0.9755} |
| $WBREGQLTY_{j,t}$ | -4.4492 | 2.4586 | 2.4558 | 2.3288 | 12.5820 ** | 0.4469 | -2.8657 | 0.8327 | -0.7234 | 9.6219 *** | 23.8891 |
| | {0.1931} | {0.4207} | {0.4765} | {0.4487} | {0.0222} | {0.8396} | {0.4758} | {0.7262} | {0.8798} | {0.0011} | {0.9638} |
| $CDCRD_{j,t}$ | -0.3721 | 0.6005 | 0.6987 | 0.8714 | 0.9237 | 0.4988 | -0.7941 | 0.6538 | 0.5422 | 1.1940 | 1.7640 |
| | {0.1496} | {0.0399} | {0.0141} | {0.0086} | {0.0000} | {0.1293} | {0.0131} | {0.0186} | {0.1136} | {0.0000} | {0.9471} |

### Panel B: Non-Investment grade countries

| | CAD | FRA | GER | ITA | JPN | UK | US | BEL | NLD | SWE | SWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $\Delta CDS_{j,t-1}$ | 0.2470 *** | 0.2496 *** | 0.2309 *** | 0.2465 *** | 0.2249 *** | -0.6940 | 0.1764 *** | 0.1576 | 0.2433 *** | 0.2300 *** | 0.2357 *** |
| | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.0000} | {0.9014} | {0.0009} | {0.2176} | {0.0000} | {0.0000} | {0.0000} |
| $B2DUM^{i}_{j,t}$ | 4.6375 | 14.8726 *** | 10.3789 | 16.8421 *** | 18.8341 *** | -38.6178 | -8.2114 * | 17.9245 ** | 2.7970 | 20.3180 *** | 15.5477 *** |
| | {0.5077} | {0.0013} | {0.1262} | {0.0039} | {0.0000} | {0.8960} | {0.0667} | {0.0153} | {0.8298} | {0.0000} | {0.0070} |
| $\Delta Rating\_NRWC^{PreB2}_{j,t-1}$ | -0.1629 | -0.2275 | -0.6925 *** | -1.0261 | -0.1835 | 2.8311 | -0.8598 | -0.0668 | -0.2486 | 0.1346 | -0.3134 |
| | {0.8941} | {0.5341} | {0.0000} | {0.1314} | {0.3841} | {0.8558} | {0.1725} | {0.3618} | {0.1269} | {0.4493} | {0.3756} |
| $\Delta Rating\_RWC^{PreB2}_{j,t-1}$ | -1.5924 | 0.1773 | -4.0866 | 3.4701 | -8.1480 | 379.2150 | 6.5465 | 26.8777 | 33.3333 | -0.5608 | -1.3712 |
| | {0.9188} | {0.9866} | {0.3921} | {0.6456} | {0.4010} | {0.8651} | {0.4914} | {0.4378} | {0.3316} | {0.9063} | {0.8456} |
| $\Delta Rating\_NRWC^{PostB2}_{j,t-1}$ | 0.1055 * | -0.0001 | 0.0784 * | -0.0771 ** | -0.0078 | -0.0611 | -0.0277 | 0.0303 | -0.0516 | -0.0064 | 0.0367 |
| | {0.0841} | {0.9976} | {0.0764} | {0.0387} | {0.8587} | {0.8535} | {0.4219} | {0.2293} | {0.2442} | {0.8531} | {0.2392} |
| $\Delta Rating\_RWC^{PostB2}_{j,t-1}$ | 0.3384 ** | -0.4272 | 0.2432 | -0.7797 ** | 0.0979 | -0.3113 | -0.0136 | -0.0503 | -0.1661 ** | -0.1711 | 0.0393 |
| | {0.0108} | {0.1538} | {0.3143} | {0.0240} | {0.6810} | {0.9339} | {0.6218} | {0.4892} | {0.0393} | {0.4333} | {0.8023} |
| $DIST^{i}_{j,t}$ | -0.0004 | 0.0002 | 0.0001 | -0.0005 | 0.0016 *** | 0.0053 | -0.0008 * | 0.0004 | 0.0014 | 0.0012 ** | 0.0001 |
| | {0.7135} | {0.7678} | {0.6804} | {0.6084} | {0.0077} | {0.8558} | {0.0710} | {0.6550} | {0.2670} | {0.0167} | {0.8032} |
| $DOTXM^{i}_{j,t}$ | 0.5024 | 0.2788 | 0.5800 | 1.6522 * | 3.6410 *** | 6.6779 | 0.3882 | 1.4787 | 1.1470 | 2.8111 *** | 0.9347 |
| | {0.4927} | {0.5415} | {0.1289} | {0.0921} | {0.0001} | {0.8535} | {0.5419} | {0.3921} | {0.2196} | {0.0003} | {0.1125} |
| $LTPORT^{i}_{j,t}$ | -0.0389 | -0.1484 | -0.0384 | 0.2861 | -0.4652 * | 0.5063 | 0.1966 | 0.9322 | -0.0583 | -0.2433 | 0.0958 |
| | {0.8841} | {0.2452} | {0.8257} | {0.6121} | {0.0895} | {0.8688} | {0.5284} | {0.2775} | {0.8045} | {0.3543} | {0.4904} |
| $GDP^{i}_{j,t}$ | -0.7663 | -1.1152 | -1.4885 | -4.1471 ** | -8.2065 *** | -10.7818 | -0.1166 | -4.0153 | -2.6168 | -5.8854 *** | -2.3871 ** |
| | {0.5421} | {0.2809} | {0.1332} | {0.0340} | {0.0000} | {0.8451} | {0.9342} | {0.1996} | {0.1819} | {0.0001} | {0.0290} |
| $SMCAPGDP_{j,t}$ | -0.0502 | -0.0142 | -0.0145 | 0.0795 | -0.0942 *** | 0.0171 | 0.0414 | -0.0289 | -0.1087 | -0.0899 *** | -0.0192 |
| | {0.4258} | {0.6093} | {0.6106} | {0.3444} | {0.0078} | {0.9522} | {0.3262} | {0.5371} | {0.3645} | {0.0097} | {0.5514} |
| $LIQTOASSET_{j,t}$ | -0.1342 | -0.0815 | -0.1756 | -0.0242 | -0.0177 | -2.4945 | -0.3134 ** | -0.2010 | -0.1212 | -0.0637 | -0.0700 |
| | {0.3419} | {0.3944} | {0.2283} | {0.8850} | {0.9171} | {0.8493} | {0.0469} | {0.5309} | {0.4470} | {0.6514} | {0.4660} |
| $WBREGQLTY_{j,t}$ | 2.6405 | 1.4444 | 2.7019 | 5.1038 | 4.2631 | 55.2857 | 1.5970 | -0.2503 | 13.9811 | 4.6296 | 1.8296 |
| | {0.4511} | {0.6353} | {0.2638} | {0.2710} | {0.2920} | {0.8580} | {0.6514} | {0.9793} | {0.1949} | {0.6410} | {0.4839} |
| $CDCRD_{j,t}$ | 0.1202 | 0.6841 | 0.3935 | 0.8154 | 0.5216 | -3.3117 | -0.3056 | 0.6007 | 0.1859 | 0.5584 | 0.7116 |
| | {0.7331} | {0.0164} | {0.2806} | {0.0264} | {0.0069} | {0.8766} | {0.3155} | {0.1524} | {0.7557} | {0.0013} | {0.0218} |

## Appendix Table 1. Variable Descriptions

The descriptions of the variables employed in this study and the data sources are provided below. They include the Bank for International Settlements' (BIS) bank claims and sovereign CDS spreads as dependent variables and sovereign credit ratings and other controls as independent variables. The control variables are either bilateral variables which are specific to each lender and borrower country pair, such as bilateral trade, portfolio flows and geographical distance measure, or borrower country specific variables, such as the cross-product of GDP per capita, stock market capitalization, and so on.

| Variables | Descriptions | Data Source |
|---|---|---|
| Bilateral Bank Claims | Quarterly observations on G10 country banks' foreign claims on intermediate borrower basis to 77 borrower countries, in US$ millions. | Table 9B: Foreign claims by nationality of reporting banks -immediate borrower basis, Q4:1999 - Q3:2013 |
| | Quarterly observations on G10 country banks' foreign exposures on ultimate risk basis to 77 borrower countries, in US$ millions. | Table 9E: Foreign exposures on selected individual countries, ultimate risk basis, Q1:2005 - Q3:2013 |
| Sovereign credit ratings (SovRating) | Foreign currency sovereign long-term credit rating | Standard & Poor's, Fitch, Moody's |
| Sovereign CDS spreads (CDS) | Sovereign credit default swap spreads for the 5-year maturity | The Markit Group (https://www.markit.com) |
| **Bilateral Control Variables** | | |
| Basel 2 Dummy (B2DUM) | Basel 2 indicator dummy that takes the value 1 for the quarters in the sample where Basel 2 requirements are iumplemented for each of the lending G10 countries and zero otherwise. | Various internet sources |
| Bilateral Long Term Portfolio Flows (LTPORT) | Natural log of Long term portfloio flows between G10 and brrower countries, in US$ millions | International Monetary Fund (IMF) |
| Distance (DIST) | Natural log of distance between capital cities of the target and donor country pairs in kilometers | Calculated from coordinates of capital cities obtained from CIA's world factbook: (https://www.cia.gov/library/publications/the-world-factbook/) |
| Gross Domestic Product (GDP) | Cross-product of lender country and borrower country GDP per capita | World Bank Development Indicators (WBDI) |
| Total Trade (DOTXM) | Sum of export and import between the target and donor country pairs in natural logs, US$ | IMF's direction of trade statistics |
| **Other Control Variables** | | |
| Cross border credits (CBCRD) | natural log of Cross border credtis extended, in US$ millions | BIS |
| FDI to GDP (FDIGDP) | Foreign direct investment, net inflows (% of GDP) | WBDI |
| GDP Per Capita (GDPPC) | GDP per capita (current US$) | WBDI |
| Interest Rate Spread (INTSPREAD) | Interest rate spread (lending rate minus deposit rate, %) | WBDI |
| Liquid Asset Ratio (LIQTOASSET) | Bank liquid reserves to bank assets ratio (%) | WBDI |
| Portfolio investment inflows (PORTINVGDP) | Portfolio Investment inflows to GDP | WBDI |
| Stock Market Capitalization (SMCAPGDP) | Market capitalization of listed companies (% of GDP) | WBDI |
| World Bank's Governance indicator on Regulation Quality (WBREGQLTY) | Regulatory Quality - Ranges from -2.5 to 2.5 | World Bank's Worldwide Governance Indicators (WGI) |