FSB FINANCIAL STABILITY BOARD

Evaluation of the effects of financial regulatory reforms on infrastructure finance

20 November 2018

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Table of Contents

Abbreviations

AEs	Advanced Economies
ASF	Available Stable Funding (NSFR)
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
CCF	Credit conversion factor
CCP	Central counterparty
CCR	Counterparty credit risk
CECL	Current expected credit loss model
CVA	Credit valuation adjustment (Basel III)
DiD	Difference-in-difference (statistical technique)
ECA	Export Credit Agency
ECL	Expected credit loss
EFRAG	European Financial Reporting Advisory Group
EMDEs	Emerging Market and Developing Economies
FASB	Financial Accounting Standards Board (US)
FSB	Financial Stability Board
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
G-SIB	Global systemically important bank
HLA	Higher loss absorbency
HQLA	High Quality Liquid Assets
IAIS	International Association of Insurance Supervisors
IASB	International Accounting Standards Board
ICS	Insurance Capital Standard
IF	Infrastructure Finance
IFI	International Financial Institution
IFRS	International Financial Reporting Standards
IOSCO	International Organization of Securities Commissions
IRB	Internal ratings based approach (Basel III)
LCR	Liquidity Coverage Ratio
LGD	Loss Given Default
LIQ	Liquidity ratio
LR	Leverage Ratio
MDB	Multilateral Development Bank
NCCDs	Non-centrally cleared derivatives
NSFR	Net Stable Funding Ratio
OECD	Organisation for Economic Co-operation and Development
OTC	Over-the-counter (Derivatives)
PPP	Private-public partnership
RBC	Risk-based Tier 1 capital ratio
RSF	Required Stable Funding (NSFR)
RW	Risk weight
RWAs	Risk-weighted assets
SIFI	Systemically Important Financial Institution
SPV	Special purpose vehicle
WACC	Weighted Average Cost of Capital

Executive Summary

This report presents the results of the evaluation of the effects of financial regulatory reforms on infrastructure finance (IF). The evaluation is carried out under the FSB framework for the post-implementation evaluation of the effects of the G20 financial regulatory reforms. It is part of a broader evaluation of the effects of reforms on financial intermediation, and complements work under the Argentine G20 Presidency to develop infrastructure as an asset class.

The evaluation focuses on IF provided by the financial sector in the form of corporate and project debt financing (loans and bonds), covering the types of financing that are most likely to be directly affected by financial regulation. IF provided by the financial sector accounts for a relatively small share (e.g. around 5-10%) of the global spending on infrastructure investments. Public financing, which constitutes the bulk of IF, is outside the scope of the evaluation, except to the extent that such financing supports private sources (such as via credit enhancements).

While the G20 reforms do not specifically target the provision of IF, a broad range of financial regulations can potentially affect it. This reflects the diverse nature of IF, involving different types of financial intermediaries and instruments. The reforms that have been largely implemented and are most relevant for this evaluation are the initial Basel III capital and liquidity requirements (agreed in 2010) and over-the-counter (OTC) derivatives reforms. Both sets of reforms are subject to qualitative and quantitative analyses. Other G20 reforms that may be relevant for IF but are at an earlier implementation stage (e.g. Basel III reforms finalised in December 2017, investment funds reforms accounting standards) are reviewed qualitatively, given the lack of data required for a quantitative assessment. In addition to the G20 reforms, national and regional regulations for insurers (e.g. differentiated treatment of infrastructure assets introduced recently into Solvency II and in some other jurisdictions) and pension funds (e.g. investment limits) may affect IF, and these regulations are also considered qualitatively.

The evaluation draws on a broad range of information sources and is based on multiple analyses. They include empirical analysis using micro and aggregate data on infrastructure investment; qualitative analysis, including a public survey on trends in IF and relevant drivers; extensive engagement with IF experts, including via a workshop with industry and interviews with market participants; a literature review; and public feedback on the consultative report. Notwithstanding data and methodological challenges, these sources – taken together – form the basis for the conclusions in the report.

Trend analysis suggests that the overall amount of IF has grown in recent years after a temporary drop during the financial crisis. The growth has been slower than in the pre-crisis years and is concentrated mainly within advanced economies (AEs). In the case of emerging market and developing economies (EMDEs), overall growth has been more contained, although there has been a mild upward trend in recent years. Market-based finance – mainly project and (particularly) corporate bond issuance as well as non-bank financing – has accounted for most of the IF growth in AEs in recent years. Infrastructure assets have become increasingly attractive for investors in search for yield. Notwithstanding this, the bulk of IF remains concentrated in a few global banks, particularly for financing to EMDEs. The relative importance of European financing providers, though still high, has declined relative to

financing providers from North America and Asia Pacific. All of these developments have taken place against a backdrop of accommodative monetary and financial conditions and adjustments to the structure and business models of global financial institutions in response to the crisis and the new operating environment.

Lending spreads for IF have returned to lower levels in recent years following a spike during the crisis, but they remain above pre-crisis levels. This trend, observed for IF loans and bonds in AEs, is in line with other financing types such as corporate loans and bonds. For EMDEs, credit spreads increased during the crisis and have stayed at those levels since then.

There are some key differences in the provision of IF in EMDEs compared to AEs. First, EMDEs rely much more on bank loans for IF; bond issuance has expanded in recent years, but from a low base. Second, a large proportion of IF in EMDEs takes place on a cross-border basis, reflecting greater dependence on foreign sources of capital. And third, a significant part of that financing is provided primarily in USD, although the importance of EMDE currencies has increased markedly in recent years. These features reflect differences in the size, structure and level of development of financial systems in EMDEs, as well as broader structural characteristics of those economies. Survey respondents note that the limited ability to hedge currency risks creates some disincentives for IF investments in EMDEs.

Following the crisis, new financing models and market participants have led to a greater diversity in the sources of IF and changes in market practices, but mainly in AEs. While the volume of bank-provided IF has remained broadly stable in absolute terms, its relative share has fallen commensurate with the increase in market-based finance. At the same time, banks have moved to shorter loan tenors and smaller exposures through different instruments (e.g. mini-perms, club deals), but have remained the primary providers of financing during the early stage of projects. In many cases, new patterns of finance have taken the form of co-investment models and hybrid structures, where funding sources include a mix of bonds and infrastructure debt and equity funds alongside bank loans.

Empirical analysis and other qualitative sources suggest that the effect of G20 financial reforms on IF has been of a second order relative to other factors. The empirical analysis – which is subject to certain data and methodological limitations – has necessarily focused on those G20 reforms that have been largely implemented. The analysis does not identify a significant effect of the initial Basel III reforms on volumes or prices across different groups of institutions (e.g. banks with weaker solvency and liquidity profiles vs stronger banks, global systemically important banks (G-SIBs) vs other banks). This finding is robust against a wide range of empirical specifications at different levels of aggregation (e.g. overall IF, project finance vs corporate finance, AEs versus EMDEs). In addition, bank-provided IF does not seem to have been affected disproportionately compared to other types of bank lending. Similarly, neither the empirical analysis nor industry engagement (through the workshop, the survey responses and consultation feedback) suggest that OTC derivatives reforms have materially impacted the provision of IF through changes in the availability and cost of hedging. These results – which are broadly similar for both AEs and EMDEs – are consistent with the existing literature and feedback from market participants, which identify the macro-financial environment, government policy and institutional factors as the main IF drivers. Surveyed banks rank financial regulation as second to currency risks in terms of importance as a negative driver of IF, though perceived impact is limited.

For G-SIBs, the analysis shows that the reforms have contributed to shorter average maturities of their infrastructure loans. A similar result is obtained for banks with weaker liquidity profiles, but the effect is limited in economic terms and is present only in some regression models. A reduction of IF maturities, which is observed for AE lenders but not for EMDE lenders, is driven by a combination of factors, including regulations, and is reflected in a decrease of loans with the longest maturities. This effect is not necessarily unintended, given that reducing maturity mismatch on bank balance sheets was one of the objectives of the reforms.

Ex ante impact assessment studies of the effects of core G20 reforms found strong net overall benefits. These studies generally found that reforms enhanced financial resilience by reducing the likelihood and severity (output costs) of financial crises. The current evaluation has not analysed the ex post effects of these reforms on resilience, but it has found no results to suggest that the benefits from enhanced resilience – as estimated at an aggregate level in ex-ante studies – do not apply in the narrower context of IF. Indeed, the analysis shows that the top bank IF providers with the lowest capitalisation during the crisis reduced their infrastructure lending volumes more than other banks.

A greater diversity of IF providers may contribute to the stability of IF over time. The analysis points to some substitution in recent years of bank financing by market-based financing in AEs, particularly during later stages of the investment life cycle. The empirical analysis suggests that the G20 banking reforms may have contributed to the substitution in the volume of IF, although they are only one of the drivers for this rebalancing. Such a shift, in addition to providing diversity in financing, might contribute to a better alignment of providers and users of finance based on their respective investment horizons and risk-bearing capacity.

For the financial reforms considered by this evaluation, the analysis does not identify material negative effects on IF to date. This conclusion is consistent with the observation from the literature and feedback from market participants that other, non-regulatory factors are important impediments to IF. Many of these factors are already being considered elsewhere, including the G20's work to develop infrastructure as an asset class. The conclusion also does not preclude international standard-setting bodies from continuing to assess the extent to which their standards are adequately calibrated to the particular characteristics and risks of IF. The feasibility and desirability of a different regulatory calibration for different sectors go beyond the scope of this evaluation, and would depend on factors such as the existence of a harmonised definition for IF, data availability, and considerations on the balance between complexity and risk-sensitivity of regulation.

1. Introduction

1.1 Motivation and objectives

In the aftermath of the financial crisis, the G20 launched a comprehensive programme of financial reforms to increase the resilience of the global financial system, while preserving its open and integrated structure. With the main elements of the reforms agreed and implementation underway, an analysis of the effects of these reforms is becoming possible. To that end, the FSB, in close collaboration with the standard-setting bodies, and informed by work carried out by its members and other stakeholders, has developed a framework for the post-implementation evaluation of the effects of the G20 financial regulatory reforms (Framework).[1] The Framework will guide analyses of whether these reforms are achieving their intended outcomes, and help to identify any material unintended consequences that may have to be addressed, without compromising on the objectives of the reforms.

One of the first two evaluations under the Framework is an examination of the effects of the G20 regulatory reforms on financial intermediation.[2] The evaluation has two parts: the first part involves an evaluation of the effects of reforms on the financing of infrastructure investment (for delivery to the Argentine G20 Summit in November 2018); and the second part involves an evaluation of the effects of reforms on the financing of small and medium-sized enterprises (for delivery to the Japanese G20 Presidency in 2019). This report describes the results of the first part of the financial intermediation evaluation, focusing on IF.

The motivation for this evaluation stems from the need to better understand the effects of the post-crisis reforms on the financing of real economic activity and their contribution to the G20 objective of strong, sustainable, balanced and inclusive economic growth. The annual FSB reports to the G20 on the implementation and effects of reforms have focused mainly on general trends in financial intermediation. The July 2017 report[3] concludes that higher financial system resilience is being achieved without impeding the supply of credit to the real economy. It finds that: the global financial system is more diversified, including through the growth in market-based finance; growth in total credit and bank lending has resumed in all regions, albeit at different paces; and the cost of financing has remained low. A more granular and systematic examination of financial intermediation trends and their drivers would validate whether these conclusions also apply for particular asset classes.[4]

The Argentine G20 Presidency has established, as one of its priorities, the development of infrastructure as an asset class (Box 1). Adequate infrastructure, such as energy generation and transmission, transportation, social infrastructure, telecommunication networks and water and

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1 See http://www.fsb.org/2017/07/framework-for-post-implementation-evaluation-of-the-effects-of-the-g20-financial-regulatory-reforms/.

2 The other initial evaluation under the Framework concerns the effects of post-crisis reforms on incentives to centrally clear OTC derivatives http://www.fsb.org/2018/11/incentives-to-centrally-clear-over-the-counter-otc-derivatives-2/.

3 See http://www.fsb.org/2017/07/implementation-and-effects-of-the-g20-financial-regulatory-reforms-third-annual-report/.

4 The FSB has undertaken previous work on financial regulatory factors affecting the supply of long-term investment finance, including reports to the G20 in 2013 (http://www.fsb.org/2013/02/r_130216a/, http://www.fsb.org/2013/08/r_130829g/) and 2014 (http://www.fsb.org/2014/09/r_140916/). A key conclusion of those reports was that it remained too early to fully assess the impact of reforms on the provision of long-term finance.

sanitation provision, is essential to support economic growth. A more thorough understanding of the effects of reforms on IF will support this G20 priority.

Box 1: Overview of G20 initiative to establish infrastructure as an asset class

IF has been identified by the G20 as a priority since 2010 due to its contribution to economic development, but also as a driver of growth, job creation and productivity. Given the broad consensus of a persistent IF gap, the G20 has been discussing how the global community can mobilise additional private capital to meet global infrastructure needs. To that end, infrastructure development has been selected as one of the three priorities of the Argentine 2018 G20 Presidency and relevant work will continue during the Japanese 2019 G20 Presidency.

The Argentine G20 Presidency launched an Infrastructure Working Group and agreed to facilitate necessary conditions to develop infrastructure as an asset class. To guide this work, the G20 Finance Ministers and Central Bank Governors endorsed a *Roadmap to Infrastructure as an Asset Class*. The Roadmap identified seven work streams, including regulatory frameworks and capital markets, as well as quality infrastructure and good governance. Core objectives include improving project preparations; moving towards greater standardisation of contracts and infrastructure financing instruments; addressing data gaps; and improving risk mitigation, taking into account country-specific conditions.

To date, priority has been given to the work on project preparations in view of its importance in delivering a pipeline of bankable projects that are strategic, feasible and have an efficient and well-balanced risk allocation scheme. Progress has also been made in most of the other areas. On data availability, international organisations are working to establish a global open database on infrastructure that builds on both public and private sources and leverages existing initiatives, with tangible milestones expected by the 2018 Leaders' Summit.

1.2 Scope

The evaluation examines the effects of financial regulations on the financing of infrastructure investment. The focus is on IF provided fully or partly[5] by the financial sector, which is the part of IF for which these regulations are relevant. This part accounts for a relatively small share (e.g. around 5-10%) of the global spending on infrastructure investments. The analysis covers both corporate and project debt financing (loans and bonds). Where possible, the evaluation presents IF trends and effects separately for AEs and EMDEs, while controlling for country-specific factors to the extent possible.[6]

The diverse nature of financial intermediaries and instruments in this market, as well as feedback from market participants, suggests that a broad range of financial regulations can potentially affect IF. These include both international reforms agreed by the G20 in the

[5] Public financing is outside the scope of the evaluation, except to the extent that such financing supports private sources (such as via credit enhancements).

[6] Countries are classified as AEs and EMDEs in this report in accordance with the IMF definition – see https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/groups.htm.

aftermath of the global financial crisis as well as other national and regional regulations. Consistent with the Framework, the focus is on post-implementation evaluation; that is, evaluating the effects of reforms for which implementation is well underway or completed. Those regulations that were considered most relevant for IF and have been largely implemented were subject to qualitative and (subject to data availability) quantitative analysis. Other regulations were evaluated qualitatively, given that the information required for a quantitative assessment of their effects is not available.

1.3 Approach

In accordance with the FSB framework, a team drawn from FSB member institutions (including standard-setting bodies and international organisations) has conducted the evaluation, supported by FSB Secretariat staff and research assistants from the Bank for International Settlements (BIS) (see Annex G). The FSB engaged two academic subject matter experts to provide feedback on the methodological approaches, empirical analysis and preliminary results of the evaluation.[7] The FSB Plenary and Steering Committee discussed the key results and conclusions of the evaluation.

The working group collected and analysed information from a variety of sources:

- feedback from industry outreach through a workshop on IF[8] held on 20 February 2018 in London and attended by 90 representatives from the industry (including banks, insurance firms, pension funds, asset managers and credit rating agencies) and the official sector (including FSB member organisations, international financial institutions and multilateral development banks (MDBs));
- interviews with a selection of market participants (banks, institutional investors, credit rating agencies, MDBs);
- empirical analysis of the effects of reforms using micro data procured from vendors and aggregate data on infrastructure investment (see Annex C);
- responses to a voluntary qualitative survey open to the public (including market participants) on trends in IF and relevant drivers (see Annex D);
- a review of the relevant literature in this area (see Annex F); and
- responses to a public consultation.[9]

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[7] The academic experts were selected on the basis of nominations received through a public call in March 2018 (http://www.fsb.org/2018/03/call-for-nominations-academic-expert-for-infrastructure-investment-finance-study/). Each academic signed the BIS Code of Conduct for Contractors; a disclosure and affirmation form about any possible conflicts of interest; and a confidentiality agreement. The role of the academics was limited to the provision of technical feedback for consideration by the working group, and did not involve the identification of conclusions or the write-up of this report.

[8] See the opening remarks by the FSB Secretary General (http://www.fsb.org/wp-content/uploads/Evaluating-the-effects-of-the-financial-regulatory-reforms-on-financing-for-infrastructure-investment.pdf).

[9] See the public responses to the consultative report (http://www.fsb.org/2018/09/public-responses-to-the-consultative-document-of-the-evaluation-on-the-effects-of-financial-regulatory-reforms-on-infrastructure-finance/) and a note that provides an overview of responses to consultation (http://www.fsb.org/2018/11/evaluation-of-the-effects-of-financial-regulatory-reforms-on-infrastructure-finance-overview-of-responses-to-the-consultation/).

Data availability (e.g. in terms of comprehensive and globally consistent IF coverage across instruments and sectors, information on credit quality etc.) and methodological questions (e.g. how to evaluate the effects of reforms aimed at a broad range of financial institutions on a fairly small segment of total financial intermediation) presented important challenges in carrying out this evaluation.[10] Notwithstanding these challenges, which are further described below (see section 4 and Box 1 in Annex C), the aforementioned information sources taken together form the basis for the conclusions presented in the report.

1.4 Structure of report

The rest of the report is structured as follows:

- Section 2 defines relevant concepts and describes the overall structure and trends in IF by financial market participants;
- Section 3 outlines relevant reforms potentially affecting IF, their implementation timelines and possible transmission channels;
- Section 4 presents the results of the qualitative and empirical analysis on the effects of reforms on IF; and
- Section 5 concludes by providing an overall assessment of the effects of reforms on IF.

The report also includes annexes with additional information on the: market structure and trends in IF (Annex A); regulations that are potentially relevant for this type of finance (Annex B); empirical analysis (Annex C); analysis of the qualitative survey responses (Annex D); stylised analysis of changes in regulatory capital to the cost of bank-based IF (Annex E); and review of the relevant literature (Annex F).

[10] Several other challenges of evaluating the effects of reforms as described in the FSB evaluation framework are also relevant in this context. These challenges include: separating the effects of reforms from other factors, such as unconventional monetary policies; distinguishing temporary from permanent effects; linking micro/sectoral indicators of progress with macro-level objectives; and selecting appropriate reference points and counterfactuals for assessing outcomes.

2. Trends in infrastructure finance

2.1 Definition and scope

This report analyses economic and social infrastructure assets that are fully or partly financed by the financial sector. These include assets that may also involve some form of risk sharing with the public sector, e.g. public-private partnerships (PPPs) or credit enhancements by MDBs. The analysis focuses on new[11] infrastructure debt financing (loans and bonds) in six sectors (Power, Transportation, Renewable Energy, Social Infrastructure, Telecommunications, and Water). The Oil, Mining and Gas sector is included in the scope of the analysis, but it is examined separately given that developments in this sector are largely driven by commodity prices and may therefore distort the analysis on the role of financial regulations. The analysis distinguishes between project and corporate finance given their different characteristics and regulatory treatment.

It is difficult to find reliable estimates of the proportion of privately-financed investments. Globally, privately-financed projects comprise a relatively small share (estimated at around 5-10%) of total infrastructure spending (see Annex A), with a higher share for EMDEs.[12] Infrastructure is, by nature, a public good, and the bulk of infrastructure assets is financed from public sources.

The financial sector is becoming an increasingly important source of IF. Public sources may not provide the levels of capital necessary to fully meet future infrastructure investment needs, for example due to fiscal constraints. In addition, cross-border financing is important particularly for projects in EMDEs, so IF can be a substantial source of foreign direct and portfolio investments.

2.2 Characteristics of infrastructure finance

Infrastructure projects have distinct characteristics that determine the type of financing used. These projects are usually long-term in nature, with significant initial investment outlays, deferred cash flow generation, and amortisation of financing over a long-time horizon. Hence, their investment returns are exposed to business, financial and other risks.[13] The risk profile of infrastructure projects is characterised by comparably high default rates during the initial years of project development and construction, and fairly robust and regular cash flows during later project stages when projects are fully in operation (Graphs A.11, A.12 in Annex A). Publicly

[11] The refinancing of infrastructure assets is excluded from the analysis unless stated otherwise.

[12] See, for example, the presentation by Bhattacharya and Romani on *Meeting the Infrastructure Challenge* (March 2013) for the G-24 Technical Group Meeting; and Serebrisky, Suarez-Aleman, Margot and Ramirez, *Financing Infrastructure in Latin America and the Caribbean: How, How Much and by Whom?* (November 2015).

[13] See *Understanding the challenges for infrastructure finance* by Ehlers (BIS Working Paper No 454, August 2014). The public utility aspect of infrastructure initiatives comes with many projects taking place in a highly regulated environment (e.g. with respect to technical and environmental standards and procurement rules) and – where projects attain partial public funding – potentially complex relations between public and private project partners over the lifecycle of a project.

available (but fairly limited) information on credit performance of infrastructure projects tends to confirm this pattern during the past 25 years, including during periods of stress.[14]

Market participants' decision to provide IF depends on a number of factors. They include the identification of bankable projects in the form of greenfield or brownfield assets; analysis of legal structures, political risk and, if applicable, the ability to hedge interest rate and foreign currency risks; and comparisons of returns with other potential investments, accounting for the fact that such projects are typically long-term, complex to monitor and illiquid.

A substantial share of infrastructure projects has historically been financed through project finance structures (Graph 4). In contrast with corporate finance, project finance is non-recourse (i.e. creditors have no or limited claims on the project sponsors' other assets, although there is usually a pledge on the project assets), so lenders' credit risk is based on project performance. At the same time, they have greater contractual rights on key financial and operational features of the project such as leverage ratios, debt-to-service coverage, a comprehensive set of contractual covenants and step-in rights (replacing the project developer and/or any other relevant counterparty of the special purpose vehicle (SPV)), which allows for a greater control over the project risk than in corporate lending. IF data (see below) and feedback from market participants suggest that corporate finance of infrastructure projects has gained importance recently. This can be attributed, at least in part, to the fact that corporates have been taking advantage of favourable market conditions to borrow (e.g. by issuing bonds) as a quicker and less expensive way to finance infrastructure projects.

An infrastructure project has a life cycle of several phases (see Graph 1**)**, each coming with specific challenges regarding financing and, in some cases, involving different players:[15]

- The **planning phase** marks the beginning of an infrastructure project. While there is no implementation or construction work happening during the planning phase, given the size and complexity of infrastructure projects, planning efforts can be substantial and take a significant amount of time, with corresponding material financial outlays.
- During the **construction phase** the majority of the capital outlays are made, and therefore financing needs are highest. At the same time, as the infrastructure is not yet operational and no revenues are generated by the project, no amortisation or interest on the investment can be financed from the project itself. Projects in construction and those early in the operational phase have a higher level of risk.
- During the **operational phase**, an infrastructure project generates revenues paid for by its users or a public entity through availability payments.[16] Projects often generate steady and certain cash flows during these stages. The changing risk profile (i.e. lower default probabilities compared to the construction and early operational phases) may trigger, in some cases, a change in the composition of financing. Projects reaching the

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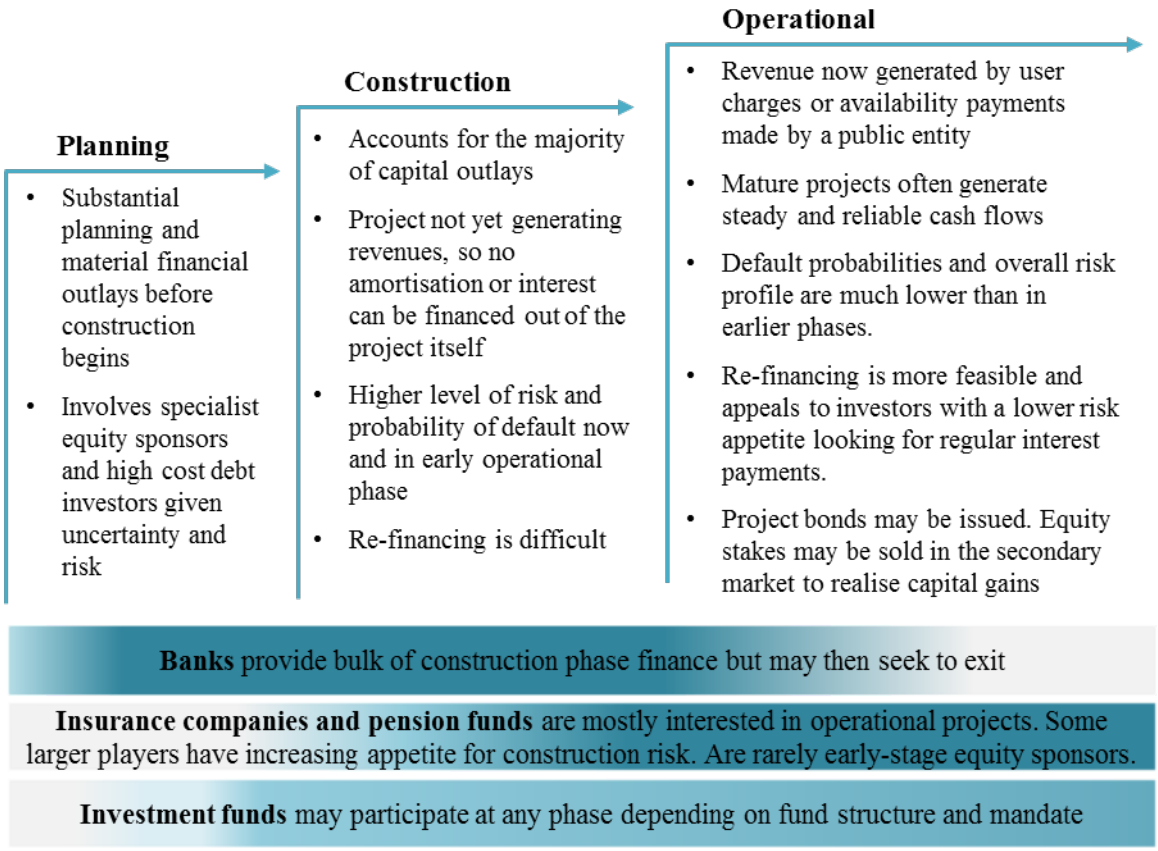
[14] See, for example, the Moody's Investors Service research reports on *Default and recovery rates for project finance bank loans, 1983-2016* (March 2018) and *Infrastructure Default and Recovery Rates, 1983-2016* (July 2017), and *Credit Risk Dynamics of Infrastructure Investment Considerations for Financial Regulators* by Jobst (World Bank Group Policy Research Working Paper 8373, March 2018).

[15] See, for example, *Guide to infrastructure financing* by AFME and ICMA, and *Project Finance in Theory and Practice* by Gatti (Third Edition), Academic Press – Elsevier.

[16] Availability payments are made (for example) to a private concessionaire by a public project sponsor based on project milestones or facility performance standards in exchange for particular services.

operational phase can be refinanced more easily by investors with lower risk appetite and require regular interest payments backed by the more stable cash flows of projects in their operational phase.

Graph 1: Infrastructure project lifecycle and providers of IF



Note: Shading represents the phase in which financers are active, a darker shade indicates greater participation.

There are several financing sources, with different risk profiles:[17]

- **Sponsors**, such as a contractor or a developer with an interest in the construction and/or the operation and maintenance aspect of the asset, providing the equity. In some cases, a financial investor (that is, not an industrial partner) can be a co-investor.
- **Banks** (both deposit-takers and broker-dealers) are primarily involved as debt providers, oftentimes as member of syndicates or club deals to limit concentration and to share risks.
- **Institutional investors** (insurance companies, pension funds, investment funds) primarily invest in debt instruments, but also provide equity and mezzanine funding. Investments are channelled through infrastructure debt or equity funds, although in

[17] See, for example, *Infrastructure Financing Instruments and Incentives* by the OECD (2015).

some cases these investors invest directly in the equity or the debt of the project or of the corporate sponsor.

- **Development and multilateral banks** arrange and provide co-financing as well as (in addition to export credit and other agencies) cover against project-specific risks.
- **Governments** are an important source of equity/debt financing and guarantees.

2.3 Market trends[18]

The total volume of IF provided by the financial sector has continued to grow after an intermittent slowdown during the global financial crisis (Graph 2).[19] IF in AEs saw a dip after the crisis but has grown steadily since. The pickup of IF in recent years was particularly marked in North America and Europe and has been more contained in EMDEs, although there has been a mild upward trend in recent years in most EMDE countries. The Asia-Pacific region saw a sharp drop between 2011 and 2013 after a rapid expansion pre-crisis, but this was largely driven by one country (India) and the region has seen an upward trend since then. Latin America and Sub-Saharan Africa have also seen a slight increase in recent years. IF tends to be concentrated in a few countries per region, both in AEs and EMDEs (Graph A.2).

While bank loans remain the main source of IF, market-based finance – defined as non-bank lending and bond financing – has grown in the past few years (Graphs 3, 4). Bank lending has followed a fairly flat trend in recent years especially for project finance, after a drop around the time of the crisis. Bond issuance has increased in recent years, mainly in AEs,[20] although the increase is predominantly related to corporate finance of companies involved in infrastructure projects. Other than bonds, IF provided by non-bank financing sources has also increased compared to pre-crisis levels in AEs, but volumes remain relatively low in absolute terms. Likewise, IF provision by development banks has increased in recent years, particularly in EMDEs, given their greater involvement in co-financing and credit enhancements (Graph A.6).

The relative shares of IF obtained via corporate and project finance have been fairly stable until recently (Graph 4). In AEs, bond issuance picked up in recent years for corporate finance, and less markedly for project finance. Project finance, which constitutes the bulk of IF, particularly in EMDEs, has declined from its 2008/10 peak and has been fairly steady in recent years. While there has been an increase in bond issuance and International Financial Institution (IFI) support for project finance, this was from low absolute levels.

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[18] Additional information on trends, as well as on the data definitions and sources, can be found in Annex A. Most of the information in this section is based on transaction level data from IJ Global and Dealogic.

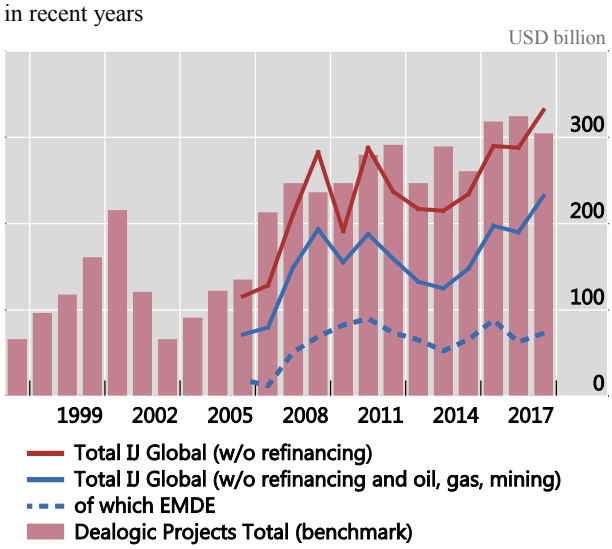
[19] The result holds across all databases analysed, i.e. IJ Global, Dealogic Syndicated Loans, Dealogic Project Bonds and Dealogic Projects.

[20] Bond issuance has also increased in EMDEs, but remains small in absolute terms (Graph A.6 in Annex A).

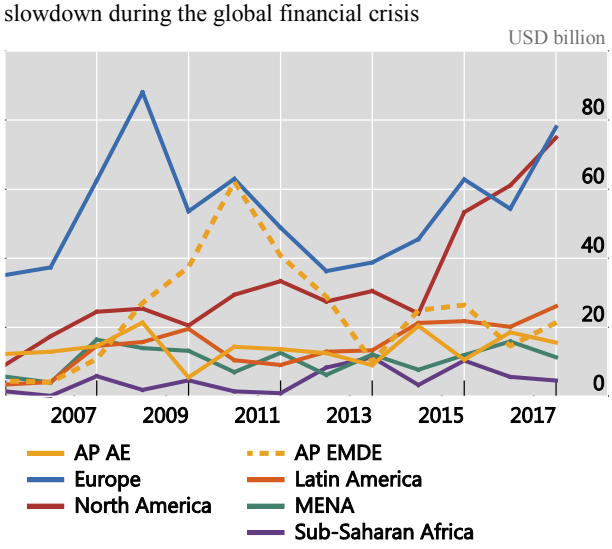
Total IF volumes and breakdown by region of recipient

Graph 2

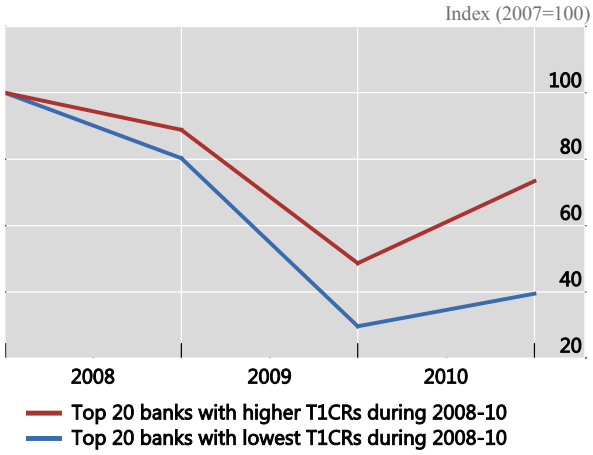
Total IF provided by the financial sector has continued to grow in recent years



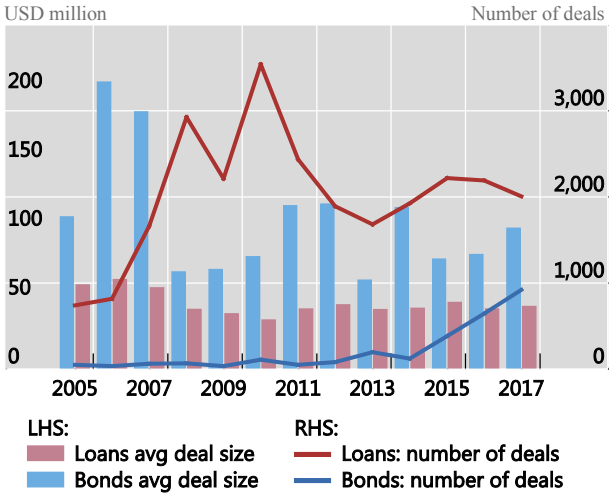
IF has grown in most regions, in some cases after an intermittent slowdown during the global financial crisis



During the crisis, the banks with the lowest Tier 1 capital ratios among the top IF providers decreased IF volumes more than the other top IF providers



The number of IF bond deals has increased in recent years, with a slightly reduced average deal size



Top left graph: The graph shows total volume of IF based on IJ Global (lines) and Dealogic (bars), excluding refinancing (red line) and the oil, gas and mining sectors (blue line and corresponding series for the AEs and EMDEs). The series provided by Dealogic go back to the 1990s, while IJ Global data is limited before 2005. All figures are based on IF subject to financial close in that calendar year, i.e. a flow type metric (the same is true throughout the report).

Top right graph: The series in the graph correspond to the blue line in the left hand graph. AP = Asia-Pacific. MENA = Middle East and North Africa.

Bottom left graph: The graph shows an index reflecting the evolution of the aggregate IF volume for banks with lower (i.e. below 9% in 2009) and higher (i.e. above 9% in 2009) risk-based Tier 1 capital ratios during the crisis.

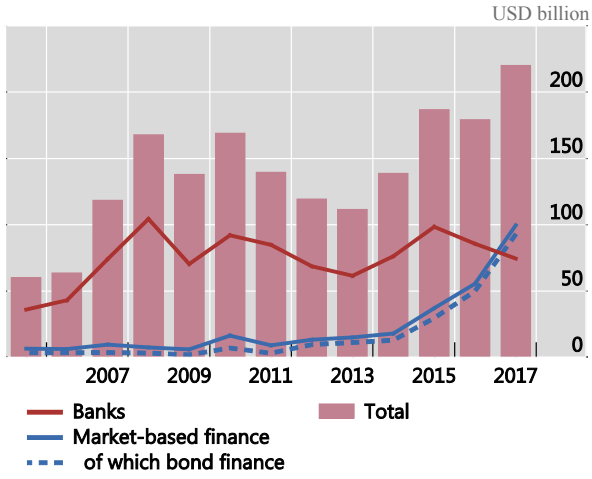
Bottom right graph: Number of deals and deal size at the tranche level by financing provider for bonds and loans.

Source: IJ Global and Dealogic.

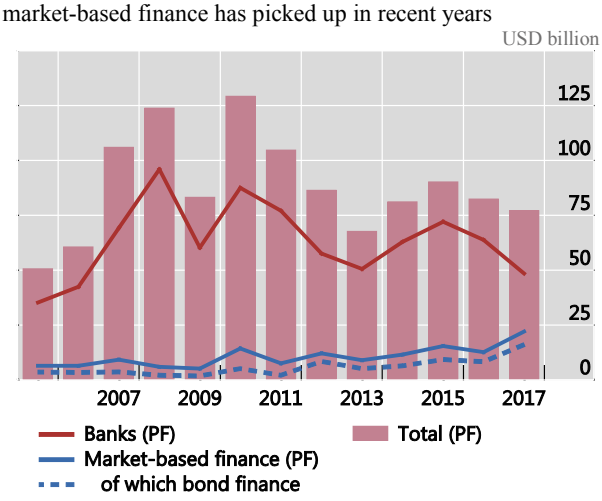
IF by different providers

Graph 3

Market-based finance has increased substantially for total IF



Banks continue to be the main providers of project finance, but market-based finance has picked up in recent years



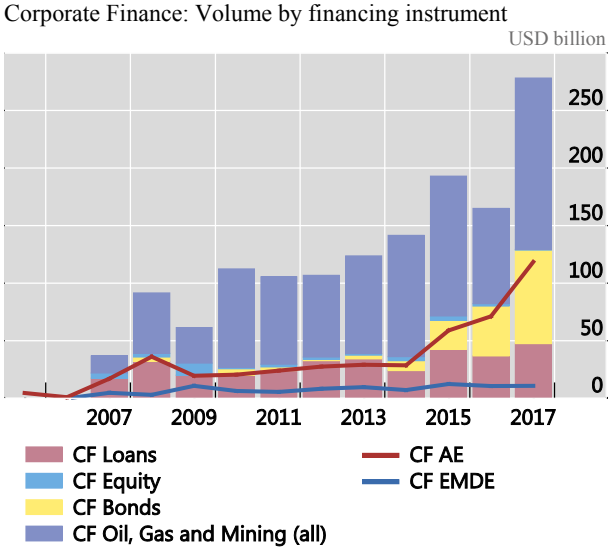
Both graphs: Market-based finance includes project and corporate bond issuance as well as non-bank lending. For bond financing, the data does not differentiate holdings for different types of investors. The oil, gas and mining sectors are excluded from the analysis. PF = Project finance.

Source: IJ Global.

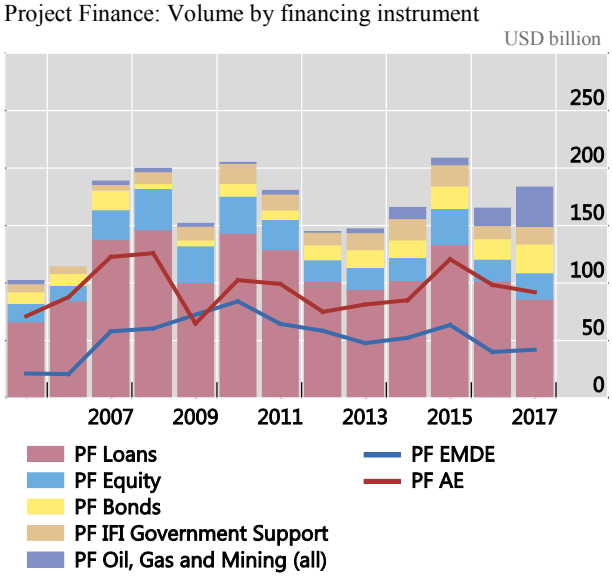
Corporate IF vs project IF

Graph 4

Corporate Finance: Volume by financing instrument



Project Finance: Volume by financing instrument



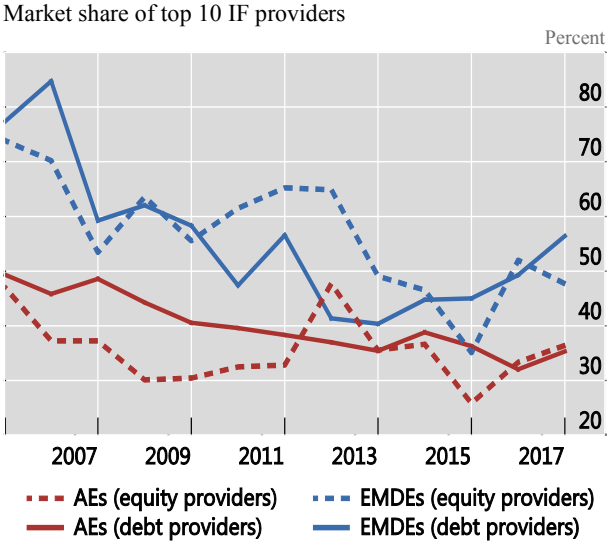
Note: The series for loans, equity and bonds and the series for the AEs and EMDEs (both for recipient country) exclude the oil, gas and mining sectors. CF = Corporate finance. PF = Project finance. IFI = International Financial Institution.

Source: IJ Global.

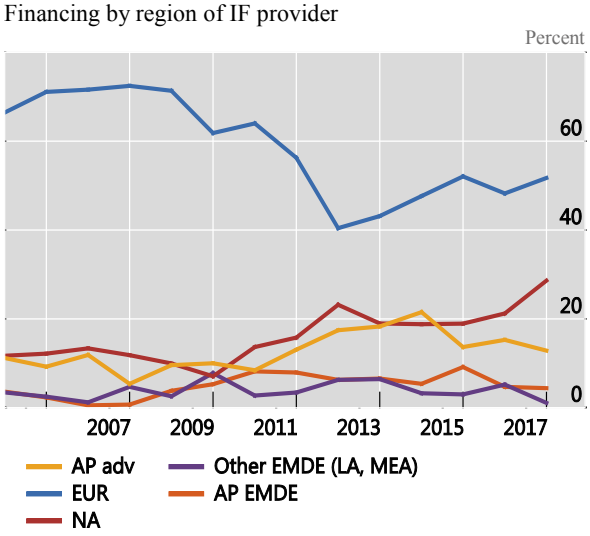
The provision of IF remains concentrated, particularly for EMDEs (Graph 5). The top 10 providers, all of which are banks, account for about 35% of IF in AEs and 50% of IF in EMDEs (debt and equity). Concentration has declined in recent years, albeit from a high level. The relative importance of European financing providers, though still high at 50%, has declined, whereas the role of financing providers from North America and Asia Pacific has increased. This shift is driven by a general increase in the size of the IF market rather than a reduction in absolute volumes by European financing providers. It is worth noting that, even for the largest bank lenders, IF corresponds to only a small part (around 1-2%) of their total balance sheet (Graph A.8 in Annex A).

Share of IF for top providers and by region — Graph 5

Market share of top 10 IF providers



Financing by region of IF provider



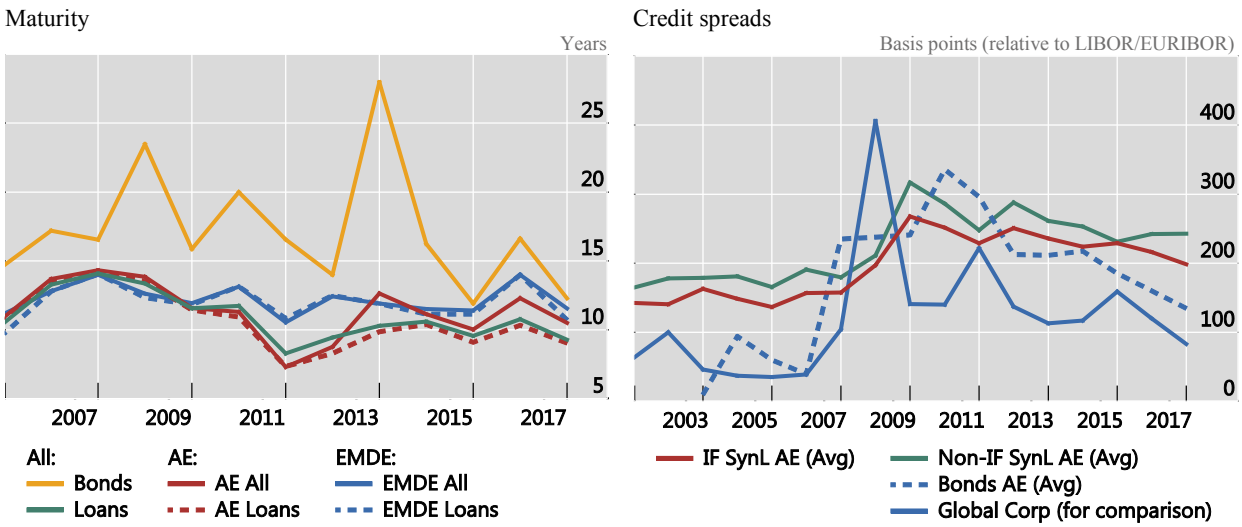
Note: IF equity provided by market participants (predominantly banks) tends to be bridge financing to non-financial corporations for their equity stake in infrastructure projects. AP = Asia Pacific. EUR = Europe (both EU and non-EU). LA = Latin America. MEA = Middle East and Africa. NA = North America (Canada, US).

Source: IJ Global.

Maturities of IF in AEs have declined post-crisis, while they have been fairly stable in EMDEs (Graph 6). The overall decrease of bank loan maturities in AEs by about three years (compared to pre-2009) and across different sectors is driven by a decline in the share of very long-dated bank loans with maturities above 14 years (Graphs A.4/2 and A.13 in Annex A). Average bond maturities have gradually decreased in recent years as well, driven by a higher share of corporate bonds (which have shorter maturities than project bonds), although they remain generally longer than for loans.

Lending spreads spiked during the crisis and have returned to lower levels in recent years, albeit still above pre-crisis levels (Graph 6). This trend, which can be observed for AE loans and bonds of different ratings (Graph A.13 in Annex A) and at the sectoral level (Graph A.4/2), is fairly aligned with the evolution of spreads for non-infrastructure syndicated loans and corporate bonds. For EMDEs, credit spreads increased during the crisis and have stayed at those levels since then; however, information on prices is fairly limited. The rating distribution for both AEs and EMDEs, where available, has been fairly constant over time.

Maturities and credit spreads of infrastructure assets Graph 6



Note: Left graph: The graph shows average maturities for bonds and loans as well as the average maturities of total IF and for loans in AEs vs EMDEs. Right graph: The rates are in basis points over LIBOR (or EURIBOR). The series for non-IF syndicated loans and the Merrill Lynch Global Corporates Index are added as a benchmark. SynL = Syndicated loans.

Sources: IJ Global (left graph); Dealogic Syndicated Loans and Project Bonds (right graph); Bloomberg.

The diversity in the sources of IF has increased in AEs following the crisis, accompanied by new market practices, financing instruments and structures. The relative share of bank financing to total IF has decreased in recent years, although banks have not reduced lending to this sector in absolute terms. Some banks have moved to shorter tenors and smaller exposures through different instruments (e.g. mini-perms[21] or club deals[22] – see Graph 6 and Annex A), although they remain the primary investors during the early stage of projects. Non-bank finance has increased mostly through bond issuance, but also through co-investment models of institutional investors with banks. In some cases, these new patterns of finance have taken the form of hybrid structures, where funding sources includes a mix of bonds and infrastructure debt and equity funds alongside bank loans.[23] These structures are characterised by longer tenors provided by debt funds and project bonds, more competitive pricing (all-in cost is lower), and a mix of foreign and local investors.

Most IF has traditionally been provided in USD and other major AE currencies, although the importance of other currencies has increased markedly in recent years (Graph 7). The existing literature and feedback from market participants (see section 4 and Annex D) suggest

[21] A mini-perm loan envisages the financing of the construction phase by a pool of banks. The duration of the loan covers the whole construction period plus some years of the operational phase, leaving a balloon payment at the end (i.e. the loan is not completely amortised). The implicit assumption is that sponsors will be able to find better financing terms on a new loan which will be used to refinance the balloon repayment.

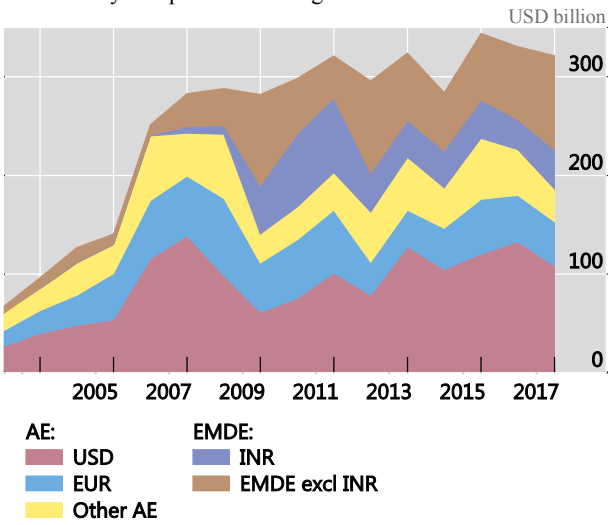
[22] When a group of sponsors approaches investors to ask for a financial commitment, a restricted pool of banks jointly proposes a financial package to the borrower with a full financial commitment. No other banks are invited to join the group and all the funds needed for the financing are provided by this small group of lenders (hence the term "club").

[23] See the Preqin Quarterly Update infrastructure reports and the Probitas Infrastructure Institutional Investors Trends Survey.

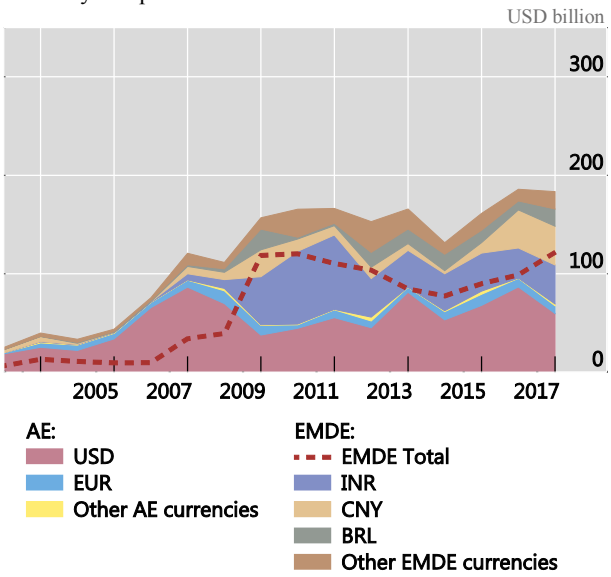
that the availability of foreign exchange hedging instruments for IF has been, and continues to be, limited in markets with less liquid currencies, particularly for EMDEs.

The importance of emerging market currencies for IF has increased markedly — Graph 7

IF: currency composition at the global level



Currency composition in EMDEs



Note: USD = US Dollar. EUR = Euro. INR = Indian Rupee. CNY = Chinese Yuan. BRL = Brazilian Real. For the other currencies classified into AEs and EMDEs, see the IMF classification.

Source: Dealogic Project.

3. Relevant reforms

3.1 Overview

The G20 financial reforms aim to create a safer, sounder and more resilient global financial system. They are intended to rebuild confidence in the ability of financial institutions to discharge their functions. Both factors have a large bearing on the financial system's capacity to intermediate financial flows through the cycle and for different investment horizons.

The G20 reforms considered most relevant for IF are those associated with banks. These reforms do not specifically target the provision of IF.[24] However, as shown in the previous section, banks are the primary providers of IF, drawing on (among other factors) their expertise in credit origination and monitoring. Previous FSB reports[25] have identified Basel III and OTC derivatives reforms as being of particular importance. The February 2018 industry workshop, the survey responses (see Annex D), interviews with market participants, the responses to the public consultation and the literature review (see Annex F) all confirm the particular importance of these reforms for IF. Basel III reforms include higher capital and liquidity requirements for banks and higher loss absorbency requirements for G-SIBs. The initial Basel III package was agreed in 2010, while the finalised one was agreed in December 2017. OTC derivatives reforms aim at higher bank capital requirements for derivatives-related exposures, mandatory central clearing of standardised derivatives, and higher margin requirements for non-centrally cleared derivatives.

Other regulations may also be relevant for IF, but their implementation is at an earlier stage (e.g. certain accounting standards, reforms applying to open-ended investment funds) or they are national or regional in nature (e.g. those applying to insurers and pension funds).[26]

3.2 Implementation status

The implementation status of reforms differs markedly across reform areas and, in some cases, relevant jurisdictions (see Table 1 below). The initial Basel III reforms agreed in 2010 are now fully implemented by most jurisdictions (Graphs 8 and B.1), with the exception of the Net Stable Funding Ratio. Implementation dates of the finalised Basel III reforms (agreed in December 2017) start in 2022. The relevant OTC derivatives reforms, some of which are still being phased in (e.g. margin requirements for non-centrally cleared derivatives), have so far been mainly implemented by AEs (though this represents a very large portion of the market).

The implementation status of these reforms, in combination with data availability, determines the scope of analysis for this evaluation (see section 4). In particular, those

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[24] In the case of Basel III, while there is no single regulatory asset class for IF, the revised Standardised Approach to credit risk already accounts for the time profile of credit risk of project finance assets (comparably high credit risk in the early years vs low levels of credit risk during the operation phase relative to corporate credit), as does the Internal Ratings based approach, which foresees an update of credit risk parameters on an annual basis.

[25] See, for example, the FSB report to the G20 on *Financial regulatory factors affecting the availability of long-term investment finance* (February 2013).

[26] Additional information on individual jurisdictions' regulations, their implementation timelines (where applicable) and potential effects on IF can be found in Annex B.

reforms that were fully (or largely) implemented by year-end 2017 have been included in quantitative and qualitative analyses, while other reforms are only considered qualitatively.

Table 1: Regulations or standards identified as potentially relevant to IF

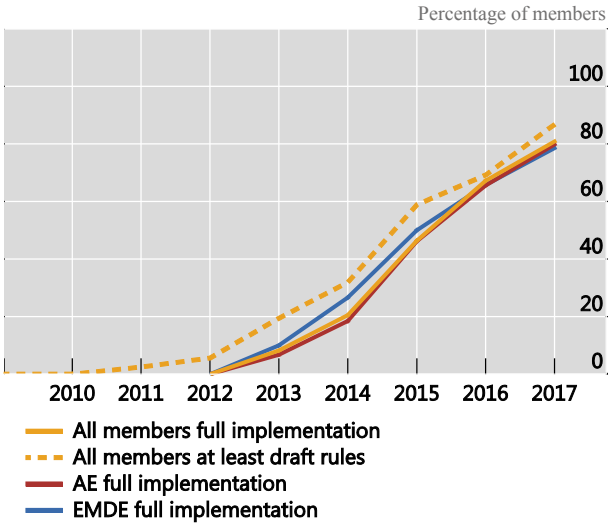
Reform area or sector	**Element of regulation or standard**	**Agreed phase-in (completed) date for G20 reforms**	**Implementation status of FSB/BCBS members**[27]
G20 reforms			
Banks (Basel III)	Risk-based capital	2013 (2019)	Fully implemented
		2022 (2027)	N/A at this stage
	Leverage ratio	2018	Largely implemented
		2022	N/A at this stage
	Framework for G-SIBs	2016 (2018)	Fully implemented
	Liquidity Coverage Ratio (LCR)	2015 (2019)	Fully implemented
	Net Stable Funding Ratio (NSFR)	2018	Partly implemented
	Large exposures regime	2019	Partly implemented
OTC derivatives	Central clearing	End-2012	Largely implemented
	Margin requirements	2016 (2020)	Largely implemented
	Basel III capital requirements:		
	• Exposures to central counterparties (CCPs)	2017	Partly implemented
	• Credit valuation adjustment (CVA)	2013	Largely implemented
		2022	N/A at this stage
Investment funds	FSB/IOSCO recommendations on liquidity risk management	Not specified	N/A at this stage
Accounting standards	IFRS 9/Current Expected Credit Losses (CECL) (US)	Effective from 2018-2021	N/A at this stage
	IFRS 17 for insurers	Effective from 2021	N/A at this stage
Non-G20 regulations			
Insurance	National/regional regulations (e.g. EU's Solvency II)	N/A	
Pension funds	National/regional regulations (e.g. investment limits)	N/A	

Note: Only those regulation or standard elements that are most relevant for IF are included, so the list is not comprehensive. Green cells refer to reform areas that have been subject to quantitative (regression) as well as qualitative analysis; other areas have been analysed qualitatively. Grey cells refer to reform areas where implementation is at a very early stage or has not yet begun. See Annex B for details.

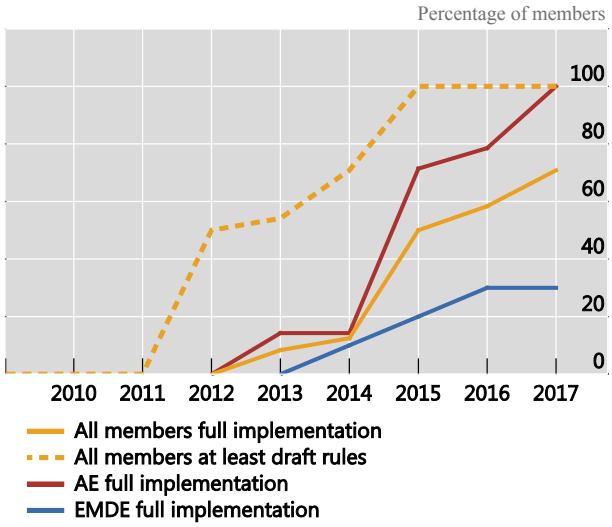
[27] Based on the FSB's *Third Annual Report on the Implementation and Effects of the G20 Financial Regulatory Reforms*, (July 2017) and BCBS *Fifteenth progress report on adoption of the Basel regulatory framework* (October 2018).

Implementation status of G20 financial reforms subject to empirical analysis Graph 8

Basel III capital, liquidity, G-SIB/D-SIB



OTC derivatives – central clearing



Sources: Implementation progress reports by the BCBS on Basel III (October 2018) and the FSB on OTC derivatives reforms (June 2017).

3.3 Transmission channels

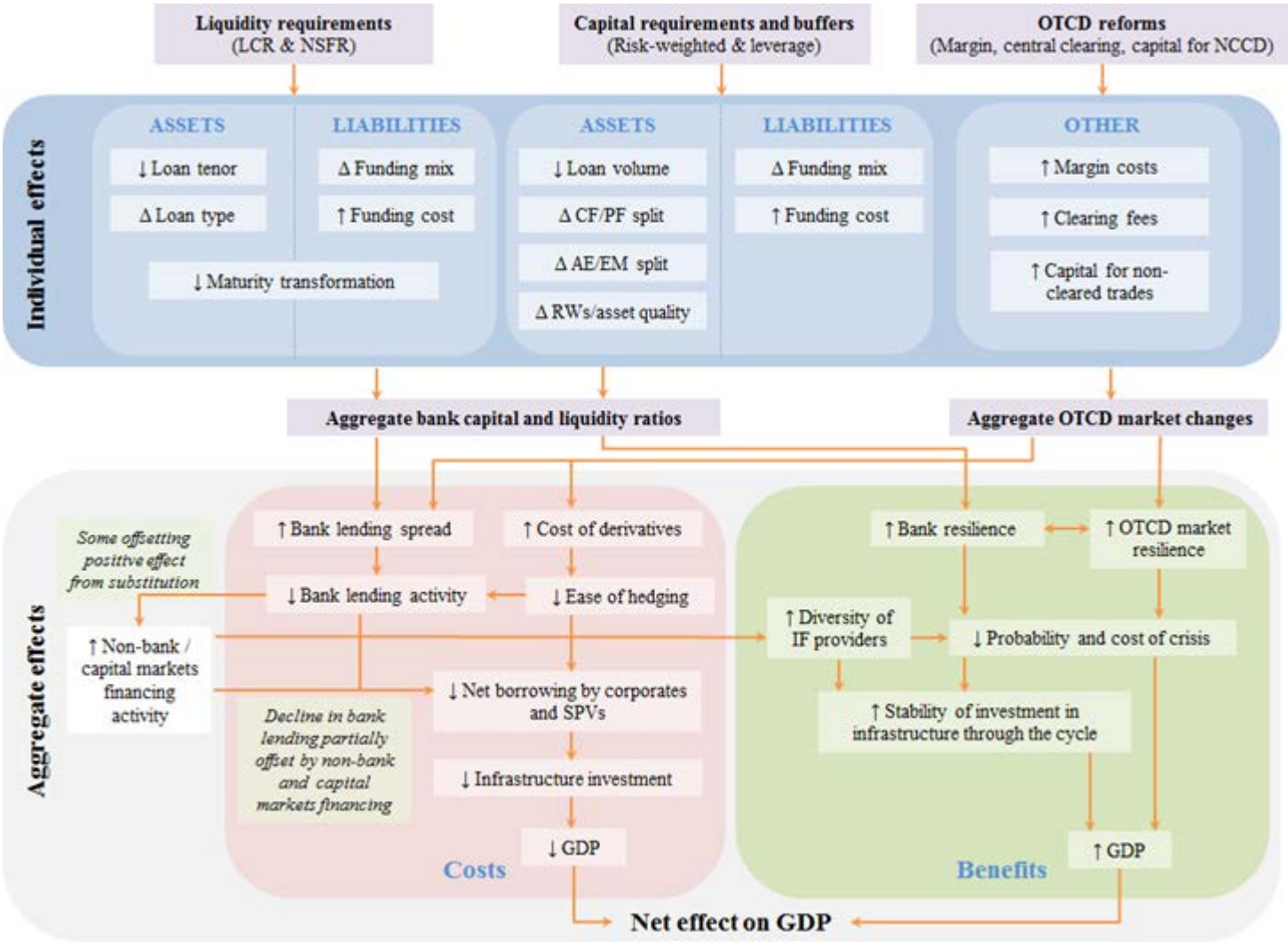
The analysis of the effects of reforms involves the identification of transmission channels through which those reforms may affect financial institutions, and thereby influence financial intermediation and economic activity more broadly. This forms the basis for comparing the realised outcomes with the reforms' intended objectives.

Financial regulations may influence both the level and structure of IF by changing the costs of different transactions and incentives of different types of financial institutions. Graph 9 shows potential stylised transmission channels from selected reforms through to balance sheets and behaviour of finance providers, and ultimately to levels of infrastructure investment and gross domestic product (GDP). Annex B provides additional information on possible transmission channels for the various reforms, while section 4 presents analysis of their effects.

Increased liquidity and capital requirements may affect both the asset and liability sides of banks' balance sheets. On the asset side, banks may adjust the volume, tenor and type of IF. On the liability side, banks' funding mix and costs may change, increasing the lending spread that would need to be charged to borrowers in order to maintain profitability. OTC derivatives reforms may increase the costs of margin and capital required for certain uncleared trades, which may incentivise banks to clear trades through central counterparties. These changes may increase the costs of some transactions and hence reduce the ease of hedging risks inherent in some IF deals, although they may also reduce counterparty and liquidity risks.

If financial regulations lead to higher lending spreads or reduced availability of hedging, bank provision of IF may decrease. This may be partly offset by non-bank market participants stepping in to capture the newly available market share. The net effect may still be negative depending on the substitution, e.g. at shorter tenors or earlier project stages, or in EMDEs with less developed capital markets. In such a case, a lower provision of finance to infrastructure projects would lead to lower investment in the real economy and hence lower GDP.

Graph 9: Stylised representation of possible transmission mechanisms of regulatory requirements to IF and economic activity



Source: Adapted from Graph 1 of the Literature review on integration of regulatory capital and liquidity instruments by the BCBS Research Task Force (March 2016).
Note: The possible transmission mechanisms shown in this graph are illustrative. See section 4 for a discussion of the results on the effects of reforms on IF.

On the other hand, to the extent that G20 reforms may have increased resilience of banks and of the OTC derivatives markets, and to the extent that such reforms increase the diversity of IF providers, they may reduce the probability and cost of future financial crises. These factors may also lead to increased stability of investment in infrastructure throughout the economic cycle, by both the private and public sector, which may have a positive effect on GDP. The overall effect of these financial reforms will therefore depend on the relative balance of the positive and negative factors described above.

The transmission channels and potential effects of some reforms may also differ in EMDEs given their design and the particular characteristics of their financial systems (see Box 2).[28]

Box 2: G20 reforms and IF – Considerations for EMDEs

EMDEs comprise a large and diverse group whose financial systems have grown in importance over the last decade. They differ substantially in terms of economic size, level of development, and legal and institutional frameworks. Notwithstanding these differences, financial systems in EMDEs tend to be smaller in size, more concentrated and less complex than systems in AEs, with banks playing a large role while capital markets and other financial institutions remain relatively under-developed. Other prevalent – although not universal – features include greater dependence on foreign capital, weaker institutional frameworks and market infrastructures, supervisory capacity constraints, a relatively greater involvement of the state in the financial system, and greater use of international currencies for domestic financial transactions. Some of these features reflect broader structural characteristics of those economies that may collectively reduce the importance of financial regulation (compared to other factors) on IF.

However, the greater reliance on banks – including global banks – for IF means that EMDEs have fewer alternative sources of finance and may be more affected by regulations affecting those institutions. For example, banks in EMDEs are more likely to use simpler approaches (e.g. standardised approaches to credit, counterparty credit and market risk) to compute their regulatory requirements for IF, which can sometimes lead to higher capital charges than alternative advanced approaches (see Box 3). Limited access to domestic long-term funding means that Basel III liquidity standards may be more binding, while smaller banks may find large exposure limits for individual IF projects relatively more constraining. In addition, the weaker institutional frameworks and more volatile macroeconomic conditions mean greater reliance on risk mitigants (e.g. credit enhancements) and hedges (e.g. through OTC derivatives transactions), opening up additional transmission channels through which the post-crisis reforms may affect IF in EMDEs. The July 2017 FSB report to the G20 on the implementation and effects of reforms notes that some EMDEs report challenges from cross-border spillovers, such as the way that home jurisdictions of hosted global banks are implementing certain reforms (e.g. risk weighting of host jurisdictions' debt).

These factors, combined with broader macroeconomic developments (e.g. growth, fiscal and commodity price trends) and the still-evolving business models of global banks, may lead to different transmission channels and associated effects of reforms on IF in some EMDEs. These potential effects were examined by the survey and empirical analysis, as set out in the next section.

[28] See, for example, *Financial Stability Issues in Emerging Market and Developing Economies* by the FSB and staff of the IMF and World Bank (October 2011); *Identifying the Effects of Regulatory Reforms on Emerging Market and Developing Economies: A Review of Potential Unintended Consequences* by the FSB (June 2012); *Impact and implementation challenges of the Basel framework for emerging market, developing and small economies* by the BCBS Basel Consultative Group (November 2014, BCBS Working Paper No 27); and *Implementation and Effects of the G20 Financial Regulatory Reforms: Third Annual Report* by the FSB (July 2017).

4. Effects of the reforms on infrastructure finance

4.1 Analytical approach

The analysis of the effects of reforms requires attribution of changes to various factors, including financial regulatory reforms, at different stages of the IF lifecycle. This gives rise to a number of challenges. The effects of reforms can be expected to gradually materialise over time, with market participants adjusting their business activities, including possibly IF, considering the long time horizon of IF engagements. Some observed effects may be only temporary, while others may be permanent shifts to a new steady state. The longer-term adjustments are expected to continue to evolve, as familiarity with implemented reforms develops and additional agreed reforms are phased in. At the same time, other macroeconomic and financial conditions impact IF. For example, the monetary environment has been highly accommodative in certain countries. Some countries might have materially rebalanced their infrastructure activities on fiscal policy grounds, while many banks have reviewed and materially changed their business models in response to crisis experiences. Moreover, many insurance companies, pension funds and asset managers have adjusted their strategic asset allocation in their search for yield. All these shifts and changes could impact AEs and EMDEs in different ways.

Disentangling the impact of reforms from other developments that have affected IF requires the use of multiple analytical approaches. For this evaluation, they include a voluntary qualitative survey,[29] which solicited information from the public (including market participants) on recent and expected trends and relevant drivers of IF, as well as quantitative analysis of deal-level data (from vendors) and market-wide data (from the Organisation for Economic Co-operation and Development (OECD), the Global Infrastructure Hub and Moody's). Such data, combined with information on a range of macro-financial variables that might affect IF and on financing providers (especially solvency and liquidity profiles), provide a quantitative estimate of the causal impact of the reforms. The descriptive and empirical analyses are subject to certain data limitations and methodological challenges (see Boxes C.1-C.3 in Annex C). Conceptually speaking, the main challenge is in how to isolate from other factors the effect of a range of reforms – both on a stand-alone basis and in aggregate terms – aimed at a substantial portion of bank balance sheets (both assets and liabilities) on a small asset segment (IF), in a market with a limited number of major players. The analysis included descriptive analysis, modelling of common types of infrastructure investments (to compare regulatory risk weights and estimated weighted average costs of credit risk capital pre- and post-implementation for relevant reforms – see Box 3 and Annex E) and partial equilibrium analysis. The empirical analysis and the survey results are accompanied by a qualitative description of financial regulations potentially affecting IF (Annex B), a review of relevant literature (Annex F), and discussions with market participants reflected throughout this report.

This evaluation assesses the effects of reforms using a two-step approach. First, starting from a comprehensive list of relevant determinants of changes in IF (including regulation, but also macro-economic conditions and borrower characteristics), the evaluation has sought to identify the most relevant drivers that may have a positive or negative impact on IF and their

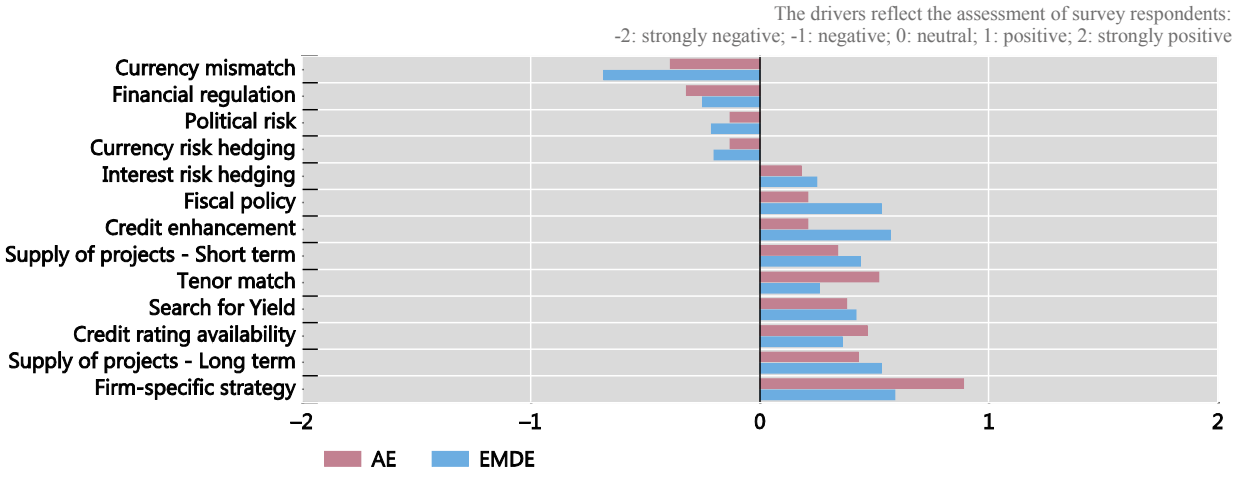
[29] See http://www.fsb.org/2018/03/fsb-survey-on-financing-and-regulation-over-the-life-cycle-of-infrastructure-projects/.

relative importance. Second, the evaluation has considered whether the identified effects are the result of specific reforms. Both steps relied on the empirical and qualitative analyses outlined further in Annexes C (empirical analysis) and D (qualitative survey).

4.2 Importance of financial regulation versus other factors

Several drivers are found to be relevant for the supply of IF (Graphs 10, 11). Some of these factors, identified by empirical and qualitative analyses, support IF activity, while others weaken investors' appetite for IF assets. Overall, the results of this analysis are consistent with the observed development of volumes and spreads in IF. Specifically, none of the drivers is seen as dominant in incentivising or disincentivising the supply of IF. The importance of these project-specific factors also needs to be viewed from a wider perspective. An overarching consideration is the limited importance of the financial sector as a source of IF (relative to the public sector), while another is the complexity and heterogeneity of infrastructure projects in general. There are also a number of country-specific factors to consider.[30]

Drivers of portfolio allocation toward infrastructure by market type — Graph 10



Note: Individual drivers cannot be aggregated to estimate the combined effect of different drivers.

Source: FSB Survey (see Annex D for details).

Supporting drivers of IF

The global search for yield has supported IF. Infrastructure assets have become increasingly attractive for survey respondents (especially institutional investors) against the backdrop of accommodative monetary and financial conditions and declining yields for more traditional asset classes. Survey responses from institutional investors note that the search for yield has positively affected their portfolio allocation towards infrastructure. Also relevant are the macroeconomic conditions in the borrower country, which are identified as one of the core

[30] These include differences in domestic implementation in terms of timelines and content, legal characteristics, technical know-how, the availability of financing in relevant currency, as well as political and regulatory risk.

factors driving IF volumes by empirical analysis, suggesting that countries with higher GDP growth rates benefited from higher IF volumes (Annex C).

While the availability of infrastructure projects has increased, market participants continue to cite a lack of sufficient investable projects. The survey suggests that investment grade projects attract private financing more easily, while higher-risk ones can still attract such financing as a result of the increased availability of credit enhancements, e.g. from MDBs (see Graph 3). Market participants (including respondents to the survey) note that demand is mainly concentrated on investment grade infrastructure assets in AEs, but that there continues to be a lack of sufficient investable projects. Market intelligence also suggests that the search for yield has led to reduced credit standards, although there is no clear support for this assertion.[31]

Investors appear to increasingly prefer shorter maturities, although this has not affected financing volumes. Maturities have shortened in recent years, mainly for bank loans, but financing providers see no difficulties in reconciling their preferred investment tenors with the long lifespans of projects. This can be explained by an increased ability to roll over financing, supported by instruments like mini-perms and the increased appetite of institutional investors to engage in IF at long maturities once projects are completed and generate revenues. At the same time, shorter maturities and reliance on roll overs can come with increased refinancing and liquidity risks.

The survey responses also suggest that fiscal policy has aided the expansion of private IF. Public spending constraints have reduced public infrastructure investment in many countries, which is seen by some survey participants as having opened up space for private investment. However, the compensatory effect is uneven across the risk profile of projects given that higher-risk projects continue to rely relatively more on public financing. A restrained fiscal stance will therefore be more detrimental to higher-risk projects and higher-risk economies, where private finance is not available.

Weakening drivers of IF

Currency risks are cited by respondents as the most relevant weakening factor for the supply of IF. This factor is relevant for cross-border financing provided by internationally active banks particularly into EMDEs, given the limited ability to hedge such risks in those countries. For example, if revenues are generated in the infrastructure project's local currency but financed in the domestic currency of the financing providers, currency risks (in addition to interest rate and credit risks) emerge due to the size of the exposures and the long investment time horizon. Hedging is possible but costly, and survey respondents have indicated that the availability and cost of hedging products have been factors that have slightly weakened their appetite for infrastructure assets. Feedback from market participants suggests that these factors, while important, have not changed significantly in recent years.

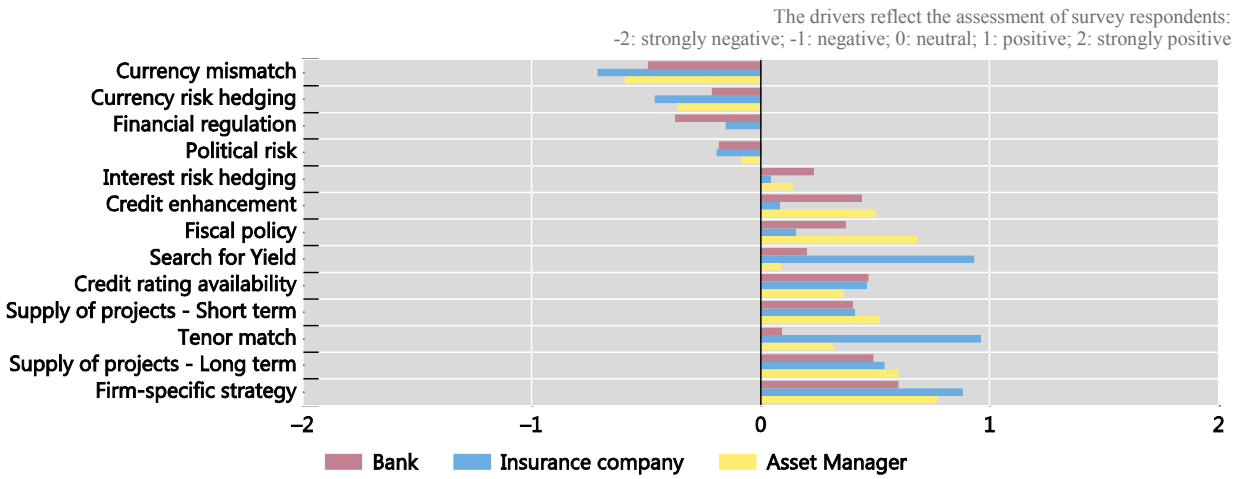
Financial regulation is not seen as the dominant negative driver of IF, which is supported by the results of the empirical analysis. Banks rank financial regulation as second to currency risks in terms of importance as a negative driver (Graph 11), though its perceived impact is limited. The perceptions on regulation might not specifically relate to its direct effect on

[31] Chart A.11 in Annex A suggests that the composition of IF (which is only available for a small subset of the transactions) has shifted slightly more towards non-investment grade deals very recently, while spreads for emerging market assets have increased during the past few years (Chart A.12).

infrastructure assets. This interpretation is supported by the relatively high importance banks attach to risk-based capital requirements (Graph 12), which affect the entire balance sheet rather than specific asset classes.

Political risk, tax policies and non-financial regulation are seen as weakening factors for the demand for infrastructure assets. The high relevance of these factors is rooted in the nature of infrastructure projects, which usually have strong public sector links paired with extensive planning processes and licensing requirements over the entire lifecycle of the project. The size of projects combined with financial and non-financial risks also call for robust legal frameworks and institutions, in case disputes arise among project stakeholders. Projects with cross-border financing expect providers to have (or obtain) such expertise in those jurisdictions, which adds to risks and costs and is likely to explain the slightly higher weight of this driver for EMDE projects. Some survey respondents also mentioned the differential tax treatment of infrastructure assets across investors of different categories (i.e. banks vs institutional investors), as an impediment for a level playing field.

Drivers of survey respondents' portfolio allocation toward IF by market — Graph 11



Note: Individual drivers cannot be aggregated to estimate the combined effect of different drivers.

Source: FSB Survey (see Annex D for details).

The above results are broadly consistent with the literature on the drivers of IF.[32] According to that literature, the gap between infrastructure needs and the actual level of investment suggests the existence of major impediments hindering private IF. A number of papers note that there is no shortage of private capital and that, while there is a supply of projects, not all of them are "bankable". The main challenges for private investors in IF cited in the literature include the lack of comprehensive, asset-level, detailed and systematic data to make informed assessments of the expected risk-return profile of infrastructure projects; poorly structured projects; political and regulatory risks (e.g. currency convertibility, changes in tariff

[32] See, for example, *Closing the Financing Gap: Infrastructure Project Bankability in Asia* by Oliver Wyman (2017); *Infrastructure Finance and Financial Sector Development* by Ray (March 2015, ADBI Working Paper No. 522); *Infrastructure Financing Instruments and Incentives* by the OECD (2015); and *Closing the Infrastructure Finance Gap: Addressing Risk* by Schwartz et al. (2014).

regulation, and the enforceability of contracts, collateral and security); and sector and project risks. Other barriers to private investment in IF in many EMDEs, mentioned in some papers, are currency volatility and illiquid capital markets, which create challenges in hedging of currency risks.

4.3 Effects of reforms

4.3.1 Conceptual approach and analytical questions

The evaluation tested a number of hypotheses about the possible effects of regulatory changes on IF using Difference-in-Difference (DiD) analysis. The DiD analysis detects any differential effects on IF between institutions that are (strongly) affected by regulations ("treatment group") versus those that are not ("control group"). To carry out this analysis, deal-level data on IF transactions was combined with bank-level data (see Boxes C.1-C.3 in Annex C for further information on methodology and limitations).

The analysis has focused on estimating the effects of reform implementation at the financing provider level, controlling for a number of potentially relevant confounding factors. While the timing of implementation of the most relevant G20 financial reforms for IF (Basel III, OTC derivatives) has been fairly similar across jurisdictions, especially for Basel III (see Section 3), their impact on institutions varies due to differences in the bindingness of regulatory constraints.[33] In these cases, the analysis distinguished between banks with weaker solvency and liquidity profiles at the time when the post-crisis reforms were announced – for which the 2010 Basel III package would have been binding, at least during the initial years – and other banks for which those reforms were not expected to be binding.[34] In addition to the implementation of reforms, the analysis controlled for country-specific variables such as the macro-financial environment, government policy and institutional factors.

The effects of reforms for the Basel III package (as agreed in 2010) and the OTC derivatives reforms were tested using a set of analytical questions:

- Did banks with more binding capital and liquidity metrics behave differently in terms of IF from banks for which Basel III was less binding? (Bindingness of regulation)
- Was there a difference in the IF behaviour between G-SIB and other banks, given that the former were subject to the most comprehensive regulatory reforms? (Impact of G-SIB specific regulation)
- How did the reforms affect banks based in AEs versus those in EMDEs and how did the reforms affect IF activities in AEs vs EMDEs? (Distributional impact of regulation)
- Did the reforms have a stronger effect on IF vs other types of finance? (IF vs other)
- How did the IF behaviour of banks (subject to comprehensive financial regulatory reforms) differ from that of non-banks? (Substitution of bank by other financing)

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[33] The analysis focuses on financing providers at the consolidated level, recognising that this will usually determine the regulatory approach taken within cross-border groups.

[34] See https://www.bis.org/bcbs/qis/index.htm for information on the bindingness of the Basel III metrics. Details of how the treatment and control groups were formed for each specification are in Annex C.

- How did the OTC derivatives reforms affect IF, if at all? (OTC derivatives reforms)

The empirical analysis did not examine whether regulation or other drivers have affected the credit quality of projects reaching financial close, due to data constraints. The time series of default rates (see Graph A.11 in Annex A) does not suggest that there has been a material change in credit quality in recent years. The analysis distinguished between general types of IF such as corporate and project finance, as well as between IF and other types of financing. It did not seek to look at effects on different IF asset classes at a more granular level, although the empirical specifications controlled for such differential effects.

4.3.2 Basel III capital and liquidity reforms

Basel III reforms aim to strengthen the resilience of banks by increasing the level and quality of capital, enhancing risk capture, constraining leverage, improving liquidity, and limiting procyclicality. The reforms do not specifically target IF, but their combined effect is to increase the regulatory capital for bank exposures and to improve their liquidity buffers vis-à-vis short-term shocks and maturity mismatch.

The initial phase of Basel III left the underlying credit risk weights (RWs) for different exposure types unchanged while increasing the amount and quality of regulatory capital required. The Basel III reforms finalised in December 2017 will change the credit RWs for specific asset classes, including for project finance under the Standardised Approach (see Box 3 and Annex B). The use of internal ratings-based (IRB) approaches for credit risk was also constrained (e.g. by introducing input floors for Loss Given Default (LGD) estimates and changes to the recognition of eligible collateral), and an 'output floor' was introduced such that modelled outputs could not diverge too far in aggregate from Standardised Approaches. These changes are due to be implemented in 2022, while jurisdictions have the option of phasing-in the output floor over a five year period. The funding costs of banks may increase as a result of both phases of the Basel III reforms (see Box 3), which could be passed on to end users.

One important caveat to the empirical analysis in this evaluation – which focuses on the first phase – is that Basel III consists of minimum standards. Different regions and jurisdictions can choose to implement supplementary requirements that go beyond these minima. Further, BCBS jurisdictional assessments have not always concluded that local implementations are consistent with the Basel standards.[35] Given the difficulty of disentangling all of these effects, the empirical work has split institutions into control and treatment groups based only on how they are affected by the agreed Basel standards (or proxies for these standards).

Banks can respond to the multiple regulatory constraints in different ways, depending on which constraints are most binding for them and on their particular risk preferences. For IF, banks can choose to modify the pricing, extent, geographical location or risk profile (e.g. maturity, instrument, risk mitigation) of the finance they are willing to provide. The overall effect will vary depending on a number of factors such as the specific risk characteristics of the transaction and the existence of alternative financing sources.

[35] See https://www.bis.org/bcbs/implementation/rcap_jurisdictional.htm.

Box 3: Illustrative examples of changes to the risk-weighted capital framework under Basel III

The first phase of Basel III ('phase 1') increased the amount and quality of regulatory capital, while leaving most underlying credit risk weights (RWs) broadly unchanged. The December 2017 finalisation of Basel III ('phase 2') will change the credit RWs for some exposures when implemented in 2022. The typical funding costs and funding mix for banks will also have changed over time.

By considering the credit RW changes for different assets, and making assumptions about typical IF exposures, funding mix and funding costs for two stylised bank IF portfolios, a weighted average cost of capital (WACC) can be computed for credit risk before and after the Basel III changes. The spread of the WACC to a risk-free rate is one of the underlying factors that may have affected loan pricing and volumes for IF. The table below shows the RW changes for two stylised samples of assets relevant to AE and EM IF respectively.

Exposure class	**Regulatory approach**	**Credit quality/rating**	**Basel II/Basel III phase 1 RW (%)**	**Basel III phase 2 RW (%)***
AE exposures				
Project finance	IRB slotting	Strong	74	70
Project finance	AIRB	N/A	108	123
Corporate finance	AIRB	BBB/Baa	89	92
EM exposures				
Project finance	IRB slotting	Good	74	70
Project finance	AIRB	N/A	115	130
Project finance	Standardised	BB/Ba	100	100
Project finance	Standardised	Pre-operational^	100	130
Project finance	Standardised	Operational^	100	100
Project finance	Standardised	High-quality operational^	100	80
Corporate finance	AIRB	BB/Ba	140	146
Corporate finance	Standardised	Unrated	100	100
Corporate finance	Standardised	BB/Ba	100	100

* Most standardised approach RWs have been revised between phases 1 and 2. The slotting and Advanced IRB approaches are unchanged between phase 1 and 2, except for the deletion of the 1.06 IRB multiplier and the introduction of LGD parameter floors. The impact from introducing an output floor in phase 2 on IRB risk weights is not captured by the analysis, since the floor applies at aggregate level and not to individual exposures.

^Assumes project is unrated by external credit rating agencies.

The Basel III phase 1 and 2 reforms taken together result in an increase in the spread of the WACC over the risk-free rate of around 50 basis points (bps) for both the AE portfolio and the EM portfolio (detailed assumptions underlying these calculations are included in Annex E). For both portfolios, but especially for AEs, the majority of the increase in WACC is driven by phase 1 of the reforms (which raised the amount and quality of capital required for all asset classes), rather than by the relative credit RW changes in phase 2 (which are expected to lead to increases of RWs for some of the assets in the sample, particularly for unrated credit exposures in the pre-operational phase under the standardised approach that may be particularly important in EMDEs).

An increase in the WACC for credit risk capital would be expected to impact loan pricing, assuming that at least some of this is passed through to borrowers. There are of course other relevant factors influencing pricing, such as temporal and structural changes in risk premia, and other macroeconomic and idiosyncratic microeconomic conditions.

Bindingness of different Basel III reform elements

The empirical analysis indicates that different Basel III regulations only had a limited effect on the aggregate availability of IF (Table 2 – columns 3 and 4, Graph 12). Specifically, Basel III capital standards (i.e. risk-based tier 1 capital (RBC) and the leverage ratio (LR)) are not found to reduce IF volumes of banks for whom regulation is more binding significantly more than other banks (shown as zero differential impact in Table 2). Likewise, there is no negative differential impact on volumes for those banks more constrained by liquidity reforms. This result holds across a wide range of empirical specifications and at different levels of aggregation, i.e. for overall IF and for project finance only (see Annex C).

Table 2: Summary of the main results of the empirical analysis

Dependent variable	Outcome of the empirical analysis						
	Bindingness of regulation		OTC derivatives	G-SIBs vs other banks	AE vs EMDE banks	IF vs other finance	Banks vs non-banks
	BIII capital	BIII liquidity					
Volume	0	0		0	0		-
Maturity	0	0 or -	0	-	-	0	
Price	0	0	0	0	0	0	

Note: Categories for statistical significance: -/0/+; "0" stands for a statistically insignificant differential effect between treatment and control groups; "-"for a statistically significant negative differential effect, and "+" for a statistically significant positive differential effect. Cells with statistically significant results are shaded in grey. A lighter colour is used for results which are only statistically significant in some of the specifications (i.e. for Basel III liquidity in case of maturity). Blank cells indicate areas not subject to regression analysis due to data constraints. The effect of OTC derivatives reforms on maturity and pricing is analysed based on staggered implementation at the country level. See Annex C for details.

Similarly, the analysis does not point to a more pronounced change in spreads from any of the groups of banks more bound by the Basel III requirements versus other banks (Table 2). There is no statistically significant support for a major increase in spreads due to regulation (shown as zero differential price impact in the above table), which is consistent with the results based on the stylised example in Box 3. The analysis also compared price information for syndicated IF loans with other type of syndicated loans and did not find a statistically different effect. These results warrant a caveat insofar as the data did not include sufficient information on credit quality (i.e. credit ratings) to allow for this to be controlled for explicitly, although the analysis controlled for project-specific features and the risk profile of IF appears to have been fairly stable over time (see Graphs A.11 and A.12 in Annex A).

For banks with weaker liquidity profiles, there is some indication that regulation has contributed to reduced average maturities of their infrastructure loans. A reduction of average maturities of up to one year is found for AE banks with weaker liquidity profiles, but not for banks with lower levels of capitalisation (Table 2 and Annex C). The differential reduction in average maturities for these banks is not significant across all empirical specifications, and is less than the general decrease in average maturities for AE – but not for EMDE – banks since 2010 of about two-four years in bank loans (Graph 6 and Graph A.14 in Annex A). A reduction in lending maturity for banks assumed to be most affected by liquidity

regulation is not necessarily unintended, given that one of the objectives of the liquidity reforms was to reduce maturity mismatch. An indirect consequence of a retrenchment of banks from longer-term lending could be a better diversification of IF exposures across the financial system, if non-banks step in as substitutes. Consistent with this, survey responses and the literature suggest increasing engagement of non-banks with longer investment horizons.[36]

Impact of G-SIB-specific regulation

G-SIBs have reduced maturities more than other banks. For volumes and prices, G-SIBs (which represent the vast majority of top 20 IF providers during 2005-2017) do not exhibit a different pattern compared to all other banks. For maturities, the analysis suggests that G-SIBs have reduced the tenor of IF assets more than other banks (Graph 9). This effect is driven by a combination of factors including regulation, and reflected in a decrease of loans with the longest maturities.

Distributional impact of regulation: Impact for AEs versus EMDEs

Overall, the empirical analysis did not find a differential effect of the reforms between AEs and EMDEs in terms of IF volumes and prices, while AE banks have decreased maturities. The finding of a decline in maturities by AE lenders compared to EMDE lenders is in line with the other results (e.g. for G-SIBs, which predominantly include AE banks). For volumes, the data does not show a significant differential effect between AE and EMDE lenders. It is important to note that there are various other factors at play, such as macroeconomic and monetary conditions and financial factors. The analyses on differences between AEs and EMDEs at the borrower country level do not indicate significant differences.

Impact of reforms on IF vs other types of finance

The empirical analysis did not find that regulations impacted IF pricing to a greater extent than pricing for other types of syndicated loan finance. While volumes and prices differ in levels, they do not exhibit differential trends. Maturities are about five years higher for IF, while credit spreads are 50 basis points lower (Graph 5, Annex C). The former clearly mirrors the long-term nature of IF, while the latter appears to be a result of a more favourable credit quality distribution (Graph A.12 in Annex A).

Impact for banks vs non-banks (substitution effect)

Trend data show that there has been some substitution of bank financing by market-based financing, and empirical analysis suggests that the reforms may have contributed to this trend (Graphs 2, 3 and Annex C). This is consistent with the survey responses, where several non-banks cited banking regulation as a positive factor for their own investment in IF. However, the reforms are only one of the drivers for this rebalancing. It is important to note that the reforms have an implicit effect rather than the explicit aim of precipitating substitution.

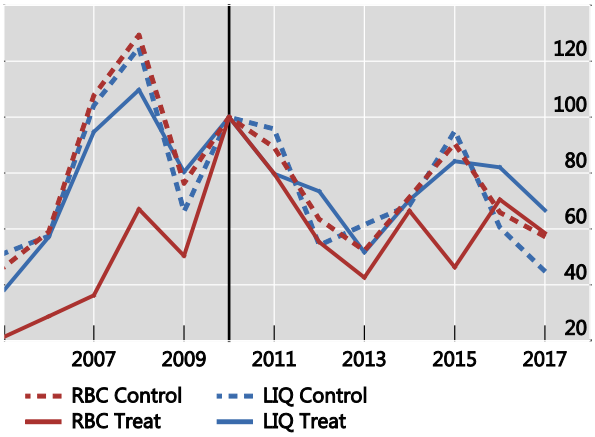
[36] The use of financial instruments such as infrastructure bonds allows for better matching of the life time of projects to the investment horizon of financers, which in turn supports market liquidity and may help offset any potential adverse effects of bank regulation on IF supply at longer maturities.

Effects of Basel III on IF volumes, prices and maturities

Graph 12

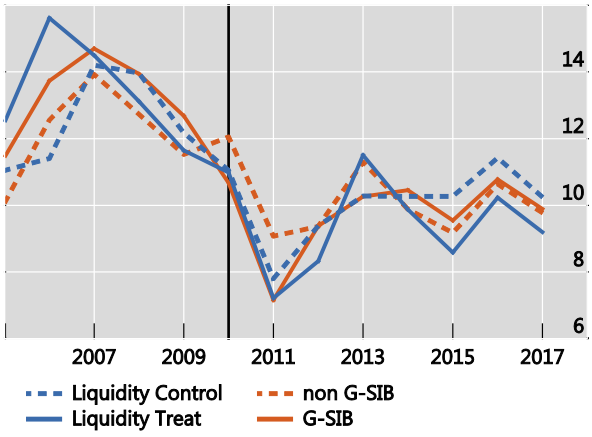
Since 2010, banks with lower initial Tier 1 capital ratios and liquidity metrics ("Treat") exhibited a fairly similar trend in terms of their IF volumes compared to other banks ("Control")

Index (2010=100)



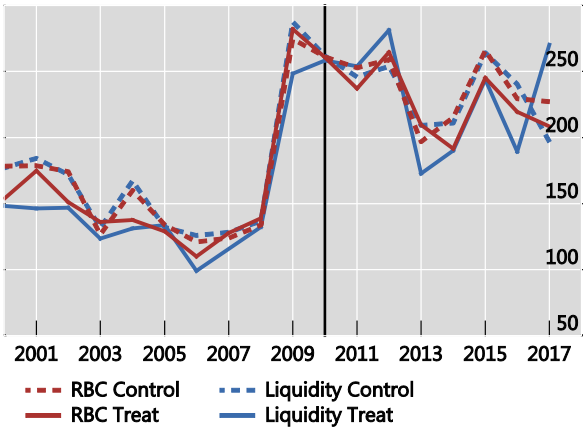
There are some signs that banks with weaker liquidity profiles have reduced loan maturities slightly more than other banks. G-SIBs have reduced their maturities more than other banks.

Years (average)



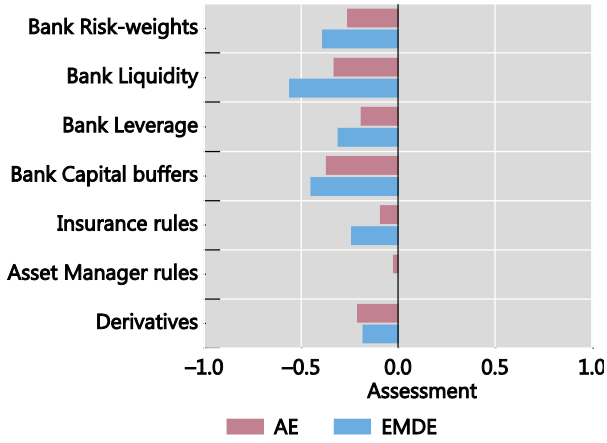
Banks on the low end of the risk-based tier 1 capital ratios and liquidity profiles did not exhibit a different pricing pattern compared to banks with higher capital ratios and stronger liquidity profiles

Spread (bps), average



Risk-based capital and liquidity are considered the most relevant reforms for IF by survey participants

Assessment by market participants



Top left graph: The graph shows the evolution of IF volumes (for project finance exposure) since 2010 and compares the differential effect for banks with stronger and weaker risk-based tier 1 capital ratio ("RBC") and liquidity profiles ("LIQ"). More information, including for proxies of the leverage ratio and the NSFR are provided in Annex C.

Top right graph: The graph uses a liquidity ratio ("LIQ", see Annex C for more information) to divide banks into two samples (banks with stronger and weaker liquidity profiles in 2009) and shows average maturities for those two samples for project finance. Equivalent series are shown for G-SIBs vs other banks.

Bottom left graph: The graph shows the evolution of average IF spreads for banks with low and higher risk-based Tier 1 capital ratios ("RBC") as well as for banks with stronger and weaker liquidity profiles ("LIQ").

Source: IJ Global (IF data, top row), Dealogic (IF data, bottom left graph), Fitch (Bank data).

Bottom right graph: Regulations considered most relevant to IF by respondents. Participants scored each area of regulation on a scale from -2 to +2 in terms of the strength of its negative/positive impact, where a score of zero would represent no effect. Source: FSB Survey (see Annex D for details).

4.3.3 OTC derivatives reforms

Financial institutions providing IF and end-users may be affected by OTC derivatives reforms since IF transactions may involve derivatives that are subject to central clearing, additional capital and potentially margin requirements. These reforms aim to mitigate systemic risk, improve transparency in the derivatives markets and protect against market abuse, and they may have an effect on cost and availability of hedging the financial risks in IF transactions. Users of derivatives may respond to these potential effects by reducing their hedging activity, accepting higher costs or restructuring their activity (e.g. switching to more standardised, lower-cost or shorter-term contracts, even when they give rise to higher rollover and basis risks). The overall effect will vary depending on factors such as the asset class, maturity, counterparty and currency of the transaction.

The analyses conducted to date do not suggest that OTC derivatives reforms have materially impacted the provision of IF. The empirical analysis shows that the (staggered) implementation of these reforms has not had differential effects on IF maturities and prices, including with respect to other finance types (see Annex C). However, this analysis focuses on IF transactions and does not directly examine whether those reforms have affected the cost and availability of OTC derivatives transactions used to hedge IF. Capital and margin requirements for non-centrally cleared derivatives were mentioned by banks and insurers in the qualitative survey as one – but not the most important – weakening driver. The survey responses also indicate the existence of currency mismatch and hedging challenges affecting IF in EMDEs (see section 4.2), but feedback from market participants suggests these challenges have not been materially increased by financial reforms given that hedging markets were undeveloped and long-dated swaps were already expensive for those currencies.[37] The derivatives-related reforms considered most relevant for IF – namely the Basel III standards for counterparty credit risk (CCR) and the credit valuation adjustment (CVA) capital charge, and margin requirements for non-centrally cleared derivatives – are not yet fully implemented, and market participants may be adjusting to their implementation.[38, 39] For some non-cleared trades, the capital requirements under the final Basel III framework could be materially higher.

4.3.4 Other reforms

Other G20 reforms

Other G20 reforms that may affect IF include forthcoming changes to liquidity risk management reforms for **open-ended investment funds,** and changes to **accounting standards** for expected credit losses and insurance contract liabilities (Table 1).

On the former, it is too early to say whether the recent IOSCO recommendations and good practices to address liquidity risk management (including the consistency between a fund's investment strategy and redemption terms) will have implications for their IF investments. These recommendations are only relevant to the subset of infrastructure funds that are open-ended (which are less common in IF than closed-ended fund structures). Survey participants, which included asset managers, did not identify the reforms for asset managers as important

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[37] Respondents also noted the increased availability of credit enhancements and interest risk hedges over the past 10 years.

[38] See also the FSB report of the evaluation on the effects of reforms on incentives to centrally clear OTC derivatives.

[39] The CVA was revised further as part of the finalisation of Basel III and these changes are not due to take effect until 2022.

drivers for IF. This view is supported by the results of a January 2017 roundtable held by IOSCO, which indicated that securities market regulations, including those applying to asset management, were not seen by the industry as an impediment to IF.

On the latter, accounting standards focus on the provision of accurate information to investors and do not seek to change asset allocation choices, but may have a bearing on the investment decisions of banks, insurers and other institutions as they seek to optimise their reported positions under the new standards. The presence and magnitude of any potential effects of the new standards for expected credit loss (ECL) – the International Accounting Standards Board's (IASB) IFRS 9 and the US Financial Accounting Standards Board's (FASB) current expected credit loss (CECL) model – on IF will be substantially determined by the way banks implement the standard, as well as by factors such as the composition and quality of their credit assets. The overall impact on banks' financial positions will also be affected by the regulatory capital treatment of loan loss provisions resulting from the move to these new accounting standards.

Given the long tenor of some insurers' asset portfolios, accounting mismatches between their liabilities (generally measured at amortised cost) and their related assets (generally fair valued) have been flagged as a factor that may drive investment behaviour. To address this, the effective date of IFRS 9 for insurers has been set for 2021 to align with the new accounting standard for insurers (IFRS 17). Given that the bulk of accounting-related changes will only come into effect in the coming years, a meaningful analysis of their effects on IF is not possible.

Other financial regulations

Financial regulations that apply to **insurers and pension funds** are also relevant, particularly since prudential norms in those regimes may impact the extent and type of investments in IF.

Although special treatment of infrastructure assets has not historically been common in insurance solvency regimes, a differentiated treatment has been introduced into Solvency II in the EU (which has been in force since 1 January 2016), and similar policy approaches have been adopted or are under consideration by other insurance regulators. Internationally-active insurance groups will, in the future, be subject to the Insurance Capital Standard (ICS) that is currently being developed by the International Association of Insurance Supervisors (IAIS).[40] The definition and appropriate calibration for infrastructure investments is being examined as part of the ICS policy development process.

While regulation is one of the drivers affecting insurance asset allocation, other factors may be even more important. One of these, also cited in the survey responses (see Annex D), is the low interest-rate environment contributing to search-for-yield behaviour, i.e. increased interest in alternative asset classes due to their relatively attractive current yields versus those of more traditional asset classes. In line with this, survey participants regard insurance regulation as relevant, but mainly for investments in EMDEs.

For pension funds, regulation is country-specific and reflects different market structures and policy priorities. The latest OECD annual survey of investment regulations of pension funds indicates that, with a few exceptions (including Australia, Canada, UK and US), most surveyed countries continued to impose various investment limits (e.g. caps on equities and direct loans,

[40] See http://www.iaisweb.org/page/supervisory-material/insurance-capital-standard.

reliance on an investment grade credit rating, prohibition on overseas investments or foreign currency exposures). These limits may have contributed to pension funds' fairly small proportion of infrastructure investments.[41] In contrast, infrastructure investment by some pension funds is particularly high in Australia and Canada, in spite of differences in the relative importance of defined contribution and defined benefit pension schemes in these countries.

[41] See the latest *Survey of Large Pension Funds and Public Pension Reserve Funds* by the OECD (April 2018). For the 95 pension funds that responded to the survey, investment in infrastructure via unlisted equity and debt represented only 1.1% of assets under management.

5. Conclusion

5.1 Cost-benefit considerations

Evaluating the overall effects of the G20 financial regulatory reforms involves an assessment of their social benefits and costs. Ex ante impact assessment studies on the effects of those reforms have found significant net overall benefits.[42] These studies estimate the expected benefits of reforms in terms of reducing the likelihood and severity (output costs) of financial crises. Higher resilience enhances the financial system's ability to intermediate financial flows through the cycle and reduces the macroeconomic costs of financial crises, in particular in the form of output and employment losses. To estimate ex ante social costs, these studies assume that more stringent regulatory requirements increase the funding costs of financial institutions, which they in turn pass on to borrowers through higher lending spreads. This reduces overall lending and investment in the economy and thereby economic output.

Much of the preceding analysis has focused on the potential costs of the reforms for IF in terms of higher spreads, shorter maturities or lower volumes of financing. The long-term economic benefits of reforms, while expected to be substantial, are more difficult to quantify since they are often less evident and immediate. This is even more the case when considering how benefits may manifest for one specific asset class like IF, which only makes up a fraction of total finance provided by the financial system. The evaluation has not analysed the ex-post effects of financial reforms on resilience in general, or on resilience of IF in particular.

A 'bottom up' estimate of the resilience benefits resulting from changes in regulation for IF would have to try to aggregate the effects of multiple regulations (which are not designed specifically or solely for IF) on several types of IF and intermediaries. A complete empirical analysis of some of the benefits would only be possible after a full financial cycle, when data would show how regulated institutions had performed during both stressed and normal market conditions. Even then, the counterfactual in the absence of regulation would not be known. However, as envisaged by the Framework, in order to provide a timely review of whether post-crisis reforms are achieving their intended outcomes and to help identify any material unintended consequences, other methods of evaluating social benefits need to be considered.

One potentially beneficial effect of the reforms for IF may be that they indirectly foster a shift in financing across financial sectors, by allowing institutional investors to increase their role relative to banks (albeit from a low base). Specifically, to the degree that banks' IF activity is constrained by regulations, institutional investors may be able to step in and capture newly available IF market share. Such a shift, in addition to providing diversity in financing, could lead to a better alignment of providers and users of finance based on their respective investment horizons and risk-bearing capacity. However, the evaluation has not analysed how this shift in financing may have impacted financial stability or allocative efficiency.

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[42] See *An assessment of the long-term economic impact of stronger capital and liquidity requirements* by the BCBS (August 2010); *Assessing the macroeconomic impact of the transition to stronger capital and liquidity requirements* by the Macroeconomic Assessment Group (December 2010); *Assessment of the macroeconomic impact of higher loss absorbency for global systemically important banks* by the Macroeconomic Assessment Group (October 2011); *Macroeconomic impact assessment of OTC derivatives regulatory reforms* by the Macroeconomic Assessment Group on Derivatives (August 2013); and *Adding it all up: the macroeconomic impact of Basel III and outstanding reform issues* by Fender and Lewrick (2016, BIS Working Papers, No. 591). For a summary, see Box 1 of the FSB report to the G20 on the *Implementation and effects of the G20 financial regulatory reforms* (November 2015).

Given these considerations, the evaluation has used two approaches to assess the social benefits of reforms on IF. The first was to examine how the provision of this type of finance varied during and after the financial crisis depending on the capitalisation and funding structures of the top IF providers (all of which are banks), to gain insights about how increased levels of bank resilience might be expected to affect the provision of IF under stressed conditions. To the extent that these insights are consistent with the relationship between resilience and lending assumed by the ex ante impact assessment studies, then the results in those studies would also be applicable here. The second was to examine the extent to which IF has shifted across sectors (substitution effects) and whether this was a result of the reforms. The aim of this was to give an indication of changes in incentives of different types of financial institutions to provide IF, as well to establish whether there is now greater diversity of such financing. The results of these two complementary approaches have then been compared to the identified costs (see below) in order to reach qualitative conclusions on the overall effects of the reforms on IF.

5.2 Overall assessment

The empirical analysis and other qualitative sources suggest that the effect of G20 financial reforms on IF has been of a second order relative to other factors. The empirical analysis – which is subject to certain data and methodological limitations – has necessarily focused on those G20 reforms that have been largely implemented. The analysis does not identify a significant effect of the initial Basel III reforms on volumes or prices across different groups of institutions (e.g. banks with weaker solvency and liquidity profiles vs stronger banks, G-SIBs vs other banks). This finding is robust against a wide range of empirical specifications at different levels of aggregation (e.g. overall IF, project finance vs corporate finance, AEs versus EMDEs). In addition, bank-provided IF does not seem to have been affected disproportionately compared to other types of bank lending. Similarly, neither the empirical analysis nor industry engagement (through the workshop, the survey responses and consultation feedback) suggest that OTC derivatives reforms have materially impacted the provision of IF through changes in the availability and cost of hedging.

These results – which are broadly similar for both AEs and EMDEs – are consistent with the existing literature and feedback from market participants on this topic, which identify the macro-financial environment, government policy and institutional factors as the main IF drivers. Surveyed banks rank financial regulation as second to currency risks in terms of importance as a negative driver of IF, though its perceived impact is limited.

For G-SIBs, the analysis shows that the reforms have contributed to shorter average maturities of their infrastructure loans. A similar result is obtained for banks with weaker liquidity profiles, but the effect is limited in economic terms and is present only in some regression models. The reduction of maturities, which is observed for AE lenders but not for EMDE lenders, is driven by a combination of factors, including regulations, and is reflected in a decrease of loans with the longest maturities. This effect is not necessarily unintended, given that reducing maturity mismatch on bank balance sheets was one of the objectives of the reforms.

The current evaluation has not analysed the ex post effects of G20 reforms on resilience, but it has found no results to suggest that the benefits from enhanced resilience – as estimated at an aggregate level in ex ante studies – do not apply in the narrower context of IF. Indeed, the

analysis shows that the top bank IF providers with the lowest capitalisation during the crisis reduced their infrastructure lending volumes more than other banks.

The analysis also points to some substitution in recent years of bank financing by market-based financing in AEs, particularly during later stages of the investment life cycle. The multivariate empirical analysis suggests that the G20 banking reforms may have contributed to the substitution in the volume of IF provided by market-based finance, although they are only one of the drivers for this rebalancing.

For the financial reforms considered by this evaluation, the analysis does not identify material negative effects on IF to date. This conclusion is consistent with observations from the literature and feedback from market participants that other, non-regulatory factors are important impediments to IF. Many of these factors are already being considered elsewhere, including the G20's work to develop infrastructure as an asset class (Box 1). The conclusion also does not preclude international standard-setting bodies from continuing to assess the extent to which their standards are adequately calibrated to the particular characteristics and risks of IF. The feasibility and desirability of a different regulatory calibration for different sectors go beyond the scope of this evaluation, and would depend on factors such as the existence of a harmonised definition for IF, data availability, and considerations on the balance between complexity and risk sensitivity of regulation.

Annex A: Market structure and trends in infrastructure finance

Definition and data sources

Conceptual approach: annual volume of infrastructure deals

Infrastructure spending is measured by the volume of deals. The main motivation for using a deal-based approach in this report is that deals more directly reflect the behaviour of financial sector participants. Deals are registered when an agreement is reached on IF (financial close). This means that if, for instance, a deal is closed in 2015 on a US$200 million project to construct a bridge over the next five years, the full amount of US$200 million is recorded as infrastructure spending in the year 2015.

The deal-based methodology is different from an alternative approach of measuring gross fixed capital formation (GFCF).[43] GFCF is part of the investment that is included in the national accounts. In the above example, this would mean that infrastructure spending would be spread over the 2015-2019 period with on average US$40 million per year.

Although the two approaches are conceptually different, in the long run they are likely to show a similar volume of infrastructure spending. Deal-based measures would typically fluctuate more over time than GFCF-based measures, as deals would dry up during recessions and recover when the economic outlook improves. Both approaches reflect IF flows.

Scope of the empirical analysis

This report focuses on economic infrastructure (power, renewables, transport, telecom, water) and social infrastructure (schools, hospitals). The Oil, Mining and Gas sector is included in the scope of the analysis, but it is analysed separately given that developments in this sector are largely driven by commodity prices that would distort the analysis on the role of financial regulations.

The analysis is based on infrastructure deals that (at least partially) involve private sector financing. This is a subset of total infrastructure spending, which for the most part is financed by non-private sources such as taxes. The main motivation for this approach is that the analysis focuses on the effects of financial regulatory reforms, which are only relevant for transactions that involve the private financial sector.

The analysis covers only a limited share of the infrastructure spending universe, as is illustrated in the table below. On the basis of 2013 data (see below), about 5-10% of total infrastructure spending is included, as the bulk is financed with public funding.[44] The focus on economic and social infrastructure has a relatively limited impact on coverage of the analysis.

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[43] The GFCF-approach is used in monitoring reports such as the Global Infrastructure Hub's *Global Infrastructure Outlook* and McKinsey's (2016) report *Bridging Global Infrastructure Gaps*.

[44] Oliver Wyman (2017), basing its work on a World Bank estimate also cited by Inderst (2016), as well as Bhattacharya and Romani (March 2013) report a much higher proportion of global infrastructure financing from the private sector. These estimates can vary greatly depending on scope (e.g. whether real estate is included in infrastructure), definitions (e.g. treatment of infrastructure spending by state-owned companies) and data sources.

Source	Amount (*)	Approach / scope
McKinsey (2016) on total infrastructure spending	USD 4.9 trn (2013) USD 3.7 trn (2013) USD 2.5 trn (2013)	GFCF, economic, social, oil/gas/mining GFCF, economic, social GFCF, economic
IJ Global data* on the IF volume provided by the financial sector	USD 0.32 trn (2013) USD 0.20 trn (2013) USD 0.18 trn (2013)	Deal-based, Ec+Soc+gas/oil/mining Deal-based, Ec+Soc (this report) Deal-based, Ec

** The 2017 figures are, respectively, USD 0.43 trn. USD 0.30 trn and USD 0.29 trn.*

Description of data sets

IJ Global

IJ Global publishes quarterly league tables (covering sponsors, Mandated Lead Arrangers, advisers and Development Finance Institutions) and also receives information through deal submissions. These league tables have been running and evolving for more than a decade with the largest known flow of deals submissions from market participants. As the data source relies on data reporting by the industry, there are some inconsistencies in the reporting which could create issues with comparison. Also, there are structural breaks in the data and reporting definitions. For this reason, the analysis focuses on data reported for 2005 onwards, where the database shows deals captured according to their most current criteria. Anything prior to 2005 could only be considered as more indicative as it would not represent the full universe of deals agreed in those years.

- **Sectors:** Renewables, Power, Transport, Social and Defence, Water, Telecoms. Mining, oil and gas are excluded from the analysis, as these sectors are highly dependent on commodities prices and could distort the analysis on financing trends.
- **Finance type:** The dataset includes Primary Financing, Portfolio Financing, Additional Facilities and Securitisation. Refinancing, asset acquisition, company acquisition and privatisations have been excluded, as these are considered out of the scope. These types of transactions can distort financing trends, as they do not relate to new infrastructure but involve strategic corporate operations financed through corporate balance sheets.
- **Data Coverage:** The data set is the most comprehensive dataset on IF at the global level. Reporting is on a voluntary basis. Information is collected by an international team of journalists (based London, New York, Hong Kong and Singapore) who produce daily news and analysis content. Details are incorporated in the database linked through to either transaction, asset, company or league table records. A team of Financial Data Analysts update the database on a daily basis. These analysts maintain relationships with market participants to source information on new activity and update existing records. The data team has also access to the wider network of information providers operating under its parent group, Euromoney Institutional Investor. This includes other industry and financial information covering local regions, capital markets, institutional investors, funds, trade finance and mining and metals.

Dealogic Syndicated Loans, Bonds, Projects

Dealogic contains data on all reported syndicated loans by banks, including corporate loans and loans to non-infrastructure sectors. The definition of syndicated infrastructure loans is based on i) loans being project loans (i.e. loans to an SPV) and ii) the borrower being in an infrastructure-related sector. The scope excludes fossil fuel industries, but includes electric and renewable energy sectors. Apart from transportation (including roads, railways, airports etc.) and communication infrastructure (e.g. telecommunications), it also includes social infrastructure such as schools or health care. It excludes services in general, even those related to the infrastructure sectors above, as services lack the typical features of infrastructure investment.

The advantage of this data is that it contains a complete set of information on loan pricing, maturities and currencies. However, for syndicates, the relative allocation among syndicate members is not provided. For the purpose of the evaluation, loan amounts are distributed equally across lenders, which is consistent with the approach followed in the literature.

Dealogic data on bonds and projects has been used as a benchmark for the IJ Global data. To this end, the evaluation used longer-term trends on volumes (Graph 1, using Dealogic Project data), and compared trends for bonds covered by Dealogic and IJ Global.

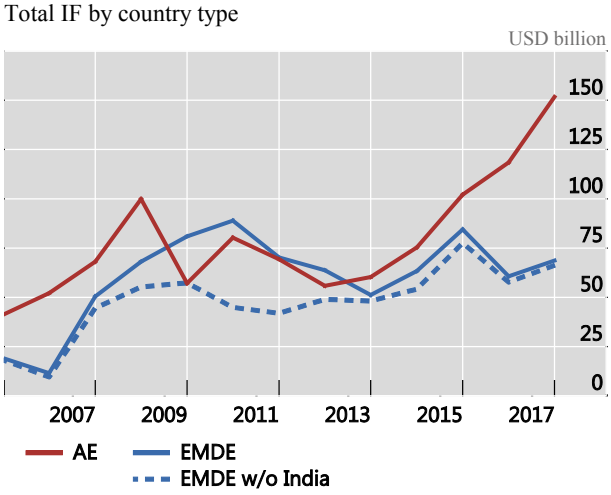
Development of IF – Summary graphs

Volumes

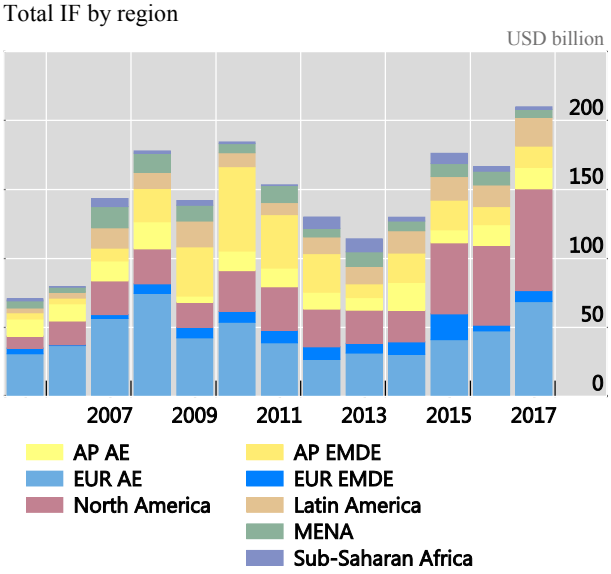
Graph A.1: IF has surpassed pre-crisis levels

Regional distribution of total IF subject to the evaluation — Graph A.1

Total IF by country type



Total IF by region



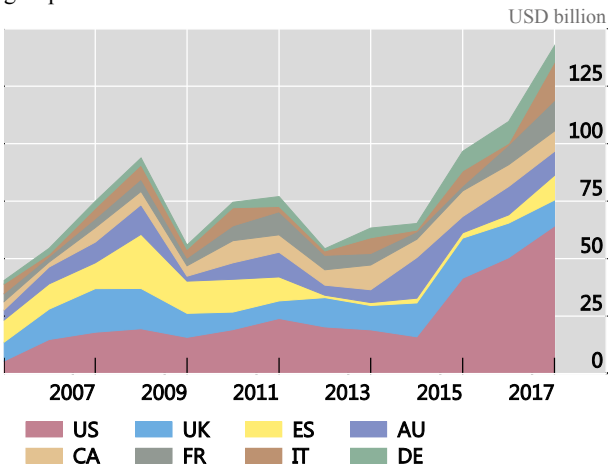
Note: The series exclude the oil, gas and mining sectors and refining transactions. Right graph: North America includes Canada and the United States.

Source: IJ Global.

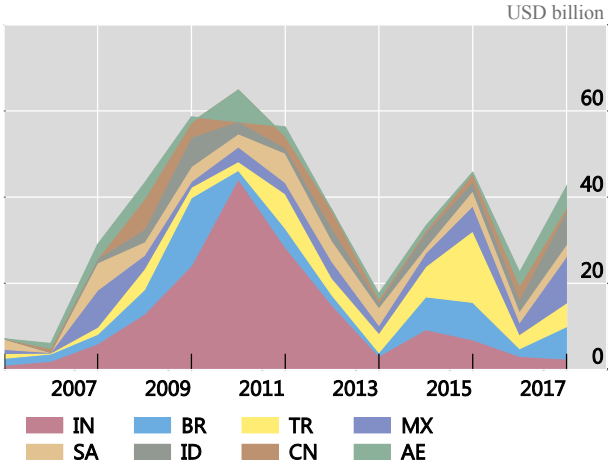
Graph A.2: There is substantial variation in IF across countries

IF volume by country — Graph A.2

IF provided by the financial sector originates from a small group of countries in both AEs…



… and EMDEs



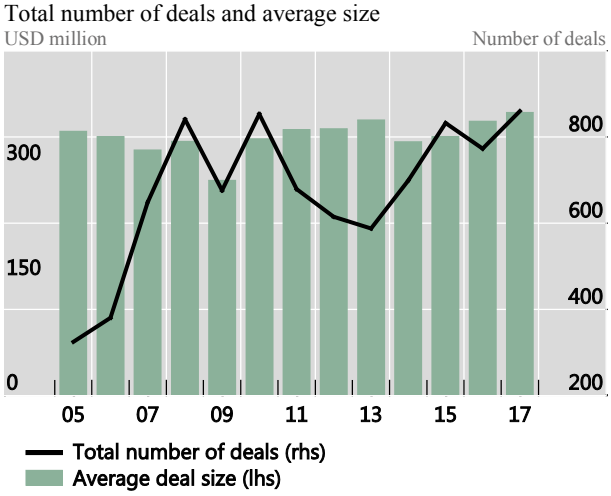
Note: The series shows the top eight AEs and EMDEs by total volume of IF during 2005-17 (AE in the right hand chart: United Arab Emirates). The series exclude the oil, gas and mining sectors and refining transactions. IF is highly concentrated for both country types, with the largest eight countries accounting for about 85% and 65% of total IF in AEs and EMDEs, respectively.

Source: IJ Global.

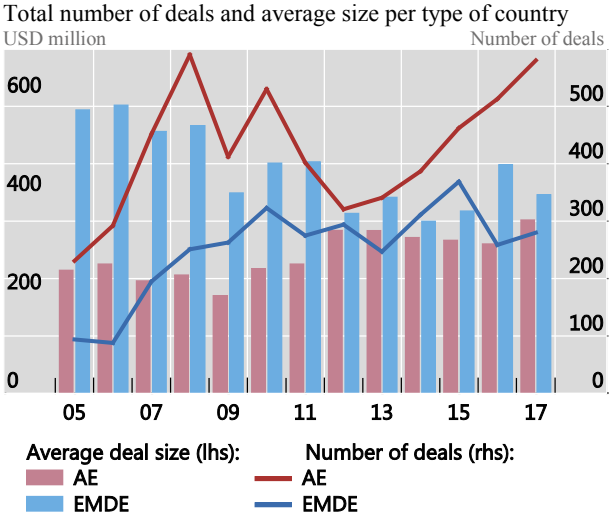
Graph A.3: The average deal size decreased slightly, while the total number of transactions has increased

Number of transactions and transaction size — Graph A.3/1

Total number of deals and average size



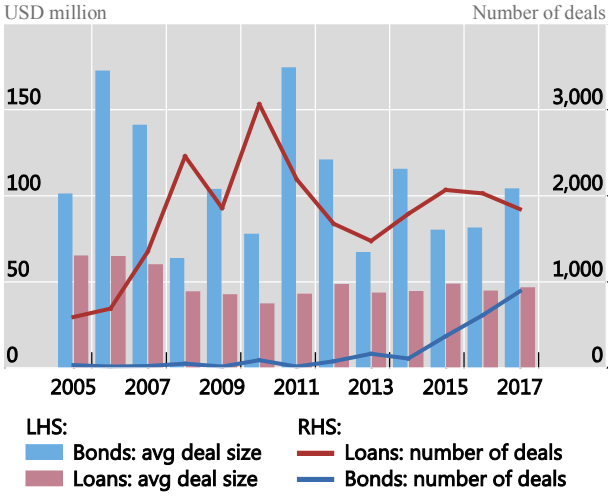
Total number of deals and average size per type of country



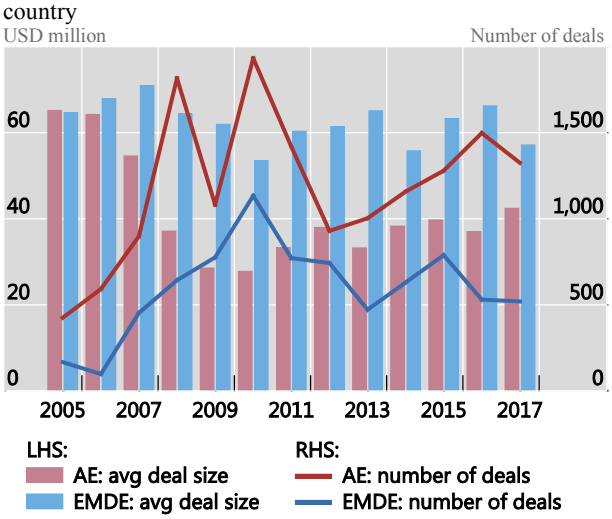
Source: IJ Global.

Number of deals and deal size at the tranche level by financing provider — Graph A.3/2

All IF assets: Total number of deals and average size



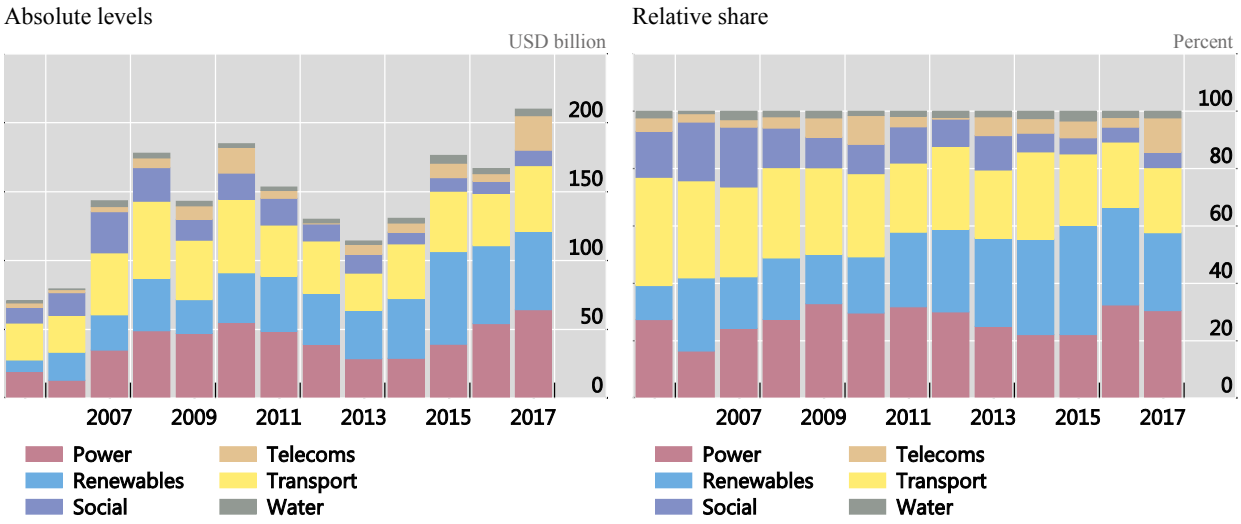
All IF loans: Total number of deals and average size per type of country



Source: IJ Global.

Graph A.4: Power, renewables and transport financing have grown since the crisis, while social and telecom infrastructure is yet to catch up

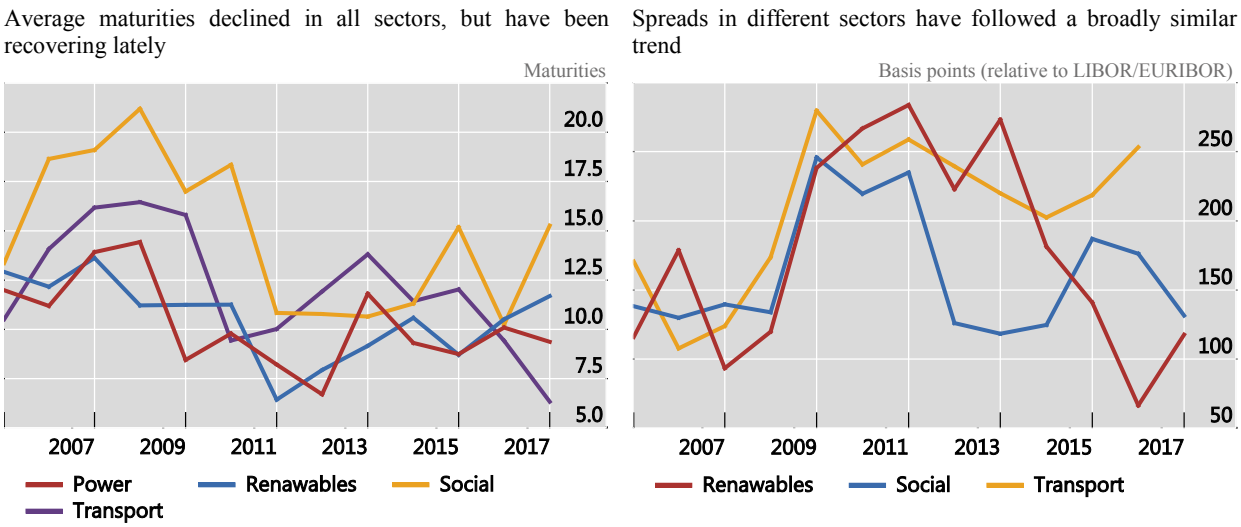
IF volumes by sector — Graph A.4/1



Note: The series exclude the oil, gas and mining sectors and refinancing transactions.

Source: IJ Global.

Sectoral developments for maturities and credit spreads — Graph A.4/2



Note: The series are for loans in AEs. Note that some of the series (especially on prices) is sparse.

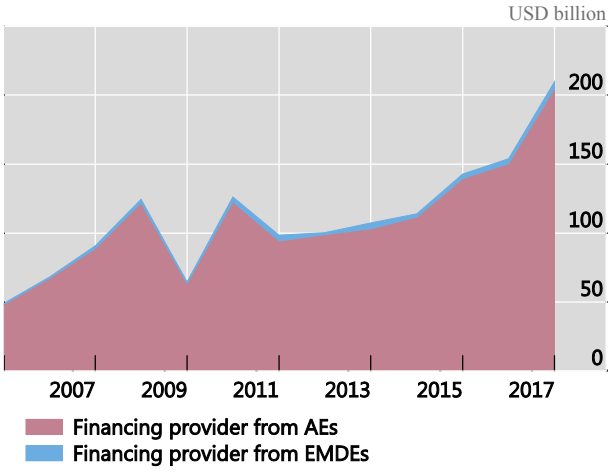
Source: IJ Global.

Regional aspects

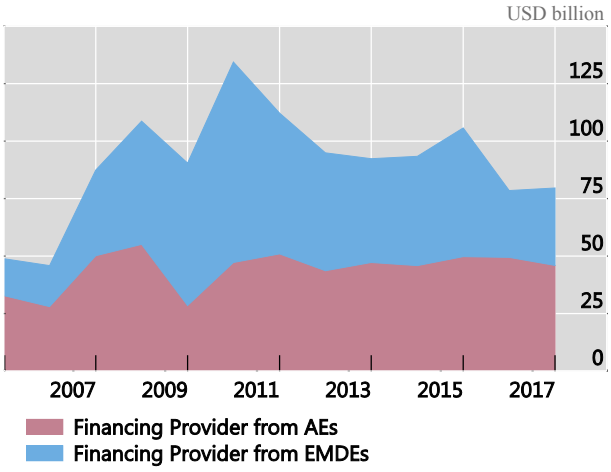
Graph A.5: Cross-border financing from AEs represents a large proportion of IF in EMDEs…

Financing volumes for AEs and EMDEs — Graph A.5

IF in AE



IF in EMDEs



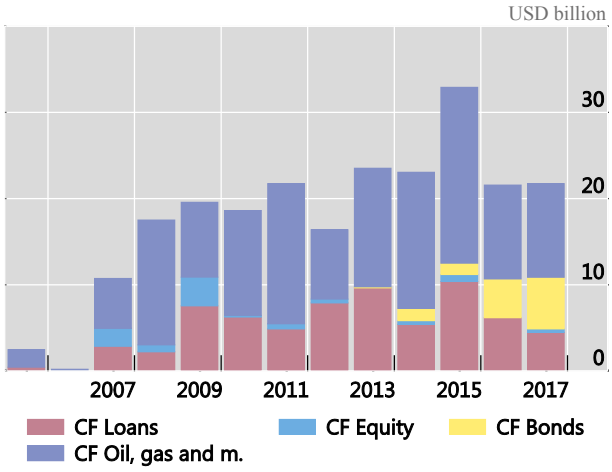
Note: The series exclude the oil, gas and mining sectors and refining transactions.

Source: IJ Global.

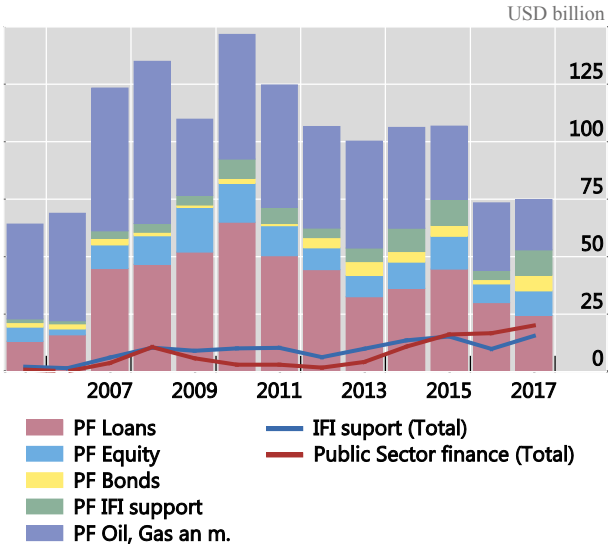
Graph A.6: … and loans remain the primary financing instrument in EMDEs

Recipient of IF: Trends for EMDEs — Graph A.6

Corporate Finance: Volume by financing instrument



Project Finance: Volume by financing instrument

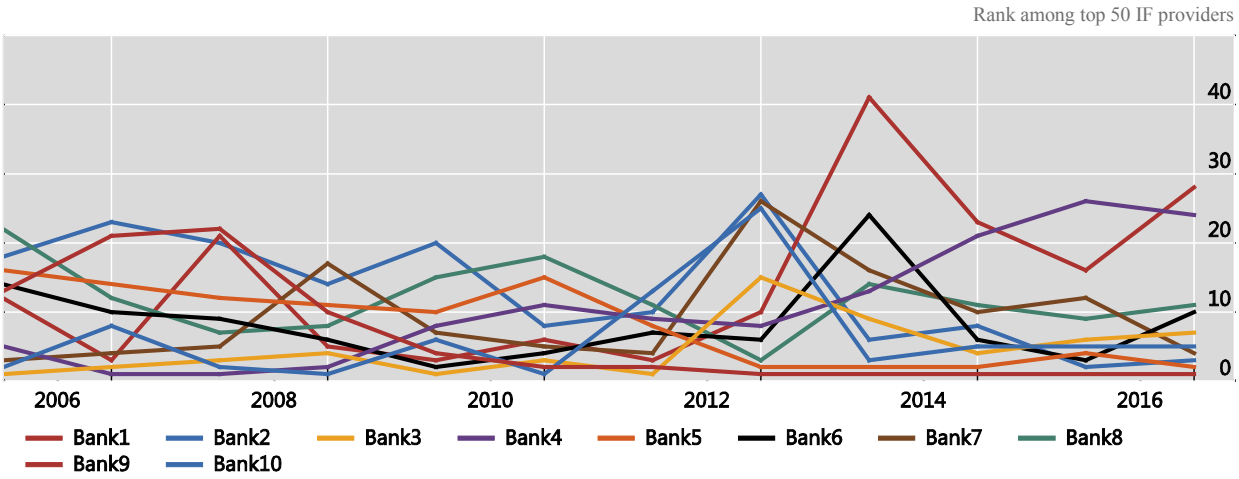


Source: IJ Global.

Graph A.7: Market concentration remains substantial…

Market concentration and significance of IF for banks

The top 10 financing providers have remained fairly similar during the last ten years — Graph A.7

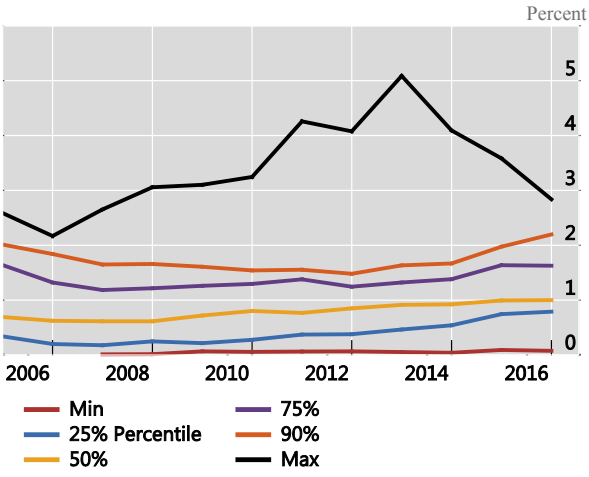


Source: IJ Global.

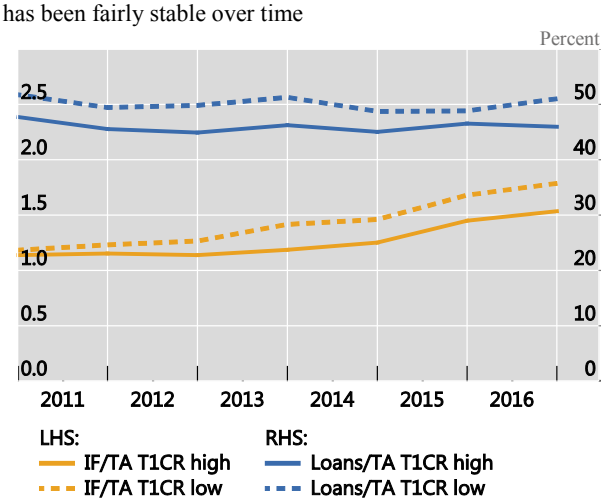
Graph A.8: … while IF represents a fairly small portion of the balance sheet size of banks.

Proxy for banks' IF relative to total assets — Graph A.8

The share of infrastructure assets accounts for 0.5-2% of the total assets of G-SIBs



The portion of infrastructure assets to total assets has increased, albeit from low levels, while the ratio of loans to total assets has been fairly stable over time



Left graph: Proxy for stock of IF to total assets computed based on flows of IF from IJ Global, assuming that IF assets subject to financial close in one year are being amortised linearly over ten years. To extend the series, the bank-specific IJ Global IF data in 2005 was scaled back to the 1990s using the IF financing pattern observed by Dealogic Projects (red bars in Graph 1).

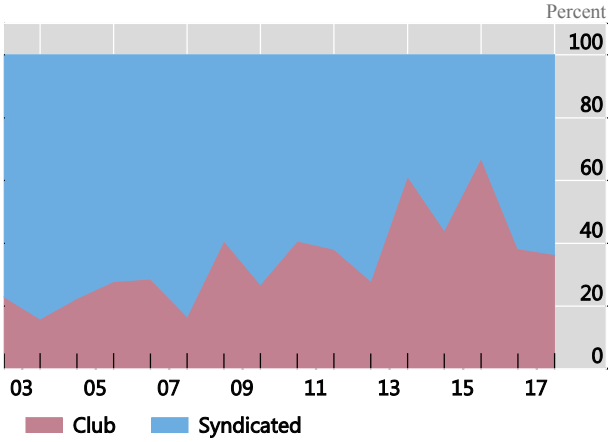
Right graph: Evolution of portion of infrastructure assets to total assets and loans to total assets for the top 20 IF providers with high (solid lines) and low (dotted lines) tier 1 capital ratios.

Source: IJ Global; Dealogic (IF data), Fitch (Bank data).

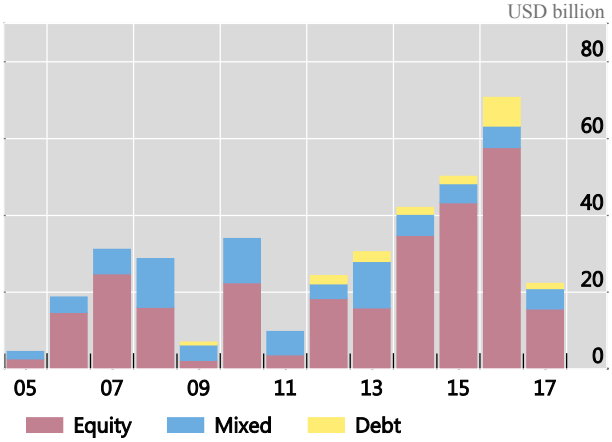
Graph A.9: New IF business practices have become more prevalent…

Risk sharing increased and new players enter — Graph A.9

Evolution of club loans vs syndicated loans for IF



Final size of infrastructure funds by strategy

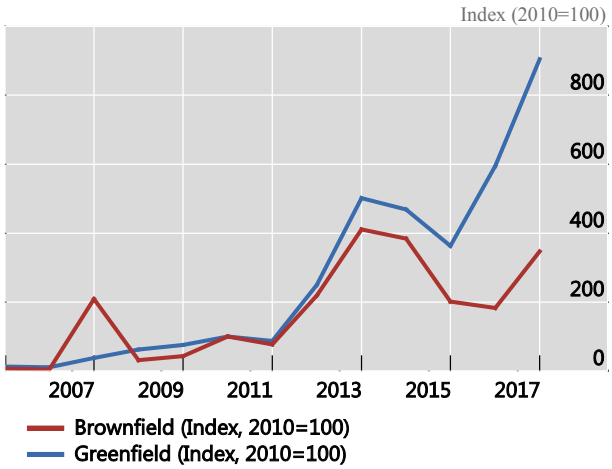


Source: Dealogic (left) and IJ Global (right).

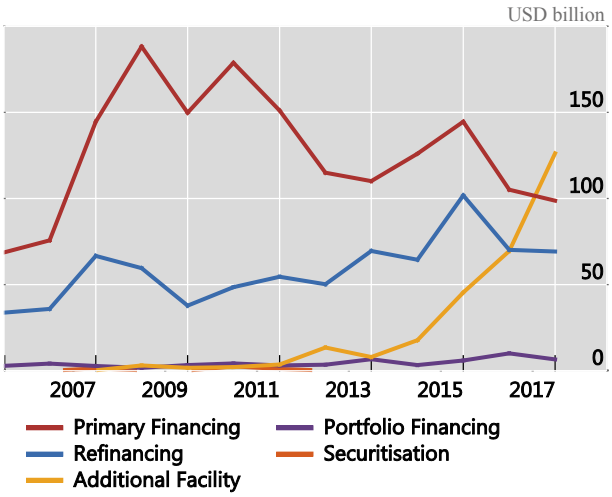
Graph A.10: … and there is increased investor interest for Greenfield projects.

Other evidence on financing patterns — Graph A.10

Greenfield vs Brownfield (Capital Expenditure)



Financing volumes by transaction type



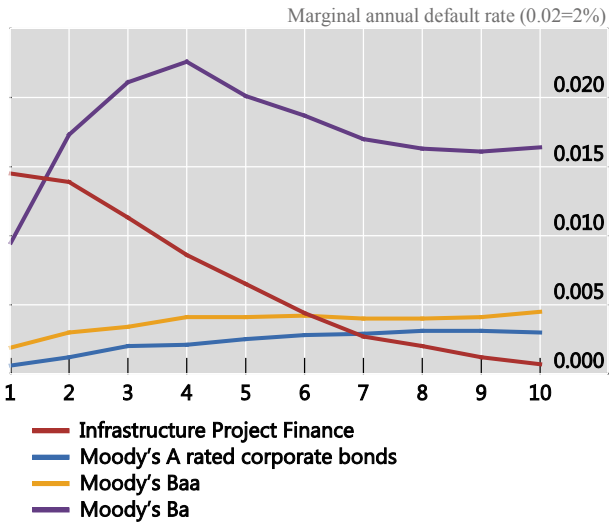
Note: The left graph shows the evolution of capital expenditure for brownfield vs greenfield assets (2010=100). Right hand graph: "Additional facility" includes bond financing, which explains the sharp increase in recent years.

Source: IJ Global.

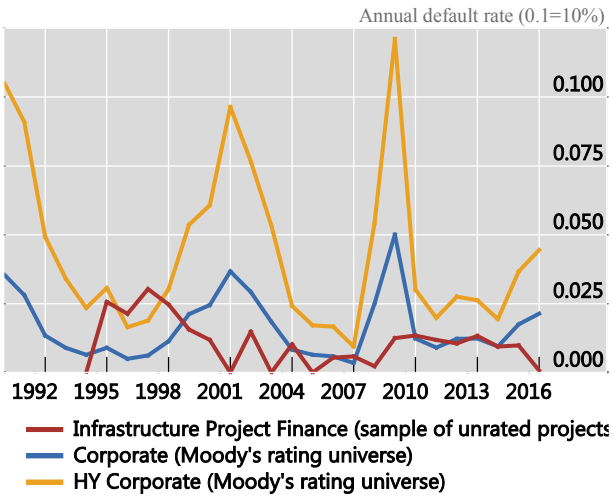
Graph A.11: The risk profile of infrastructure assets is distinct

Risk profile of infrastructure assets (project finance) Graph A.11

Marginal default rates for project finance assets compared against corporate bonds



Annual default rate of infrastructure project finance assets compared against corporates



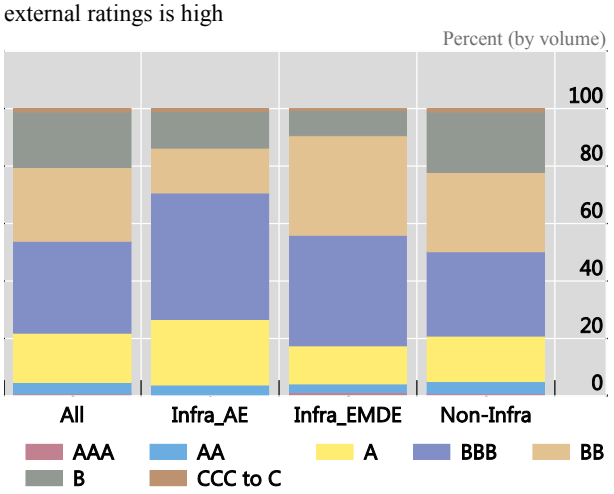
Notes: Left Graph: The x-axis shows the number of years after origination. It should also be noted that the data underlying the IF/project finance series is fairly limited.

Sources: Default and recovery rates for project finance bank loans, 1983-2016, Exhibit 15. Right graph: Series for infrastructure project finance taken from Exhibit 32 in Moody's, Default and recovery rates for project finance bank loans, 1983-2016. Source for default rates for corporates: Moody's, Annual Default Study: Corporate Default and Recovery Rates, 1920-2016.

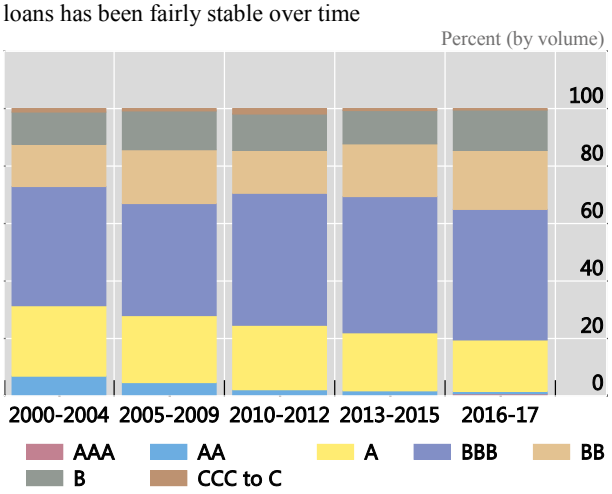
Graph A.12: External rating information for IF assets is limited

Rating distribution of infrastructure syndicated loans vs other assets Graph A.12

The credit quality of infrastructure syndicated loans with external ratings is high



The investment grade share of AE infrastructure syndicated loans has been fairly stable over time

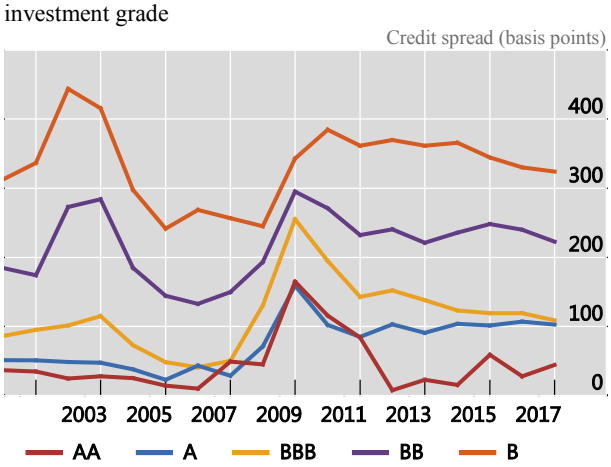


Sources: Dealogic.

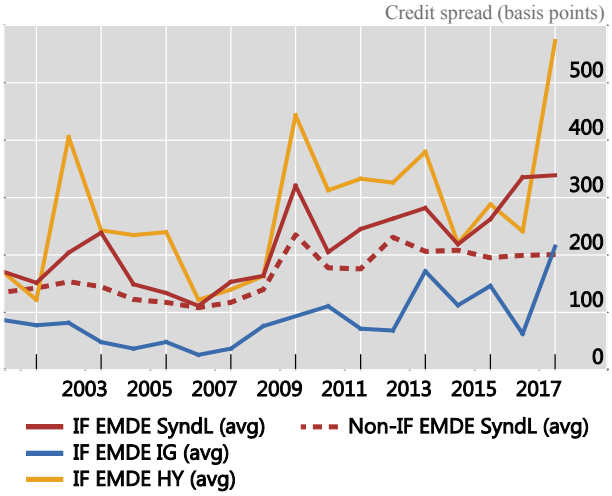
Graph A.13: Additional results for credit spreads of infrastructure assets

Credit spreads of infrastructure syndicated loans — Graph A.13

Credit spreads for infrastructure syndicated loans have come down after a spike during the crisis, but less so for sub-investment grade



Credit spreads for infrastructure assets in EMDEs increased during the crisis and have remained at similar levels since then

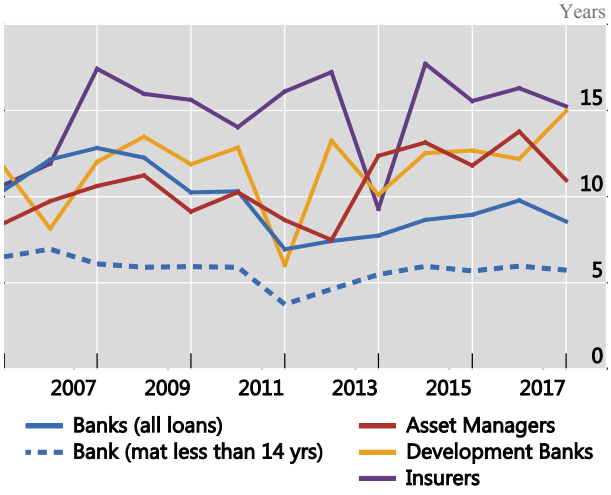


Sources: Dealogic.

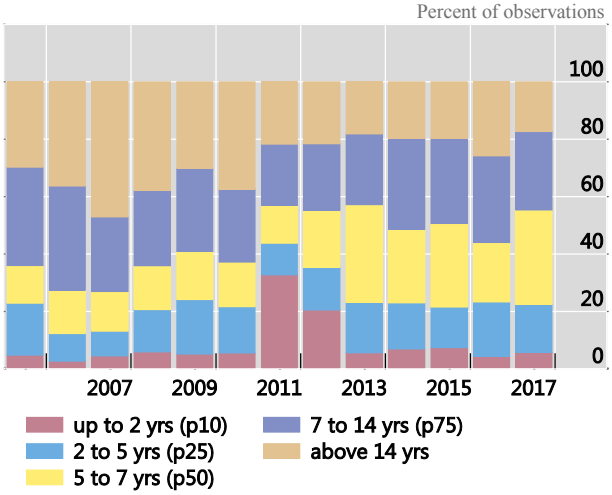
Graph A.14 Banks have shortened IF maturities, by reducing loans with very long maturities

Trends for maturities — Graph A.14

Maturity for loans by financing provider type



Maturity distribution for loans



Note: Both graphs show average maturities (i.e. based on the number of observations). Note that data is limited for the non-bank financing providers. The maturity distribution for syndicated loans exhibits a similar pattern as shown in the right hand graph.

Source: IJ Global.

Annex B: Financial regulations potentially affecting infrastructure finance

Basel III[45]

Basel III is a comprehensive set of policy measures designed to strengthen the regulation, supervision and risk management of the banking sector in response to the lessons from the global financial crisis. The Basel III standards are minimum requirements that apply to internationally active banks. BCBS member jurisdictions have committed to implementing them within the timeframe established by the Basel Committee, while other jurisdictions are implementing them on a voluntary basis.[46]

Jurisdictions may choose to supplement the Basel framework with their own prudential requirements on banks. While these local variations may be relevant, there is no straightforward way to separate out their impacts when evaluating the effects of reforms on IF.

The new capital and liquidity requirements introduced since the crisis have increased the potential number of binding regulatory constraints for banks.[47] Some banks focus only on their most binding resource constraint, while others may seek to manage across multiple constraints at different levels of the organisation.[48] The effects may differ depending on the approach used by the bank to determine its regulatory capital requirements (e.g. standardised vs model-based approaches) and on whether they arise from domestic implementation or from cross-border spillovers (i.e. adoption of reforms by the home jurisdiction of the local bank). As a result, also given different starting points and risk preferences, banks are not expected to have homogeneous reactions to these regulatory changes.

A brief description of Basel III elements potentially affecting IF is provided below. Only those elements that may be most relevant for IF are included, so the list is not comprehensive.[49]

Risk-based capital

Quality of capital, minimum capital requirements and capital buffers: The first phase of the Basel III reforms, agreed in 2010-11, sought to improve the quality of capital and raise the level of minimum required capital. Capital conservation and countercyclical capital buffers were also introduced. These reforms have now been implemented across all BCBS member jurisdictions.

These changes do not specifically target a bank's infrastructure loans as distinct from its other exposures, since they affect the multipliers that are applied to a bank's total risk-weighted assets (RWAs). However, they may have an indirect effect on IF banks respond by altering their mix of activities. For example, a bank constrained by risk-based capital requirements may choose to pull back from higher risk-weight lending before exiting lower-risk business lines.

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[45] See https://www.bis.org/bcbs/basel3.htm and https://www.bis.org/bcbs/basel3/b3_bank_sup_reforms.pdf. For more information on the Basel III implementation status, see https://www.bis.org/bcbs/implementation.htm.

[46] See the *FSI Survey on Basel II, 2.5 and III Implementation* (July 2015).

[47] See, for example, *Literature review on integration of regulatory capital and liquidity instruments* by the BCBS Research Task Force, BCBS Working Paper No 30 (March 2016).

[48] See, for example, *Financial Resource Management: Balancing complex and competing constraints on capital, liquidity and funding* by Oliver Wyman and IACPM (2017).

[49] For example, the revised Basel securitisation framework is not included since infrastructure loans are not generally securitised given their large size, illiquidity and bespoke characteristics.

Credit risk weights for infrastructure assets: The first phase of the Basel III reforms revised some risk weights that had proved to be acutely miscalibrated (including for market risk, counterparty credit risk and securitisation) but left credit risk weights broadly unchanged. The finalisation of Basel III in December 2017 amended the credit risk framework, as part of efforts to restore credibility in the calculation of RWAs and improve the comparability of banks' capital ratios.[50] The use of internal ratings-based (IRB) approaches for credit risk was constrained (e.g. by introducing input floors for Loss Given Default (LGD)[51] estimates, in addition to changes to the recognition of eligible collateral), and an 'output floor' was introduced such that modelled outputs could not diverge too far in aggregate from standardised approaches. These changes are due to be implemented by 2022, while jurisdictions have the option of phasing-in the output floor over a 5-year period.

The effect of these changes for IF assets will depend on the financing instrument used (see Table B-1 below). The changes to risk weights in isolation would not be expected to have a significant effect on banks' behaviour:

- the changes to the standardised approach for project finance are relatively small. Where an issue-specific credit rating is unavailable or cannot be used, the approach has been made more risk-sensitive, to reflect the quality of the project and the change in credit risk profile as a project matures from the construction to the operational phase; and
- all of the IRB approaches that were permissible for project finance under Basel II, including Advanced IRB and slotting, will remain available under the finalised Basel III agreement with some additional constraints.

Measurement of off-balance sheet exposures: The finalisation of Basel III in December 2017 also introduced changes to the credit conversion factors (CCFs) used to convert off-balance sheet items into credit exposure equivalents. Since the loan finance for infrastructure projects is typically drawn down in stages, part of a bank's total commitment may remain undrawn. The CCFs for undrawn commitments of banks with an original maturity of more than one year will be decreased from 50% (for banks adopting the standardised approach to credit risk) and 75% (for banks adopting the slotting and F-IRB approaches) in Basel II to 40% in Basel III.[52] The net impact of these changes would therefore be expected to be positive for IF.

The finalised Basel III also disallowed internal estimation of CCFs for banks adopting the A-IRB approach for non-revolving commitments. In future, these banks will be required to use the prescribed 40% CCF. Internal estimates of CCFs for revolving commitments will continue to be permitted, subject to some additional constraints. The overall net impact of this change is less certain and will depend on whether the relevant facilities are of a revolving nature and on the magnitude of banks' internally-estimated CCFs.

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[50] See *High-level summary of Basel III reforms* by the BCBS (December 2017).

[51] The rationale for the introduction of such floor was to enhance the reliability of model estimates and to reduce excessive variability in RWAs.

[52] Undrawn commitments of banks with an original maturity of one year or less will be increased from 20% (for banks adopting the standardised approach to credit risk) and decreased from 75% (for banks adopting the slotting and F-IRB approaches) in Basel II to 40% in Basel III. However, this may be less relevant since the original maturity of lending to infrastructure finance is likely to be more than one year.

Table B-1: Risk weights for selected exposures under different calculation approaches

	Project finance loan categorised as 'specialised lending'	BBB-rated loan/bond to corporate	Unrated loan to corporate	Loan with credit guarantee by MDB		Equity
Basel II Standardised Approach	Follows corporate tables based on external ratings (**20% to 150%**), **100%** for unrated.	**100%**	**100%**	**0%** (if MDB among list of eligible MDBs), otherwise risk weights for banks		**100%**
Basel II / III IRB	May use slotting, foundational IRB (F-IRB), or advanced IRB (A-IRB); depends on estimated parameters. Approaches remain available in final Basel III framework (from 2022), but 1.06 multiplier has been removed and input floors have been further defined for A-IRB.					Several approaches possible under Basel II are no longer available under Basel III.
Final Basel III Standardised Approach (from 2022)	Follows corporate tables based on external ratings (**20% to 150%**). Or, where an issue-specific credit rating is not available or external ratings cannot be used, 130% during the pre-operational phase and 100% during the operational phase; high quality projects will be subject to a risk weight of 80% during the operational phase.	**75%** In jurisdictions where external ratings cannot be used, 65% for investment grade corporates;[53] 100% for corporates which are not investment grade.	**100%** In jurisdictions where external ratings cannot be used, 65% for investment grade corporates.	**0%** (if MDB among list of eligible MDBs), higher risk weight otherwise.		**250%** (Certain equity exposures might attract a 100% or 400% risk weight.)
Notes	BCBS plans a review of the slotting approach.		Some jurisdictions (e.g. Brazil, US) do not use external ratings for regulatory purposes.	Only minor changes under Basel III rules compared to Basel II.		Jurisdictions may remove the IRB with or without a phase-out period of five years.

[53] An 'investment grade' corporate is defined by the BCBS as a corporate entity that has adequate capacity to meet its financial commitments in a timely manner and its ability to do so is assessed to be robust against adverse changes in the economic cycle and business conditions.

Leverage ratio

A minimum leverage ratio was introduced to constrain excess leverage in the banking system and complement risk-weighted capital requirements. It requires a bank to have high-quality capital resources equivalent to 3% of its total on- and off-balance sheet exposures (its 'leverage exposure measure'). Proposals for a leverage ratio were agreed in 2010 and then revised in 2014. Banks were expected to report their leverage ratios from 2015 onwards, and to comply with a minimum requirement from 2018 onwards. Nearly all BCBS members have implemented the initial leverage ratio.

The finalisation of Basel III in December 2017 amended the definition of the exposure measure, and introduced a G-SIB 'surcharge' (taking the form of a capital buffer) equivalent to 50% of a G-SIB's risk-weighted higher-loss absorbency requirements. The implementation date for both measures is 1 January 2022.

For banks that consider the leverage ratio as a constraint when making lending decisions, low-risk-weight exposures may appear relatively less attractive. This is because such exposures will tend to offer lower returns versus the relevant hurdle rate, despite generating the same capital requirement (due to the leverage ratio) as a riskier, higher-return asset with the same exposure value.

IF assets may have particularly low or zero risk weights where they have been guaranteed by a body such as an export credit agency (ECA), an MDB or a highly-rated sovereign. However, since it is a non-risk-based measure, the leverage ratio does not allow risk mitigants such as guarantees to reduce the leverage exposure measure. Such guarantees may therefore be less attractive to banks that are leverage-constrained, or that place weight on leverage requirements (in addition to risk-weighted requirements) when making lending decisions.

G-SIB framework

Systemically important banks (SIBs) are financial institutions whose distress or disorderly failure, because of their size, complexity and systemic interconnectedness, would cause significant disruption to the wider financial system and economic activity. As part of the policy framework for addressing the negative externalities of SIBs and to protect the system from wider spillover risks, the BCBS adopted in 2011 (and revised in 2013 and 2017) an assessment methodology to identify G-SIBs and introduced higher loss absorbency requirements (HLA) for them. G-SIBs are scored against published criteria (based on size, interconnectedness, lack of substitutability, global activity and complexity) and placed into buckets of systemic importance that require them to have an additional capital buffer, which will be phased in from 2016 to 2019.[54] Final rules on HLA requirements are now in force in all jurisdictions that have G-SIBs headquartered in them.

The potential effects of this reform are similar in nature to those of the new minimum capital requirements introduced by Basel III. In particular, the higher capital buffer does not specifically target a bank's infrastructure loans as distinct from its other exposures, but may have an indirect effect on IF if the bank responds by altering its mix of activities.

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[54] See *Global systemically important banks: updated assessment methodology and the higher loss absorbency requirement* by the BCBS (July 2013). G-SIBs are also subject to a total loss-absorbing capacity requirement and a leverage ratio buffer requirement.

Liquidity standards

Basel III has introduced two minimum standards for funding liquidity: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR).

LCR: The LCR seeks to ensure that a bank has sufficient unencumbered High Quality Liquid Assets (HQLA) to survive an acute stress scenario of cash outflows lasting for 30 days. The LCR was published as a standard in 2010 and revised in 2013, with implementation being phased in between 2015 and 2019. All BCBS members have implemented the LCR standard.

Banks can use contractually-due inflows to offset outflows under the LCR stress. Given the relatively long term of infrastructure lending, the inflows contractually due from any loans over the next 30 days would probably be small relative to the total portfolio, so the treatment of these inflows under the LCR is unlikely to be a material issue for IF.

In the LCR stress scenario, undrawn credit and liquidity facilities[55] provided to SPVs are assumed to be fully drawn down, whereas the same facilities provided to other types of entity (including corporates) have much lower drawdown rates. SPV structures are widely used for project finance, so this may reduce its relative attractiveness compared to corporate finance. However, the outflows arising from these facilities are only likely to be a small proportion of a bank's total outflows under the LCR stress.

NSFR: The NSFR incentivises banks to use more stable sources of funding on an ongoing basis. It was introduced in the December 2010 Basel III agreement, and was revised in 2014 to focus on the riskier types of funding profile employed by banks while improving alignment with the LCR and reducing cliff effects. It became a minimum standard in 2018. As of end-March 2018, only around one third of BCBS member countries have implemented the NSFR, although the majority of members have issued draft rules on it.

The NSFR categorises a bank's assets into buckets to determine a total amount of Required Stable Funding (RSF). Banks' sources of funding are also bucketed to determine total Available Stable Funding (ASF). A bank must have ASF greater than RSF over a time horizon of one year to comply with the NSFR. There is no separate bucket for infrastructure loans, so such loans with remaining maturity >1 year would be expected to fall into the 100% RSF bucket.

It has been argued[56] that relative to the pre-crisis framework, the NSFR creates a disincentive to undertake longer-term lending (such as infrastructure lending) because it increases the cost of the funding required to support that lending. It is true that the NSFR would make it more expensive for a bank to fund a long-term (over one year) loan (100% RSF) with short-term (less than one year) funding (50% ASF). However, this is an intended effect of the reform, which seeks to reduce overreliance on short-term funding for maturity transformation purposes. Moreover, the NSFR does not differentiate by term for assets or liabilities with maturities of one year or greater – so it does not, for example, make a 15 year loan less attractive than a 10 year loan. Given this, the NSFR still permits a significant degree of maturity transformation.

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[55] These facilities are defined as explicit contractual agreements or obligations to extend funds at a future date to retail or wholesale counterparties. They only include agreements that are contractually irrevocable or conditionally revocable.

[56] See, for example, *Interaction, coherence and overall calibration of post crisis Basel reforms* by Oliver Wyman (August 2016).

Large exposures regime

The large exposures regime seeks to mitigate systemic risks arising from interlinkages across banks and concentrated exposures.[57] It prescribes a general limit applied to all of a bank's exposures to a single counterparty, which is set at 25% of a bank's Tier 1 capital. This limit also applies to a bank's exposure to identified groups of connected counterparties. The framework was agreed in 2014 and is scheduled to take effect from 1 January 2019, superseding the 1991 standard on this topic. Implementation to date of this standard is still at an early stage.

The large exposures regime was cited as a potential impediment to IF for smaller banks, which may limit their participation given the typical size of infrastructure deals.[58] Such banks, however, do not typically have the expertise to participate in this market, which is dominated by G-SIBs (see section 2 and Annex A). In addition, a mitigating factor is that, where an exposure is guaranteed by an MDB, the exposure is counted as being to the MDB and not to the borrower, which could therefore increase banks' capacity to lend to larger projects.

OTC derivatives reforms

The global financial crisis exposed weaknesses in the structure of OTC derivatives markets that had contributed to the build-up of systemic risk and the damage caused by the crisis. In response, the G20 Leaders made several commitments to reform OTC derivatives markets. The aims of the reforms were to mitigate systemic risk, improve transparency in the derivatives markets and protect against market abuse.[59]

IF transactions can give rise to interest rate, currency, commodity and credit risk. Some of these risks can be hedged by entering into a derivative contract. A derivatives end-user would normally hedge with a bank dealer, which would in turn lay off much or all of the risk in the inter-dealer market. Some examples of OTC derivatives of particular relevance to IF include:

- Interest rate swaps: Borrowers may prefer to borrow at fixed rates (for certainty), while lenders may prefer to lend floating (to match their funding profile). Depending on the terms of the transaction, one of these parties may choose to hedge by entering into a separate interest rate swap agreement.
- Cross-currency swaps: If an internationally active bank based in an AE funds an EMDE project, the bank may prefer to lend in its own currency, whereas the borrower would prefer domestic currency (to match its revenues). Whichever party bears the currency risk can purchase a cross-currency swap to manage idiosyncratic currency risk.
- Commodity derivatives: If a project requires a commodity as input (e.g. natural resources), the project sponsors may wish to mitigate the risk of commodity price inflation through future/forward contracts.

The regulatory treatment of an OTC derivative will depend on, among other things, who the counterparties are and whether the trade is centrally cleared (which will determine whether the trade is subject to margin or higher capital requirements). Users of derivatives may respond to

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[57] See BCBS, *Supervisory framework for measuring and controlling large exposures* (April 2014). A tighter limit of 15% of Tier 1 capital will apply to exposures between banks that have been designated as G-SIBs.

[58] See, for example, the World Bank working paper on *Private Financing of Public Infrastructure through PPPs in Latin America and the Caribbean* by Garcia-Kilroy and Rudolph (2017).

[59] See http://www.fsb.org/what-we-do/policy-development/otc-derivatives/.

these potential effects by reducing their hedging activity, accepting higher costs, restructuring their activity (e.g. switching to more standardised, lower-cost or shorter-term contracts, even when they give rise to higher rollover and basis risk). The overall effect will vary depending on factors such as the asset class, maturity, counterparty and currency of the transaction.

A brief description of OTC derivatives reform elements potentially affecting IF is provided below. Only the most relevant elements are included, so the list is not comprehensive.[60]

Clearing and margin requirements

To help mitigate systemic risk, the G20 Leaders agreed in 2009 that all standardised derivatives contracts should be cleared through CCPs by end-2012. The G20 also agreed to adopt higher capital and margin requirements on non-centrally cleared derivatives (NCCDs) in order to strengthen the incentive for banks to centrally clear these transactions, where possible. Under the BCBS and IOSCO margin framework (developed in 2013, and revised in 2015 to adjust the phase-in schedule),[61] variation margin has been required to be exchanged between counterparties within scope of the requirements since March 2017. Under the framework, the exchange of initial margin is being phased in under a gradually reducing threshold of which the final and most important level (in terms of the number of entities in-scope) will be reached in September 2020.

As at June 2017, central clearing frameworks and margin requirements have been implemented in most FSB member jurisdictions. Requirements to clear specific products (mostly for interest rate derivatives, an asset class for which there is widespread availability of CCPs) have been adopted in almost half of the FSB member jurisdictions. Implementation has progressed the most in jurisdictions with the largest OTC derivatives markets, but it remains behind schedule in some other jurisdictions.[62]

Clearing and margin reforms may impact hedging activities as they may make the use of derivatives more expensive. In the absence of these reforms, it could be expected that counterparties would typically continue not to centrally clear OTC derivatives, and some margin for NCCDs would have been exchanged at least for larger trades. Typically, initial margin would not be exchanged for bank-client trades but only for inter-dealer trades, a position that will gradually change as the initial margin requirements on NCCDs are phased-in.

However, an FSB study of the effects of the OTC derivatives reforms[63] found only limited support for the impact on the ability or readiness of end-users to hedge their financial risks (e.g. availability of risk management tools, cost of hedging financial risks, and extent to which end users hedge financial risks). Any observations in this area thus remain tentative. Any costs should also be weighed against the benefits that these reforms are expected to provide, including by reducing counterparty credit risk, enhancing financial stability and driving increased levels of automation and standardisation in these previously largely unregulated markets.

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60 For example, trade reporting and platform trading requirements are not covered given their limited relevance for IF.

61 See BCBS-IOSCO *Margin requirements for non-centrally cleared derivatives* (March 2015).

62 For more details on implementation status of these reforms, see the FSB *OTC Derivatives Market Reforms: Twelfth Progress Report on Implementation* (July 2017)

63 See the FSB *Review of OTC derivatives market reform: Effectiveness and broader effects of the reforms* (June 2017).

Bank capital requirements

Certain elements of Basel III affect banks involved in OTC derivatives markets, reflecting the G20 commitment for higher capital charges for NCCDs. In particular, banks whose derivatives are centrally cleared are now subject to explicit capital requirements for CCPs, while an explicit credit valuation adjustment (CVA) capital charge has been introduced for counterparty credit risk stemming from bilateral derivatives exposures. This reflects the experience of the crisis that counterparty risks arising from bilateral derivatives exposures were being undercapitalised.

Exposures to CCPs: There were no specified capital requirements for any CCP exposures under the Basel II regime. An interim framework on bank capital requirements for exposures to CCPs was agreed in 2012 and revised in 2014:

- Banks face a 2% risk weight for trade exposures to qualifying CCPs. For non-qualifying CCPs, the Standardised Approach to Credit Risk applies (so a minimum RW of 20%). Exposure amounts are calculated using the usual method for counterparty credit risk.[64]
- A specified treatment was introduced for default fund contributions to qualifying and non-qualifying CCPs.

The 2012 framework has been largely implemented across jurisdictions. The 2014 revisions have been partially implemented (with an implementation deadline of 1 January 2017).[65]

Credit Valuation Adjustment (CVA): Derivative contract values are subject to a CVA to reflect the risk of losses from changes in the creditworthiness of the counterparty. By some estimates, the mark-to-market losses for banks on derivatives as a result of increased CVAs during the crisis (due to the deterioration in creditworthiness of counterparties) were double the losses from outright derivative counterparty defaults. This volatility in CVA was not captured under the Basel II framework, and so banks held no regulatory capital against this risk.

The first phase of Basel III introduced a capital charge to cover CVA risk, which has been implemented by some jurisdictions. The finalisation of Basel III in December 2017 included a revised CVA risk framework, which is due to apply from 2022.[66] The CVA charges do not apply to trades cleared through a qualified CCP. The revised framework is intended to be more risk-sensitive, robust and consistent. Internal model approaches will no longer be allowed and banks will have the choice of a standardised or basic approach, plus a simplified option for banks with only limited exposure to NCCDs.

The CVA capital charge increases with the duration of the derivative, with the exact relationship depending on different factors. As IF projects are long-term, the associated derivatives are likely to be of a similar duration. It is therefore possible that the CVA charge impacts the cost and availability of long-term hedging, particularly for transactions denominated in currencies (such as those in EMDEs) that would not be subject to mandatory central clearing.

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[64] Basel III has revised the approaches to calculating Exposure at Default for counterparty credit risk, leaving one modelled approach and one standardised approach, with the aim of addressing a number of shortcomings exposed during the crisis.

[65] For more details on implementation status of these reforms, see the BCBS *Fourteenth progress report on adoption of the Basel regulatory framework* (April 2018).

[66] See *High-level summary of Basel III reforms* by the BCBS (December 2017).

Insurance regulation

Prudential regulation of insurance is diverse globally, reflecting the different structures and levels of development of domestic markets.[67] The two largest insurance markets, in the European Union and the United States, are subject to risk-based solvency regulations in the form of Solvency II and the Risk-Based Capital Standard respectively. The main other countries with some features of risk-based solvency regulations for insurers are Australia, Canada, Japan and Switzerland. EMDEs operate a diverse range of solvency regimes, with risk-based solvency regimes dominating in most advanced insurance markets like those in South Africa.

In general, infrastructure is typically treated as an alternative asset class in these solvency regulations. Unlisted infrastructure equity investments are normally included within the private equity category. A number of countries have introduced rules aimed at positively supporting infrastructure investments, such as India with minimum portfolio allocation requirements for insurers in infrastructure bonds. Although special treatment of infrastructure assets has not historically been common in insurance solvency regulations, a differentiated treatment has recently been introduced into Solvency II (which has been in force since 1 January 2016),[68] and similar policy approaches have been adopted (e.g. China and Korea) or are under consideration by other insurance regulators (e.g. Singapore, US).[69] The IAIS is also considering the appropriate calibration for infrastructure investments as part of developing the ICS for internationally-active insurance groups.[70]

Aside from the capital charges that apply, other regulatory features that may affect infrastructure investment include:

- The use of hard investment limits versus principles-based guidance on asset allocation (with the latter allowing greater investment freedom);
- The approach taken to the regulatory valuation of assets and liabilities (e.g. market value versus other approaches), and how the regulatory balance sheet responds to movements in interest rates and financial market prices;[71]

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[67] The G20 and FSB, via the International Association of Insurance Supervisors (IAIS), are guiding the development of an international Insurance Capital Standard (ICS), which will apply to internationally-active groups on a consolidated group-wide basis. As such, this section discusses only local /regional prudential regulation of insurers that may be relevant for IF.

[68] Solvency II was revised by lowering the standard formula risk charges that apply to equity and debt investments in qualifying infrastructure projects and corporates. Qualifying infrastructure investments are limited to OECD and EEA countries and must have investment-grade credit quality. There must also be a high degree of revenue predictability. These qualifying criteria are intended to ensure that the regulatory treatment remains aligned with the level of investment risk, and insurers must balance the capital benefit against any administrative costs of assessing compliance with the criteria.

[69] An October 2017 US Treasury report (https://www.treasury.gov/press-center/press-releases/Documents/A-Financial-System-That-Creates-Economic-Opportunities-Asset_Management-Insurance.pdf) recommended that state insurance regulators and the National Association of Insurance Commissioners (NAIC) evaluate potential steps to encourage the development of a more calibrated regulatory treatment of high-quality infrastructure investments.

[70] The IAIS issued ICS 2.0 for public consultation (until October 2018). The consultation asked respondents for views on the appropriate calibrations for infrastructure investments, and on a possible segmentation and definitions for various types of infrastructure investment. Once the ICS is approved by the IAIS, it will enter the five year monitoring period during which further work on fine-tuning the standard will be undertaken by the IAIS and the relevant insurance supervisors.

[71] This includes measures aimed at smoothing out 'artificial' short-term movements in the regulatory balance sheet. Examples would include the 'Matching Adjustment' and the 'Volatility Adjustment' that were introduced as part of the Solvency II regime. The Matching Adjustment can be applied to closely cash-flow matched portfolios of assets and liabilities that meet

- The treatment of assets without an external/public credit rating (e.g. some regulatory frameworks allow the use of internal credit ratings for such assets, while others may place them into an 'unrated' category); and
- The provision of guidance about how alternative asset classes such as infrastructure will be treated under different parts of the regulatory solvency and valuation regime.

Pension fund regulation

The regulation of pension funds is country-specific and reflects different market structures and policy priorities. The OECD undertakes an annual survey of investment regulations of pension funds.[72] As at the end of 2016, with a few exceptions (including Australia, Canada, UK and US), most countries surveyed imposed investment limits on pension funds:

- Most countries cap investments in equities. For bonds, limits are less stringent for government bonds than for other types of bonds. Limits may also depend on credit ratings, and may hinder or prevent unrated or non-investment-grade investment.
- Direct investment in loans is usually subject to low limits or completely prohibited, which would rule out several forms of infrastructure investment. However, indirect investment (e.g. through bonds and shares of infrastructure companies) is sometimes permitted.
- Overseas investments may be prohibited outright, or only permitted in certain geographical areas, with implications for pension funds' ability to finance infrastructure in emerging markets.
- Some funds are also subject to restrictions on foreign currency exposure, derivatives and concentration, which may similarly disincentivise infrastructure investments that are in non-local currencies or that are large in size.

The survey results since 2001 have shown a trend towards increased investment discretion.

In most countries, pension funds only have a small share of infrastructure investments. For the 95 pension funds that responded to an OECD survey, investment in infrastructure via unlisted equity and debt represented only 1.1% of assets under management.[73] Exceptions are found in Australia and Canada, where the average infrastructure investment by pension funds is particularly high, with some large funds even having double-digit allocations.[74]

Defined contribution (DC) pension vehicles often offer daily pricing or liquidity, which may be difficult to reconcile with long-term, illiquid asset classes such as infrastructure.[75] However,

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certain criteria. It rewards investing in long-term assets with fixed cash flows (such as some infrastructure loans or debt) if they are held to match long-term, stable liabilities; however, not all types of infrastructure asset are eligible.

[72] See http://www.oecd.org/finance/private-pensions/annualsurveyofinvestmentregulationofpensionfunds.htm. The most recent available survey captures regulatory frameworks as at the end of 2016. It covers all types of pension funds. References to investment limits include limits set down in law, regulations or guidelines.

[73] See the latest *Survey of Large Pension Funds and Public Pension Reserve Funds* by the OECD (April 2018).

[74] See Inderst and Della Croce (July 2013), *Pension Fund Investment in Infrastructure: A Comparison between Australia and Canada*, OECD Working Papers on Finance, Insurance and Private Pensions, No.32.

[75] The popularity of the low-cost 'default' funds offered by most DC schemes may also make it difficult to cover the expense of investing in alternative asset classes such as infrastructure.

these features may be due to commercial and competitive considerations (to meet market norms), rather than being mandated by regulation. In countries such as Australia, the vast majority of pension assets are within DC schemes and yet infrastructure investment is relatively high, suggesting that such schemes can still be compatible with infrastructure investment.

Investment fund regulation

Infrastructure funds can come in several formats subject to different regulatory treatment.

In January 2017, the FSB issued a set of policy recommendations to address structural vulnerabilities from asset management activities, several of which were addressed to IOSCO.[76] In response, IOSCO published recommendations in February 2018 that address liquidity risk management and a report on good practices for liquidity and risk management covering, among other things, consistency between an open-ended fund's investment strategy and its redemption terms and conditions.[77] IOSCO intends to assess their implementation in two to three years' time.

These recommendations may be relevant for IF to the extent that they may reduce the attractiveness of investing in these types of assets given their illiquid nature. However, the recommendations are only relevant to the subset of infrastructure funds that are open-ended (which are less common than closed-ended fund structures for infrastructure investments) so their impact, if any, is unclear.

Accounting standards for banks and insurers

The objective of general purpose financial reporting is "to provide financial information about the reporting entity that is useful to existing and potential investors, lenders, and other creditors in making decisions about providing resources to the entity." General purpose financial reporting standards do not seek to influence investors' capital allocation decisions or actions taken by management; rather, they aim to provide better information to inform those decisions and actions. Since the financial crisis, both the IASB and FASB have issued new and amended accounting standards to improve general purpose financial reporting.

The relevance of these new standards to IF mainly relates to the revised accounting treatment of expected credit losses and insurance contract liabilities, given their impact on the reported financial position of banks and insurers respectively.

Expected credit loss (ECL) accounting

During the crisis, credit losses were only recognised upon an observable 'triggering event'. As a result, even in the face of clearly deteriorating credit quality, banks did not generally recognise losses until the obligor's default or delinquency were evidenced, or until data indicated a measurable decrease in estimated future cash flows. This reduced transparency and delayed the identification and management of problem assets. As a result, the G20 Leaders directed

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[76] See http://www.fsb.org/2017/01/policy-recommendations-to-address-structural-vulnerabilities-from-asset-management-activities/.

[77] See http://www.iosco.org/library/pubdocs/pdf/IOSCOPD590.pdf. The recommendations also cover the use of liquidity risk management tools; fund-level stress testing; disclosure to investors; and contingency planning. The examples and good practices also address liquidity risk management tools and stress testing.

accounting standard setters in April 2009 to 'strengthen accounting recognition of loan-loss provisions by incorporating a broader range of credit information'.[78]

The ECL model in IFRS 9 and FASB's current expected credit loss (CECL) model (ASU 2016-13) respond to this by changing the timing of credit loss recognition. The ECL estimate needs to consider forward-looking information (instead of simply information about past events and current conditions), and is based on the probability of future credit events and the estimated cash shortfalls at a particular point in time.

Concerns have been expressed by some market participants about the new accounting standard potentially having cliff effects due to a sudden increase in loan loss provisions[79] and cyclical effects stemming from higher volatility of earnings in general,[80] including for IF due to its long-term nature.[81] However, IFRS 9 was only effective as of 1 January 2018, and CECL is not effective until 1 January 2020 for SEC filers (1 January 2021 for all other entities). Accordingly, it is too early to conclusively analyse any potential effects on IF of the new regime, which will be substantially determined by the way banks implement the standards, as well as by factors such as the composition and quality of their credit assets. The overall impact on banks' financial positions will also be affected by the regulatory capital treatment of loan loss provisions resulting from the move to these new accounting standards.[82]

Accounting for insurers

IFRS 9 requires equity holdings to be measured at fair value (in order to provide a more accurate representation of the investing entity's financial position), but in some circumstances allows fair value changes to be reported through other comprehensive income rather than the profit-and-loss statement.[83] The use of fair value versus other approaches (such as historic or amortised cost) has historically been the subject of extensive debate, which is continuing in the context of IFRS 9 and its potential effects on long-term investment.[84] Given the long tenor of

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[78] See https://www.iasplus.com/en/news/2009/April/news4621.

[79] For example, under IFRS 9 the ECL provision for a loan will move from a 12-month horizon to a 'lifetime loss' horizon if there is a significant deterioration in credit quality. Some concerns have been expressed about this leading to a cliff effect due to a sudden large increase in provisions, particularly for longer-dated assets such as IF.

[80] A report on *Financial stability implications of IFRS 9* by the European Systemic Risk Board (July 2017) noted that banks may react by shortening the maturity of loans and rolling them over more frequently, although this would need to be balanced against increased operational costs and increased refinancing risks for the borrower.

[81] Rigot and Demaria argue that IFRS affects funding for long-term investment in a variety of ways, depending on the activities in which banks and insurance companies engage – see *The impact on long-term capital investment of accounting and prudential standards for financial intermediaries* (2017). See also the *public responses to the consultative document on the effects of reforms on infrastructure investment*.

[82] See, for example, *The interplay of accounting and regulation and its impact on bank behaviour* by the BCBS Research Task Force (July 2017), BCBS Working Paper 31.

[83] See a discussion of the IASB's rationale for this treatment at https://www.ifrs.org/news-and-events/2018/04/ifrs-9-and-equity-investments/.

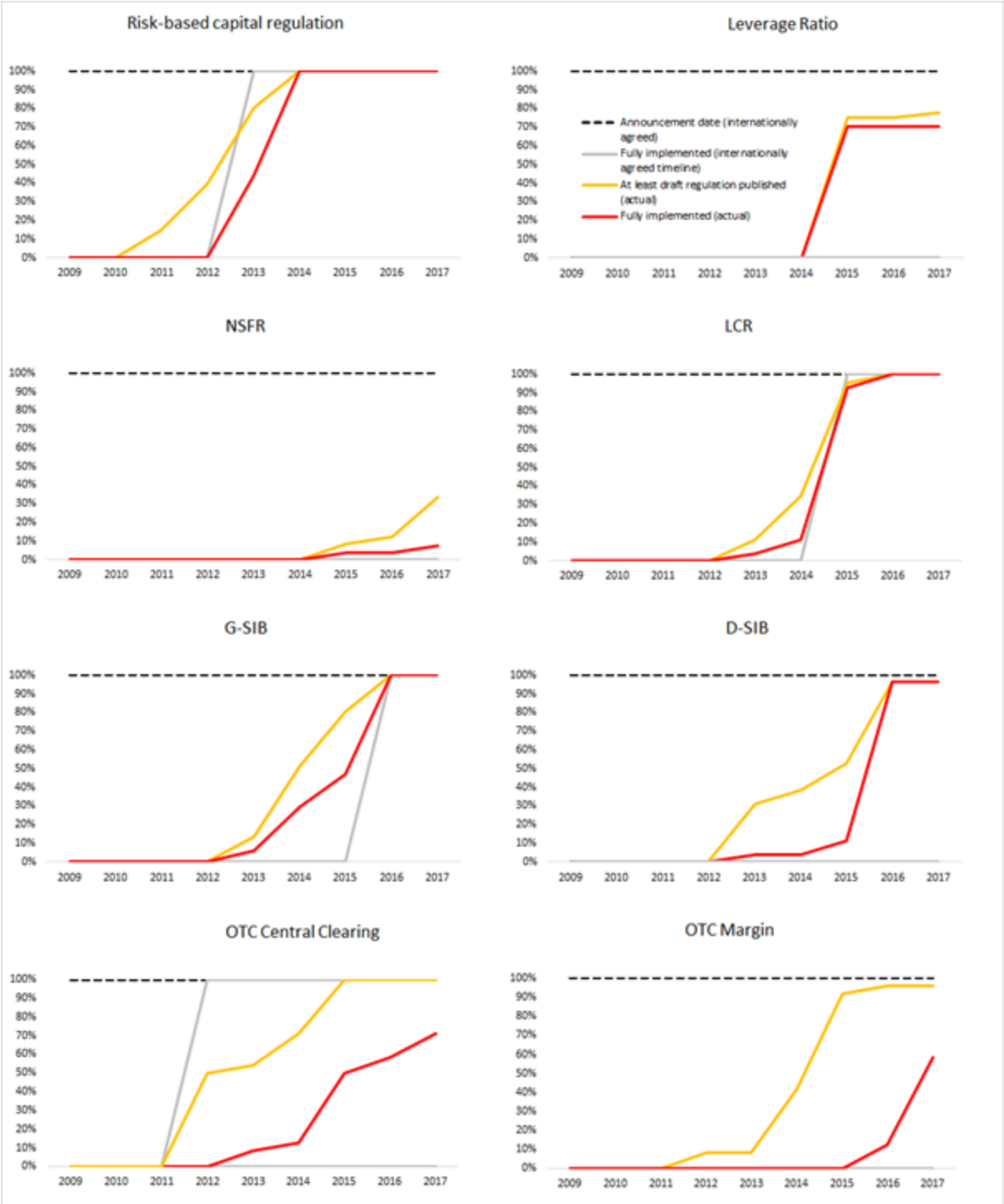
[84] In response to a European Commission request, the European Financial Reporting Advisory Group (EFRAG) investigated the potential effects of IFRS 9 on investment decisions and strategies of long-term investors, and concluded that the limited academic and empirical evidence makes it difficult to draw conclusions. For more details, see the *Interaction of IFRS 9 and Long-term Investment Decisions: Academic Literature Review* by EFRAG (March 2018). The IASB's recently revised Conceptual Framework recognises that information must be useful to long and short-term investors alike. The IASB is also discussing updates to Practice Statement 1, which provides a framework for the presentation of management commentary, including how management intends to implement its strategies over the long term. For a discussion, see the IFRS Foundation presentation on *IFRS Standards and long-term investments*.

some insurers' asset portfolios, accounting mismatches between their liabilities (generally measured at amortised cost) and their related assets (generally fair valued) have been flagged as a factor that may drive investment behaviour and potentially affect the provision of long-term finance such as infrastructure investment.[85]

To address this concern about mismatches, the effective date of IFRS 9 for insurers has been set for 2021 to align with IFRS 17, which was issued by the IASB in 2017. The standard sets out a consistent approach to the accounting for insurance contracts, based on a current measurement model, and will provide updated information about the obligations, risks and performance of insurance contracts. Similar to ECL standards, it is too soon to assess the impact of IFRS 17, as it will not be effective until 1 January 2021, and some jurisdictions (e.g. EU) are still in the process of its endorsement.

[85] See, for example, *The Effect of Solvency Regulations and Accounting Standards on Long-Term Investing: Implications for Insurers and Pension Funds* by Severinson and Yermo (November 2012), OECD Working Papers on Finance, Insurance and Pensions, No. 30; and *Unlocking Investment in Infrastructure: Is current accounting and reporting a barrier?* by the B20 Panel of six international accounting networks (June 2014).

Graph B.1: Aggregate picture of implementation status



The graph shows the proportion of FSB members that had published draft regulations and final regulations for Basel III and OTC derivatives reforms over the period 2009-17. It also shows the international announcement date and the agreed implementation date (where applicable).

Annex C: Data, design and findings of empirical analysis

C.1 Data sources

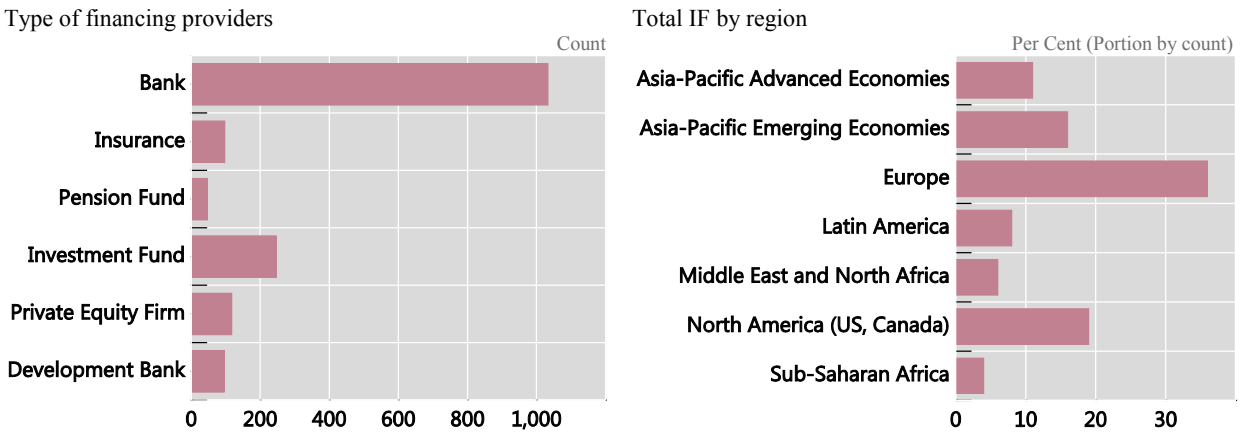
The empirical work on the effects of reforms (i.e. descriptive and econometric analysis) is based on publicly available data, with a complementary set of information, including:

- **Select micro data procured from vendors** (IJ Global and Dealogic Syndicated Loans, Project and Bond data), which are considered most useful and complementary for the purpose of this study (see Box C.1). These IF data have been merged with other relevant data, including data on financing providers (e.g. to determine the degree of bindingness of the different elements of Basel III metrics), on the implementation of the reforms at the country and institution level and on factors influencing IF (macroeconomic variables, market data, etc.).
- **Aggregate data on infrastructure investment (OECD, Global Infrastructure Hub, Moody's and other relevant sources in the literature),** e.g. on volumes and the composition of IF, as well as on risk characteristics and risk performance, which were mainly used to establish trends (see section 2 and Annex A).

Data on financing providers

Graph C.1 displays the number of different financing provider types involved in IF for IJ Global. The list includes **1,033 banks** (about half of which were matched with bank data from Fitch), 97 insurance companies, 47 pension funds and 246 investment funds. In addition, there are more than 7,000 other financing providers (such as non-financial corporates, law firms, developers, but also governments and development banks etc.). **60% of the financing providers are based in AEs and 40% in EMDEs**. All regions are represented, although European financing providers dominate the sample, followed by financing providers from North America and emerging Asia Pacific.

Information on financial providers — Graph C.1

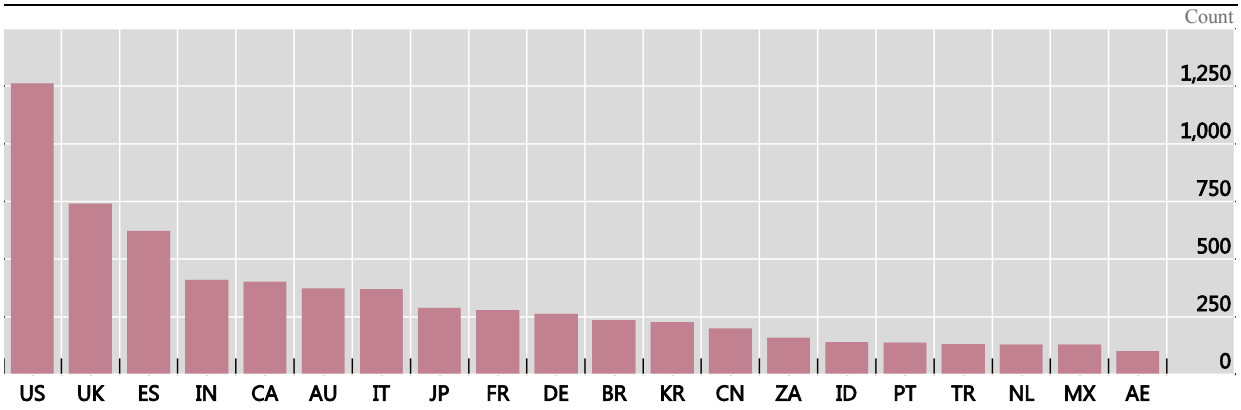


Source: IJ Global

The top 20 countries by number of financing providers are displayed in Graph C.2.

Financing Provider Country

Graph C.2



AE = United Arab Emirates; AU = Australia; BR = Brazil; CA = Canada; CN = China; DE = Germany; ES = Spain; FR = France; ID = Indonesia; IN = India; IT = Italy; JP = Japan; KR = South Korea; MX = Mexico; NL = Netherlands; PT = Portugal; TR = Turkey; UK= United Kingdom; US = United States; ZA = South Africa

Source: IJ Global

The evaluation team considered the following **financial variables** for the banks matched with Fitch data (all data at annual frequency).

Table C.1: Financial variables considered by the study for the banks in IJ Global and Dealogic matched with Fitch data (note that all data at annual frequency)

Variable	Description
Total Assets	million USD *(not used in final specifications)*
Risk-based Tier 1 capital ratios (RBC)	Percent
Proxy for Basel III Leverage Ratio	Tier 1 capital to total assets
LCR	As reported by banks in recent years
Proxy for NSFR	Stable funding (same as used for the liquidity ratio) divided by the sum of proxied required stable funding for each asset class
Liquidity Ratio	Liquid Assets to stable funding (i.e. reg. capital, customer deposits (subject to a 5% haircut) and long-term wholesale funding)
Customer loans to total assets	*Used for cost-benefit analysis*
Return on Equity	*(not used in final specifications)*
RWA to total assets	*(not used in final specifications)*
Customer deposits to total funding	*(not used in final specifications)*
Categorical variables	
Dummy whether risk-based Tier 1 ratio is binding	*See definition below*
Dummy whether proxy for Leverage Ratio is binding	*See definition below*
Dummy whether LCR is binding	*See definition below*
Dummy whether proxy for NSFR is binding	*See definition below*
Dummy for trading bank	Dummy is 1 if portion of trading assets to total assets above 15%, and 0 otherwise *(not used in final specifications)*

Dummy for wholesale funding	Dummy is 1 if portion of wholesale funding to total funding above 25% *(not used in final specifications)*
Lender country	
Bank based in FSB jurisdiction	Dummy 1 if "yes" *(not used in final specifications)*
Lender region	*(not used in final specifications)*
Lender country type (AE, EMDE)	

Implementation at the institution level: Bindingness of financial regulation

Risk-based Tier 1 capital ratio ("RBC")

The effect of the risk-based Tier 1 capital ratio ("T1CR" or "RBC") is assessed by dividing banks up into those institutions with a ratio below 9% in 2009[86] ("TREAT", which applies for about 25% of all banks) and those above 9% ("CONTROL"). The former group approximately constitutes the set of internationally active institutions for which the T1CR was binding between 2010 (when the initial Basel III package was announced) until end 2013/14, by which time the capital shortfalls of the internationally active banks (vis-à-vis the fully-phased in reforms due by 2019) had largely disappeared.[87] The metric is available for about 480 banks, including for 85 (29) of the top 100 (30) IF providers, and tends to be more binding for smaller banks (Table C.5/4).

Proxy for the leverage ratio

The team computed a proxy for the leverage ratio in 2009 by dividing tier 1 capital by total assets and divided banks up into those institutions below the 25th percentile (3.5%[88], "TREAT") and those above ("CONTROL"). The proxy for the leverage ratio tends to be more binding for the larger banks (Table C.5/4). The metric is available for about 500 banks, including for 83 of the top 100 IF providers.

Proxy for the NSFR

Actual NSFR figures are only reported for a very small sample of banks and only in recent years. Hence, the evaluation team has used relevant balance sheet characteristics to compute proxies for the NSFR. Banks were divided into constrained ones (the bottom 25% of the NSFR

[86] The study uses two definitions for the cut-off, one capturing the 25th percentile of bank's RBC ratios based on all observations, where each bank's ratio is counted as many times as that bank has participated in IF transactions, and another one using one single RBC ratio per bank. For both datasets, the study uses by default the cut-off based on multiple observations, while the other cut-off is used for robustness purposes. The reason for that is that the international standards were calibrated for internationally active banks, and this definition takes account of that fact and that IF is concentrated among large banks. The 25th percentile based on all observations is around 9% (9.01%), which is the same as when using one observation by bank (8.96%). For RBC, approximately the same number of banks (and the same institutions) fall into the treated vs control groups for both definitions (Table C.5).

[87] Precise information on the bindingness of the rules is not available in the public domain, but proxies to compute the fully-phased T1R (as of 2019) during the transition period (based on aggregate QIS information) suggest that the simple ratio used herein is a meaningful benchmark for bindingness.

[88] The 25th percentile cut-off by banks is at 4%, while the 25th percentile cut-off based on all observations is at 3.5%, hence large banks are more represented if one uses the cut-off at the observation level (Table C.5). As outlined above, the study uses the cut-off at the number of observations by default, while the other cut-off is used for robustness purposes.

proxies in 2009,[89] "TREAT") and the less constrained banks ("CONTROL"). The ratio tends to be more binding for the larger banks (Table C.5/4). The metric is available for about 300 banks, including for about half of the top 100 IF providers.

Liquidity ratio

Banks were divided into the more funding constrained ones (the bottom 25% for the liquidity ratio in 2009[90], "TREAT") and the less constrained ones ("CONTROL"). The ratio is more binding for the largest banks compared to the capital ratios. The metric is available for about 300 banks, including for about half of the top 100 IF providers.

LCR

The team used average LCR figures reported by banks for 2013-2016 to split the banks into those with averages below 114% (the 25th percentile, "TREAT") and those above 114% ("CONTROL"). However, the data is fairly limited, available for only 150 banks, and the definition of the LCR differs from the other ratios.[91] Hence, the results for this metric are not reported herein and were only used for robustness purposes, and tends to be more binding for smaller banks (Table C.5/4).

Control variables

The analysis considered an initial list of above 50 control variables, which was narrowed down considerably to 29 based on data availability and reduced further to *eleven core variables* based on statistical properties (pair-wise correlation and autocorrelation analysis) – as shown in Table C.7. As outlined below, these variables are only used for the specifications which explicitly look at the contribution of different drivers, while the other specifications use fixed effects.

Table C.2: List of control variables used by the evaluation

	Financial variables
1	Interest rate differential (borrower country vs lender country)
2	10 year USD swap rate
3	Exchange rate (lender country : borrower country)
	Macroeconomic variables
4	Real GDP growth for lender country, y-o-y growth
5	Real GDP growth for borrower country, y-o-y growth
6	Borrower country general government total expenditure/GDP
	Other variables (on structural elements, political risk, etc.)
7	Political stability and absence of violence (Borrower country)

[89] With a view to enhancing the sample size, NSFR proxies for 2010 or 2011 were used as a substitute for missing 2009 data – subject to a case-by-case review of the data. The cut-off for the NSFR proxy based on one observation per banks is at 0.38 while it is at 0.31 by all observations. Hence, large banks are more represented if one uses the cut-off at the observation level (Table C.5).

[90] With a view to enhancing the sample size, liquidity ratios for 2010 or 2011 were used as a substitute for missing 2009 data – subject to a case-by-case review of the data. The cut-off for the liquidity ratios based on one observation per banks is at 0.06 while it is at 0.14 by all observations. Hence, large banks are less represented if one uses the cut-off at the observation level (Table C.5).

[91] For the other ratios, the metric reflects banks' solvency and liquidity profiles at the time when the 2010 Basel III package was announced, while the LCR is computed based on recent data, after banks had already adjusted their balance sheets and business models.

	Global variables
8	G4 Credit Growth
9	Commodity price index
10	VIX
11	Equity price index

Notwithstanding efforts to make the data as useful for the study as possible, it is important to recognise its limitations, as outlined in Box C.1.

Box C.1: Data limitations

It is important to recognise a number of limitations of the data used for the empirical analysis (i.e. descriptive analysis and econometric analysis). After a stocktake of micro data, the evaluation team decided to rely mainly on data from two vendors – IJ Global and Dealogic – given their broad market and data coverage (see Graph 2 in the main text).

While the quality of IF data (both IJ Global and Dealogic) was found to be robust (and only some outliers had to be filtered out for the analysis) some caveats apply:

- IJ Global data has limited information on prices and none on transaction currency. Although IJ Global data is the most comprehensive single dataset on IF at the global level across all IF types, its coverage is slightly lower than the combined coverage of the three Dealogic databases (projects, syndicated loans and bonds). However, the underlying trends on volumes are broadly similar.
- Both data sets include no (or only very limited) information on the creditworthiness of different projects and/or their ex post performance, which limits the scope of analysis, especially on pricing.
- The scope of coverage of IJ Global data has increased in recent years (which is why the data before 2005 were excluded) and its composition has changed, with coverage of corporate finance improving. This may introduce bias into analysis of financing trends over time. Dealogic data goes back further in time. Market coverage by IJ Global is likely higher for the AEs (given that the dataset includes smaller transactions – see Graph A.3), although coverage of IF for EMDEs appears high enough to draw general conclusions.
- Neither dataset includes detailed information on the financing providers, which required a manual match of banks with Fitch data. This match was done for about 600 names in IJ Global and more than 1,000 names in Dealogic. The matched banks accounted for close to 100% of recorded deal volume, given the high level of concentration in the IF market.

C.2 Analytical design and conceptual approach

Hypotheses

The evaluation team has analysed the effects of reforms based on six main hypotheses (Table C.3). In doing so, the team has chosen specifications that turned out to be most useful given the purpose of the analysis (e.g. to analyse the impact of specific elements of Basel III on IF), availability of data (which turned out to be challenging in a number of cases given the multitude of required variables needed for the analysis, see Box C.1) and their suitability given

the conceptual approach. The final analysis used a narrow set of specifications, for which the outcome is summarised below.

Table C.3: Main hypotheses

H	Description of hypothesis and analytical question
1	*H:* Banks constrained by regulation are less engaged in IF, i.e. the more binding the regulation, the greater its effect on banks' ability and incentive to participate in IF (in terms of volumes, prices and maturities). Q: Did banks with more binding Basel III capital and liquidity metrics behave differently in terms of IF from banks for which Basel III was less binding? *(Bindingness of regulation)*
2	*H:* G-SIBs could be less active in IF after the implementation of the G20 financial regulatory reforms, given that this group of banks was subject to the most comprehensive regulatory reforms Q: Was there a difference in the IF behaviour between G-SIB and other banks, given that the former were subject to the most comprehensive regulatory reforms? *(Impact of G-SIB specific regulation)*
3	H: Internationally active banks (mainly based in AEs) have changed their business models, with implications on IF (e.g. they could be less active in EMDEs) Q: How did the reforms affect banks based in AEs versus those in EMDEs and how did the reforms affect IF activities in AEs vs EMDEs? *(Distributional impact of regulation)*
4	H: The reforms have changed the incentives of market participants to engage in different activities and markets and IF could be affected negatively. Q: Did the reforms have a stronger effect on IF vs other types of finance? *(IF vs other)*
5	H: Banks were subject to various reforms after the crisis, while other market participants were less affected, which could lead to substitution effects. Q: How did the IF behaviour of banks (subject to comprehensive financial regulatory reforms) differ from that of non-banks? *(Substitution of bank financing by other financing)*
6	H: OTC Derivative reforms are likely to have had an impact on IF. Q: How did the OTC Derivative reforms affect IF, if at all? *(OTC Derivative reforms)*

Methodology

The empirical analysis was based on descriptive studies and partial equilibrium analysis (PE). In terms of PE, the main technique is Difference-in-difference (DiD) analysis, which has been identified as a useful element of PE analysis to establish causality, and has been used by a number of studies in recent years. More specifically, the PE view is helpful in determining whether there are effects of regulatory changes on IF, and whether this effect is stronger for one particular group of entities relative to another control group of interest. This is done through comparison of the effects for one particular group of entities affected by a shock (i.e. regulation), the so-called "**treated**" **group** (such as G-SIBs, which were subject to the most comprehensive regulatory reforms, banks bound by the regulatory minimum at the time when the reforms were announced, and banks more generally, given that many of the G20 reforms focus on banks) relative to a "**control**" **group** of interest (e.g. banks well above the regulatory minimum, non-banks). One key requirement for a robust DiD analysis is to rule out the

possibility that different behaviour (if any) before and after the "treatment" (i.e., the regulation announcement) is driven by heterogeneous structural features of the two groups, rather than the treatment itself. More information on the approach is provided in Box C.2 and in the technical Appendix to the Framework for Post-implementation evaluation of the effects of reforms (p.5).

Box C.2: Methodology

The DiD approach is used to examine the effect of a "treatment" (e.g. regulation) on a "treatment group" versus a non-treated "control group". To this end, the approach compares observations taken before the treatment with those taken after the treatment. The treatment is assumed to have an effect if the treatment group reacts differently to the treatment as compared to the control group. By design, the question of whether an observed entity is part of the treatment or the control group is exogenous, i.e. needs to be determined ex-ante and cannot be influenced by an entity.

For example, consider a new regulation that applies only to G-SIBs, but not to other banks. If both G-SIBs and other banks were providing credit to non-financial corporations in sufficiently similar ways before the regulation, it may be sufficient to compare the post-implementation lending of those two groups of banks to estimate the regulation's effect. If instead, the two groups already differed in their lending behaviour before the regulation then the DiD approach comes into play. Instead of comparing only the post-implementation lending, the DiD approach compares the change in lending between the two groups by removing the time-invariant determinants of lending behaviour between the two groups. For the approach to work, it must, however, hold that (1) the regulation, were it applied to the non-treated banks, would have the same effect than it has for the treated banks, and that (2) there are no unobserved and un-modelled time-varying differences in the two groups that drive their lending behaviour ("parallel trends" assumption). Note that bias may be introduced if the regulation indirectly affects the non-treated group, for example, due to spillovers from the treated group. For information on these aspects is provided in the main text.

The DiD analysis was mainly based on 'fixed effects' specifications, i.e. controlling for various relevant dimensions, such as the time invariant characteristics of financing providers (the ID of the financing provider and its country of origin), of IF assets (e.g. the industry sector, financing instrument type, time invariant borrower country type (i.e. AE vs EMDE)) and time effects (using year dummies). Besides, specifications explicitly controlling for different factors (Table C.2) were used to derive attribution.

All regressions were run at the most granular level (i.e. the tranche level, with the exposures split by financing provider) to exploit all available data and to saturate the model with fixed effects to control for time invariant unobservable factors. The specifications reflect permutations along three dimensions:

- Dependent Variables: Volume of IF, Maturity, Credit Spreads
- Reforms: Risk-based capital ("RBC"), Proxy for Leverage ratio ("LR"), Proxy for NSFR, a simple liquidity ratio ("LIQ", liquid assets to stable funding) and OTC derivatives reforms
- Treatment vs control: Banks more vs less bound by regulation, G-SIBs vs other banks, AE vs EMDE banks, Banks vs non-banks

In addition to data on the announcement date of the international reforms in 2009/10 and implementation status at the jurisdiction level, the evaluation team used bank-level information to estimate the bindingness of certain Basel III regulations. While the timing of implementation of the Basel III reforms has been fairly similar across jurisdictions (see also section 3 and Annex B), their impact on institutions varies due to differences in bindingness at the financing provider level (i.e. for different banks). It is recognised that bank capitalisation and other characteristics measured as of 2009 may reflect both the bindingness of financial reforms for a given bank and general post-crisis financial conditions of a bank. As such, where the analysis rests on the 2009 bindingness measures, we cannot disentangle between: 1) the interpretation that financial reforms had an effect, and 2) the possibility that banks that were better capitalised during the crisis were more likely to lend on different terms after the crisis. One means to cope with the second dimension was to exclude data from banks that defaulted post-crisis. For Basel III, the evaluation focussed entirely on bindingness, as reflected in Hypothesis 1. For the OTC Derivative reforms, the analysis used country-level variation in implementation to split the sample into treated jurisdictions and the control group of jurisdictions.

The evaluation was subject to a number of conceptual challenges, as documented in Box C.3. One response to those challenges was to compare the results across multiple datasets, market segments, and methodological choices. Other caveats remain, such as the fact that the bindingness specifications that divide the sample into banks that are more or less constrained by regulation generates two sub-samples of banks that are – by design – different with respect to at least some of their balance sheet characteristics (see Table C.5). However, these differences between the two groups pertain to the level of observable traits, which are largely controlled for by fixed effect regressions. The changes of these variables, in turn, remain fairly stable pre- and post-treatment, which is important for the robustness of the results. The evaluation recognises that differences in observables between banks in the treatment and control groups may point to differences in unobservable characteristics that were not control for. To the extent that there might be differences in unobservables, the ability to draw causal inference is limited. Likewise, regulation, even if applicable only to specific firms, may have some implications for the rest of the market, so spillover effects from the treatment may contaminate the control group. Finally, post-crisis financial reforms subject to quantitative analysis have been proposed, adopted, and implemented over a decade and with overlapping treatment and control groups and periods. Where, for instance, the treatment group for one reform overlaps with the control group of other reforms, our ability to disentangle the causal impacts of various reforms is reduced.

Box C.3 Conceptual challenges for the empirical analysis

- **Analysis of the effects of reforms requires attribution of changes in IF to various factors, including financial regulatory reforms.** This gives rise to a number of challenges. These include, for example, analysing a multitude of transmission channels and behavioural responses, accounting for interactions between regulatory and non-regulatory factors, and differentiating between transitional and long-term effects (see also main text in section 4.1).
- **For IF, an additional challenge is how to isolate the effect of a range of reforms aimed at a wide range of activities (and affecting both assets and liabilities) on one small asset segment (i.e. IF), in a market segment with a fairly small number of major players**.
- From a conceptual point of view, it is important to note that the key reforms considered by the evaluation (i.e. Basel III and OTC derivative reforms) and their calibration were not directly driven by IF-related issues.
- With respect to the evaluation of Basel III, one should note that the internationally agreed reforms consist of minimum standards. Implementation reviews have not always concluded that local implementation is fully compliant with the internationally agreed Basel standard. Given the difficulty of disentangling all of these local effects (in both directions), the empirical work has split institutions into control and treatment groups based on how they are affected by the agreed Basel standards (or proxies of these standards) at the time when the internationally agreed reforms were announced. The split of banks will capture the initial bindingness of the reforms for all banks.
- The analysis distinguishes between general types of IF such as corporate and project finance (which are subject to different regulatory treatment for at least some of the approaches) as well as, where feasible, between IF and other types of financing. A granular comparison of effects for different regulatory asset classes would require collection of regulatory data from banks.
- Due to a lack of data the empirical analysis did not consider credit quality. Hence, the evaluation did not assess whether regulation or other drivers have affected the credit quality of projects. The limited time series of default rates (Graph A.11) do not suggest that there has been a material change so far.
- Robustness checks were performed. One check was to compare the results based on IJ Global data and Dealogic data, in addition to a number of established ways to verify the results (as documented below). Robustness of the results (i.e. properly identifying a differential impact of regulation on the treatment versus the control group) requires that any systematic differences between the treatment and control group that are unrelated to the treatment must be controlled for (which was, to the extent feasible, accounted for by the fixed effects and the choice of the controls).
- Econometric analysis is one element within the toolbox to analyse the effects of reforms on IF. As such, its results should be compared with the outcome of other analysis rather than being considered the sole source of information to provide relevant answers.

Relevant outcome variables

The empirical analysis sought to establish a causal link between the financial reforms (along with other relevant factors) and IF volumes, maturities and prices. Differential impact of financial reforms was analysed through analysis of differential impact along the dimensions of the main hypotheses (Table C.3). Where feasible (i.e. using IJ Global data), and as a robustness check, results were established for different market segments, defined as follows:

- Sample 1 ("S1"): Total IF volume, i.e. corporate finance and project finance, all sectors (i.e. including oil, gas and mining), but excluding re-financing (see "Total" in Graph 1 in the main text, i.e. red solid line)
- Sample 2 ("S2"): Sample 1, but without the oil, gas and mining sectors (see blue line in Graph 1 in the main text)
- Sample 3 ("S3"): Sample 2, but limited to loans and bonds[92] only
- Sample 4 ("S4"): Sample 3, but project finance only

C.3 Overview of results

Table C.4: Summary of the results

Dependent variable	Outcome of the empirical analysis								
	Bindingness of regulation (H1)				OTC derivatives (H6)	G-SIBs vs other banks (H2)	AE vs EMDE banks (H3)	IF vs other finance (H4)	Banks vs non-banks (H5)
	RBC	LR	NSFR	LIQ					
Volume	0	0				0	0		-
Maturity	0	0	0 or -	0 or -	0	-	-	0	
Price	0	0	0	0	0	0	0	0	

Note: Categories for statistical significance: -/0/+; "0" stands for a statistically insignificant differential effect between treatment and control groups; "-"for a statistically significant negative differential effect, and "+" for a statistically significant positive differential effect. Cells with statistically significant results are shaded in grey. A lighter colour is used for results which are only statistically significant in some of the specifications (i.e. for the NSFR proxy and the liquidity ratio ("LIQ") in case of maturity). Blank cells indicate areas not subject to regression analysis due to data constraints. The effect of OTC derivatives reforms on maturity and pricing is analysed based on staggered implementation at the country level. For details see below.

The results are presented using **descriptive analysis** (mainly **graphical information** on the differential effects of reforms for the treated vs the control group) and the outcome of regression analysis. **A consolidated overview of the results is presented in Table C.4 (and in Table 2 in the main text)**.

For all specifications shown below, outliers were filtered out (e.g. very small deals for the regressions on volume and excessively high spreads for the price specifications[93]), and data from banks that defaulted post-crisis[94] was excluded. All specifications considered only data from banks with IF activity in at least two years before 2010 and after 2010.

[92] Note that bonds are excluded for the analysis of regulatory bindingness for banks, given that the actual bond holdings are unknown. Given that sample 3 is fairly similar to sample 2 the results are computed but not reported – as they turned out to be very similar.

[93] Those observations were dropped from the sample. For volumes, the threshold was at 1 (for the dependent variable, i.e. log deal size); for maturities, any observation (for bonds and loans) with a maturity of zero was dropped; for the spreads, observations at above 2,000 basis points was excluded from the analysis.

[94] That is, those that ceased to exist or where nationalised for an extended period of time.

Outcome for Hypothesis 1: Did banks with binding Basel III capital and liquidity metrics behave differently in terms of IF from banks with more favourable metrics? *(Bindingness of regulation)*

Model specification

$$y_{i,b,t} = \alpha + \beta_1 R_t + \beta_2 CR_i R_t + D_i + D_b + \gamma Z_{i,b,t} + \varepsilon_{i,b,t}$$

- The dependent variable $y_{i,b,t}$ is volume (deal size), maturity or pricing. CR_i is a dummy characterising bank i's risk-based Tier 1 capital ratio ("RBC") (or the corresponding other Basel III metrics – LR, NSFR, LIQ) prior to the change in regulation R at time t (R_t pre-post dummy). By default, the specifications use the announcement date of the reforms as the timing of the shock (i.e. 2010, when the initial Basel III reforms were announced), given that banks were aware of the reforms' bindingness from that time on. The specification assesses whether $\beta_2 > 0$ in case it is volume or maturity, and $\beta_2 < 0$ in case the dependent variable reflects pricing. D_i controls for any fixed effects across financing providers (including for being in the treated or in the control group), D_b for any unobserved borrower-specific characteristics. Common unobserved time-fixed effects (D_t) are captured by some specifications, in which case the pre- post dummy (R_t) is dropped. $Z_{i,b,t}$ is a vector of relevant control variables.

Treatment vs control group

The study uses two definitions for the cut-off between the treatment and control group - one capturing the 25th percentile of bank's RBC ratios based on all observations[95] (thereby recognising the concentration in the market and the fact that the international standards were calibrated for the large institutions) and another one using one single observation per bank.[96] By default, the evaluation team presents results for the former definition, while indicating wherever there is a relevant difference in outcomes for these definitions in the econometric analysis.

Based on the first definition, about 25% of the 'top 30' IF providers (all of which are banks) fall into the treatment group (see Table C.5/1). For the cut-off set at the bank level, top 30 banks are overrepresented among the treated banks for the LR and the NSFR (i.e. many of the largest banks had comparably unfavourable LR ratios and NSFR proxies in 2009) and underrepresented for the liquidity ratio, while the assignment for RBC remains the same. The liquidity ratios (NSFR and LIQ) are not available for about one third of the top 30 banks. The statistics are for IJ Global.

Table C.5/2 illustrates the complementary nature of the Basel III regulation treatment groups for both definitions; of the top 30 banks, only one was assigned to the treatment group for both RBC and LR when using the cut-off based on all observations. The same is also true for the two liquidity metrics (Table C.5/3). Limited overlap is expected, given the complementary

[95] Hence, each bank's metric (e.g. RBC) for 2009 enters the computation as many times as the bank has provided IF during 2005-2017.

[96] In that case, the cut-off is the 25th percentile of the 2009 RBC ratios of the 500 matched banks.

objectives of the different regulations resulting in differential bindingness for institutions at the time when the reforms were announced. In technical terms, this feature adds an element of robustness.

Table C.5/1: Number of bank IF providers in the treatment vs control group (IJ Global)

	RBC	LR	NSFR	LIQ
Top 30 (cut-off for treatment vs control accounting for number of IF tranches provided per each bank)				
Treat	8	8	5	5
Control	21	21	14	15
no data	1	1	11	10
Top 30 (cut-off for treatment vs control based on one observation per bank)				
Treat	8	16	10	1
Control	21	13	9	19
no data	1	1	11	10
All banks (cut-off for treatment vs control accounting for number of IF tranches provided per each bank)				
Treat	119	128	75	67
Control	354	369	207	199
All banks (cut-off for treatment vs control based on one observation per bank)				
Treat	117	68	32	107
Control	356	429	250	159

Table C.5/2: Number of top 30 bank providers in the treatment vs control groups for RBC and LR (using cut-off based on observations) (IJ Global)

	RBC & LR Treat	RBC T & LR C	RBC C & LR T	RBC C & LR C
# (by obs)	1	7	7	15
# (by bank)	5	3	11	10

Table C.5/3: Number of top 30 bank providers in the treatment vs control groups for NSFR and LIQ (using cut-off based on observations) (IJ Global)

	NSFR & LIQ Treat	NSFR T & LIQ C	NSFR C & LIQ T	NSFR C & LIQ C
# (by obs)	1	4	3	11
# (by bank)	0	10	0	9

Table C.5/4 shows balance sheet characteristics as well as Return on Equity (RoE) for the treatment and control groups for each of the four bindingness metrics, using the cut-off based on all observations. The statistics reveal that the two groups are different, as would be expected. The important feature is that the differences between the two groups remain fairly stable pre- and post-treatment, and are controlled for by fixed effects. An exemption to this pattern is the leverage ratio, where the size of the institutions is different pre-crisis, but similar post crisis – which is an intended effect of the reforms. Hence, a key assumption underlying the DiD analysis appears to be met, although causal inference is qualified by the fact that the choice of individual

banks for the treatment group is exogenous, but not random (as would be the case in a true randomised trial experiment, which is not feasible in this evaluation).

For the liquidity ratios, data is not available for all banks, especially for the NSFR proxy. While this information gap limits the ability to check whether the DiD assumptions hold, it does not affect the DiD analysis as such because this information has not been used for the analysis (Table C.2).

For the cut-off computed based on one observation per bank (which is not shown), the same general result holds, namely that the treatment and control groups differ along various financial metrics but that those differences are similar pre- and post- crisis.

Table C.5/4: Descriptive statistics for treatment vs control group using cut-off based on all observations (IJ Global)

	Treatment group		Control group		Treatment group		Control group	
	Pre-2010		Pre-2010		Post-2010		Post-2010	
	n	Mean (StD)	n	Mean (StD)	n	Mean (StD)	n	Mean (StD)
Variable	Risk-based capital							
Total Assets (USD bn)	117	62 (122)	356	114 (291)	117	109 (224)	356	155 (402)
Loans to total assets (%)	89	63 (11)	236	55 (16)	90	63 (11)	243	57 (16)
Customer deposits to total funding (%)	88	77 (23)	233	70 (24)	89	78 (19)	241	73 (22)
Risk-weighted assets to total assets (%)	48	65 (16)	202	65 (20)	90	62 (16)	239	60 (22)
Return on Equity (%)	74	10 (8)	227	13 (8)	76	7 (8)	225	10 (7)
	Leverage ratio proxy							
Total Assets (USD bn)	68	151 (366)	429	101 (256)	68	144 (252)	429	150 (386)
Loans to total assets (%)	39	50 (21)	302	59 (15)	38	52 (19)	300	60 (15)
Customer deposits to total funding (%)	39	59 (31)	299	71 (23)	38	62 (29)	299	73 (22)
Risk-weighted assets to total assets (%)	28	36 (16)	251	68 (17)	38	36 (17)	297	61 (19)
Return on Equity (%)	38	67 (8)	299	12 (8)	38	5 (7)	299	9 (8)
	NSFR proxy							
Total Assets (USD bn)	31	115 (130)	250	96 (287)	31	177 (158)	250	116 (334)
Loans to total assets (%)	16	48 (13)	150	57 (15)	15	51 (12)	162	59 (12)
Customer deposits to total funding (%)	16	53 (26)	150	75 (19)	15	54 (26)	162	79 (16)
Risk-weighted assets to total assets (%)	16	59 (23)	119	67 (20)	15	53 (26)	159	62 (20)
Return on Equity (%)	16	12 (10)	149	13 (7)	15	11 (9)	162	10 (7)
	Liquidity Ratio							
Total Assets (USD bn)	103	75 (170)	151	168 (406)	103	108 (276)	151	191 (450)
Loans to total assets (%)	72	60 (14)	77	52 (17)	75	63 (10)	86	55 (14)
Customer deposits to total funding (%)	72	74 (20)	77	67 (22)	75	80 (16)	86	70 (19)
Risk-weighted assets to total assets (%)	53	67 (19)	74	63 (22)	73	60 (18)	83	62 (23)
Return on Equity (%)	70	13 (7)	77	13 (9)	75	10 (6)	86	11 (7)

H1/Volume of IF

IF Volume is analysed based on IJ Global, as there is limited information in Dealogic Syndicated Loans on the specific IF volume provided by financing providers within the syndicates.[97]

Descriptive evidence on volumes (Graph C.3) does not suggest a materially different behaviour of banks with weaker capitalisation and liquidity profiles compared to the other banks. This observation also applies for different market segments (red line – Corporate Finance and Project Finance ("S2"); blue line – Project Finance ("S4")). The time pattern of the disaggregated series is fairly in line with overall bank-based IF trends (Graph 2 in the main text), with a spike before the crisis and a fairly flat trend since then. For two metrics (LR, NSFR), the treatment group of banks was more active in IF than the control group prior to 2010, while there was no distinct pattern of pre-2010 behaviour for the liquidity ratio. For RBC, the control group was more active than the treatment group. After 2010 (i.e. when the initial Basel III reforms were announced), the trends in volumes for the treated vs control group are fairly similar for all metrics, although banks with higher RBC ratios continue to be more active, as was the case before 2010.

Graphs C.4 and C.5 decompose volume into deal size and the number of deals (and both effects have to be multiplied to infer the effect on volume; the effect of maturity also matters for the stock of IF[98] and has therefore been controlled for in the regressions). Graph C.4 shows that IF transaction size dropped between 2005 and 2008/9 and has stayed fairly stable since then (see also Graph A.3), but that there is no significant difference between the treatment and the control group. For the number of deals, the treatment group differs from the control group for both RBC and NSFR, but the difference is consistent pre- vs post-2010.

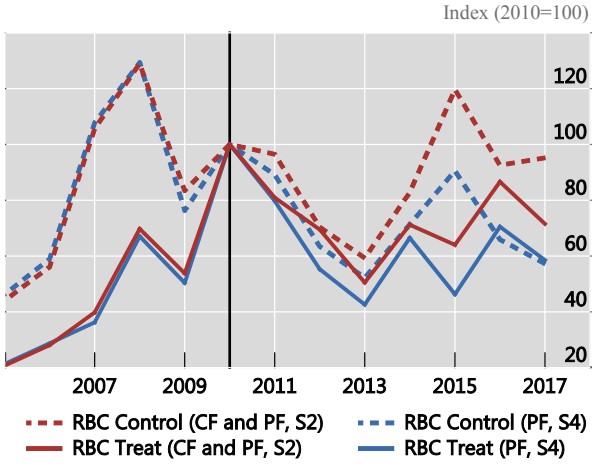
[97] Nevertheless, the evaluation has run analysis using Dealogic data based on the assumption that each finance provider participated equally and the findings were in line with the ones reported for IJ Global, i.e. there is no statistically significant differential effect from the Basel III metrics on IF volume.

[98] Tranches with longer maturities will have a positive effect on the stock of IF, which is why the team controlled for maturity.

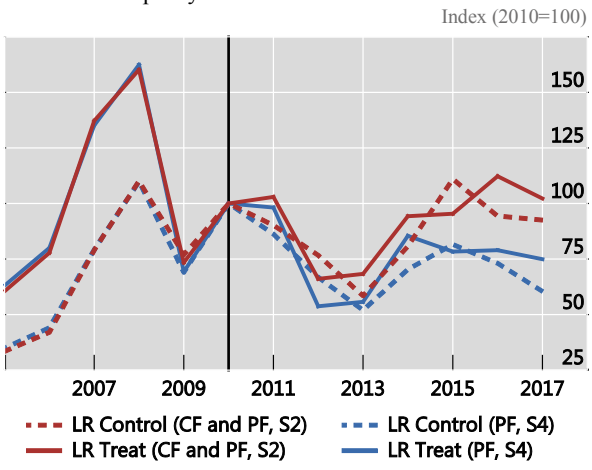
Basel III bindingness: IF volumes for different market segments (CF & PF ("S2"), PF only ("S4"))

Graph C.3

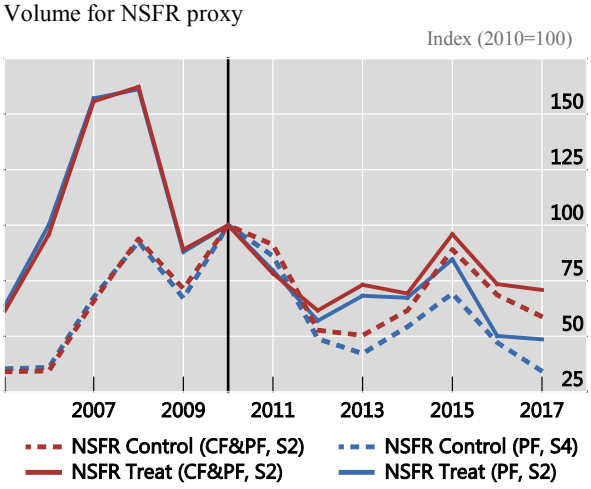
Volume for RBC



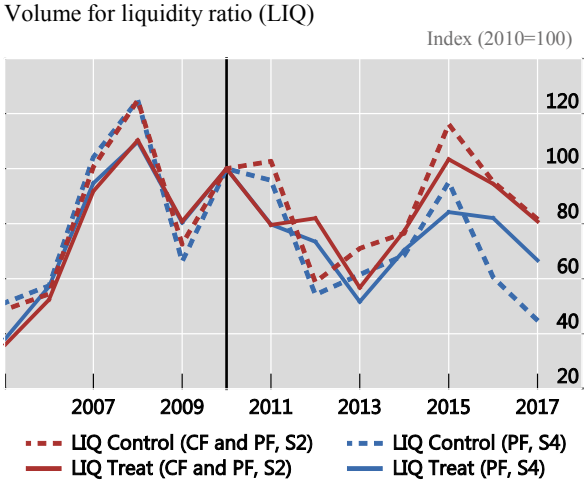
Volume for LR proxy



Volume for NSFR proxy



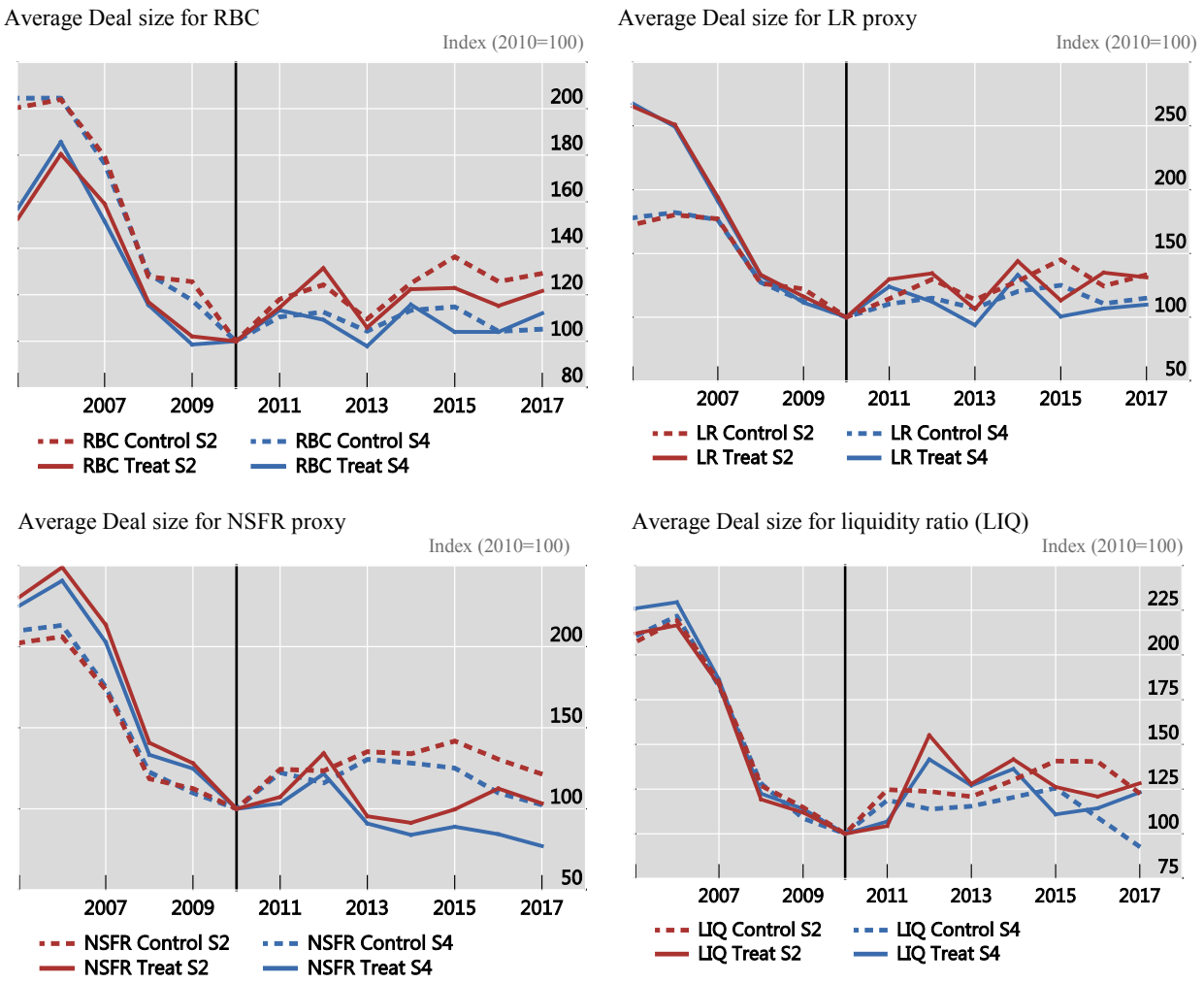
Volume for liquidity ratio (LIQ)



Note: The graphs shows the evolution of *IF volume* for the treatment vs control group before and after the announcement of the initial Basel III reforms in 2010, for CF and PF (in red) and for PF only (in blue). The top left graph is for risk-based Tier 1 capital ratios (RBC); the top right graph is for proxy leverage ratios (LRs); the bottom left graph is for proxy NSFRs; and the bottom right graph is for liquidity ratios (LIQ).

Source: IJ Global (IF data), Fitch (Bank data).

Basel III bindingness: IF deal size for different market segments (CF & PF, PF only) Graph C.4



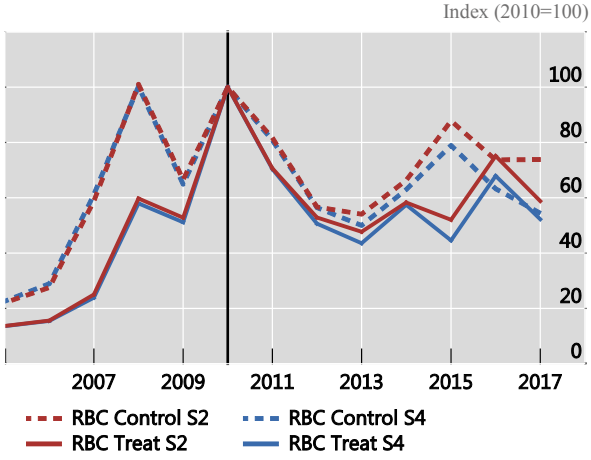
Note: The graphs shows the evolution of *IF deal size* for the treatment vs control group before and after the announcement of the initial Basel III reforms in 2010, for CF and PF (in red) and for PF only (in blue). The top left graph is for risk-based Tier 1 capital ratios (RBC); the top right graph is for proxy leverage ratios (LRs); the bottom left graph is for proxy NSFRs; and the bottom right graph is for liquidity ratios (LIQ).

Source: IJ Global (IF data), Fitch (Bank data).

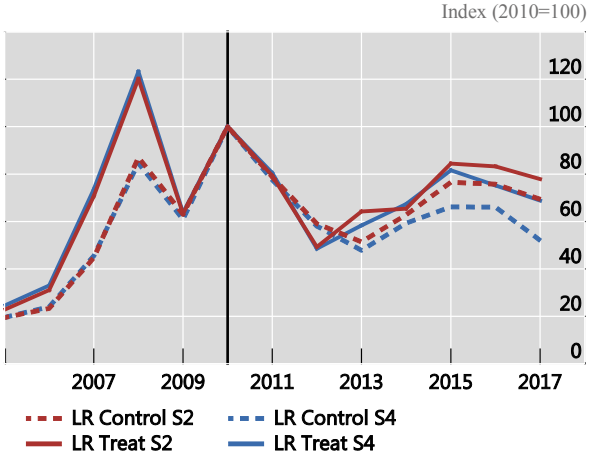
Basel III bindingness: Number of IF deals for different market segments (CF & PF, PF only)

Graph C.5

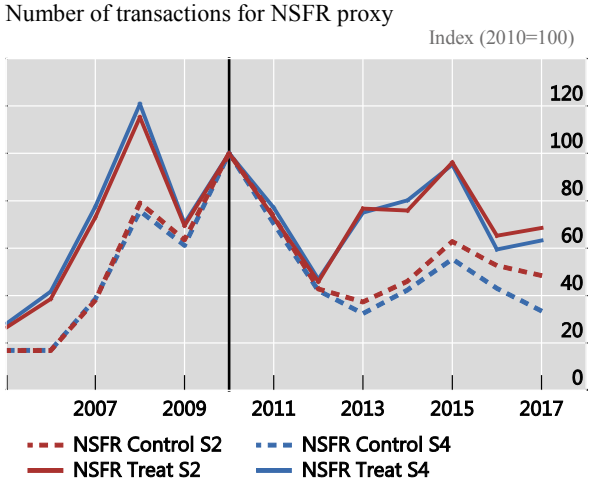
Number of transactions for RBC



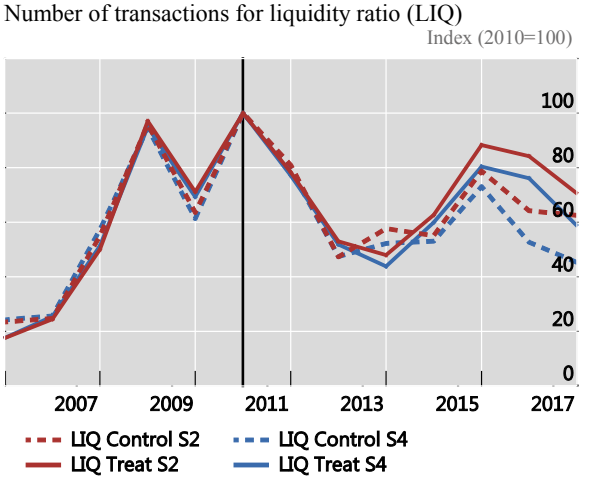
Number of transactions for LR proxy



Number of transactions for NSFR proxy



Number of transactions for liquidity ratio (LIQ)



Note: The graphs shows the evolution of the *number of IF transactions* for the treatment vs control group before and after the announcement of the initial Basel III reforms in 2010, for CF and PF (in red) and for PF only (in blue). The top left graph is for risk-based Tier 1 capital ratios (RBC); the top right graph is for proxy leverage ratios (LRs); the bottom left graph is for proxy NSFRs; and the bottom right graph is for liquidity ratios (LIQ).

Source: IJ Global (IF data), Fitch (Bank data).

Econometric result

The objective of the analysis is to analyse the effects of reforms on volumes. Given that the specification uses data at the most granular levels, thereby benefitting from the most comprehensive information, the **dependent variable is the logarithm of deal size**[99]; in order to infer the effect of the different Basel III metrics on volume, the analysis controls for the number of transactions per financing provider and year, as well as for the corresponding average maturities.

In addition to the differential effect of the reforms post-2010 (e.g. "RBCTreat#Post2010" in H1/1), the specifications measure the changes of the dependent variable post-2010 compared to pre-2010 period (driven by the reforms and other factors) ("Dummy Post 2010" in H1/1), for the treatment versus control groups. Differences in the level of the dependent variable for the treatment vs control group are captured by bank ID fixed effects and not displayed separately.

- *Results for RBC (H1/1, columns (1) to (3)):*
    - Banks with low risk-based capital levels have been less active in IF before 2010, and this trend has continued after 2010, although the difference has diminished (Graph C.3). Due to the diminished difference between the two groups of banks, the differential effect driven by bindingness of the reforms ("RBCTreat#Post2010", highlighted in grey in the table H1/1 below) on IF volume (i.e. deal size controlling for the number of deals and maturity) is positive, but it is not statistically significant.
    - The volume of bank-financed IF post 2010 has decreased by 17% (Sample 2) and around 18% (Sample 4) compared to the pre-reform period. This change is driven by several factors, one of them being post-crisis macro-financial effects, which led to contraction of IF between 2010 and 2013 (see specification H7/1).
- *Results for the LR proxy (H1/1, columns (4) to (6)):*
    - Banks with high leverage levels rapidly increased IF before 2010 (and other types of financing more generally), but have behaved fairly in sync with other banks since 2010 (Graph C.3). The differential effect of the LR ("LRTreat#Post2010") is negative but not found to be statistically significant at all levels of aggregation.
- *Results for the NSFR proxy (H1/2, columns (1) to (3)):*
    - For the NSFR proxy, banks with comparably unfavourable NSFR proxies rapidly increased IF before 2010, while their IF lending behaviour has been similar to other banks since 2010. The NSFR proxy does not suggest a statistically significant differential effect.
- *Results for the liquidity ratio (H1/2, columns (4) to (6)):*
    - For the liquidity ratio, descriptive statistics do not suggest a differential effect. This is confirmed for sample 1, while there is a significant positive effect for samples 2 and 4, suggesting that banks with weaker liquidity ratios have extended relatively more IF after 2010 compared to the other banks. This outcome is driven by a fairly

[99] Accounting for the fact that there are many small deals in the sample.

strong increase IF in activity by the five largest banks falling into the treatment group.

There is no differential effect for any of the Basel III metrics for the cut-off set at the bank level.

H1/1 RBC & LR Vol	(1)	(2)	(3)	(4)	(5)	(6)
IJ Global Sample	S1	S2	S4	S1	S2	S4
Reform	RBC	RBC	RBC	LR	LR	LR
Dependent variable	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize
Post2010	-0.0671	-0.170***	-0.184***	-0.0389	-0.135***	-0.122**
	(-1.92)	(-4.29)	(-3.96)	(-1.10)	(-3.44)	(-2.66)
RBCTreat#Post2010	0.104	0.122	0.155			
	(-1.46)	(-1.29)	(-1.46)			
LRTreat#Post2010				-0.0336	-0.0495	-0.117
				(-0.54)	(-0.72)	(-1.37)
Num. of transactions	-0.00232***	-0.00289***	-0.00353***	-0.00222***	-0.00275***	-0.00338***
	(-5.77)	(-4.86)	(-3.99)	(-5.68)	(-4.57)	(-4.08)
Average maturity	0.00571	0.00225	0.0208***	0.00665	0.00273	0.0205***
	-1.35	-0.51	-3.54	(1.53)	(0.60)	(3.46)
R-sqr	0.222	0.222	0.161	0.229	0.228	0.165
adjusted-R-sqr	0.213	0.209	0.145	0.219	0.215	0.150
R-sqr-within	0.004	0.007	0.011	0.004	0.007	0.011
F	12.3	11.3	11.4	12.5	10.6	10.7
p_value	0	0	0	0.000	0.000	0.000
No_of_obs	20656	14683	12134	20176	14397	11836
No_of_hdfe	5	5	3	5	5	3
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y
InstrumentID	Y	Y	N	Y	Y	N
FinanceTypeID	Y	Y	N	Y	Y	N
BorrowerCountryID	Y	Y	Y	Y	Y	Y
Year	N	N	N	N	N	N

Note: The specification shows the results for volume (measured by deal size) for RBC (specs 1-3) and the LR (specs 4-6), for samples 1 (specs 1,4), 2 (specs 2,5) and 4 (specs 3,6).
t statistics in parentheses. * p<0.05, ** p<0.01, *** p<0.001. All errors are clustered by financing provider ID ("CompanyID"). For all specifications, *outliers and data from banks that defaulted post crisis is excluded. All specifications considered only data from banks with IF activity in at least two years before 2010 and from 2010 (i.e. including 2010).*

"lnDealsize" (the dependent variable) is the logarithm of deal size.

"Post2010" is a dummy, which is 1 from 2010 and 0 otherwise, reflecting the announcement date of the initial Basel III package.

The interaction terms "RBCTreat#Post2010" ("LRTreat#Post2010") characterise the announcement date and whether a bank is bound by RBC (the LR) and is the core measure for the differential effect of the reforms (thus highlighted in grey).

"Num. of transactions" is the number of transactions per financing provider per year, for the respective sample.

"Average maturity" is the average maturity per financing provider per year, for the respective sample.

The fixed effects control for differences across banks (CompanyID), infrastructure sector (SectorID, i.e. power, telecoms, etc.), financing instrument (InstrumentID, i.e. loans, bonds and equity), finance type (FinanceTypeID,

i.e. corporate vs project finance) and the borrower country (BorrowerCountryID). Difference over time are captured by the pre- post 2010 time dummy (rather than year fixed effects).

H1/2 NSFR & LIQ Vol	(1)	(2)	(3)	(4)	(5)	(6)
IJ Global Sample	S1	S2	S4	S1	S2	S4
Reform	NSFR	NSFR	NSFR	LIQ	LIQ	LIQ
Dependent variable	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize
Post2010	-0.0874*	-0.167***	-0.184***	-0.121*	-0.235***	-0.264***
	(-2.08)	(-3.80)	(-3.68)	(-2.54)	(-4.75)	(-4.85)
NSFRTreat#Post2010	0.146	0.0817	0.106			
	(-1.46)	(-0.66)	(-0.63)			
LIQTreat#Post2010				0.0986	0.169*	0.206*
				(1.42)	(2.16)	(2.39)
Num. of transactions	-0.0025***	-0.0037***	-0.0041***	-0.0025***	-0.0033***	-0.0037***
	(-4.95)	(-4.83)	(-3.59)	(-5.21)	(-4.96)	(-3.68)
Average maturity	0.00555	0.00146	0.0138**	0.000691	-0.00467	0.0145*
	(-1.1)	(-0.35)	(-2.95)	(0.13)	(-0.95)	(2.28)
R-sqr	0.246	0.251	0.183	0.243	0.243	0.172
adjusted-R-sqr	0.235	0.238	0.166	0.233	0.231	0.156
R-sqr-within	0.005	0.009	0.015	0.006	0.010	0.014
F	11.0	9.7	16.4	13.8	14.2	15.1
p_value	0.000	0.000	0.000	0.000	0.000	0.000
No_of_obs	14021	10010	8172	14158	10133	8201
No_of_hdfe	5	5	3	5	5	3
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y
InstrumentID	Y	Y	N	Y	Y	N
FinanceTypeID	Y	Y	N	Y	Y	N
BorrowerCountryID	Y	Y	Y	Y	Y	Y
Year	N	N	N	N	N	N

Note: The interaction term "NSFRTreat#Post2010" ("LIQTreat#Post2010") characterises the announcement date and whether a bank is bound by the NSFR proxy. For the other variable definitions, see H1/1.

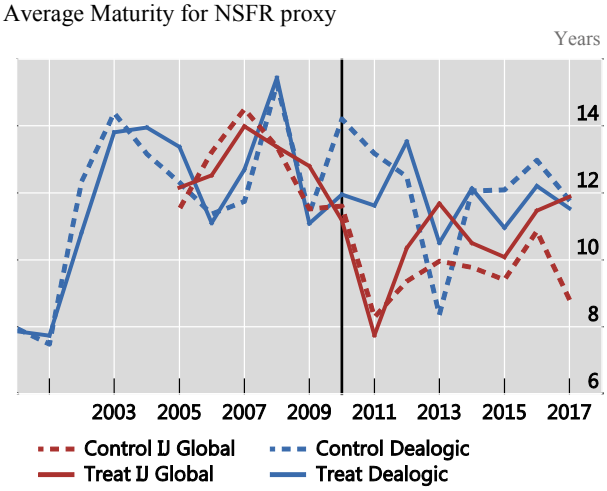
H1/Maturity

Descriptive result (Graph C.6)

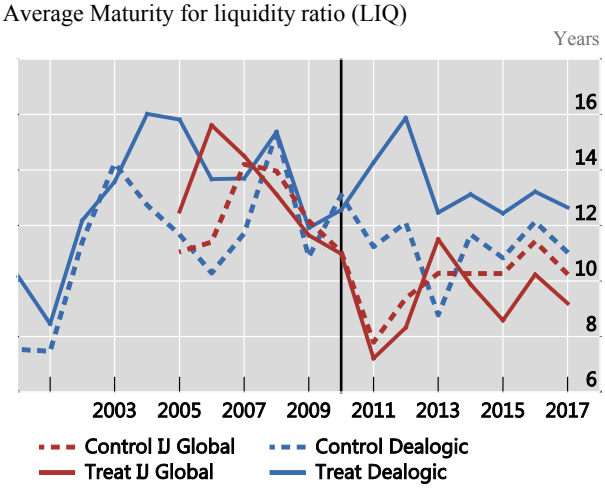
Basel III bindingness: IF maturities PF

Graph C.6

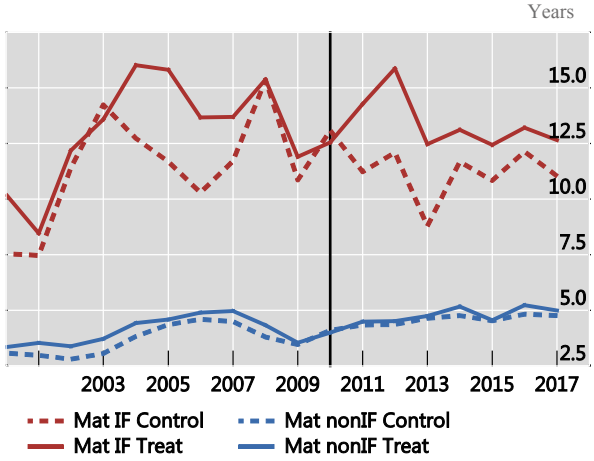
Average Maturity for NSFR proxy



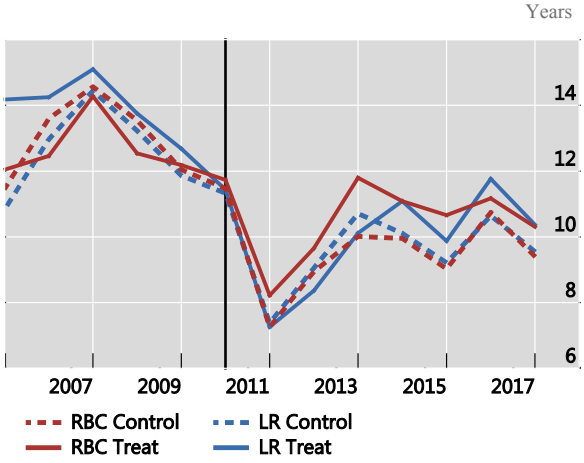
Average Maturity for liquidity ratio (LIQ)



Average Maturity for IF Syndicated Loans vs other Syndicated Loans



Average Maturity for RBC and LR



Top left: The graph shows the evolution of IF maturities for banks with low and higher proxy NSFRs, for PF.

Top right: The graph shows the evolution of IF maturities for banks with low and higher liquidity ratios, for PF.

Bottom left: The graph shows the evolution of IF maturities for syndicated loans vs other syndicated loans.

Bottom right: The graph shows the evolution of IF maturities for banks with low and higher RBC and LR ratios, for PF

Source: IJ Global (IF data), Dealogic (IF data), Fitch (Bank data).

Econometric result

- Post crisis, average maturities are found to have dropped by about three years.
- For capitalisation (RBC, LR – not reported), no differential effect is found on maturities.
- For the liquidity metrics (NSFR, LIQ – see H1/3 & H1/4), the coefficients for the differential effect of the reforms are mostly negative. Hence, there are some signs that regulation has had a differential negative effect, although the coefficients are only significant for some specifications (specs 2-3 in H1/3 for the NSFR and spec 6 in H1/4 for LIQ) and any such effect is limited at around one year or less (except for H1/3, spec 2, where the effect is above one year).
- No differential effect is found between trends in maturities of IF syndicated loans and other syndicated loans, for which the average maturity is about 5.5 years lower (H1/4, row "infra").

H1/3 NSFR & LIQ Vol	(1)	(2)	(3)	(4)	(5)	(6)
IJ Global Sample	S1	S2	S4	S1	S2	S4
Reform	NSFR	NSFR	NSFR	LIQ	LIQ	LIQ
Dependent variable	Maturity	Maturity	Maturity	Maturity	Maturity	Maturity
Post2010	-1.885***	-2.238***	-1.736***	-2.429***	-3.020***	-2.319***
	(-5.47)	(-5.53)	(-4.76)	(-9.82)	(-9.51)	(-7.95)
NSFRTreat#Post2010	-1.199	-1.839**	-1.154*			
	(-1.91)	(-2.65)	(-2.22)			
LIQTreat#Post2010				-0.520	-0.503	-0.771
				(-0.73)	(-0.65)	(-1.01)
Num. of transactions	0.0101*	0.00668	0.00615	0.00894*	0.00415	0.00365
	(2.42)	(1.00)	(1.10)	(2.47)	(0.71)	(0.76)
Size of transaction	0.759***	0.963***	1.341***	0.749***	0.927***	1.279***
	(7.04)	(8.43)	(13.59)	(7.21)	(8.17)	(11.38)
R-sqr	0.278	0.298	0.255	0.281	0.309	0.270
adjusted-R-sqr	0.265	0.283	0.237	0.269	0.295	0.253
R-sqr-within	0.032	0.049	0.069	0.035	0.054	0.070
F	30.7	44.1	51.8	54.4	81.0	76.2
p_value	0.000	0.000	0.000	0.000	0.000	0.000
No_of_obs	11478	8074	6608	11476	8087	6544
No_of_hdfe	5	5	3	5	5	3
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y
InstrumentID	Y	Y	N	Y	Y	N
FinanceTypeID	Y	Y	N	Y	Y	N
BorrowerCountryID	Y	Y	Y	Y	Y	Y
Year	N	N	N	N	N	N

Note: The interaction term "NSFRTreat#Post2010" ("LIQTreat#Post2010") characterises the announcement date and whether a bank is bound by the NSFR proxy. The size of transaction is the dependent variable for volume (i.e. ln tranche size). For the other variable definitions, see H1/1.

H1/4 NSFR & LIQ Dealogic	(1)	(2)	(3)	(4)	(5)	(6)
Reform	NSFR	NSFR	NSFR	LIQ	LIQ	LIQ
Dependent variable	Maturity	Maturity	Maturity	Maturity	Maturity	Maturity
NSFRTREAT#Post2010	-0.254	0.0783	-0.011			
	(-0.74)	-0.27	(-0.15)			
LIQTREAT#Post2010				-0.342	-0.006***	-0.0798
				(-0.95)	(-21.18)	(-1.40)
Num. of transactions	0.00234	-0.00106	0.000145*	0.00315	5.53E-05	0.000162*
	(-0.76)	(-0.40)	(-2.19)	(-1.11)	(-1.09)	(-2.46)
Size of the transaction	0.774***	0.832***	-0.0435	0.774***	1.167***	-0.0434
	(-9.1)	(-10.77)	(-0.86)	(-9.09)	(-12.95)	(-0.86)
NSFRTREAT #Post2010#infra			-0.558			-0.772
			(-1.14)			(-1.79)
LIQTREAT #Post2010#infra						-0.772
						(-1.79)
infra			5.457***			5.524***
			(-18.17)			(-19.76)
TREATNSFR#infra			0.282			
			(-0.86)			
TREATLIQ#infra						0.228
						(-0.57)
R-sqr	0.267	0.372	0.283	0.267	0.667	0.283
adjusted-R-sqr	0.259	0.354	0.282	0.259	0.614	0.282
R-sqr-within	0.0276	0.0327	0.0799	0.0276	0.0722	0.08
No_of_obs	32008	31961	930827	32008	30914	930827
No_of_hdfe	4	3	3	4	3	3
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	N	Y
BorrowerCountryID	Y	Y	Y	Y	N	Y
Year	Y			Y	Y	
ProjectID	N	N	N	N	Y	N

Note: Most variable definitions are the same as above (see H1/1). "Infra" is a dummy which is one for infrastructure type syndicated loans and zero otherwise. In case of specification two, the fixed effects include one interaction term (BorrowerCountryID and Year), as displayed in the table.

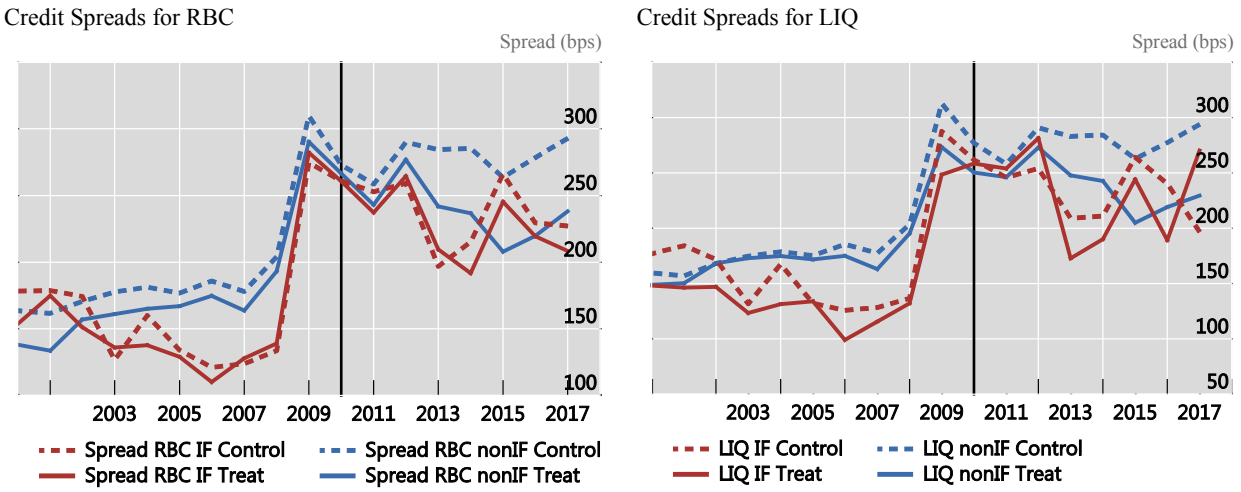
H1/Price

- *Caveat: For the analysis of prices, there was not enough data to control for credit quality in both datasets (despite efforts to match ratings from other sources), but all specifications controlled for tranche specific effects (i.e. characteristics of each tranche). These tranche fixed effects capture, among others, the time invariant component of credit quality.*

Descriptive result

- The analysis of spreads focusses on data from Dealogic, given more limited information in IJ Global. Any observed differences between the two data sets is reported.
- Post-crisis, average spreads are about 50 basis points higher than pre-2010, while the spreads for infrastructure syndicated loans are about 50 basis points lower than for other types of financing.
- The graphs do not suggest that there is a differential effect of the Basel III metrics, including for the LR and the NSFR (which are not shown below).

Basel III bindingness: IF credit spreads — Graph C.7



Left graph: The graph shows the evolution of IF syndicated loans credit spreads for banks with low and higher RBC ratios, along with the corresponding series for non-IF syndicated loans.

Right graph: The graph shows the evolution of IF syndicated loans credit spreads for banks with low and higher liquidity ratios, along with the corresponding series for non-IF syndicated loans.

Source: Dealogic (IF data), Fitch (Bank data).

Econometric result

- There is no statistically significant differential effect on price for banks more constrained by RBC or any of the other Basel III metrics (NB: table below illustrates RBC results only), nor is there a differential effect between IF and other types of financing; the same outcome holds for IJ Global data (H1/5).
- In line with descriptive results (see Graph C.7) infrastructure syndicated loans are priced about 50 basis points below other syndicated loans (row "infra").

H1/5 Dealogic RBC	(1)	(2)	(3)	(4)
Reform	RBC	RBC	RBC	RBC
Dependent variable	Spread	Spread	Spread	Spread
RBCTREAT#Post2010	-19.87	-11.33	-0.0182	2.669
	(-1.33)	(-1.54)	(-0.23)	(-0.32)
Num. of transactions	-0.0523	0.0172	-0.00079	0.00266
	(-0.76)	(-0.47)	(-1.04)	(-0.54)
Maturity	0.914	1.045	1.872*	12.14***
	(-1.42)	(-1.47)	(-2.55)	(-11.37)
RBCTREAT#Post2010post#infra				41.16
				(-1.97)
infra				-46.75**
				(-3.44)
RBCTREAT #infra				-8.689
				(-0.77)
R-sqr	0.397	0.565	0.84	0.287
adjusted-R-sqr	0.385	0.547	0.821	0.285
R-sqr-within	0.00425	0.00426	0.0204	0.0469
No_of_obs	13361	13344	13172	593119
No_of_hdfe	4	3	3	3
CompanyID	Y	Y	Y	Y
SectorID	Y	Y	N	Y
BorrowerCountryID	Y	Y	N	Y
Year	Y		Y	
ProjectID	N	N	Y	N

Note: Most variable definitions are the same as above (see H1/1). "Infra" is a dummy which is one for infrastructure type syndicated loans and zero otherwise.

Outcome for Hypothesis 2: Is there a difference in the IF behaviour between G-SIB and other banks? *(Impact of G-SIB specific regulation)*

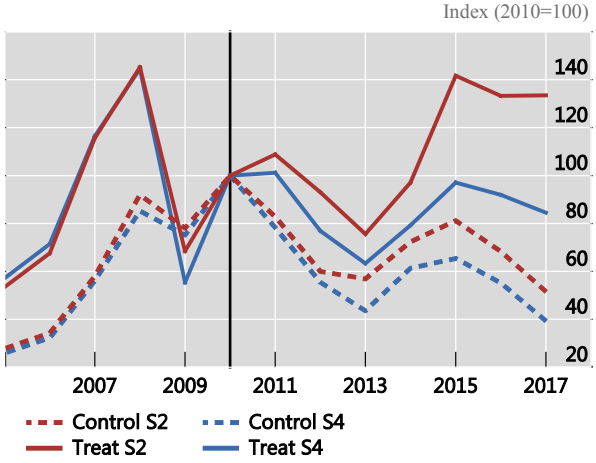
Descriptive result

- For IF volumes, descriptive information suggests that G-SIBs have continued to be more active players in the market compared to other banks in recent years.
- G-SIBs have reduced average maturities for loans more than other banks since pre-2010.

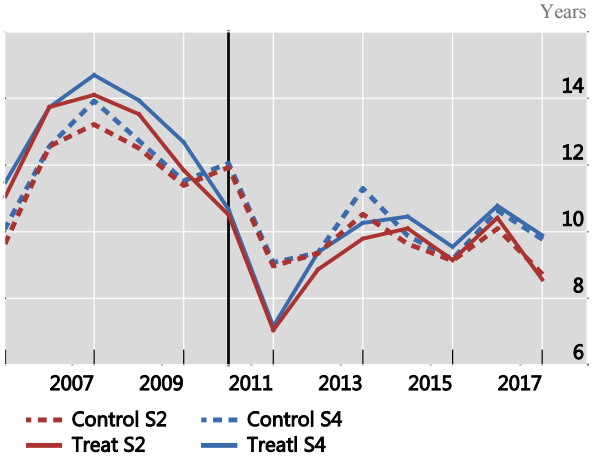
G-SIBs vs other banks

Graph C.8

After 2010, G-SIBs have extended more IF than other banks, as was the case before 2009



G-SIBs have reduced their average maturities more than other banks



Left graph: The graphs shows the evolution of *IF volume* for the treatment vs control group (i.e. for G-SIBs vs other banks) before and after the announcement of the initial Basel III reforms in 2010, for CF and PF (in red) and for PF only (in blue). Right graph: This graph is the corresponding graph for average maturities for G-SIBs vs other banks.

Source: IJ Global (IF data).

Econometric result

H2/Volume

- There is no statistically significant differential effect for G-SIBs vs non-G-SIBs for IF volume (H2/1 – specs 1,2); G-SIBs with lower LRs have reduced IF compared to other G-SIBs (spec 4), while the opposite is true for the liquidity ratio (which includes very few treated G-SIBs, though – see Table C5/1).

H2/1 G-SIB Volume	(1)	(2)	(3)	(4)	(5)	(6)
IJ Global Sample	S2	S4	S4	S4	S4	S4
Reform	G-SIBs vs other banks					
Dependent variable	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize
Post2010	-0.089*	-0.055	-0.069	-0.010*	-0.045	-0.151
	(-2.34)	(-1.28)	(-1.41)	(-1.99)	(-0.74)	(-1.94)
GSIBTreat#Post2010	-0.0489	-0.125	-0.156	-0.0244	-0.220*	-0.167
	(-0.72)	(-1.63)	(-1.97)	(-0.26)	(-2.27)	(-1.67)
Num. of transactions	-0.003***	-0.003***	-0.004***	-0.003***	-0.004***	-0.004***
	(-4.57)	(-3.72)	(-3.54)	(-4.08)	(-3.52)	(-3.72)
Average maturity	0.0051	0.022***	0.020***	0.020***	0.021***	0.0159**
	(1.22)	(3.99)	(3.42)	(3.44)	(4.53)	(2.75)
GSIB#Post2010#TreatRBC			0.160			
			(0.83)			
GSIB#Post2010#TreatLR				-0.202*		
				(-2.24)		
GSIB#Post2010#TreatNSFR					0.0288	
					(0.14)	
GSIB#Post2010#TreatLIQ						0.411***
						(4.27)
R-sqr	0.244	0.177	0.161	0.166	0.184	0.173
adjusted-R-sqr	0.230	0.159	0.145	0.150	0.167	0.158
R-sqr-within	0.006	0.011	0.011	0.012	0.016	0.016
F	7.5	7.8	8.9	23.9	13.1	20.8
p_value	0.000	0.000	0.000	0.000	0.000	0.000
No_of_obs	16534	13586	12127	11813	8172	8201
No_of_hdfe	5	3	3	3	3	3
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y
InstrumentID	Y	N	N	N	N	N
FinanceTypeID	Y	N	N	N	N	N
BorrowerCountryID	Y	Y	Y	Y	Y	Y
Year	N	N	N	N	N	N

Note: Most variable definitions are the same as above (see H1/1). "GSIB" is a dummy which is one for G-SIBs and zero otherwise.

H2/Maturity

Econometric result

- There is a statistically significant negative differential effect for G-SIBs vs non-G-SIBs for average IF loan maturities, equivalent to about two years, on top of a general decrease of maturities by one-two years. G-SIBs with weaker liquidity profiles exhibit shorter maturities. For syndicated loans in Dealogic, there is no differential effect on maturities for G-SIBs.

H2/2 G-SIB Maturity	(1)	(2)	(3)	(4)	(5)	(6)
Sample	S2	S4	S4	S4	S4	S4
Reform	G-SIBs vs other banks					
Dependent variable	Maturity	Maturity	Maturity	Maturity	Maturity	Maturity
Post2010	-1.22***	-1.38***	-1.60***	-1.89***	-0.93*	-1.74***
	(-3.83)	(-4.27)	(-4.37)	(-5.05)	(-2.41)	(-3.80)
GSIB#Post2010	-2.48***	-2.23***	-2.03***	-2.27***	-1.99**	-1.14
	(-4.37)	(-3.81)	(-3.47)	(-3.37)	(-3.24)	(-1.81)
Num. of transactions	0.00990	0.00846	0.00845	0.0101	0.0105	0.00873
	(1.92)	(1.45)	(1.62)	(1.71)	(1.54)	(1.40)
Size of the transaction	1.00***	1.06***	1.04***	1.08***	1.17***	1.13***
	(10.78)	(10.67)	(9.84)	(10.12)	(9.02)	(8.39)
GSIB#Post2010#TreatRBC			0.00614			
			(0.00)			
GSIB#Post2010#TreatLR				1.86*		
				(2.61)		
GSIB#Post2010#TreatNSFR					-1.53	
					(-1.08)	
GSIB#Post2010#TreatLIQ						-2.45**
						(-3.34)
R-sqr	0.329	0.322	0.323	0.320	0.295	0.311
adjusted-R-sqr	0.311	0.304	0.308	0.304	0.276	0.294
R-sqr-within	0.063	0.068	0.070	0.075	0.076	0.080
F	74.0	75.6	56.4	74.0	32.9	82.3
p_value	0.000	0.000	0.000	0.000	0.000	0.000
No_of_obs	11556	10579	9365	9069	6297	6226
No_of_hdfe	5	3	3	3	3	3
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y
InstrumentID	Y	N	N	N	N	N
FinanceTypeID	Y	N	N	N	N	N
BorrowerCountryID	Y	Y	Y	Y	Y	Y
Year	N	N	N	N	N	N

H2/Price

Econometric result

- No statistically significant differential effect is found for credit spreads charged by G-SIBs vs non-G-SIBs, both for Dealogic and for IJ Global.

H2/3 Dealogic Spread	(1)	(2)	(3)	(4)	(5)
Reform	G-SIBs vs other banks				
Dependent variable	Spread	Spread	Spread	Spread	Spread
GSIB#Post2010	12.94	8.984	10.67	0.126	-4.459
	(1.28)	(1.68)	(1.09)	(0.94)	(-0.51)
Num. of transactions	-0.110	-0.0154	-0.113	-0.00163	0.00209
	(-1.59)	(-0.40)	(-1.59)	(-1.53)	(0.40)
Maturity	0.716	0.853	0.173	1.773*	11.67***
	(1.12)	(1.18)	(0.31)	(2.38)	(10.15)
EMDE (dummy)			46.20**		
			(3.38)		
EMDE#Post2010			-58.56		
			(-1.16)		
GSIB#EMDE			-14.45		
			(-1.54)		
GSIB#Post2010#EMDE			36.67		
			(1.00)		
GSIB#Post2010#infra					9.030
					(0.60)
infra					-57.00**
					(-3.95)
GSIB#infra					1.691
					(0.18)
R-sqr	0.402	0.583	0.317	0.831	0.308
adjusted-R-sqr	0.390	0.566	0.307	0.811	0.306
R-sqr-within	0.00296	0.00337	0.0184	0.0195	0.0486
No_of_obs	13009	12992	13012	12844	392522
No_of_hdfe	4	3	3	3	3
CompanyID	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	N	Y
BorrowerCountryID	Y	Y	N	N	Y
Year	Y		Y	Y	
ProjectID	N	N	N	Y	N

Note: For variable definitions see H1/1. "GSIB" is a dummy which is one for G-SIBs and zero otherwise. The "EMDE" dummy is 1 for financing providers based in EMDEs and zero otherwise.

Outcome for Hypothesis 3: How did the reforms affect banks based in AEs versus those in EMDEs, and how did the reforms affect IF activities in AEs vs EMDEs? *(Distributional impact of regulation)*

H3/Volume for AE vs EMDE banks

Econometric Result

- There is no differential impact of being an AE vs an EMDE bank on IF financing volume for any market segment.

H3/1 AE Lender Volume	(1)	(2)	(3)
IJ Global Sample	S1	S2	S4
Reform	AE vs EMDE Bank		
Dependent variable	lnDealsize	lnDealsize	lnDealsize
Post2010	0.0106	-0.0758	0.0106
	(0.23)	(-1.34)	(0.23)
AELender#Post2010	-0.0155	-0.0145	-0.0155
	(-0.27)	(-0.21)	(-0.27)
Num. of transactions	-0.00244***	-0.00308***	-0.00244***
	(-5.67)	(-4.94)	(-5.67)
Average maturity	0.0103**	0.00768*	0.0103**
	(2.90)	(2.13)	(2.90)
R-sqr	0.257	0.265	0.257
adjusted-R-sqr	0.244	0.248	0.244
R-sqr-within	0.004	0.005	0.004
F	8.7	6.9	8.7
p_value	0.000	0.000	0.000
No_of_obs	25747	18812	25747
No_of_hdfe	5	5	5
CompanyID	Y	Y	Y
SectorID	Y	Y	Y
InstrumentID	Y	Y	N
FinanceTypeID	Y	Y	N
BorrowerCountryID	Y	Y	Y
Year	N	N	N

Note: For variable definitions see H1/1. "AELender" is a dummy which is one for financing providers based in AEs and zero otherwise.

H3/Maturity for AE vs EMDE banks

Econometric Result

- Post-2010, average maturities of loans by AE lenders have been two-three years lower than those of EMDE lenders; this difference does not seem to be driven by one specific Basel III metric, although the Basel III liquidity metrics might have contributed to this decline (as suggested by some specifications). Note that there is an overlap between AE lenders and G-SIBs (specification H2/2), but the correlation between the two dummies is fairly low at 0.08.

H3/2 AE lender Maturity	(1)	(2)	(3)	(4)	(5)	(6)
IJ Global Sample	S2	S4	S4	S4	S4	S4
Reform	AE vs EMDE Bank					
Dependent variable	Maturity	Maturity	Maturity	Maturity	Maturity	Maturity
Post2010	-0.0951	-0.309	-0.232	-0.417	0.0261	-0.771
	(-0.30)	(-1.01)	(-0.64)	(-0.84)	(0.06)	(-0.98)
AELender#Post2010	-2.85***	-2.63***	-3.29***	-3.27***	-2.70***	-2.14*
	(-6.04)	(-5.70)	(-6.51)	(-5.10)	(-4.54)	(-2.51)
Num. of transactions	0.00771	0.00691	0.00686	0.00819	0.00927	0.00679
	(1.56)	(1.19)	(1.31)	(1.42)	(1.42)	(1.12)
Size of the transaction	0.974***	1.032***	1.037***	1.085***	1.176***	1.125***
	(11.48)	(11.41)	(9.80)	(10.11)	(9.20)	(8.24)
AELender#POST2010#RBC			0.272			
			(0.28)			
AELender#POST2010#LR				1.375*		
				(2.46)		
AELender#POST2010#NSFR					-1.684	
					(-1.44)	
AELender#POST2010#LIQ						-1.023
						(-1.37)
R-sqr	0.345	0.337	0.325	0.321	0.296	0.309
adjusted-R-sqr	0.325	0.317	0.310	0.305	0.278	0.292
R-sqr-within	0.059	0.064	0.073	0.076	0.078	0.077
F	66.5	65.9	64.3	80.9	32.5	73.7
p_value	0.000	0.000	0.000	0.000	0.000	0.000
No_of_obs	13111	12084	9371	9089	6296	6225
No_of_hdfe	5	3	3	3	3	3
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y
InstrumentID	Y	N	N	N	N	N
FinanceTypeID	Y	N	N	N	N	N
BorrowerCountryID	Y	Y	Y	Y	Y	Y
Year	N	N	N	N	N	N

Note: For variable definitions see H1/1. "AELender" is a dummy which is one for financing providers based in AEs and zero otherwise. RBC, LR, NSFR and LIQ are the treatment dummies.

H3/Price for AE vs EMDE banks

Econometric Result

- There is no differential effect for AE vs EMDE banks on credit spreads (which also holds for IJ Global, not shown). Specification 4 shows how the spreads have evolved for AE lenders in emerging market economies.

H3/3 Dealogic Spread	(1)	(2)	(3)	(4)	(5)	(6)
Reform	AE vs EMDE bank					
Dependent variable	Spread	Spread	Spread	Spread	Spread	Spread
AELender#Post2010post	-29.08	19.84	-15.62	-14.69	0.426	-29.90*
	(-0.60)	(0.32)	(-0.48)	(-0.65)	(0.59)	(-2.88)
AELender	-19.52					
	(-1.33)					
Num. of transactions	-0.162**	-0.0914	0.00174	-0.0827	-0.00146	0.00215
	(-3.28)	(-1.35)	(0.05)	(-0.77)	(-1.11)	(0.41)
Maturity	0.560	0.714	0.847	0.156	1.773*	11.65***
	(0.84)	(1.12)	(1.17)	(0.27)	(2.34)	(10.14)
EMDE				49.89		
				(2.04)		
EMDE#Post2010				-45.65		
				(-0.48)		
AELender#EMDE				-11.89		
				(-0.74)		
AELender#Post2010post#EMDE				6.018		
				(0.07)		
infra						-9.199
						(-0.52)
AELender#infra						-51.51*
						(-2.14)
AELender#Post2010#infra						8.828
						(0.59)
R-sqr	0.364	0.401	0.583	0.315	0.831	0.309
adjusted-R-sqr	0.359	0.390	0.566	0.305	0.811	0.306
R-sqr-within	0.0108	0.00270	0.00313	0.0163	0.0195	0.0491
No_of_obs	13017	13009	12992	13012	12844	392474
No_of_hdfe	3	3	3	3	3	3
CompanyID	N	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	N	Y
BorrowerCountryID	Y	Y	Y	N	N	Y
Year	Y	N		Y	Y	
ProjectID	N	N	N	N	Y	N

Note: For variable definitions see H1/1. “AELender” is a dummy which is one for financing providers based in AEs and zero otherwise. “EMDE” is a dummy which is 1 for borrowers based in EMDEs and 0 otherwise.

H3/Volume in AEs vs EMDEs (i.e. borrower perspective)

- Descriptive results show that the total volume of IF provided by the financial sector has continued to grow after an intermittent slowdown during the global financial crisis (Graph 2). IF in AEs saw a dip after the crisis but has grown steadily since. Aggregate growth of IF has been more contained in EMDEs, although there has been a mild upward trend in recent years in most EMDEs countries (Graphs A.1, A.2). For project finance, IF volumes evolved fairly similarly in AEs vs EMDEs.

Econometric Result

- There is no differential impact on IF volumes in AEs vs EMDEs (not shown).
- IF vs non-IF cannot be analysed in a meaningful manner, given data limitations for volume in Dealogic and no such information being available in IJ Global.

H3/Maturity in AEs vs EMDEs (i.e. borrower perspective)

Econometric Result

- Descriptive analysis shows that maturities have dropped in AEs, while they have been fairly stable in EMDEs, hence this dimension has not been subject to specific follow-up analysis using a DiD approach.

H3/Price in AEs vs EMDEs (i.e. borrower perspective)

Econometric Result (captured as part of H4/1, shown below)

- Spreads are found to be 38 basis points higher in EMDEs post-2010 (row 'EMDE').
- There is no statistically significant differential effect of RBC bindingness on the difference in spreads between AEs and EMDEs – and the same holds for the other Basel III metrics (for which results are not shown).

Outcome for Hypothesis 4: ***Did the reforms have a stronger effect on IF vs other types of finance? (Distributional impact of regulation on IF)***

H4/Volume

- There is no meaningful data to analyse differential trends in IF volumes vs volumes of other financing types; high level statistics that compares the share of IF lending by banks with total customer lending suggest a slight increase for IF (Graph A.8) and a flat trend for the share of customer loans to total assets.

H4/Maturity

- Descriptive evidence from Dealogic on maturities for IF vs other finance types is shown in Graph C.6 (bottom left). For IF, the average maturity is about 5 years higher than for other syndicated loans, and that difference has been fairly stable over time.
- Econometric evidence confirms that there is no statistically significant differential trend in maturities between IF syndicated loans and other syndicated loans (H1/5).

H4/Price

- Descriptive information is shown in Graph C.7, which documents that credit spreads for non-IF syndicated loans have been about 50 basis points higher during the last 15 years and that the relationship has been fairly robust over time (Graph 6 in the main text). For RBC and LIQ, descriptive evidence does not suggest that there is a differential trend (Graph C.7).

Econometric Result

- There is no statistically significant effect that would suggest a differential increase of IF spreads compared to spreads of other syndicated loans (H4/1 – dummy "RBCTreat#infra"[100], see also H1/5).

[100] The same result holds also true for the other Basel III metrics.

H4/1 Spread IF vs other Dealogic	(1)	(2)	(3)	(4)	(5)
Reform	RBC	RBC	RBC	RBC	RBC
Dependent variable	Spread	Spread	Spread	Spread	Spread
RBCTREAT#Post2010	-20.44	-11.44	-1.92	-0.113	2.062
	(-1.36)	(-1.56)	(-0.20)	(-1.09)	(-0.22)
Num. of transactions	-0.0532	0.0173	-0.0596	-0.00127	0.00272
	(-0.77)	(-0.47)	(-0.93)	(-1.41)	(-0.49)
Maturity	0.921	1.044	0.359	1.873*	11.82***
	(-1.43)	(-1.47)	(-0.63)	(-2.55)	(-10.3)
EMDE			37.89**		
			(-3.65)		
EMDE#Post2010			-8.474		
			(-0.31)		
RBCTREAT#EMDE			-2.863		
			(-0.24)		
RBCTREAT#Post2010#EMDE			-40.99		
			(-1.20)		
RBCTREAT#Post2010#infra					25.2
					(-1.24)
infra					-54.86***
					(-4.08)
RBCTREAT #infra					-2.578
					(-0.24)
R-sqr	0.397	0.566	0.319	0.842	0.308
adjusted-R-sqr	0.385	0.548	0.308	0.823	0.306
R-sqr-within	0.00438	0.00428	0.0155	0.0206	0.0486
No_of_obs	13361	13344	13365	13172	405881
No_of_hdfe	4	3	3	3	3
CompanyID	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	N	Y
BorrowerCountryID	Y	Y	N	N	Y
Year	Y		Y	Y	
ProjectID	N	N	N	Y	N

Note: For variable definitions see H1/1. “EMDE” is a dummy which is one for IF borrowers based in EMDEs and zero otherwise.

Outcome for Hypothesis 5: How does the IF behaviour of banks (subject to comprehensive financial regulatory reforms) differ from that of non-banks? *(Substitution of bank financing by other financing)*

H5/Volume

- Descriptive information is shown in Graph 2, which suggests that market-based finance has grown in recent years, while bank-based financing has been fairly steady after a drop during the financial crisis.

Econometric Result

- There is a statistically significant differential effect between bank-based finance and market-based finance, suggesting that the latter has increased in relative terms for all market segments; triple interaction effects with the four Basel III metrics are not statistically significant, which indicates that none of these single reforms has contributed to substitution. However, there might still be an indirect combined effect, along with other factors.

H5/1 Bank vs market-based finance	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IJ Global Sample	S2	S4	S2	S2	S2	S2	S2
Reform	Bank vs market-based finance						
Dependent variable	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize
Post2010	0.0488	0.249***	-0.0181	-0.0126	-0.154	-0.121	-0.150
	(0.81)	(3.53)	(-0.19)	(-0.13)	(-1.40)	(-0.95)	(-0.65)
Bankvsother#Post2010	-0.177*	-0.456***	-0.152	-0.137	-0.0168	-0.108	0.0894
	(-2.54)	(-5.51)	(-1.39)	(-1.32)	(-0.15)	(-0.76)	(0.38)
Num. of transactions	-0.003***	-0.004***	-0.003***	-0.003***	-0.004***	-0.003***	-0.003***
	(-5.77)	(-5.13)	(-5.40)	(-5.55)	(-5.03)	(-5.06)	(-4.64)
Average maturity	0.00835*	0.0155***	0.00298	0.00341	0.00139	-0.00496	0.00852*
	(2.50)	(4.40)	(0.71)	(0.81)	(0.33)	(-1.04)	(2.35)
BankOther#Post2010#RBC			0.0505				
			(0.62)				
BankOther#Post2010#LR				-0.0845			
				(-1.22)			
BankOther#Post2010#NSFR					0.151		
					(1.51)		
BankOther#Post2010#LIQ						0.103	
						(1.61)	
BankOther#Post2010#GSIB							-0.154*
							(-2.49)
R-sqr	0.271	0.205	0.222	0.228	0.252	0.243	0.260
adjusted-R-sqr	0.254	0.184	0.210	0.215	0.238	0.230	0.244
R-sqr-within	0.006	0.015	0.007	0.007	0.009	0.009	0.008
F	15.1	27.5	12.6	13.9	9.7	12.3	10.3
p_value	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No_of_obs	19043	15641	14683	14397	10010	10133	14245
No_of_hdfe	5	3	5	5	5	5	5
CompanyID	Y	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y	Y
InstrumentID	Y	N	Y	Y	Y	Y	Y
FinanceTypeID	Y	N	Y	Y	Y	Y	Y
BorrowerCountryID	Y	Y	Y	Y	Y	Y	Y
Year	N	N	N	N	N	N	N

Note: For variable definitions see H1/1.

H5/Maturity** and **Price: Market-based finance is composed mainly of bonds, hence there is only very limited evidence to compare maturities and prices of non-bank lending with bank-based financing. For prices, information in IJ Global is fairly limited and does not allow for robust specifications.

Outcome for Hypothesis 6: How did the OTC Derivative reforms affect IF, if at all? *(OTC Derivative reforms)*

- Aim: test whether country-specific variation in OTC derivative reform implementation has an impact on IF maturities and/or credit spreads (volume is excluded given data limitations in Dealogic); the analysis distinguishes between central clearing reforms ("OTC CC") versus all OTC Derivative reforms ("OTC all") (i.e., central clearing, margin requirements, platform trading, trade reporting) (see Graph 7 and Annex B).
- Caveat: given the aggregate nature of specifications, especially H6/1 and H6/2 (i.e. the fact that the analysis does not consider bindingness at the financing provider level and specific characteristics which could be relevant at the deal level), no firm conclusions can be drawn.

H6/Maturity

Econometric result

- There is no statistically significant effect that would suggest a decrease of IF maturities as a result of staggered OTC Derivative reform implementation across jurisdictions (see the cells highlighted in grey in H6/1).

H6/1 Maturity OTCD Dealogic	(1)	(2)	(3)	(4)	(5)	(6)
Sample	IF only	IF only	IF and other finance	IF only	IF only	IF and other finance
Reform (s)	OTC CC	OTC CC	OTC CC	OTC all	OTC all	OTC all
Dependent variable	Maturity	Maturity	Maturity	Maturity	Maturity	Maturity
OTCTREAT	0.262	-0.0053	0.125	0.0204	-0.00728	0.285
	(-0.67)	(-1.40)	(-0.87)	(-0.06)	(-1.40)	(-1.41)
Num. of transactions	0.0028	2.31E-05	0.000325**	0.00278	2.39E-05	0.000324**
	(-0.72)	(-0.57)	(-3.53)	(-0.72)	(-0.59)	(-3.53)
Size of the transaction	0.751***	1.175***	-0.0716	0.751***	1.175***	-0.0715
	(-8.67)	(-12.4)	(-1.32)	(-8.67)	(-12.4)	(-1.32)
OTCTREAT #infra			-0.708			-0.833
			(-1.80)			(-2.07)
infra			5.548***			5.594***
			(-18.3)			(-18.3)
R-sqr	0.269	0.659	0.262	0.269	0.659	0.262
adjusted-R-sqr	0.262	0.606	0.262	0.262	0.606	0.262
R-sqr-within	0.0263	0.0728	0.0835	0.0262	0.0728	0.0837
No_of_obs	27854	26903	597863	27854	26903	597863
No_of_hdfe	4	3	4	4	3	4
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	N	Y	Y	N	Y
BorrowerCountryID	Y	N	Y	Y	N	Y
Year	Y	Y	Y	Y	Y	Y
ProjectID	N	Y	N	N	Y	N

Note: For variable definitions see H1/1. "OTCTREAT" is a dummy which is one if a bank is based in a jurisdiction that has implemented the OTC derivative reforms (either for central counterparties or various different OTCD reforms) and is zero otherwise.

H6/Price

Econometric result

- There is no statistically significant effect that would suggest an increase of IF spreads as a result of staggered OTC Derivative reform implementation across jurisdictions, either for central clearing reforms in isolation or for the broader set of reforms (see the results for the variables "OTCTREAT" and "OTCTREAT#infra", highlighted in grey in H6/2).

H6/2 Spread OTCD Dealogic	(1)	(2)	(3)	(4)	(5)	(6)
Sample	IF only	IF only	IF and other finance	IF only	IF only	IF and other finance
Reform (s)	OTC CC	OTC CC	OTC CC	OTC all	OTC all	OTC all
Dependent variable	spread	spread	spread	spread	spread	spread
OTCTREAT	22.85	-0.0388	-29.54*	16.85	-0.135***	-40.52***
	(1.04)	(-0.33)	(-2.20)	(0.48)	(-11.80)	(-4.41)
Num. of transactions	-0.0794	0.000191	-0.00468	-0.0798	0.000203	-0.00451
	(-1.13)	(0.27)	(-0.80)	(-1.14)	(0.28)	(-0.77)
Maturity	0.772	1.727*	11.12***	0.772	1.727*	11.13***
	(1.19)	(2.23)	(9.70)	(1.19)	(2.23)	(9.69)
OTCTREAT#infra			28.71			27.08
			(1.82)			(1.68)
infra			-51.32**			-51.25**
			(-3.41)			(-3.39)
R-sqr	0.392	0.832	0.261	0.392	0.832	0.261
adjusted-R-sqr	0.381	0.812	0.260	0.381	0.812	0.260
R-sqr-within	0.00287	0.0186	0.0445	0.00266	0.0186	0.0445
No_of_obs	12249	12084	367249	12249	12084	367249
No_of_hdfe	4	3	4	4	3	4
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	N	Y	Y	N	Y
BorrowerCountryID	Y	N	Y	Y	N	Y
Year	Y	Y	Y	Y	Y	Y
ProjectID	N	Y	N	N	Y	N

Note: For variable definitions see H1/1. "OTCTREAT" is a dummy which is one if a bank is based in a jurisdiction that has implemented the OTC

Analysis of spreads for foreign-currency loans

- The existing literature and survey responses (see section 4 and Annex D) suggest that the availability of hedging instruments for IF is limited in markets with less liquid currencies, particularly for EMDEs, and that this may act as a drag on IF. Analysis of credit spreads for foreign currency vs domestic currency IF syndicated loans suggests no significant differential increase in spreads post 2010 (nor from the staggered implementation of OTC derivative reforms – not shown) – see row 'FXLoan#Post2010', specifications 1,2, 4 and 5 in table H6/3.
- The analysis has been performed from both the 'borrower side' and the 'lender side'. Borrower side specifications distinguish whether a syndicated loan is in a foreign currency relative to the borrower's 'home' currency and whether the borrower is based in an EMDE. Lender side specifications distinguish whether a loan is in a foreign currency relative to the lender's 'home' currency and whether the lender is based in an EMDE.
- The result shows that there is a general EMDE ("EMDE*") and FX loan ("FXLoan") premium, both on the borrower side and the lender side, but that those premia do not seem to be linked to the reforms (see the interaction terms including the Post2010 dummy highlighted in grey).

H6/3 FX Loans Dealogic	(1)	(2)	(3)	(4)	(5)	(6)
	Borrower side			Lender side		
	IF only	IF only	IF vs other	IF only	IF only	IF vs other
Reform (s)	Post 2010 reforms					
Dependent variable	Spread	Spread	Spread	Spread	Spread	Spread
FXLoan#Post2010	-26.12	5.167	-5.633	-35.68*	-26.92	21.47*
	(-1.38)	(-0.27)	(-0.53)	(-2.55)	(-1.81)	(2.59)
FXLoan	1.323	0.564	15.85***	24.20*	42.23***	-13.11**
	(-0.08)	(-0.04)	(-5.64)	(2.75)	(5.79)	(-3.09)
EMDE*		78.79*			68.11*	
		(-2.2)			(2.47)	
FXLoan#EMDE*		-44.43			-47.54	
		(-1.63)			(-1.71)	
FXLoan#Post2010#EMDE*		9.331			46.70	
		(-0.12)			(0.59)	
FXLoan#Post2010#infra			-18.42			-0.117
			(-1.03)			(-0.01)
R-sqr	0.402	0.318	0.309	0.405	0.316	0.31
adjusted-R-sqr	0.391	0.308	0.306	0.394	0.306	0.307
R-sqr-within	0.00435	0.0195	0.0496	0.00931	0.0173	0.0501
No_of_obs	13009	13012	392522	13009	13012	392522
No_of_hdfe	4	3	4	4	3	4
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y
BorrowerCountryID	Y	N	Y	Y	N	Y
Year	Y	Y		Y	Y	
ProjectID	N	N	N	N	N	N

Note: For variable definitions see H1/1. “FXLoan” is a dummy which is one for foreign currency denominated syndicated loans and zero otherwise. For specifications 1-3, “EMDE*” is a dummy which is 1 for borrowers based on EMDEs, otherwise zero, and the same is true for lenders based in EMDEs for specifications 4-6. All specifications control for the maturity and the number of transactions. Specification 2 and 5 control for EMDE borrowers post 2010. Specifications 3 and 6 control for differences in spreads for IF vs other finance (dummy “infra”) and for IF pre- vs post crisis.

Effect of factors other than regulation

As mentioned above, the main specifications used for this evaluation have used fixed effects, a 'high government spending' dummy and a pre/post-2010 dummy to control for factors other than the effect of the treatment. However, alternative specifications can be constructed that remove some of the fixed effects and instead include specific control variables. Such specifications can help to show whether the specific control variables act as significant drivers of the dependent variable (and hence whether they are likely to be important drivers of the observed trends in the supply of IF).

Table C.6 shows the 11 control variables that have been analysed in this way and their expected effect on volumes of IF.

Table C.6: Hypotheses on effect of control variables

	Variable	Definition (unless self-explanatory)	Expected Sign (for IF volume)
1	Interest rate differential	borrower country long-term rates - lender country long-term rates	Positive
2	10yr USD Swap Rate	Indicator for global liquidity	Negative (but: long-term nature of IF)
3	Exchange rate	Lender country : Borrower country	Negative (Depreciation reduces foreign returns)
4	GDP growth (lender country)		Negative (push factor/search for yield)
5	GDP growth (borrower country)		Positive
6	Borrower country government expenditure to GDP		Positive (due to co-financing)
7	Political Stability	Indicator on political stability (Link)	Positive
8	G4 credit growth	Indicator for global liquidity (G4 = US, Euro area, Japan, UK)	Positive (but: long-term nature of IF)
9	Commodity Price	Relevant for oil, gas and mining sector	Positive
10	VIX	Indicator for risk aversion	Negative (but: long-term nature of IF)
11	Equity Prices	Global equity index	Positive (but: long-term nature of IF)

Table C.7 shows that the pairwise correlations between these control variables are generally low (yellow cells), although there are some pairs for which a stronger positive or negative association seems to exist (green and red cells respectively).

Table C.7: Pair-wise correlations for control variables

	1	2	3	4	5	6	7	8	9	10	11
1	1.00										
2	-0.03	1.00									
3	0.23	0.01	1.00								
4	-0.07	0.14	0.00	1.00							
5	0.05	0.14	0.07	0.69	1.00						
6	-0.23	-0.15	-0.19	-0.36	-0.56	1.00					
7	-0.27	-0.07	-0.14	-0.23	-0.31	0.42	1.00				
8	0.04	-0.51	0.00	0.09	0.07	0.03	0.10	1.00			
9	-0.01	-0.31	-0.01	0.02	0.03	0.06	0.07	0.13	1.00		
10	-0.06	0.19	0.00	-0.30	-0.30	0.04	-0.15	-0.47	0.06	1.00	
11	0.06	-0.42	0.00	0.19	0.18	0.02	0.12	0.85	0.10	-0.65	1.00

Specifications constructed to include these control variables suggest that several are statistically significant (see cells highlighted grey in table 7/1 and 7/2 below), and their sign is as expected (Table C.6), which suggests that IF volumes and maturities are driven by several macro-financial variables.

- H7/1 displays specifications for volume – three including dummies for RBC bindingness and another three for bank- vs non-bank financing.
- H7/2 displays three specifications for maturities, differentiating between G-SIB and other banks.

H7/1 Volume with controls (and w/o FE)	(1)	(2)	(3)	(4)	(5)	(6)
IJ Global Sample	S2	S2	S2	S2	S2	S2
Reform	RBC			Bank vs market-based finance		
Dependent variable	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize	lnDealsize
Post2010	-0.00564	0.170	0.278**	0.459***	0.518***	0.589***
	(-0.11)	(1.79)	(2.65)	(6.50)	(5.25)	(5.50)
RBCTREAT#POST2010	-0.00223	0.0542	0.0122			
	(-0.02)	(0.54)	(0.12)			
BankOther#POST2010				-0.630***	-0.449***	-0.440***
				(-9.01)	(-5.95)	(-5.80)
Num. of transactions	-0.0029**	-0.0049***	-0.00288*	-0.0041***	-0.0054***	-0.00406***
	(-3.25)	(-4.92)	(-2.50)	(-5.74)	(-5.73)	(-3.88)
Average maturity	0.00606	0.0105*	0.00556	0.00942**	0.0114**	0.00935*
	(1.27)	(2.36)	(1.25)	(2.72)	(3.16)	(2.41)
High gov. spending	0.329***	-0.00374	0.0474	0.350***	0.0312	0.0627
	(6.63)	(-0.04)	(0.44)	(7.43)	(0.33)	(0.65)
Interest rate differential		0.0730***	0.0644***		0.0717***	0.0674***
		(6.62)	(5.78)		(7.06)	(6.54)
GDP growth (lender)		-0.0288*	-0.0199		-0.0325**	-0.0277*
		(-2.22)	(-1.36)		(-2.65)	(-2.04)
GDP growth (borrower)		0.0733***	0.0710***		0.0709***	0.0692***
		(6.83)	(6.21)		(6.95)	(6.64)
Exchange rates		-0.0000004	-0.0000004		-0.000001*	-0.0000006*
		(-1.74)	(-1.91)		(-2.37)	(-2.47)
Political stability		0.0885**	0.0773*		0.0829**	0.0770*
		(2.76)	(2.27)		(2.65)	(2.46)
10 yr USD swap rate		0.0826*	0.0862		0.0852*	0.104*
		(2.15)	(1.66)		(2.27)	(2.28)
G4 Credit growth		0.00488	0.109***		-0.00302	0.0663*
		(0.25)	(3.90)		(-0.17)	(2.52)
commodity price			-0.00276*			-0.00131
			(-2.45)			(-1.45)
VIX			-0.0144**			-0.0106**
			(-3.18)			(-2.69)
Equity price			-0.0091***			-0.0065***
			(-4.47)			(-3.54)
R-sqr	0.157	0.157	0.163	0.211	0.196	0.199
adjusted-R-sqr	0.146	0.144	0.150	0.195	0.179	0.181
R-sqr-within	0.008	0.027	0.034	0.029	0.033	0.036
F	17.7	24.2	42.4	48.8	34.3	36.0
p_value	0.000	0.000	0.000	0.000	0.000	0.000
No_of_obs	14211	10237	10237	17890	12761	12761
No_of_hdfe	2	2	2	2	2	2
CompanyID	Y	Y	Y	Y	Y	Y
SectorID	Y	Y	Y	Y	Y	Y

H7/2 G-SIB Maturity w/o FE	(1)	(2)	(3)
IJ Global Sample	S4	S4	S4
Reform	G-SIBs vs other banks		
Dependent variable	Maturity	Maturity	Maturity
POST2010	-1.602***	0.914	-0.757
	(-4.57)	(1.23)	(-0.97)
GSIB#Post2010	-1.836**	-2.265**	-2.067**
	(-2.73)	(-3.07)	(-2.66)
Num. of transactions	0.00626	0.00107	-0.00266
	(0.76)	(0.10)	(-0.22)
Transaction size	1.342***	1.419***	1.415***
	(12.28)	(11.53)	(11.83)
High gov. spending	-0.303	2.659**	2.808**
	(-0.48)	(3.11)	(3.23)
Interest rate differential		-0.838***	-0.921***
		(-5.18)	(-5.79)
GDP growth (lender)		0.172	0.177
		(1.35)	(1.31)
GDP growth (borrower)		-0.438***	-0.491***
		(-3.88)	(-4.29)
Exchange rates		0.00000646***	0.00000646***
		(4.71)	(5.09)
Political stability		-0.361	-0.625
		(-0.70)	(-1.21)
10 yr USD swap rate		1.347**	-0.184
		(3.32)	(-0.41)
G4 Credit growth		0.596***	0.226
		(4.80)	(1.19)
commodity price			-0.0326**
			(-3.20)
VIX			-0.0116
			(-0.35)
Equity price			0.0479**
			(3.14)
R-sqr	0.211	0.238	0.245
adjusted-R-sqr	0.193	0.220	0.225
R-sqr-within	0.068	0.087	0.094
F	70.1	32.7	31.1
p_value	0.000	0.000	0.000
No_of_obs	9265	6984	6984
No_of_hdfe	2	2	2
CompanyID	Y	Y	Y
SectorID	Y	Y	Y

Summary of robustness tests

a. IJ Global vs Dealogic
    - Where possible, the analysis compared the results established based on Dealogic vs IJ Global datasets – especially for the effect of bindingness of regulation on maturities and price.

b. Variation in terms of sample (broadest to narrow, see IJ Global specifications)
    - See results for samples 1-4: the result tends to be the same at all aggregation levels.

c. Announcement date vs effective implementation date
    - The results for Hypothesis 1 remain similar if the shock is applied at the time of the internationally agreed effective implementation date (i.e. 2013 in case of RBC) rather than the announcement date of the international standards (2010).

d. Run analysis with constant sample
    - All specifications only include observations from financing providers which are in the sample for at least two years pre- and post-crisis.

e. Consideration of demand effects
    - When considering potential effects of IF demand (proxied by general government expenditure) the results remain stable (e.g. for a dummy "High gov. spending"[101] as included in specifications H7/1 and H7/2).

f. Waterfall of fixed effects
    - Analysed for key specifications and the results were found to be robust

g. Pre/post reform implementation specifications (not shown).

h. Other (Multicollinearity, Endogeneity) (not shown).

[101] This dummy is 1 for the borrower countries whose government spending growth (relative to GDP) is in the top 25% during the respective year and 0 otherwise.

Annex D: Qualitative survey design and results

Structure of survey and approach to outreach

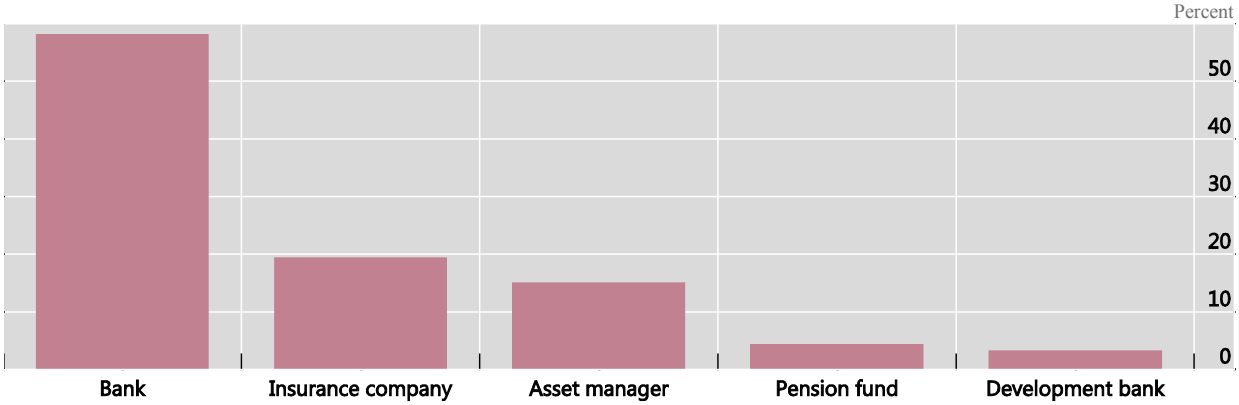
The survey targeted all financial services providers active in the IF market and was conducted in March and April 2018. It aimed at receiving a comprehensive and representative (in terms of types, size and region) sample of views of market participants on the relevance of different drivers in this market. Particular attention was given to the effects of regulatory reforms: where possible, the survey sought to differentiate between individual reforms to identify any specific effect they may have on IF.

The survey had four main parts: (1) characteristics of the respondent and its business activities; (2) market trends over the last 10 years; (3) drivers of change; and (4) relevance of regulation. The survey was voluntary in nature and was launched publicly through the FSB website.[102] Amongst others, the Global Infrastructure Hub, the OECD, the World Bank and the Long-Term Infrastructure Investors Association supported the exercise by forwarding the survey to their investor networks and encouraging members to participate.

Coverage of responses

90 institutions submitted a response to the survey. The sample of respondents is geared toward banks, representing 60% of the submissions. Insurance companies and asset managers (both acting as or on behalf of investors into infrastructure) comprise one-third of the sample (Graph D.1). Only a few pension funds and development banks responded.

Survey respondents by type of institution — Graph D.1

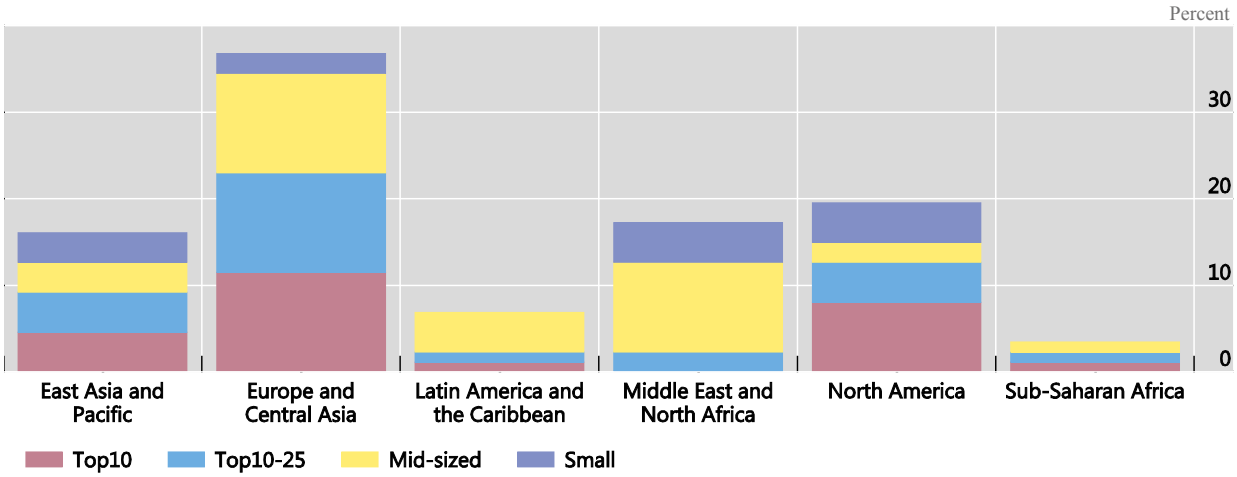


Source: FSB Survey.

[102] See http://www.fsb.org/2018/03/fsb-launches-survey-on-infrastructure-financing-as-part-of-its-efforts-to-evaluate-the-impact-of-g20-regulatory-reforms/.

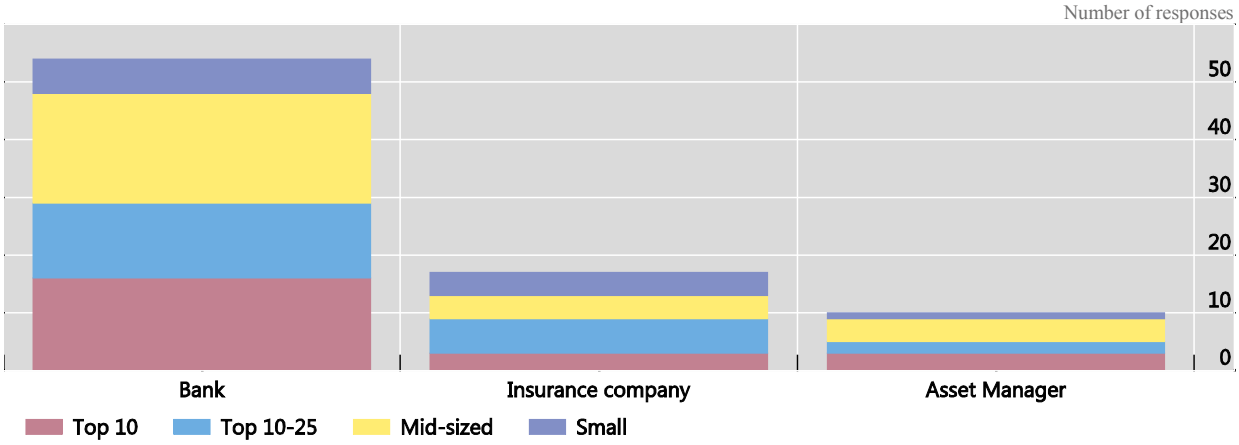
The sample is broadly representative in terms of geography (home regions of respondents) and size (Graphs D.2 and D.3). Respondents were asked to rank themselves (as a player) in their sector, with respect to the IF market. European, North American, and East Asian players contribute heavily to the sample, although mid-sized players from other regions are also well represented.

Respondents by region: All regions are represented — Graph D.2



Source: FSB Survey.

Sample characteristics reflect institutional market setup — Graph D.3



Source: FSB Survey.

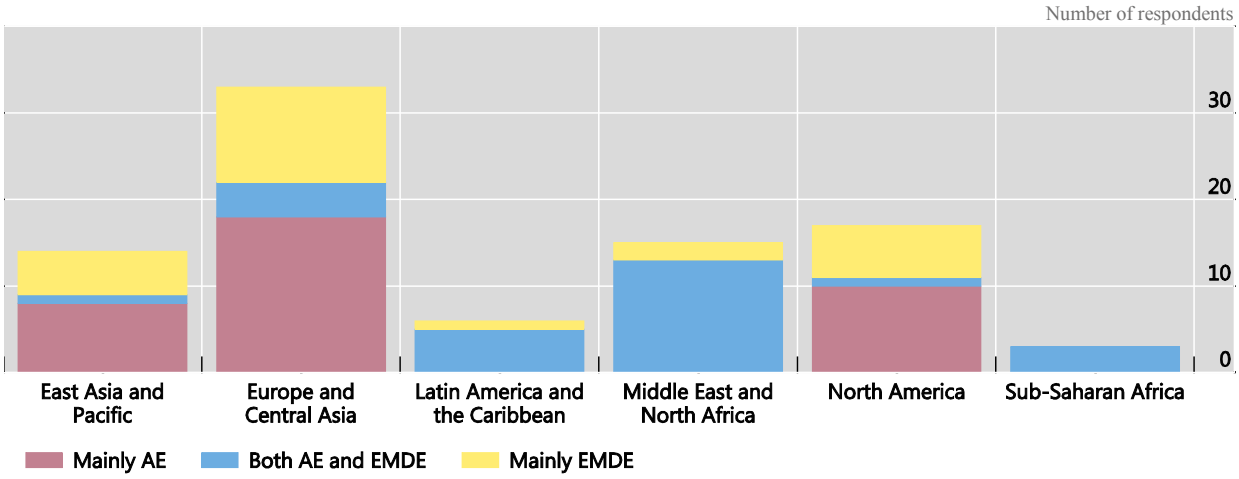
In terms of services offered, most banks, insurers and asset managers that responded concentrate on the provision of financing. Banks are the main providers of hedging tools for market risk. Few respondents seemed to be active in typical insurance activities, given the sample characteristics.

Geographical focus of respondents

The aggregated set of responses does not seem to exclude or under-weight specific regions. Most respondents allocate at least some of their IF portfolio to each region.

However, the responses indicate a "home bias" in the provision of IF, i.e. many respondents' portfolios are majority allocated to their geographical home region (not shown separately) and their IF engagement by AEs versus EMDEs (Graph D.4).

Responses document that there is regional bias — Graph D.4



Source: FSB Survey.

Financial instruments employed by respondents

A variety of financial instruments is employed by respondents to finance infrastructure projects at all levels of the capital structure, including both standardised and bespoke instruments.

In general, respondents note that syndicated, club and direct lending are the most common instruments used across projects. They also identified the following themes:

(i) Direct loans used to be the main source of financing ten years ago (especially in Europe). Some respondents indicated that the market has changed since then. Mini-perm structures are reported to have gained in prominence in recent years.

(ii) Project bonds have developed, but are reported to still have a limited penetration (especially in EMDEs).

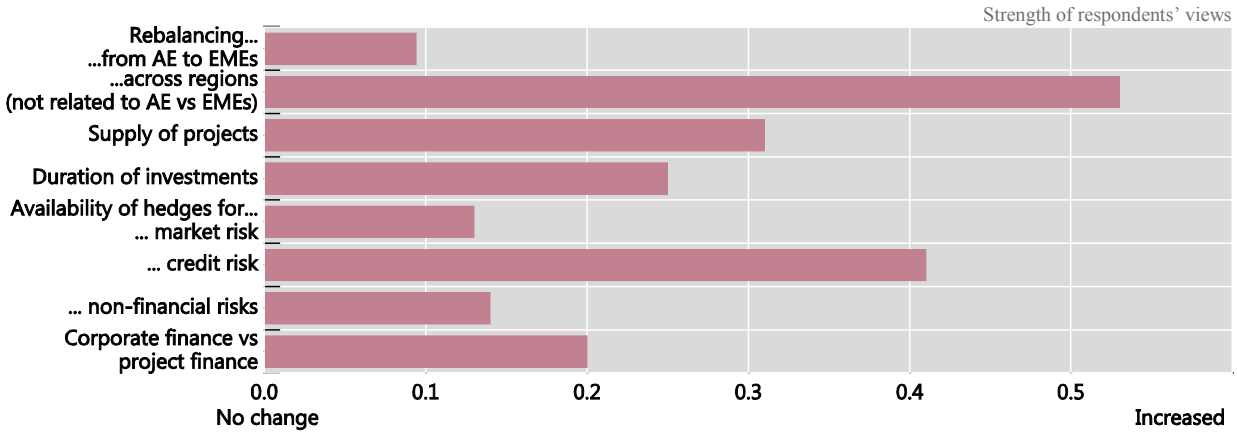
(iii) Funds (both dedicated and diversified) are reported to be taking a growing interest in the sector (as infrastructure as an asset class in its own right develops) via both public and private (unlisted) debt. This trend is reported as less prevalent in EMDEs.

According to the responses, there is little variation in the use of financial instruments across the different stages of IF, notwithstanding differences in the cash flow characteristics of a project over its lifetime.

Market trends

Respondents were asked whether they had observed particular shifts and trends as increasing (+1), neutral (0) or decreasing (-1) in the market over the past 10 years. Their mean response is charted below (Graph D.5).

Market-wide shifts over the last 10 years — Graph D.5



Source: FSB Survey.

Respondents highlighted the following as the most important shifts:

(i) Regional rebalancing: Respondents across all sectors attributed this to a growing preference for EMDE projects over those AEs, partly reflecting the search for yield, project supply and the general tendency to seek diversification in asset allocation.

(ii) Ability to hedge credit risk: Respondents highlighted the key role played by MDBs and ECAs in increasing the ability for investors to hedge credit risk. This takes a variety of forms, including providing entirely novel products, direct guarantees, or providing political risk cover which makes it easier to hedge credit risk in the market. Some respondents report a return of private insurers to the market.

(iii) Project supply: Respondents singled out specific government initiatives (such as PPP frameworks) and broader trends (e.g. push for new renewable energy infrastructure in AEs) as contributing to a healthy pipeline of projects. This goes some way to offset the reported reduction in new brownfield AE projects.

(iv) Investment duration: Longer durations are reported to be mainly driven by the increasing participation of institutional and direct investors with longer time horizons. Positive steps by ECAs and MDBs are said to have also helped mitigate related risks.

On average respondents (in particular, non-banks) expect to increase their IF activities over the next five years.

Drivers of recent market developments

Respondents were asked to identify the importance of various factors on their portfolio allocation to IF on a scale of strongly negative (-2) to strongly positive (+2). The mean

responses (by driver and type of institution) are plotted below, including a breakdown between AE and EMDE projects.

Some factors were clearly identified as more impactful than others, but in absolute terms no factor is particularly strong. On an aggregate level, this suggests that the reported factors have, at best, only a moderate impact on infrastructure asset allocation.

The key positive drivers singled out by respondents were in descending order of importance:

(i) Search for yield and tenors: Given low risk-free rates and the compression of risk premia across the investible universe, infrastructure assets (particularly in EMDEs) are seen as attractive. Graphs 10 and 11 show that this is reported as a much more important factor for insurers and asset managers than for banks.

(ii) Supply of projects: Respondents generally feel positively about the supply of projects, though the analysis of free-text comments suggest that competition in the market is quite high.

(iii) Firm-specific strategies: Respondents indicated that broader strategic considerations issues (not covered in the survey) were also quite relevant to their decision-making on this front.

The key negative drivers identified by respondents are in descending order of importance:

(i) Currency risks: Banks, insurers and asset managers consider currency mismatch risks as a broadly negative factor. Some respondents also seem to hold the view that hedges that would help mitigate these risks are less easily available or less well-priced. This issue tends to affect EMDE-based projects to a greater extent.

(ii) Financial regulation: While this is appears to be the second highest ranked factor, the sector analysis reveals that it is skewed by the responses by banks; for insurers and asset managers, the effect is far less material.

(iii) Political risk: This seems to be related to a lack of certainty of future cash flows (risk of expropriation etc.), and affects projects in EMDEs to a greater extent.

Impact of specific regulatory reforms

Respondents were asked for their views on various elements of the regulatory framework that could be relevant for their portfolio allocation on IF (Graph 12, bottom right).

While all reforms are seen as having a negative impact on the respondents' infrastructure activities, in absolute terms no factor is particularly strong. At an aggregate level, the low mean and material variance of responses suggests that the surveyed factors have, at best, only a moderate impact on infrastructure asset allocation.

The answers differ according to the institutional sector of the respondent and – for some factors – across AEs and EMDEs. In general, answers indicate that respondents do not significantly differentiate between individual elements of a regulatory package (such as the treatment of credit risk of infrastructure loans vs. securitisations as part of the Basel III capital rules).

For banks, risk-based capital requirements are reported as the single most important factor negatively impacting their propensity to finance infrastructure. Some respondents note that capital requirements for such investments are too high and not sufficiently risk-sensitive. A few

also raised concerns over the variety of regulatory approaches permissible under Basel III (e.g. IRB vs standardised approach) for credit risk, which may create a non-level playing field.

Liquidity requirements are reported to rank lower than capital requirements as a negative factor in driving bank financing decisions. There are concerns expressed by some respondents that the low margins on project finance are insufficient to compensate for the higher funding costs they face due to the NSFR. Some respondents also raise concerns about the impact of the leverage ratio and of the counterparty credit risk framework on derivatives pricing.

Insurance companies mention derivative regulation and portfolio diversification rules for asset managers and pension funds as the regulatory drags, although the effect is regarded as minor. A few insurance companies mentioned that changes to the capital framework for banks could be a positive factor for insurers' involvement in the sector (on account of lower competition).

Non-bank, non-insurance institutions regard large exposures, liquidity and capital requirements for banks as negatively affecting their own infrastructure activities. Some insurers, pension funds and asset managers also comment on the negative impact of rules introduced for securitizations, some of which apply to all financial institutions.

Certainty and stability of the regulatory framework

A specific question in the survey concerned whether participants considered there was sufficient regulatory certainty to make long-term financing decisions. The overall sentiment of respondents was neutral in aggregate, but with a variation across responses. Perceived uncertainty on future financial regulation is considered less of an issue in EMDEs than in AEs.

Some bank respondents perceive insufficient stability of the regulatory environment. This includes both financial and non-financial regulations for IF (e.g. government policies, social, environmental and technical standards for projects). These respondents also point out that the interpretation of new rules is sometimes unclear and that insufficient impact studies are carried out to anticipate consequences.

Non-banks report that they are generally satisfied with the stability of the current regulatory framework, though there are some differences depending on the jurisdiction where the respondent is established. Some insurance companies raise the issue of insufficient clarity around the IAIS Insurance Capital Standard (ICS) whose development is underway.

Annex E: Stylised example of the impact of changes in regulatory capital

Objective

Analyse the change in a typical bank's funding costs for different types of infrastructure credit exposures as a result of the G20 reforms. The focus is only on credit risk for direct lending that is, inter alia, relevant to a bank's hurdle rate for potential infrastructure financing projects.[103] This is intended to produce results that help to qualitatively describe the likely direction, and rough order of magnitude, of the effect of reforms.

Scope

The weighted average cost of capital (WACC) of a project is affected by the cost of funding incurred by the bank in granting credit. The relevant scope of post-crisis reforms here is:

- Changes in quality and quantity of capital requirements (first phase of Basel III)
- Changes in the credit risk-weighted assets (RWA) regime (latest Basel III agreement).

We only consider the RWA/WACC of direct lending without the possible impact of any credit enhancement. We look at the impact of the reforms on the following exposure types, making varying assumptions about credit quality, maturity and regulatory capital approach used:[104]

- Project finance loan
- General corporate finance bond.

Analysis

The analysis is conducted in two steps.

Step 1: Changes to the composition and cost of funding (Basel III phase 1)

A bank's WACC can be expressed as:

$$WACC = \sum_i \%\ of\ funding\ source\_i * cost\ of\ funding\ source\_i$$

$$i = CET1, AT1, Tier\ 2, other\ liabilities\ (deposits, other\ debt, etc)$$

Banks fund a credit exposure with some amount of regulatory capital (usually in excess of the minimum), with the rest coming from other sources (deposits, other non-eligible debt, wholesale funding etc.). The initial phase of the Basel III reforms (2010-11) will have directly

[103] Several other factors are relevant to the hurdle rate assessment, but the focus here is solely on the assessment of credit risk.

[104] Most infrastructure credits are likely to fall into one of these exposure classes. The analysis can be extended to additional classes using different assumptions. Only a few permutations are used as examples to keep the analysis tractable.

affected the WACC by changing the composition of funding sources. In addition, the cost of funding has changed over time, both in absolute terms and with reference to the risk-free rate.

For changes to the composition of *regulatory capital*, we look at the actual changes in risk-based capital ratios (as a % of RWAs) based on the regular BCBS Quantitative Impact Study (QIS) monitoring reports for Group 1 banks:[105]

	Pre-reform (2009)	Post-reform (2017)	***Change***
CET1	5.7%	12.5%	**+6.8%**
AT1	0.6%	1.1%	**+0.5%**
Tier 2	2.1%	1.8%	**-0.3%**

For changes in the costs of various forms of funding, we look at the movements relative to the *spread* to a risk-free rate:

Funding source	**Pre-crisis cost[106]**	**Updated cost[107]**
CET1	15%	10%
AT1	10%	5%
Tier 2	7%	2%
Other funding (deposits, wholesale funding etc.)	5%	1.5%
Risk-free rate proxy: 3m US Libor	*5% (end 2007)*	*1.5% (end 2017)*

Step 2: Changes to risk weights (RWs) (Basel III phase 2)

Changes in RWs generate changes in the absolute amount of regulatory capital that each exposure consumes, and hence its marginal cost of capital for that exposure. This feeds directly into the WACC calculation.

The December 2017 Basel III agreement contains changes to the credit RWAs framework. In summary, the changes relevant to the exposure classes above are the new approaches to specialised lending under the standardised approach (SA), changes to the calibration of various parameters under the IRB regime (e.g. the LGD parameter floors,[108] but no changes to the supervisory slotting framework), and the removal of the 1.06 IRB scalar. The detailed assumptions and workings can be found in the addendum below.

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[105] Source for 2009 Capital ratios, Table 2 in https://www.bis.org/publ/bcbs186.pdf and for 2017 Capital ratios, Table 2 in https://www.bis.org/bcbs/publ/d433.pdf

[106] The cost of pre-crisis CET1 is based on the 2010 LEI study: https://www.bis.org/publ/bcbs173.pdf. We assume a 5% pre-crisis cost for the 'catch all' other funding category (including deposits and other wholesale borrowing) to be equivalent to 3m US Libor. The assumptions on non-CET1 funding spreads are based in part on the BIS primer (2013) on CoCos, which cited a rough 5pp spread to senior unsecured debt and 3pp spread to other subordinated debt.

[107] The updated cost of AT1 is based on the effective yield of the ICE BoAML CoCo index as of 31 December 2017 (4.7%). The cost of CET1 and Tier 2 is then derived by applying +5pp and -3pp spreads respectively (as above).

[108] The analysis does not consider any impact on IRB risk weights from the output floor set by the Standardised Approach.

Results

We look at the following different hypothetical infrastructure credits in AEs and EMs. Given the typical tenor of IF credits, these are all assumed to have a maturity in excess of five years.

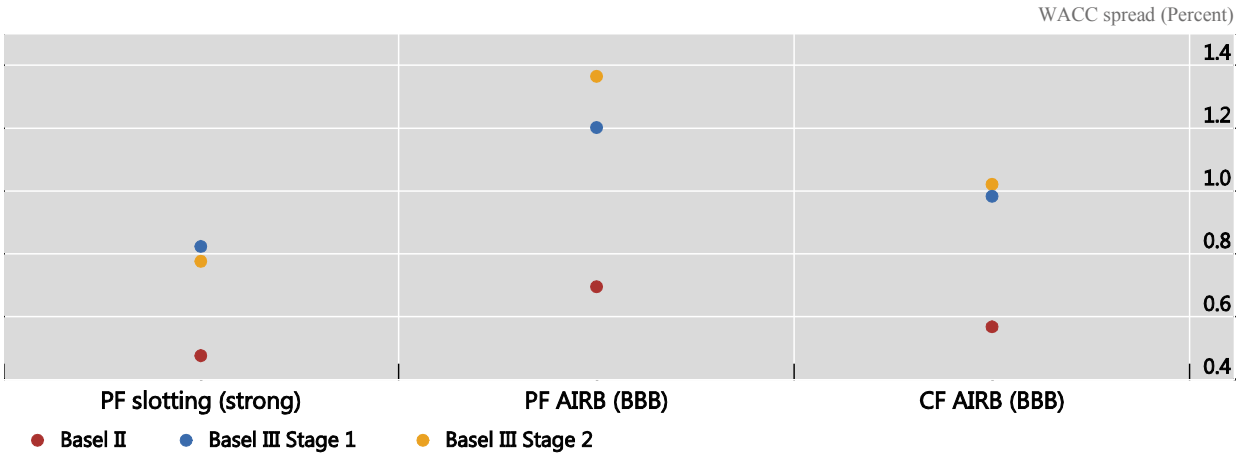
AE portfolio

We assume that the typical bank use some variant of the IRB approach for their AE IF exposures. We also assume that AE credits tend to be of a relatively high credit quality.

Exposure class	**Regulatory approach**	**Credit quality**	**Basel II/Basel III phase I[109] RW**	**Basel III phase 2 RW**
Project finance	IRB slotting	Strong	74%	70%
Project finance	AIRB	BBB/Baa equivalent[110]	108%	123%
Corporate finance	AIRB	BBB/Baa equivalent[111]	89%	92%

We plot the spread of the Basel II and Basel III WACCs relative to the relevant risk-free rate for the AE IF assets below.

WACC spreads under Basel II vs Basel III for AEs — Graph E.1



[109] There was no change to most RWs for credit exposures in Basel III phase 1.

[110] PD derived from the long-run one year default rate of OECD project finance credits. See Exhibit 21 in Moody's, Default and Recovery Rates for Project Finance Bank Loans, 1983-2015. 40% LGD assumed for Basel II/III Phase I and 48% for Basel III Phase II (accounting for the introduction of LGD input floors).

[111] PD derived from the long-run one year default rate of Baa credits. See Exhibit 12 in Moody's, Default and Recovery Rates for Project Finance Bank Loans, 1983-2015. 40% LGD assumed for Basel II/III Phase I and 44% for Basel III Phase II (accounting for the introduction of LGD input floors).

Based on the underlying assumptions, the average WACC[112] spread to the risk-free rate is expected to have risen by c.47 basis points (bps) for typical AE IF credits. As can be seen in the chart above, much of the effect is driven by the first phase of the reforms on quantity and quality of capital rather than by the latest reforms (i.e. changes to LGD parameter floors).

EM portfolio

For EM IF assets, we consider a wider range of regulatory approaches and assume a lower credit quality (BB/Ba)[113] than for AE IF assets.

Exposure class	**Regulatory approach**	**Credit quality**	**Basel II/Basel III phase I[114] RW**	**Basel III phase 2 RW**
Project finance	IRB slotting	Good	74%	70%
Project finance	AIRB	BB/Ba equivalent[115]	115%	130%
Project finance	Standardised	BB/Ba	100%	100%
Project finance	Standardised	Unrated, pre-operational	100%	130%
Project finance	Standardised	Unrated, operational	100%	100%
Project finance	Standardised	Unrated, high-quality operational	100%	80%
Corporate finance	AIRB	BB/Ba equivalent[116]	140%	132%
Corporate finance	Standardised	Unrated	100%	146%
Corporate finance	Standardised	BB/Ba	100%	100%

The average WACC[117] spread to the risk-free rate is expected to have risen by c.52bps for typical EM IF credits. As for the AEs, some of the effect is driven by the first phase of the reforms on quantity and quality of capital, but the changes to the risk weights under the Standardised Approach in stage 2 are also relevant.

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[112] Weighted by the observed split of PF/CF for AE IF credits (roughly 50/50). Sourced from IJ Global.

[113] Assumed to be one notch below the average EMDE sovereign rating (BBB). See Chart 1 in S&P, Emerging Markets Sovereign Rating Trends Midyear 2017.

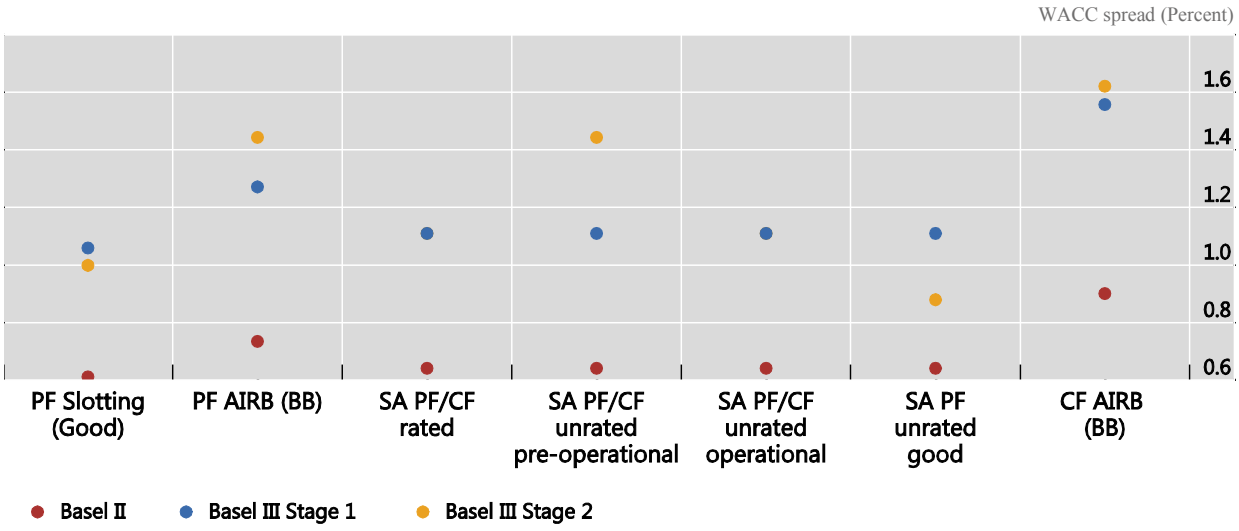
[114] There was no change to most RWs for credit exposures in Basel III phase 1.

[115] PD derived from the long-run one year default rate of non-OECD project finance credits. See Exhibit 21 in Moody's, Default and Recovery Rates for Project Finance Bank Loans, 1983-2015. 40% LGD assumed for Basel II/III Phase I and 48% for Basel III Phase II (accounting for the introduction of LGD input floors)

[116] PD derived from the long-run 1 year default rate of Ba credits. See Exhibit 12 in Moody's, Default and Recovery Rates for Project Finance Bank Loans, 1983-2015. 40% LGD assumed for Basel II/III Phase I and 44% for Basel III Phase II (accounting for the introduction of LGD input floors).

[117] Weighted by the observed split of PF/CF for EM IF credits (roughly 80/20). Sourced from IJ Global.

WACC spreads under Basel II vs Basel III for EMDEs Graph E.2



Alternative top-down approach

An alternative approach would be to use the results of the BCBS Long-term economic impact exercise. This assumed that for every 1% increase in CET1 capital ratios, banks raise lending spreads by 13bps. As CET1 ratios have risen by an average of 7pp since 2009, this mechanically translates into a c.90bps increase in lending spreads. However, the LEI exercise assumed there would be no 'Modigliani-Miller' (MM) offset, i.e. there would be no change in the cost of equity and debt as the composition of the liability structure changes. Several studies since then have shown that there is, in fact, such an offset as higher equity capital cushions necessarily reduce the volatility of equity and debt returns, hence reducing the required rates of return demanded by investors. A typical estimate for the overall effect on the cost of capital (and hence on lending spreads) is about 50% (Fender and Lewrick, 2016). Applying this to the 90bps estimate from the LEI would mean a c.45bps increase in lending spreads in the long run. This suggests the estimate of around 50bps derived above is in line[118] with the top-down LEI-type macroeconomic approach.

[118] The LEI calculated an average impact across a typical bank's balance sheet, and hence the 45bps estimate would technically apply in an equivalent fashion to all forms of lending. The 45-50bps bottom-up estimate on typical infrastructure credits implicitly accounts for lower equity and debt risk premia, reflecting a built-in MM offset.

Addendum: detailed assumptions and workings to estimate change in WACC for project finance (pre-operational phase) under the standardised approach

Pre-crisis framework

- RW = 100%
- Regulatory capital stack: 5.7% CET1, 0.6% AT1, 2.1% Tier 2
- Cost of funds: 15% CET1, 10% AT1, 7% Tier 2, 5% other funding
- Risk-free rate assumed: 5%

For a project finance exposure with a 100% RW, need the following proportion of funding:

- CET 1: 100%*5.7% = 5.7%
- AT 1: 100%*0.6% = 0.6%
- Tier 2: 100%*2.1% = 2.1%
- Other funding: 100%-(5.7%+0.6%+2.1%) = 91.6%

Since

$$WACC = \sum_i \%\ of\ funding\ source\_i * cost\ of\ funding\ source\_i$$

The pre-crisis WACC for this exposure would be given by:

$$5.7\% * 15\% + 0.6\% * 10\% + 2.1\% * 7\% + 91.6\% * 5\% = \mathbf{5.64}\%$$

And the pre-crisis WACC spread over the risk-free rate would be given by

5.64% - 5% = **0.64%**

Post-crisis – Basel III phase 1

If we assume that under Basel III phase 1 the funding mix, funding costs and risk-free rate changed to:

- Regulatory capital stack: 12.5% CET1, 1.1% AT1, 1.8% Tier 2
- Cost of funds: 10% CET1, 5% AT1, 2% Tier 2, 1.5% other funding
- Risk-free rate assumed: 1.5%

the new proportion of funding for a 100% RW exposure would be:

- CET 1: 100%*12.5% = 12.5%
- AT 1: 100%*1.1% = 1.1%
- Tier 2: 100%*1.8% = 1.8%
- Other funding: 100%-(12.5%+1.1%+1.8%) = 84.6%

with the new WACC given by:

$$12.5\% * 10\% + 1.1\% * 5\% + 1.8\% * 2\% + 84.6\% * 1.5\% = \mathbf{2.61}\%$$

and the new WACC spread over the risk-free rate given by:

2.61% - 1.5% = **1.11%**

Post-crisis – Basel III phase 2

Layering on phase 1, Basel III phase 2 changes the RW under the standardised approach for pre-operational phase project finance exposures to 130%. Keeping the regulatory capital stack and funding costs the same as under phase 1, the new proportion of funding for this would be:

- CET 1: 130%*12.5% = 16.25%
- AT 1: 130%*1.1% = 1.43%
- Tier 2: 130%*1.8% = 2.34%
- Other funding: 100%-(16.25%+1.43%+2.34%) = 79.98%

With the new WACC given by:

$$16.25\% * 10\% + 1.43\% * 5\% + 2.34\% * 2\% + 79.88\% * 1.5\% = \mathbf{2.94}\%$$

And the new WACC spread over the risk-free rate given by:

2.94% - 1.5% = **1.44%**

Annex F: Literature review and bibliography

Given the pivotal role that infrastructure plays for economic growth, there is a broad range of literature on the financing of infrastructure projects and its challenges. This review focuses on literature considered relevant to the effects of financial regulatory reforms on IF. The literature reviewed by the evaluation team included academic studies as well as private and official sector papers, articles and other publications between 2012 and 2018 (see bibliography, which also includes references and weblinks, where available, to all the papers cited in this report).

Most of the literature on the effects of financial regulatory reforms focuses on bank lending in general rather than IF in particular. This includes both ex ante impact assessments as well as more recent studies that include empirical evidence on effects to date.

Ex ante impact assessment studies on the effects of the core G20 reforms have found strong net overall benefits (see Box 1 of FSB, 2015). These reforms are intended to be risk-proportionate and are not designed to encourage or discourage particular types of finance (FSB, 2014). The most important contribution that they make to long-term investment is to promote a safer, sounder and therefore more resilient financial system that can intermediate financial flows through the cycle and across different investment horizons (FSB, 2013a and 2014).

A literature review by the BIS (2016) concludes that the overall impact of an appropriate increase in capital requirements seems to be positive, at least from pre-crisis levels, as long-run benefits are large and short-term costs[119] are smaller. It further points out that the optimal range for capital requirements is not dissimilar to the current calibration of the Basel III requirements once all regulatory buffers have been included and banks' own voluntary surplus above these requirements are taken into account. Overall, the report finds evidence that better capitalised banks make the provision of credit more stable in a downturn. The report also cites empirical studies on the impact of liquidity requirements in the UK and the Netherlands, which suggest that neither lending nor output should be heavily affected by the imposition of the LCR.

There are mixed views in the literature about the effects of higher capital requirements on bank lending. Some empirical studies focusing on European banks (Gropp et al., 2016; Kanngiesser et al., 2017; Fraisse et al., 2017) show that in response to an increase in prudential requirements, banks tended to reduce their lending instead of increasing their capital. On the other hand, Gambacorta and Shin (2016), in their empirical analysis on the lending of major international banks from AEs, find that banks with higher equity tend to show higher lending growth than banks with lower equity, due to the lower funding costs enjoyed by better capitalised banks.

With regard to cross-border lending, the literature notes that the response of banks to changes in capital and liquidity requirements is transmitted to foreign countries if those banks maintain business relations there. This might have an impact on the credit allocated to those countries even if they are outside the scope of the regulatory changes (Aiyar et al., 2014; BIS, 2016; Buch and Goldberg, 2017). Various papers (Claessens and van Horen, 2014; Claessens, 2017; McCauley et al., 2017) find that international bank lending has declined since the crisis and that its structure has shifted towards regionally-funded lending.

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[119] According to the paper, the empirical evidence suggests that an increase in capital requirements by 1% forces banks to cut their lending in the long run by 1.4-3.5% or reduce credit growth by 1.2-4.6%. Oliver Wyman (2016) notes that, based on the total projected increase in capital ratios since 2010, the median estimate of potential increases in credit spreads across different types of lending is 60-84 basis points, depending on the region.

A few papers examine financial regulatory reforms explicitly in the context of IF. Most of these papers are qualitative in nature and provide ex ante projections of how such financing may be affected by the reforms. For example, in a working paper, Ma (2016) argues that the implementation of Basel III will raise banks' funding costs and thereby reduce the number of banks able to extend project loans. Negative potential effects on long-term bank lending as a result of the NSFR are mentioned in Oliver Wyman (2016). Alonso et al. (2013) discuss the potential effects of Solvency II and Basel III, and suggest that the more favourable calibration of capital requirements for insurers as compared to banks, may lead to increasing competition or partnership of banks on the one side and pension funds/insurers on the other side in project finance for IF. The paper notes that, in the future, pension funds and insurers might play a more important role during the operational phase of infrastructure projects, since this would fit with their long-term business model.

The few studies undertaken to date have not identified major effects of reforms on IF. CEPA (2015) conducts a qualitative impact assessment with a focus on Sub-Saharan African countries to understand the constraints on the flow of private capital to infrastructure projects. The analysis suggests that despite concerns over Basel III and other prudential regulations, these do not seem to have had a negative impact on lending patterns at least for African-based lenders, though the support of credit enhancements may be helping.

Alonso et al. (2015) find that financial regulation on its own has no statistically significant impact on the infrastructure investments of pension funds. Nevertheless, it might have a relative importance if other factors are also taken into account such as the degree of financial protection, progress in stability and fairness of the legal rights, and the improvement of quality and strength of financial institutions.

A study commissioned by the European Commission (LE Europe, 2016) finds no clear evidence that increased capital requirements under the Capital Requirements Regulation (CRR) are having a major negative impact on bank financing of infrastructure in the EU, although longer tenor projects are perceived as being less attractive in light of these requirements. Similarly, the FSB's annual reports (2015-2017) to the G20 on implementation and effects of reforms note that there is little tangible information to suggest that these reforms have had adverse consequences on the provision of long-term finance, including IF.

Some of the literature on financial regulation and IF makes reference to the differentiated risk profile of infrastructure investments compared to corporate exposures. Jobst (2018), for example, argues that a more nuanced regulatory treatment with regard to capital requirements for infrastructure might be warranted for insurers. He conducts supplementary analysis suggesting that greater differentiation for capital charges than under the finalised Basel III framework would encourage a more efficient allocation of capital by shifting the supply of long-term financing to insurers. He analyses the historical credit performance of infrastructure debt securities and unrated project finance bank loans (see also Moody's, 2017), and concludes that infrastructure project finance loans have a credit risk profile that improves over time. As a result, he argues that even modest reductions in capital charges may have a significant impact on capital efficiency, resulting in a higher return on equity for infrastructure investments under a differentiated regulatory regime.

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Annex G: Composition of the evaluation working group

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Germany	**Max Treuer** Federal Ministry of Finance
	Erika Renneke Deutsche Bundesbank
Hong Kong	**Susanna Wong** Hong Kong Monetary Authority
Italy	**Vincenzo Meola** Ministry of Economy and Finance
	Valerio Vacca Banca d'Italia
	Francesco Franceschi Banca d'Italia
Japan	**Ryozo Himino** Japan Financial Services Agency
	Masahiko Takeuchi *Japan Financial Services Agency*
	Makoto Minegishi Bank of Japan
Mexico	**Juan Cardenas** Banco de M**é**xico
Netherlands	**Paul Hilbers** De Nederlandsche Bank
Saudi Arabia	**Moath A. Alyousef** Saudi Arabian Monetary Authority
Singapore	**Lily Chan** Monetary Authority of Singapore

Spain	**Mikel Bedayo** Bank of Spain
Switzerland	**Ronald Gindrat** Swiss Federal Department of Finance
Turkey	**İzzet Yerdeş** Turkish Treasury
UK	**James Talbot** Bank of England
	Gerardo Ferrara Bank of England
	Ruth Hendon (until September 2018) Bank of England
	Priya Mistry Bank of England
	Rohan Sakhrani (until August 2018) Bank of England
	Kyoungsoo Yoon Bank of England
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	Don Morgan Federal Reserve Bank of New York
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ECB	**Markus Behn**
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