

**FOR  
AGENDA**

SM/14/266

September 3, 2014

To: Members of the Executive Board

From: The Secretary

Subject: **October 2014 Global Financial Stability Report—Chapters 2 and 3**

Attached for consideration by the Executive Directors are Chapters 2 and 3 of the *October 2014 Global Financial Stability Report*, which is tentatively scheduled for discussion on **Thursday, September 25, 2014**. Chapter 1 will follow as a separate document.

Questions may be referred to Mr. Brockmeijer (ext. 38551) and Mr. Gelos (ext. 39427) in MCM.

This report will be revised for publication in light of the Executive Board discussion. If Executive Directors have additional comments after the Board discussion, they may notify Mr. Gelos by **noon on Friday, September 26, 2014**.

This document will shortly be posted on the extranet, a secure website for Executive Directors and member country authorities.

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Department Heads





September 2, 2014

## OCTOBER 2014 GLOBAL FINANCIAL STABILITY REPORT— CHAPTERS 2 AND 3

Approved By  
**José Viñals**

The chapters were prepared by teams led by Nico Valckx (Chapter 2), and Luis Brandão Marques and S. Erik Oppers (Chapter 3), under overall leadership of Gaston Gelos.

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## CHAPTER 2: SHADOW BANKING AROUND THE GLOBE: HOW LARGE, AND HOW RISKY?<sup>1</sup>

### SUMMARY

**This chapter describes the growth, risks, and regulatory responses to shadow banking—financial intermediaries or activities involved in credit intermediation outside the regular banking system, and therefore lacking a formal safety net.**

**The largest shadow banking systems are found in advanced economies, where more narrowly defined shadow banking measures indicate stagnation, while broader measures (which include investment funds) show continued growth since the global financial crisis.** In emerging market economies, the growth of shadow banking has been strong, outpacing that of the traditional banking system.

**Although shadow banking takes vastly different forms across and within countries, some of the key drivers behind its growth are common to all: a tightening of banking regulation and ample liquidity conditions, as well as demand from institutional investors, tend to foster nonbanking activities.** The current financial environment in advanced economies remains conducive to further growth in shadow banking. Many indications there point to the migration of some activities—such as lending to firms—from traditional banks to the nonbank sector.

**Shadow banking can play a beneficial role as a complement to traditional banking by expanding access to credit or by supporting market liquidity, maturity transformation, and risk sharing.** It often, however, comes with bank-like risks, as seen during the 2007–08 global financial crisis. Although data limitations prevent a comprehensive assessment, the U.S. shadow banking system appears to contribute most to domestic systemic risk; its contribution is much less pronounced in the euro area and the United Kingdom.

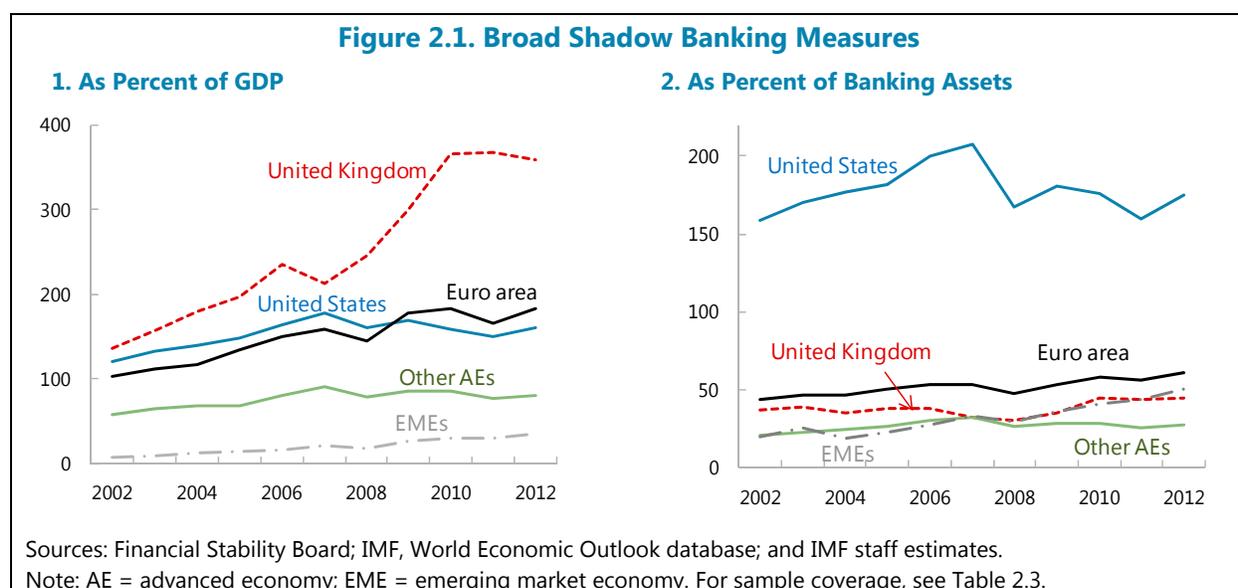
**The challenge for policymakers is to maximize the benefits of shadow banking while minimizing systemic risks.** This chapter encourages policymakers to address the continued expansion of finance outside the regulatory perimeter through a more encompassing approach to regulation and supervision that focuses both on activities and on entities and places greater emphasis on systemic risk. To begin with, however, important data gaps need to be addressed because even aggregate information about many activities remains scarce in most countries.

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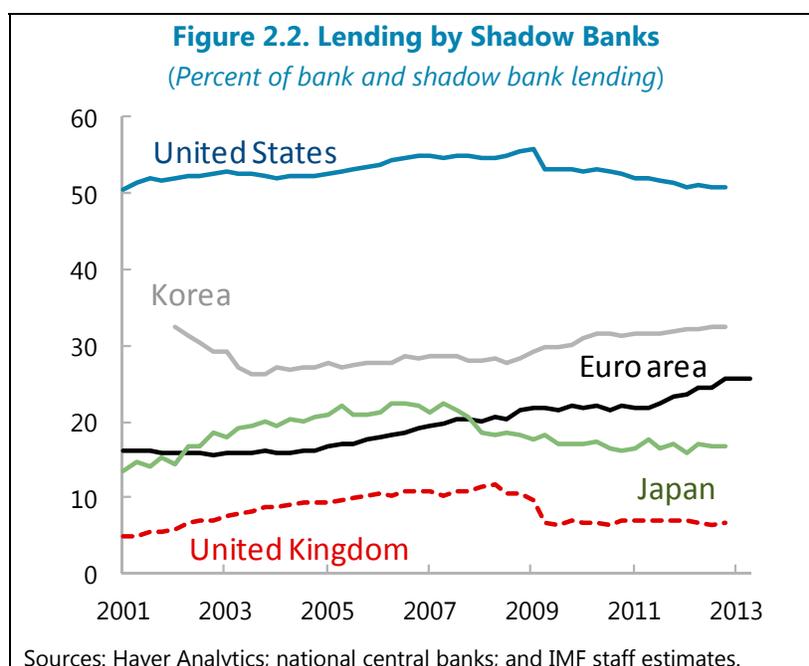
<sup>1</sup> The authors of this chapter are Nico Valckx (Team Leader), Goran Amidzic, Nicolas Arregui, Johannes Blankenheim, Johannes Ehrentraud, Dale Gray, Artak Harutyunyan, John Kiff, Ivo Krznar, Alexander Massara, Samar Maziad, Miguel Segoviano, Nobuyasu Sugimoto, with contributions by Viral Acharya, Stephen Cecchetti, and Poonam Kulkarni, and research support from Yoon-Sook Kim.

## INTRODUCTION

**1. Shadow banking, broadly defined as credit intermediation outside the conventional banking system, constitutes about one-fourth of total financial intermediation worldwide.** The official financial community has (through the Financial Stability Board (FSB), of which the IMF is a member) been engaged since 2011 in a global project to monitor and measure shadow banking, and adapt the regulatory framework to better address shadow banking risks. The United States, the euro area, and the United Kingdom have the largest shadow banking systems according to FSB data (Figure 2.1). In the United Kingdom, shadow banking assets as a share of GDP are more than twice those in any other area, and only in the United States do shadow banking assets exceed those of the conventional banking system. Shadow banking has been growing rapidly in emerging market economies.



**2. Shadow banking can complement traditional banking by expanding access to credit or by supporting market liquidity, maturity transformation, and risk sharing.** For example, in developing economies, finance companies and microcredit lenders often provide credit and investments to underbanked communities, subprime customers, and low-rated firms (Ghosh, Gonzalez del Mazo, and Ötoker-Robe 2012). In advanced economies, various types of funds have been stepping in (often as intermediaries for insurance companies and pension funds) to provide long-term credit to the private sector while banks have been repairing their balance sheets and retrenching from certain activities (see the April 2014 *Global Financial Stability Report*, GFSR). In fact, lending by shadow banking entities contributes significantly to total lending in the United States and is rising in many countries, including in the euro area (Figure 2.2). Finally, shadow banks often enhance the efficiency of the financial sector by enabling better risk sharing and maturity transformation and by deepening market liquidity (Claessens and others 2012). For example, securitization mobilizes illiquid assets, and structured finance techniques can be used to tailor risk and return distributions to better fit the needs of ultimate investors.



**3. However, the global financial crisis revealed that, absent adequate regulation, shadow banking can put the stability of the financial system at risk in several ways.** In advanced economies, some shadow intermediaries (such as money market mutual funds (MMFs), and securitization vehicles) were highly leveraged or had large holdings of illiquid assets during the crisis, and were vulnerable to runs when investors withdrew large quantities of funds at short notice. This led to fire sales of assets, which intensified the financial turmoil by reducing asset values and helped spread the stress to traditional banks. Since then, global regulatory reforms coordinated by the FSB have called for greater disclosure of asset valuations, improved governance, ownership reforms, and stricter oversight and regulation of shadow banks (FSB 2013a and b).

**4. Since the crisis, the ongoing tightening of bank regulations may be encouraging a shift of traditional banking activities into the shadows.** The interplay of different regulations (capital, liquidity, activity restrictions, governance) and increased compliance costs and legal risks may be affecting banks' willingness to support certain activities (for example lending to smaller enterprises, leveraged loans, project finance, and hedging). Increased scrutiny of the shadow banking system is only beginning to reveal the patterns of these shifts, and their implications for systemic risk are not yet well understood.

**5. This chapter aims to provide a conceptual framework for understanding different types of shadow banking around the world by answering the following questions:**

- How has shadow banking evolved since the early 2000s in advanced and emerging market economies?
- What drives the growth of shadow banking? Are there common underlying factors across advanced and emerging market economies?

- When does shadow banking activity become a risk to financial stability?
- What can regulation and supervision do to contain risks without unduly stifling financial intermediation?

**6. The chapter highlights key commonalities across vastly differing forms of shadow banking.** First, it identifies the different dimensions of risk associated with diverse shadow banking activities and entities. Second, it compares various measures of shadow banking, including a new one introduced here. Third, it provides a statistical analysis of factors driving the growth of shadow banking, illustrates the findings with country examples, and highlights key similarities. Fourth, it offers a risk scoring of various shadow banking segments and presents a new assessment of the contribution of shadow banking to systemic risk in some major advanced economies. Fifth, it describes various recent shadow banking developments around the world. Finally, it relates the findings to the ongoing regulatory reform agenda and provides new, specific, and generally applicable proposals for further steps.

**7. These are the main findings:**

- Although shadow banking takes different forms around the world, the drivers of shadow banking growth are fundamentally very similar: shadow banking tends to flourish when tight bank regulations are combined with ample liquidity and when it serves to facilitate the development of the rest of the financial system. The current financial environment in advanced economies remains conducive to further growth in shadow banking activities.
- Most broad estimates point to a recent pickup in shadow banking activity in the euro area, the United States, and the United Kingdom, while narrower estimates point to stagnation. Whereas activities such as securitization have seen a decline, traditionally less risky entities such as investment funds have been expanding strongly.
- In emerging market economies, shadow banking continues to grow strongly, outstripping banking sector growth. To some extent, this is a natural byproduct of the deepening of financial markets, with a concomitant rise in pension, sovereign wealth, and insurance funds.
- So far, the (imperfectly) measurable contribution of shadow banking to systemic risk in the financial system is substantial in the United States but remains modest in the United Kingdom and the euro area. In the United States, the risk contributions of shadow bank activities have been rising, but remain slightly below pre-crisis levels. Our evidence also suggests the presence of significant cross-border effects of shadow banking in advanced economies. In emerging market economies, the growth of shadow banking in China stands out.
- In general, however, assessing risks associated with recent developments in shadow banking remains difficult, largely because of a lack of detailed data. It is not clear whether the shift of some activities (such as lending to firms) from traditional banking to the nonbank sector will

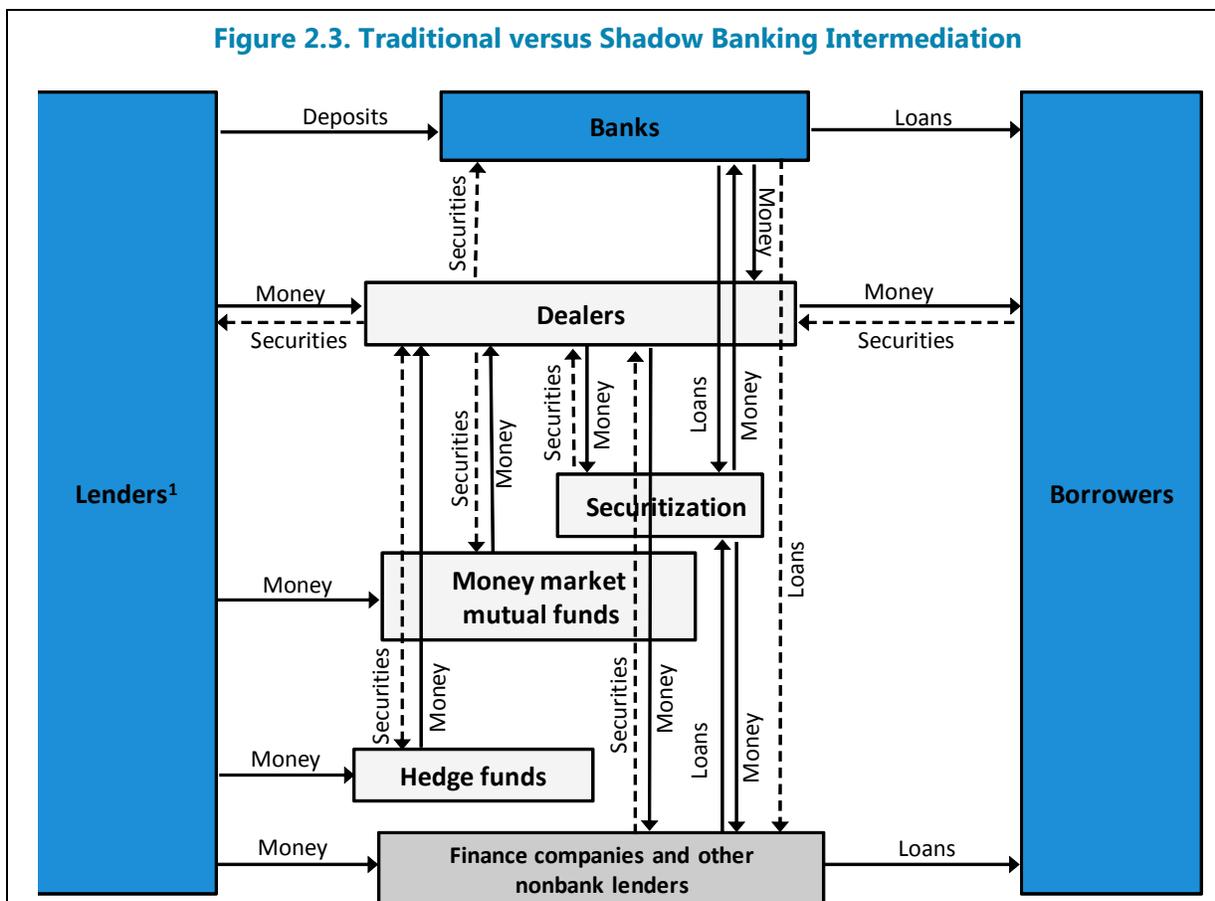
lead to a rise or reduction in overall systemic risk. There are, however, indications, that, as a result, market and liquidity risks have risen in advanced economies (see also Chapter 1).

- Overall, the continued expansion of finance outside the regulatory perimeter calls for a more encompassing approach to regulation and supervision that combines a focus on both activities and entities and places greater emphasis on systemic risk and improved transparency. A number of regulatory reforms currently under development try to address some of these concerns (see Annex 2.4). This chapter advocates a macroprudential approach and lays out a concrete framework for collaboration and task sharing among microprudential, macroprudential, and business conduct regulators.

## WHAT IS SHADOW BANKING, AND HOW SHOULD IT BE MEASURED?

**8. Most studies define shadow banking by the nature of the entity that carries it out: it is usually less regulated than traditional banks and lacks a formal safety net** (for example, Claessens and Ratnovski 2014). Other definitions focus instead on instruments (McCulley 2007; Mehrling and others 2013) or markets (Gorton and Metrick 2012). The FSB has described it as “credit intermediation involving entities and activities outside the regular banking system” (FSB 2013a—see Annex 2.1 for an overview of definitions used in the literature). This chapter introduces a new definition of shadow banking based on nontraditional (noncore) funding—in this “activity” concept, financing of banks and nonbank institutions through noncore liabilities constitutes shadow banking, regardless of the entity that carries it out. For example, according to this definition, securitization is shadow banking; whether it is conducted directly by a bank or indirectly through a special purpose vehicle (SPV) ultimately does not matter under the activity view.

**9. An ideal definition would be precise and all-encompassing—which is difficult given the large differences in shadow banking activities across countries.** In advanced economies, shadow banking typically involves a network of financial entities and activities that decompose the process of credit intermediation between lenders and borrowers into a sequence of discrete operations (see the inner quadrant in Figure 2.3 for a simplified schematic representation; for a more comprehensive description, see Pozsar and others 2013). In developing economies, these chains are usually absent, with shadow banking taking a more straightforward intermediation role between ultimate lenders and ultimate borrowers.

**Figure 2.3. Traditional versus Shadow Banking Intermediation**

Source: IMF staff illustration.

Note: This simplified representation of the financial sector shows the flow of funds from lenders to borrowers. It does not show the reverse flows, such as bank deposit withdrawals and money market mutual fund redemptions. The blue boxes represent the components of a bank-based economy, with the rest representing the shadow banking sector. The boxes on the outside characterize a simple shadow banking system as might be found in a less developed economy. The lighter colored boxes in the middle reflect the kinds of shadow banking activities and entities usually associated with more advanced economies, with dealers as the hub of most activity. This activity comprises issuing securities on behalf of borrowers (including securitization vehicles, finance companies, and other nonbank lenders), providing prime broker services to hedge funds, and conducting repurchase agreements and securities lending. Securitization vehicles do not generally involve borrowers directly. Securitized assets generally come from banks and nonbank lenders, and securities from dealers. See Annex 2.2 for details on the role of securitization.

<sup>1</sup> The lenders category includes institutional investors (including insurance companies and pension funds) and official sector institutions (such as central banks and sovereign wealth funds).

**10. The usefulness of a definition also depends on the extent to which it covers relevant risk dimensions.** These include the specific risks of each business model and its potential for spillovers (Annex 2.2 and Balance Sheet Risk Measures in this chapter). These are the specific risks:<sup>2</sup>

<sup>2</sup> Shadow banking does not only entail risk: it may contribute to financial stability because some entities (such as private equity funds) may be able to lend at very long maturities without facing the risk of a run.

- *Run risk*: Since shadow banks perform credit intermediation, they are subject to a number of bank-like sources of risk, including run risk, stemming from credit exposures on the asset side combined with high leverage on the liability side, and liquidity and maturity mismatches between assets and liabilities. However, these risks are usually greater at shadow banks because they have no formal official sector liquidity backstops and are not subject to bank-like prudential standards and supervision (see Adrian 2014, for a review).
- *Agency problems*: The separation of financial intermediation activities across multiple institutions in the more complex shadow banking systems tends to aggravate underlying agency problems (Adrian, Ashcraft, and Cetorelli 2013).<sup>3</sup>
- *Opacity and complexity*: These constitute vulnerabilities, since during periods of stress, investors tend to retrench and flee to quality and transparency (Caballero and Simsek 2009).
- *Leverage and procyclicality*: When asset prices are buoyant and margins on secured financing are low, shadow banking facilitates high leverage. In periods of stress, the value of collateral securities falls and margins increase, leading potentially to abrupt deleveraging and margin spirals (FSB 2013b; Brunnermeier and Pedersen 2009).
- *Spillovers*: Stress in the shadow banking system may be transmitted to the rest of the financial system through ownership linkages, a flight to quality, and fire sales in the event of runs, (see Box 2.1 and Systemic Risk and Distress Dependence). In good times, shadow banks also may contribute substantially to asset price bubbles because, as less regulated entities, they are more able to engage in highly leveraged or otherwise risky financial activities (Pozsar and others 2013).

Recognizing the variation in these risks across countries, entities, and activities, the FSB deliberately starts by casting the net wide, but also offers a narrower definition that focuses on a subset of nonbank credit intermediation in which (1) systemic risk is increasing (in particular, through maturity and liquidity transformation, imperfect credit risk transfer, and leverage); and (2) regulatory arbitrage is undermining the benefits of financial regulation.

**11. However, risk characteristics can differ even across similar activities, depending on the context in which they are conducted.** Risk scores may differ by country or regulatory context and may change over time (see Balance Sheet Risk Measures). For example, risks surrounding repurchase agreements (repos) and securities lending depend on whether there are limits on the reuse of collateral. Similarly, the public in one country may regard shares in fixed-income mutual funds as bank-like deposits (possibly because of perceptions of implicit guarantees by governments or associated banks), but this perception may be different elsewhere and may also change over time.

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<sup>3</sup> Ashcraft and Schuermann (2008) describe informational frictions in the securitization of subprime mortgage credit before the financial crisis.

Therefore, risks need to be evaluated in light of country-specific conditions, regulations, and public perceptions.

**12. Given these difficulties, no single definition or measure of shadow banking is likely to suffice for all purposes, and as a starting point this chapter uses three different approaches to measure shadow banking.** The first two measures are entity based; the third is activity based and derived from the noncore-financing definition of shadow banking.

- *Flow of funds (FOF) measure:* Data from flow of funds accounts capture the financial assets of other financial intermediaries (OFIs). OFIs consist of (1) all nonbank financial corporations and quasi corporations engaged mainly in financial intermediation and (2) entities providing primarily long-term financing.
- *FSB measure:* Using flow of funds and sectoral accounts, the FSB constructs a broad measure of shadow banking activity based on nonbank financial intermediaries (NBFIs) engaged in credit intermediation activities, and a narrow measure, excluding NBFIs that do not provide credit intermediation directly—such as equity investment funds—and NBFIs that are prudentially consolidated into banking groups.<sup>4</sup>
- *The size of noncore liabilities:* This is a new measure, based on the funding definition of shadow banking presented earlier. It includes noncore liabilities both from banks and from “other financial corporations.”<sup>5,6</sup> A *narrow* measure of noncore liabilities excludes those confined to the financial sector; it is thus a proxy for the intermediation between ultimate lenders and ultimate borrowers—that is, between the financial sector and the real economy. The difference between the broad and narrow measures represents an estimate of the amount of credit intermediation conducted *within* the shadow banking sector (Annex 2.1).<sup>7,8</sup>

These measures are conceptually somewhat different and can be expected to yield different size estimates.<sup>9</sup> Each measure has its own merits and can be used to capture specific issues of interest

<sup>4</sup> Our proxy for the narrow FSB measure only excludes equity funds.

<sup>5</sup> For example, securitization can be seen as a way for intermediaries to tap nondeposit funding by creating securities that can be pledged as collateral (Shin 2010).

<sup>6</sup> See Harutyunyan and others (forthcoming). The measure is based on IMF member countries’ reporting of monetary data through the Standardized Report Form (SRF). However, only 36 of 142 SRF reporting countries provide data on other financial corporations. See also Annex 2.1, which discusses the reason for excluding insurance and pension funds and non-money-market investment funds from both the banking and shadow banking sectors.

<sup>7</sup> Noncore liabilities of the U.S. financial system are sometimes also used as proxies for global liquidity (IMF 2014b).

<sup>8</sup> The financial stability implications of the reliance by financial institutions on noncore liabilities depend on the degree to which these occur within group structures, such as conglomerates (especially if they span national borders).

<sup>9</sup> The broad FSB measure is based on both disaggregated sectoral data and flow of funds statistics and hence may differ from the FOF measure.

(Table 2.1). For various analyses in this chapter, the chapter also examines specific shadow banking activities and entities in more detail, depending on data availability.

	<b>Flow of Funds</b>	<b>Financial Stability Board</b>	<b>Noncore Liabilities</b>
Coverage	Nonbanks - Engaged in financial intermediation - Providing long-term financing Excludes non-MMF investment funds	Nonbanks - Engaged in financial intermediation - Providing long-term financing Includes non-MMF investment funds	Banks Nonbank financial institutions MMFs Excludes non-MMF investment funds
	Advanced economies	Advanced economies Emerging market economies	Advanced economies Few emerging market economies
Source	Flow of funds statistics Quarterly, long history, starting 1980s	Flow of funds and sector data, FSB Annual, short history, starting 2002	IFS Quarterly, short history, starting 2001
Entities/ Activities	Money market mutual funds	Money market mutual funds	Narrow measure (excluding intrafinancial sector holdings)  Deposits excluded from M2 Securities Loans MMF shares/units
	Financial leasing corporations	Finance companies	
	Securitization vehicles	Securitization vehicles	
	Broker/dealers	Broker/dealers	
		Investment funds (bonds, equity, mixed)	Broad measure adds intrafinancial sector deposits, securities, loans, and MMF shares/units
		Hedge funds	
	Country-specific entities - Financial holding corporations - Development capital companies - Other entities	Country-specific entities - Financial holding corporations - Private development banks - Other entities	
	Venture capital corporations		
		Other (not specified)	
Features	Entity based (narrower entity set) Entity breakdown not always available Balance sheet breakdowns available Somewhat more country specific	Entity based (broader entity set) Broad and narrow measures No balance sheet breakdowns More cross-country consistency Not publicly available Data more subject to valuation effects (due to importance of investment funds)	Entity and activity-based Broad and narrow measures No balance sheet breakdowns Somewhat country-specific Relates to financial fragility literature Captures shadowy banking activities

Source: IMF staff.  
Note: IFS = International Financial Statistics database; MMF = money market mutual fund.

**13. Whereas the FOF and the noncore measure exclude non-MMF funds, the FSB measure includes them.** Both approaches have their merits. On the one hand, fund asset managers manage assets on behalf of clients. As opposed to bank deposit holders, clients bear gains and losses directly, rather than asset management firms. Therefore, as opposed to banks (who accept deposits with a liability of redemption at par and on demand (OFR 2013)), funds have typically not faced capital requirements; and studies have often excluded them from shadow banking measures (Bakk-Simon and others 2012, Adrian and Ashcraft 2012). However, more recently, concerns have been expressed that many of these funds can pose bank-like risks. For example, they can issue money-like liabilities; they can be vulnerable to runs in the event of a crisis of investor confidence, particularly if they hold illiquid assets, and they often are subject to easy redemptions (OFR 2013, and Feroli and others 2014). Runs can be transmitted through the rest of the financial system through fire sales, especially in the presence of leverage, and in the presence of high concentration in the industry. Herding into certain asset classes can magnify market volatility (Chapter 1). This chapter therefore considers both approaches.

## HOW MUCH IS IT GROWING?

### A. Main Facts

**14. FSB estimates point to a recent pickup in shadow banking activity in the euro area, the United Kingdom, and the United States, while narrower gauges of shadow banking suggest stagnation.**

The different measures share a similar growth trend until 2007, when their paths markedly diverge (Figure 2.4). After a mild drop around 2008, the FSB measures show varying degrees of recovery in the United States, the euro area, and the United Kingdom. In contrast, the flow of funds and noncore liabilities measures remain broadly constant, which reflects two opposing forces: the decline in the role of certain activities after the crisis, such as securitization and lending via repos and securities (Figure 2.6 and Box 2.1), and a concomitant rise in other activities, including those of country-specific entities. The pickup in the FSB measures can be partly explained by positive valuation effects from the growth in the investment fund industry. The large difference between broad and narrow noncore funding measures in the United States and Japan (about \$6–\$7 trillion in 2013 in both countries) and in the euro area (about \$4 trillion) reflects significant activity within the financial system that is not captured by other shadow banking measures.<sup>10</sup>

**15. In advanced economies, shadow banking seems to be shifting to less-well-monitored activities.**

Only investment funds, especially bond funds, country-specific entities, and “other” entities continued to grow after 2008 (Figure 2.5). The growth of the “other” entities could imply a shift in financial stability risk toward activities that are not as well understood. Box 2.2 suggests that these may comprise new forms of direct lending and over-the-counter derivatives trading.

**16. In emerging market economies, overall shadow banking continues to grow strongly.**

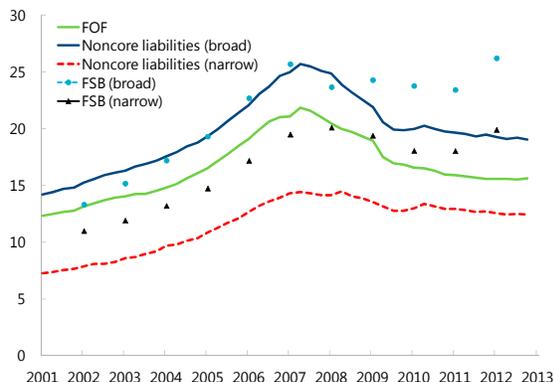
Shadow banking assets as a proportion of GDP expanded from 6 percent to 35 percent between 2002 and 2012 (see Figure 2.1), while banking sector assets grew from 30 percent to 85 percent of GDP over the same period.<sup>11</sup> To some extent, an increase in shadow banking activities is a natural part of domestic financial deepening in these economies (April 2014 GFSR). The expansion of shadow banking was significantly driven by the growth of broker-dealer activities and finance companies as well as the growth of entities similar to MMFs (Figures 2.5 and 2.6). In some countries, including South Africa and Brazil, mutual funds have also been growing strongly; in others, including Mexico and Turkey, real estate investment trusts have expanded especially fast (albeit from a low base). In dollar terms, China’s shadow banking sector became the fifth largest among FSB jurisdictions in 2012 (see Boxes 2.2 and 2.3).

<sup>10</sup> The difference is small for the United Kingdom, but this is mainly related to a lack of disaggregated data. The large differential for Japan is attributable to the significance of interbank deposits, bank holdings of securities of other financial corporations, and loans between other financial corporations for broad noncore liabilities.

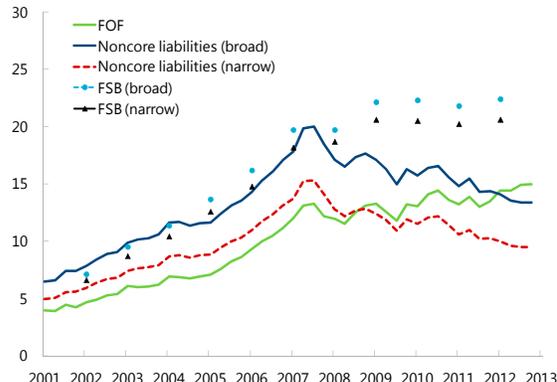
<sup>11</sup> This growth is broad-based across emerging markets FSB (2013c).

**Figure 2.4. Alternative Measures of Shadow Banking Size**  
(Trillions of U.S. dollars)

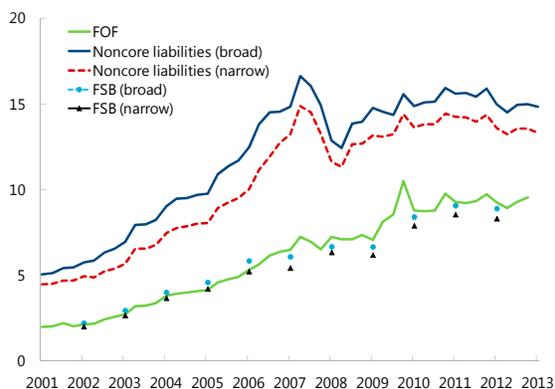
**1. United States**



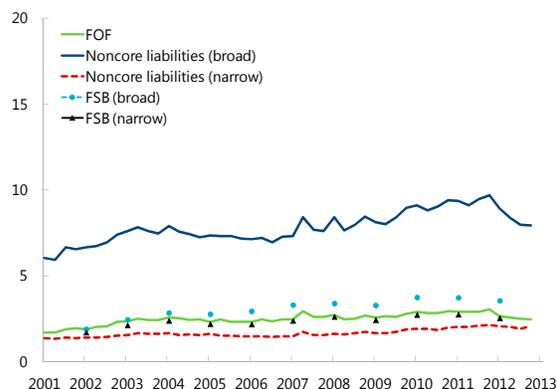
**2. Euro Area**



**3. United Kingdom**



**4. Japan**

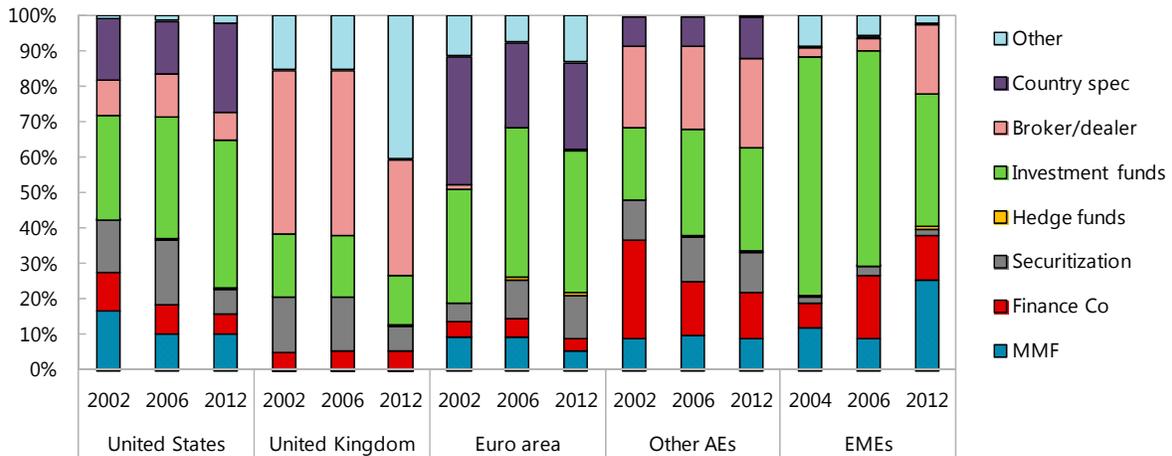


Sources: European Central Bank; Financial Stability Board (FSB); Haver Analytics; and IMF staff estimates.

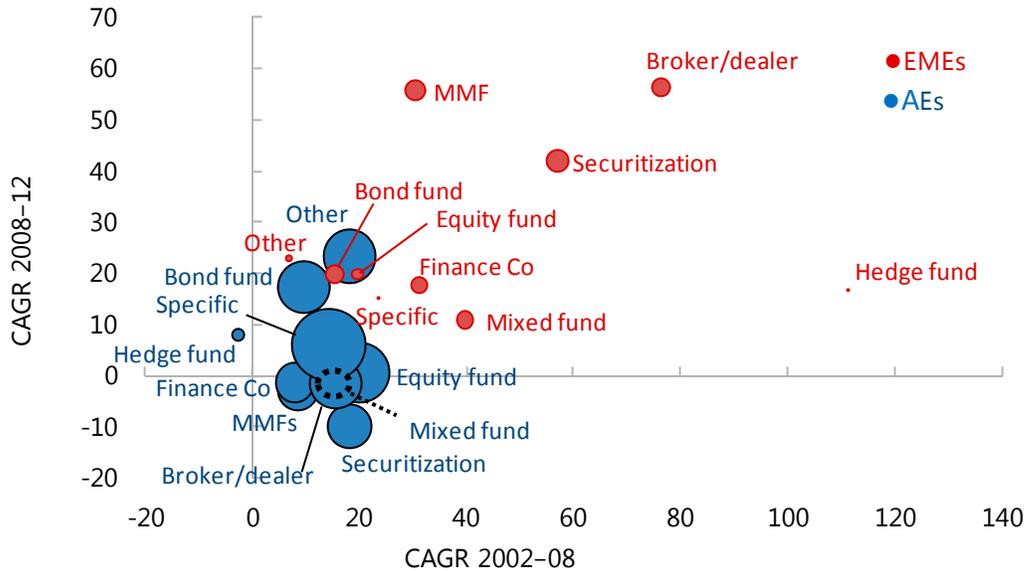
Note: FOF = flow of funds measure. The FSB broad measure includes all nonbank financial intermediaries; this figure's proxy for the narrow FSB measure excludes equity funds, but not entities prudentially consolidated with banks (for example, structured investment vehicles and retained securitization). The broad (narrow) noncore liabilities measure includes (excludes) intrafinancial sector liabilities. For the definition of U.S. FOF shadow bank entities, see Adrian and Ashcraft (2012). For the definition of euro area FOF shadow bank entities, see Bakk-Simon and others (2012). Euro area noncore liabilities cover liabilities of banks and, within the nonbank sector, only liabilities of financial vehicle companies, which explains the decline after 2008.

**Figure 2.5. Shadow Banking Subsectors**

**1. Breakdown by Subsectors (percent of entities' financial assets)**



**2. Compound Annual Growth Rates (CAGR) by Subsector (percent)**

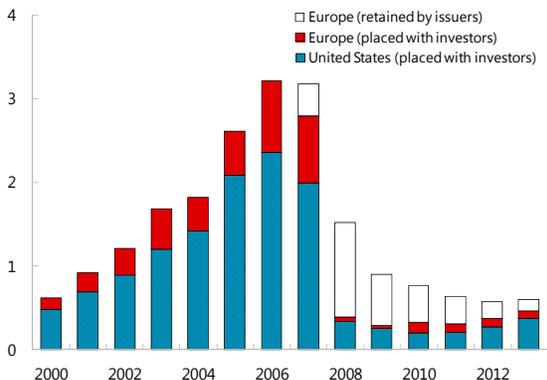


Sources: Financial Stability Board; European Central Bank; Hedge Fund Research (HFR); People's Bank of China; and IMF staff estimates.

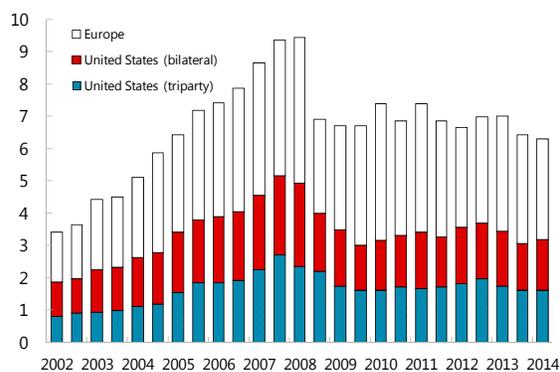
Note: AE = advanced economy; Country spec/Specific = country-specific shadow entities, such as U.S. holding corporations, Dutch special financial institutions, and Swiss mortgage bond institutions; EME = emerging market economy; MMF = money market mutual fund; Finance Co = finance companies; OFI = other financial institution; Other = residual category. Investment funds in Figure 2.5. include bond, equity, and mixed funds. FSB data have been supplemented with hedge fund data from HFR, and some subsector trends have been extrapolated to produce this figure. An estimate of China's shadow banking sector was inferred from various issues of the *China Financial Stability Report* and Wind Info, and includes data on wealth management products, finance companies, trust loans and entrusted loans, securities investment funds, and bank acceptances. Growth rates are scaled by the subsectors' financial assets in 2012. For emerging market economies, CAGR in the first subperiod is for 2004-08 instead of 2002-08. For sample coverage, see Table 2.3.

**Figure 2.6. Size of Shadow Banking Markets**  
(Trillions of U.S. dollars)

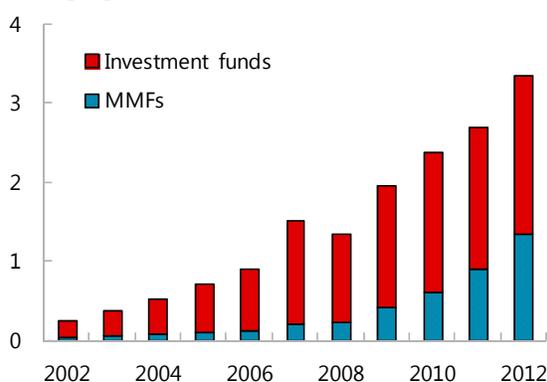
**1. U.S. and European Private-Label Securitization Issuance**



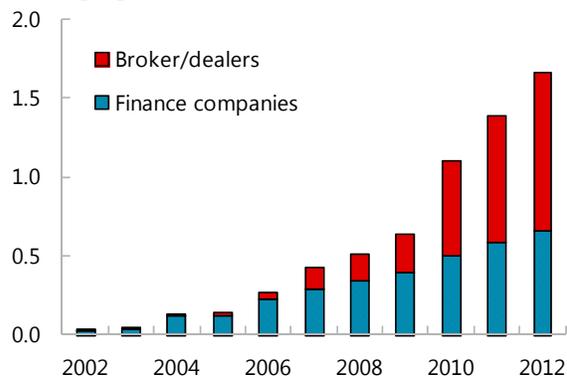
**2. U.S. and European Repo Markets**



**3. MMFs and Investment Fund Assets in Emerging Market Economies**



**4. Broker-Dealers and Finance Companies in Emerging Market Economies**



Sources: Association for Financial Markets in Europe; Board of Governors of the Federal Reserve System; Federal Reserve Bank of New York; CRE Finance Council; Financial Stability Board; Inside Mortgage Finance; International Capital Markets Association; J.P. Morgan Chase & Co.; and IMF staff estimates.

Note: MMF = money market mutual fund. For U.S. triparty repurchase agreements (repos), data between 2002 and 2005 were interpolated.

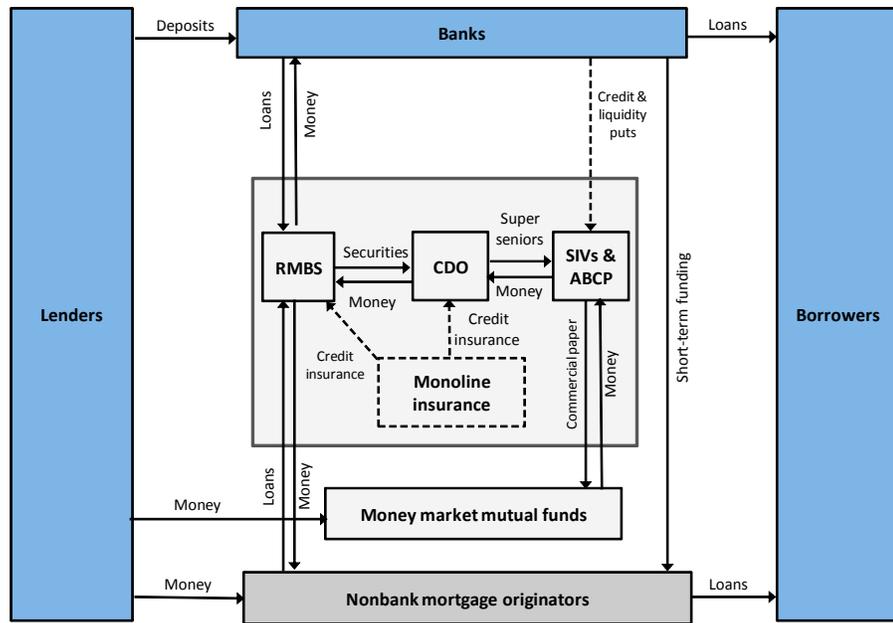
**Box 2.1. The Run on the Shadow Banking System and Bank Losses during the Financial Crisis**

*This box analyzes the risk transmission in the shadow banking system as a chain of interlinked, risk-adjusted balance sheets. It shows that risks of shadow banks' reliance on short-term funding caused adverse spillovers to banks and guarantors, which had provided liquidity backstops and debt guarantees to these shadow entities.*

**Until 2007, shadow banking activities in the United States and Europe had grown very rapidly, but many of them collapsed during the financial crisis.** Over time, the U.S. and European financial systems had come to rely increasingly on repo and securitization financing, through conduits and structured finance vehicles, while money market mutual funds (MMFs) and other funds benefited from inflows due to ample global liquidity (Figure 2.6). Eventually, rapidly rising defaults in the U.S. housing market in 2007 led to a liquidity crisis in the markets for private-label securitization and asset-backed commercial paper (ABCP) as investors refused to roll over their holdings (Acharya, Schnabl, and Suarez 2013). MMFs experienced a run in September 2008 after the default of Lehman Brothers, and MMF sponsors were unable to absorb the losses.<sup>1</sup>

**Contingent claims analysis (CCA) can be used to model banks' relationships with the U.S. shadow banking system.** In essence, CCA models the financial system as a chain of interlinked, contingent claims (that is, risk-adjusted balance sheets). The claims include cross-holdings of risky prime and subprime debt. They also include residential mortgage-backed security tranches held in asset-backed commercial paper conduits and structured investment vehicles (SIVs) financed by short-term funds (Figure 2.1.1). Banks provided explicit liquidity and credit guarantees to ABCP conduits and SIVs and short-term loans to nonbank mortgage originators. "Monoline" insurers provided insurance against losses on ABCP and SIV borrowing.

**Figure 2.1.1. U.S. Shadow Banking System**



Source: IMF staff.  
 Note: This is a simplified schematic of the precrisis U.S. financial sector showing the flow of funds from lenders to borrowers and the links between them and shadow banks. Securitization vehicles include asset-backed commercial paper (ABCP) conduits, collateralized debt obligations (CDOs), residential mortgage-backed securities (RMBSs) and structured investment vehicles (SIVs). See notes to Figure 2.3.

The author of this box is Dale Gray.

<sup>1</sup> For a review of the causes of the crisis in the United States, including the evolution of shadow banking, see FCIC (2011).

<sup>2</sup> For more details on the CCA approach, see Gray, Merton, and Bodie (2008).

**Box 2.1. The Run on the Shadow Banking System and Bank Losses during the Financial Crisis (concluded)**

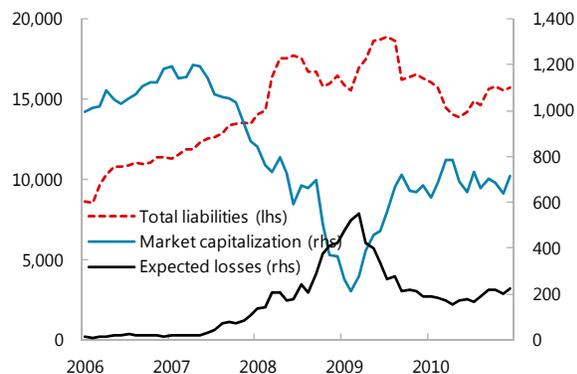
**In each risk-adjusted CCA balance sheet, assets equal equity and risky debt.** An entity’s equity can be modeled as an implicit call option on its assets. Risky debt equals the default-free value of debt minus the expected loss due to possible default and can be modeled as an implicit put option. If a third party (say, a bank or a monoline insurer) is providing a debt guarantee, the value of this guarantee can also be modeled as an implicit put option. For example, if commercial paper lenders provide short-term funds to an SIV with credit puts from a bank, the commercial paper provider is “long” the default-free value of the short-term debt, but the bank is “short” the implicit put option—that is, it provides a guarantee.<sup>2</sup>

**The CCA model of major U.S. and European banks captures a significant increase in expected losses as the crisis unfolded (Figure 2.1.2).** From August 2007 to March 2009, bank liabilities rose by 32 percent (in part because they brought SIVs onto their balance sheets), and total market capitalization fell by 74 percent. Expected losses embedded in their liabilities (that is, implicit put options with three-year horizons) peaked at \$550 billion in March 2009 and averaged \$395 billion between September 2008 and August 2009. The activation of bank credit puts (guarantees) provided to ABCP and securitization vehicles contributed to this severe negative financial shock to the banks. Moreover, as housing prices began to fall in 2007, widespread mortgage refinancing led to a “refinancing ratchet effect” because higher interest rates applied to the refinancing, which dramatically increased mortgage defaults. Banks suffered directly from losses on residential mortgages because of a severe underestimation of the correlation between house prices and mortgage default (Khandani, Lo, and Merton 2013). This increased potential residential mortgage losses to \$1.7 trillion (inferred from implicit put options on mortgage debt) from June 2006 to December 2008.

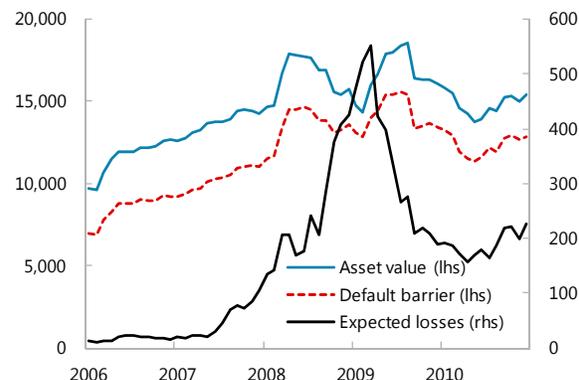
**This analysis highlights the ability of CCA analysis to provide timely information on the severity of bank losses as the crisis developed, unlike financial statements, which become available only with considerable lags.** In this case, it also demonstrates how rapidly risk can increase for banks when they guarantee their off-balance-sheet vehicles when the latter engage in a search for yield that relies on short-term funding and funding backstops from parent banks.

**Figure 2.1.2. CCA Simulations of Implicit Shadow Banking Puts**

**1. Bank Liabilities, Market Capitalization, and Expected Losses (billions of U.S. dollars)**



**2. Bank Assets, Default Barrier, and Expected Losses (billions of U.S. dollars)**



Sources: Moody’s CreditEdge; and IMF staff estimates.

Note: Data represent aggregates for Citibank, J.P. Morgan, Bank of America, Deutsche Bank, Credit Suisse, UBS, Barclays, and Royal Bank of Scotland. Total liabilities comprise debt and deposits. Expected losses are the sum of the implicit puts. Asset value equals equity and risky debt, which is measured as the default-free value of debt minus the expected loss from possible default. Default barrier is the default-free value of debt and deposits, estimated to be short term, plus one-half of long-term debt in the Moody’s framework.

## B. What Contributes to Shadow Banking Growth?

**17. This section identifies key drivers of the growth patterns just discussed, stressing commonalities across advanced and emerging market economies.** Both quantitative analyses and concrete country examples are presented.

**18. The literature suggests that a search for yield, regulatory arbitrage, and complementarities with the rest of the financial system play a role in the growth of shadow banking.** Taking these in turn, first—when government bond yields are low and investors are looking for higher-yielding assets—it is the shadow banking system that often supplies those assets: the search-for-yield effect.<sup>12</sup> Some have stressed the international dimension of the effect, pointing to the role of shadow banks in intermediating capital flows (Shin 2010). Second, tighter bank regulation encourages institutions to circumvent it through nonbank intermediation.<sup>13</sup> This phenomenon has long been recognized in the literature on financial repression in developing economies (Vittas 1992). Third, growth of shadow banking can be complementary to the rest of the financial system. In emerging markets, the growth of pension funds and insurance companies has often come along with the growth of investment funds and other nonbank intermediaries (April 2014 GFSR). In the United States, argues Pozsar (2011), shadow banking grew from the demands of so-called institutional cash pools for alternatives to insured deposits and safe assets.<sup>14</sup> However, to some extent, this, too, can be regarded as a special case of a reaction to regulations (that is, limits on deposit insurance) in an environment of ample liquidity. No comprehensive empirical assessment of the drivers of shadow banking appears to have been conducted yet.

### Econometric evidence

**19. Econometric analysis supports the role of these factors in explaining shadow banking growth.** Given its broader coverage and higher frequency, this chapter uses the FOF measure (in national currency) as a proxy for the shadow banking system.<sup>15</sup> Although many of the findings are consistent with causal interpretations as discussed above, the chapter does not claim to overcome potential endogeneity problems, and the results should be interpreted primarily as correlations. The

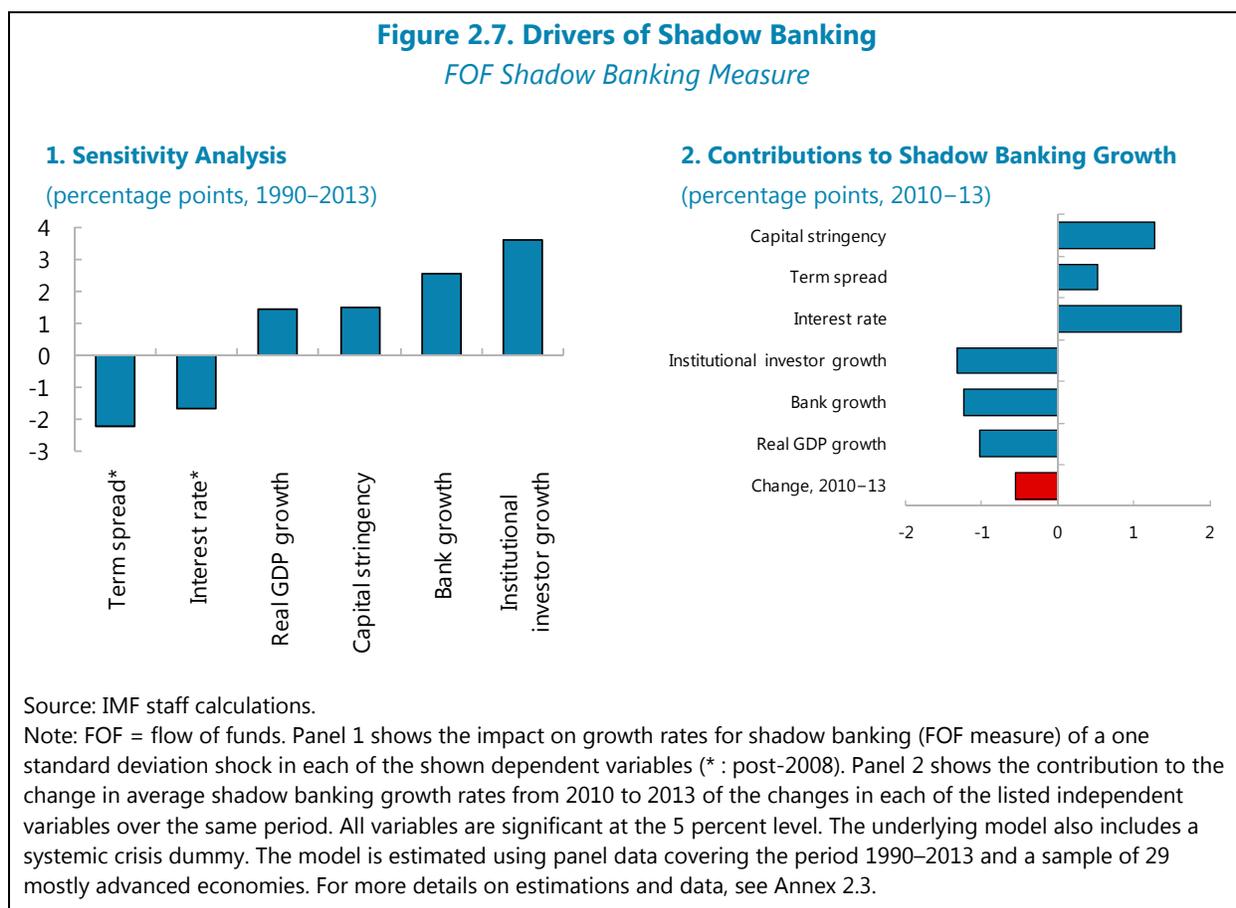
<sup>12</sup> See Jackson (2013), Caballero (2010), Goda, Lysandrou, and Stewart (2013), Goda and Lysandrou (2014), and Lysandrou (2009, 2012).

<sup>13</sup> See Kanatas and Greenbaum (1982), Bernanke and Lown (1991), Udell and Berger (1994), and Duca (1992, 2014).

<sup>14</sup> Institutional cash pools are insurance companies, pension funds, and large nonfinancial firms.

<sup>15</sup> This sample largely comprises advanced economies, but given the significant time coverage also includes a number of countries considered emerging market economies in earlier years of the sample. The FSB measure (covering fewer countries, a shorter time span, and at a lower frequency, but comprising more emerging market economies) is also used in a robustness check (Annex 2.3). A separate estimation for emerging market economies was not possible due to lack of data. Estimations with the noncore liabilities measure yielded broadly similar results. For FOF estimations, all variables are measured in national currencies and hence, results are not affected by currency fluctuations. FSB data are measured in U.S. dollars; however, controlling for exchange-rate movements did not affect any of the findings reported here).

main findings of the econometric assessment are that higher growth of shadow banking is associated with the following factors (Figure 2.7, Table 2.2, Annex 2.3):<sup>16</sup>



- **Bank regulation:** More stringent capital requirements, for example, are associated with stronger growth of shadow banking. This is consistent with the notion that banks have an incentive to shift activities to the nonbank sector in response to certain regulatory changes.
- **Liquidity conditions:** The negative correlation of shadow banking growth with term spreads and interest rates becomes considerably stronger after 2008.<sup>17</sup> This shift is in line with the changed role of the term spread in the context of quantitative monetary easing since then. However,

<sup>16</sup> Panel regressions were conducted to assess the potential role of these factors over the period 1990–2013. The level of real interest rates and the term spread were used to measure financial conditions, a variety of regulatory variables (from World Bank surveys on bank regulation and supervision), and the growth of banking and insurance companies and pension funds' assets to measure complementarities. To control for valuation effects, stock market returns were included in the model, but this did not affect the significance of any of the factors under examination.

<sup>17</sup> Some studies argue that, at least in the United States, other effects related to the quantitative easing by the Federal Reserve have played a role in this period (Pozsar 2011).

there was no direct evidence for the role of capital flows, possibly because their effects are already captured by the other explanatory variables.

**Table 2.2. Summary of Panel Regressions on Shadow Banking Growth**  
*FOF Shadow Banking Measure*

	Expected Sign	Estimate
<b>Macrofinancial Variables</b>		
Real GDP Growth	+	+
Banking Sector Size	+	+
Institutional Investors Size	+	+
Real Short Term Rate (lag 4)	-	n.s.
Real Short Term Rate (lag 4, from 2008)	-	-
Term Spread	-	n.s.
Term Spread (from 2008)	-	-
<b>Regulatory Variables</b>		
Overall Capital Stringency	+	+
Capital Regulatory Index	+	+
Supervisory Power Index	-	n.s.
Financial Statement Transparency	+/-	-
Global Liquidity Quantities (lag 4)	+	n.s.

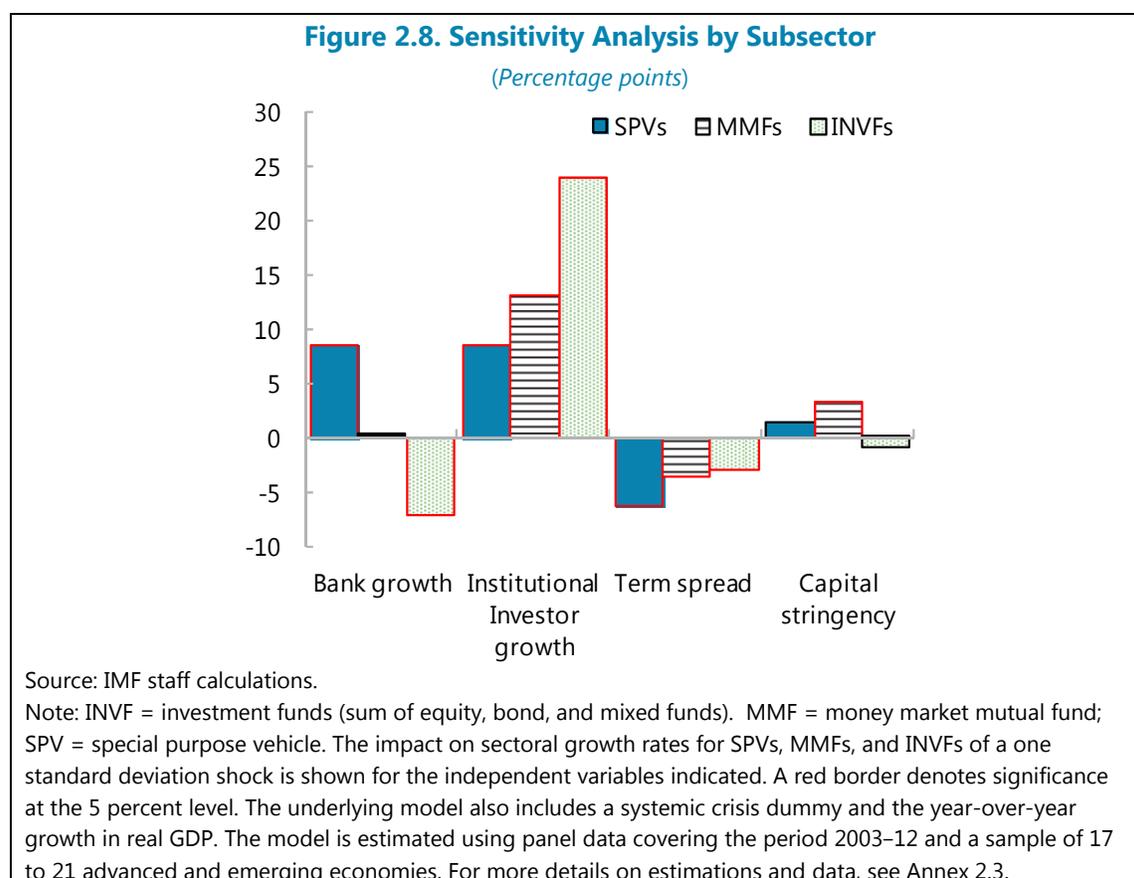
Source: IMF staff calculations.

Note: FOF = flow of funds. The first column shows the expected signs of the determinants of the growth of shadow banking assets from panel regression models. If statistically significant at the 5 percent confidence level, the sign of the estimated coefficient is shown (+ or -). "n.s." indicates that the variable is not statistically significant. Coefficients of macro-financial variables are taken from the baseline regression results (without regulatory variables), whereas coefficients of regulatory and global liquidity variables are taken from a regression in which these variables are added one by one to the baseline regression. See Annex 2.3 for further details.

- *Institutional cash pools and financial development*: Stronger growth of institutional investors is associated with higher growth in shadow banking, consistent with complementarities and demand-side effects. Alternatively, this could reflect a general trend in financial development.
- *Growing banking sector*: Countries with higher banking sector growth rates tend to experience higher growth of shadow banking, again suggesting complementarities.<sup>18</sup> Alternatively, the results could reflect a general trend in financial deepening driven by other factors.

**20. To gain further insight into the drivers of growth within subsectors of the shadow banking system, MMFs, investment funds, and securitization were examined separately (Figure 2.8).** Because data for these particular shadow banking activities are more limited—they are available only since 2002, on an annual basis, and for a smaller number of countries—their explanatory power is more limited.

<sup>18</sup> Banks have also often sponsored shadow banking activities (see Mandel, Morgan, and Wei, 2012, for details).



- *MMFs and investment funds:* Banking growth is not important in explaining the growth of MMFs, and the correlation is negative for investment funds, in line with the notion that the latter substitute for, rather than complement, the banking system.<sup>19</sup> However, the growth of MMFs and investment funds is strongly associated with the growth of institutional investors, which supports the cash-pool demand hypothesis. Similarly, the compression of the term spread (capturing search for yield) plays only a small role for MMFs and investment funds.
- *Securitization:* The growth of private-label securitization via SPVs is strongly associated with growth of the banking sector, probably because SPVs are frequently sponsored or owned by banks. As expected, the growth of institutional investors is less correlated with the growth of securitization. Securitization growth is more strongly (and negatively) associated with the term spread than are MMFs. The impact of capital regulations is less important for securitization than for MMFs.

<sup>19</sup> For MMFs, the insignificance of the banking sector may also reflect heterogeneity in the composition of MMFs: MMFs with fixed net asset values (NAVs) resemble bank deposits more closely than those with variable NAVs.

## Country-specific evidence

### 21. This section complements the previous findings with country-specific examples.

Viewed globally, shadow banking is highly varied, but the factors advancing its growth are often very similar.

#### **Advanced economies**

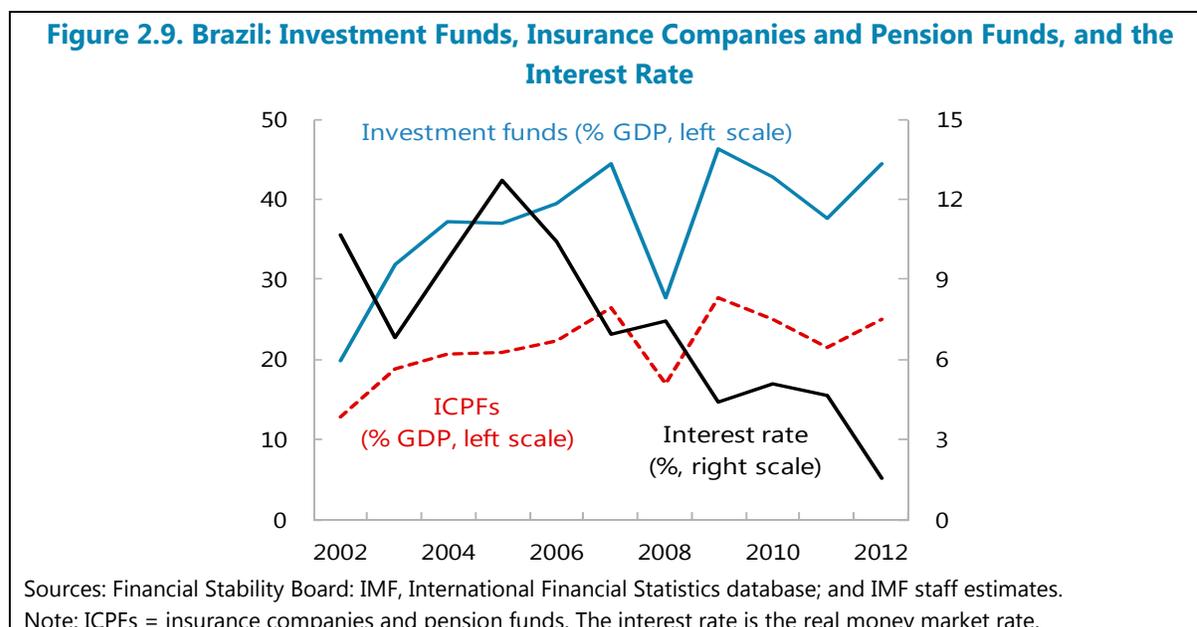
- *Regulatory arbitrage* following the 1988 Basel Accord spurred the growth of securitization in Europe and the United States. The Basel Accord on bank capital rules boosted the securitization of low-risk loan portfolios and the retention of high-risk loans because of a lack of differentiation between high- and low-quality loans (Allen 2004). In the late 1980s, regulatory arbitrage also motivated the introduction of collateralized debt obligations (CDOs) and structured investment vehicles (SIVs). The growth in securitization markets strengthened in the low-interest rate environment in the mid-2000s, in line with the econometric evidence.
- *Bank restrictions, low real interest rates, and demand from institutional cash pools* have been key drivers behind the growth of MMFs in the United States. MMFs originated in the 1970s as a way to circumvent bank interest rate restrictions during times of rising inflation, which made real interest rates on regulated deposits increasingly negative (Calomiris 2013).<sup>20</sup> Today, there is large demand for MMFs from so-called institutional cash pools (Pozsar 2011). However, bank regulation, now in the form of limits on deposit insurance, still contributes to demand because the limits induce large depositors to seek higher-seniority claim status with nonbank institutions that offer liquidity similar to that of bank deposits.
- *Search for yield, which began around the mid-2000s*, accelerated flows into hedge funds and private equity funds and stimulated the rapid growth of structured finance and investment funds. In the euro area, for example, low sovereign yields and ample liquidity in global financial markets were key factors in driving investors to seek higher returns in riskier markets (structured finance, leveraged buyouts—ECB 2006).

#### **Emerging market economies**

- *Heightened restrictions on banks* seem to be an important driver of shadow banking in China. In response to the rapid growth of bank lending and concerns about inflation, in 2010, the Chinese government placed significant restrictions on the traditional banking system (including more conservative credit quotas). The intervention slowed conventional lending but not off-balance-sheet loan originations (see Boxes 2.2 and 2.3).

<sup>20</sup> In addition, MMFs are exempt from reserve requirements and Federal Deposit Insurance Corporation deposit insurance taxes, and can take on some credit, market, and maturity risk without being subject to the full set of prudential regulation. Moreover, in the United States, MMFs have so far been able to use stable net asset values (NAVs) for reporting and redemption purposes—which sustained the perception of MMFs as a “safe” asset, although new regulations may alter this feature.

- *Regulatory arbitrage and government support* encouraged the growth of special-purpose nonbank financial institutions (Sofoles) in Mexico. These institutions specialized in mortgage finance to lower- and middle-income households in the informal sector, and they remained outside the regulatory perimeter because they did not take deposits. Moreover, to improve financial access, the federal government provided them with support and backstopping, allowing their mortgage-backed securities to receive the highest credit rating. Severely hit during the global financial crisis, Sofoles (converted to Soforems) are now subject to the same regulation as banks.
- *Banking activity is complemented in India by nonbank financing companies.* Acharya, Khandwala, and Öncü (2013) find that these companies are seen by banks with less developed branching networks as a way to complement credit allocation in nonurban areas of the Indian economy, in particular to meet their assigned targets for lending to priority sectors.<sup>21</sup> Hence, nonbank financial institutions sometimes are more able than banks to reach out to certain groups of borrowers.
- *The demand from institutional cash pools* appears to have played a role in the growth of investment funds in Brazil, whose assets increased from 25 percent of GDP to 50 percent between 2002 and 2013. This growth was due in part to an increase in institutional investors (such as pension funds and insurance companies), which account for roughly 40 percent of the funds' investor base (Figure 2.9). A search for yield in a period of falling real interest rates also likely contributed.



<sup>21</sup> "Priority sectors" are those that may not get timely or adequate credit in the absence of a special policy, and hence lending targets have been established for them.

## WHERE ARE THE RISKS AND WHAT IS NEW?

**22. This section assesses the various risks surrounding shadow banking entities.** It analyzes systemic risk and interconnectedness in the financial sector for the euro area, the United Kingdom, and the United States. It also discusses benefits and risks related to recent developments in the shadow banking systems of advanced and emerging market economies (see Chapter 1).

### A. Balance Sheet Risk Measures

**23. Data from flow of funds and sectoral accounts can provide a quantitative approximation of various sources of shadow banking risk and their evolution.** Specifically, in addition to size, rough approximations of maturity risk (based on whether assets are of long or short duration), liquidity risk (based on whether assets are liquid and easy to trade), credit risk (based on the share of loan assets that carry substantial credit risk), leverage (total assets to equity), and interconnectedness (how these entities are exposed to banks through asset holdings or liabilities) can be inferred from flow of funds and sectoral balance sheet breakdowns.<sup>22</sup> Using this information, rough risk scores can be constructed based on simple ratios for various entities in the euro area, Japan, and the United States.

**24. Although useful, a risk analysis based on this type of data has limitations.** Aggregation at the sectoral level can mask important vulnerabilities at the entity level. Some risks, such as fire sale and run risks, cannot be easily quantified, nor can some risks associated with the environment in which shadow banks operate (such as the extent of regulation and supervision, and the availability of backstops). Moreover, risk scores of individual sectors may underestimate both interdependence among shadow banking entities and exposure to common factors, which can result in sudden and disproportional deterioration of these entities' balance sheets (Box 2.1 and the section Systemic Risk and Distress Dependence address some of these issues through the use of market prices). Nevertheless, despite its limitations, this level of analysis may be a useful starting point for assessing the magnitude of risks posed by shadow banking entities and tracking their evolution over time.

**25. A look at some key shadow banking sectors for major advanced economies supports the notion that a granular examination is required to assess risks (Figure 2.10).** Even this relatively simple scoring method reveals significant variations in risk dimensions across activities. Moreover, as highlighted earlier, similar types of activities carry different types of risks across countries and over time. For example, euro area MMFs seem to be more directly connected with banks and have longer maturity and less liquid assets than their U.S. and Japanese counterparts.

**26. In the euro area and the United States, traditionally less risky activities have been growing the fastest since 2009, but to some extent, they are taking on more liquidity risk.** In the euro area, bond, mixed, and other funds grew strongly, whereas securitization and the size of

<sup>22</sup> The method used here largely follows the methodology proposed in FSB (2014).

MMFs fell (see Figure 2.10). These funds tend to be exposed to some liquidity and maturity risk but score low on other risk dimensions. At least in the euro area, however, bond funds now tend to hold less liquid and longer-maturity assets than five years ago. Similarly, in the United States, investment funds—which entail some maturity risk, but do not display high risk scores in other areas—have been the fastest-growing form of shadow banking, expanding from 35 percent to 70 percent of GDP. Their aggregate risk profile has, however, not changed markedly. A caveat to this is that the breakdown between different types of non-MMF funds is not available for the United States, where “other funds” also include equity funds. Chapter 1 highlights the rising asset flows into mutual funds focused on less liquid high-yield fixed-income assets, which can only partially be captured with the type of data examined here.<sup>23</sup>

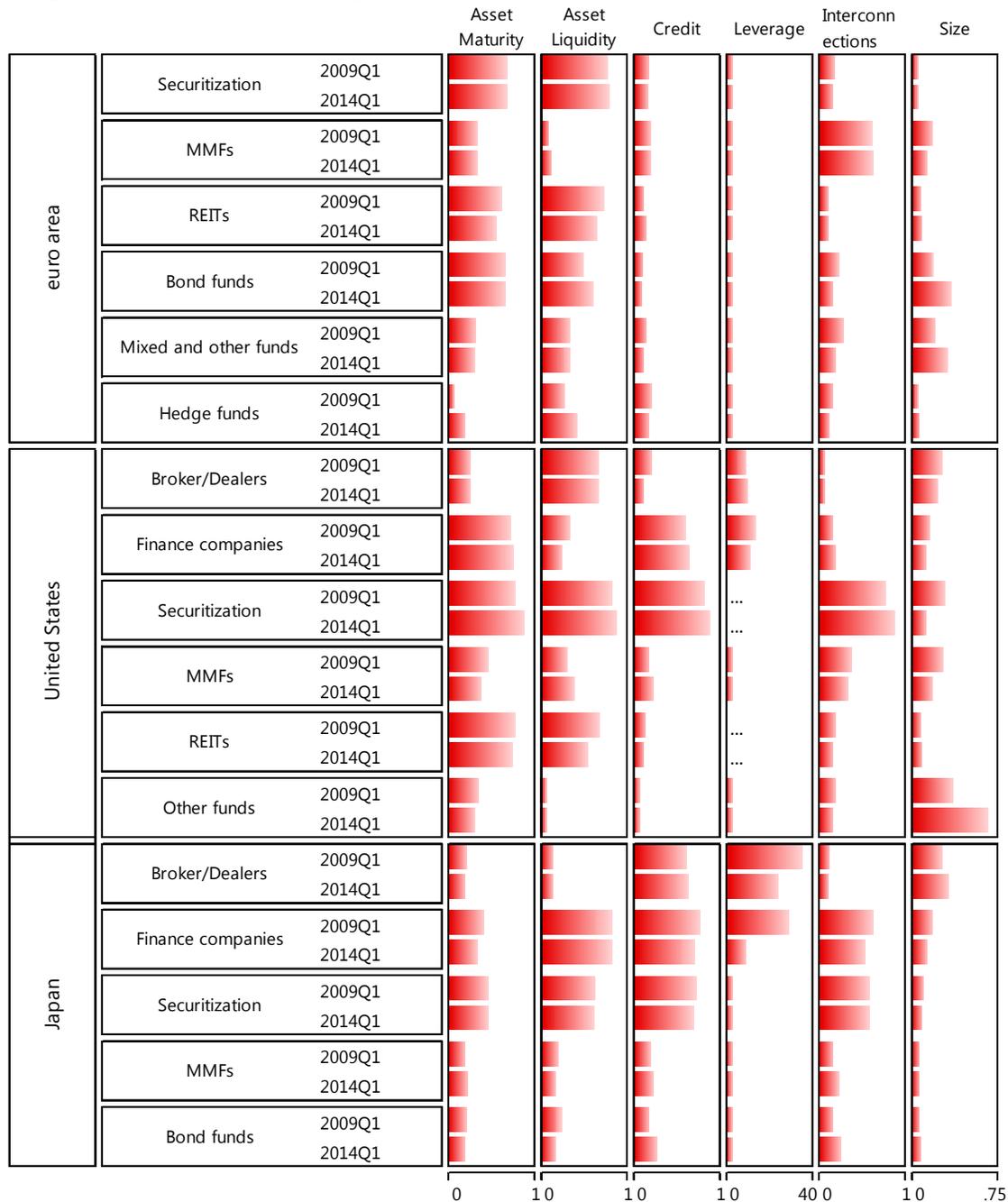
**27. In Japan, broker/dealers (which are more exposed to credit risk and high leverage) gained market share.** In Japan, broker/dealers grew from 25 percent to 31 percent of GDP while other shadow activities either declined or remained relatively small. Compared with U.S. broker/dealers, their Japanese counterparts appear to have higher (albeit falling) leverage and potentially higher credit risk (but lower liquidity risk). Other shadow banking entities do not seem to be systemically important in terms of size, although on certain risk dimensions, they have relatively high scores (for example, finance companies on credit and liquidity risk, and securitization on interconnectedness).

**28. Data limitations prevent computing similar risk scores for many (new) shadow banking activities, although this would be useful for monitoring purposes.** So far, data are generally lacking to systematically monitor new, or even a range of existing, shadow banking activities and entities in most countries along these lines. Box 2.2 provides a qualitative discussion of some recent shadow banking developments around the world, together with a qualitative risk assessment.

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<sup>23</sup> For some other fund types, even fewer data are available. For example, exchange-traded funds (not included in “other funds”) can transmit and amplify financial shocks originating in other parts of the financial system (OFR 2013). These products have grown rapidly, with \$1.7 trillion in combined U.S. assets at the end of March 2014.

**Figure 2.10. Shadow Banking Risks in the Euro Area, the United States, and Japan**



Sources: Bank of Japan; European Central Bank; Federal Reserve; Haver Analytics; SNL Financial; and IMF staff estimates. Note: Scores of various sources of risk (balance sheet ratios) are shown across shadow banking sectors on the x-axis. Longer bars indicate greater risk. Asset maturity risk = long-term assets to total assets; asset liquidity = 1-liquid assets to total assets; credit = loans to assets; leverage = asset/equity multiplier; interconnections = bank debt and loans to shadow banking sector's assets; size = ratio of shadow banking sector's assets to GDP; MMF = money market mutual fund; REIT = real estate investment trust. For U.S. funds and securitization vehicles (ABS issuers) and for Japanese shadow banking sectors, some assumptions were made as regards asset liquidity and maturity, due to lack of disaggregated data. U.S. other funds refer to open-end (non-MMF) mutual funds.

### Box 2.2. New Shadow Banking Developments

**In advanced economies, nonbank lending is rapidly growing as banks are apparently withdrawing from certain activities in response to strengthened regulations.**

- *Direct corporate lending in Europe and the United States.* New lenders comprise a wide and growing range of nonbank entities, including pension funds and insurers. Moreover, U.S. entities (such as private equity or distressed debt funds) are increasingly providing European firms with long-term funding. In the United States, according to market sources, the nonbank share of leveraged lending rose from about 20 percent in 2000 to 80 percent in 2013, and loan funds expanded from \$80 billion to \$160 billion between 2010 and 2013 (Figure 2.2.1, panel 1).<sup>1</sup>
- *Peer-to-peer online lending platforms.* Although this market is currently small—about \$6.5 billion outstanding at the end of March 2014—its potential for growth is large (Kirby and Worner 2014). So far, most activity is taking place in the United States and the United Kingdom and is focused on loans to households and small businesses, although various institutions are seeking to securitize these loans, expand toward riskier borrowers, and form partnerships with banks (McCrum 2014; S&P 2014).
- *Mortgage servicing rights (MSRs).* MSRs are the right to receive a portion of mortgage interest and fees collected from borrowers in return for administering loans. In the United States, banks have been selling MSRs to lightly regulated nonbank specialty servicing firms because of increased capital risk weights. Nonbank servicers accounted for \$1.8 trillion remaining principal balance on U.S. mortgages at the end of March 2014 versus nearly none at the end of 2010 (Kroll 2014). MSRs carry significant short-term risks in terms of compliance and operational factors (such as interruption of servicing or delays in transfers).
- *Derivative product companies (DPCs).* DPCs are special-purpose companies set up by banks, jointly with private equity firms and hedge funds, to trade with non-affiliated counterparties in non-centrally cleared derivatives and avoid higher capital charges on the latter (Whittall 2014). Since DPCs may be rated higher than parent banks, they may attract business from rating-constrained counterparties and also help banks reduce their required liquidity buffers. So far, only a few DPCs have been newly established.

**Among recent developments in emerging market economies, growth in shadow banking in China stands out.**

- *Rapidly growing and varied shadow banking in China.* As of March 2014, shadow banking social financing had risen to 35 percent of GDP and is expanding at twice the rate of bank credit.<sup>2</sup> *Entrusted loans and trust loans*, originated outside the highly regulated banking system, account for a large share of shadow banking social financing.<sup>3</sup> Banks have also begun to issue *wealth management products (WMPs)*, which share some of the characteristics of structured investment vehicles and collateral debt obligations used by U.S. banks before 2008 and keep loans off their balance sheets.<sup>4</sup> WMPs offer higher yields than bank deposit rates and are promoted as a low-risk instrument (see Box 2.3). In early 2014, WMPs accounted for 25 percent of GDP, growing by 50 percent since early 2013 and threefold since early 2011 (Figure 2.2.1, panel 2). Furthermore, *retail payment platforms* recently instituted a method of

The authors of this box are Nicolas Arregui, John Kiff, and Samar Maziad.

<sup>1</sup> This is in line with the substitution effect found between investment funds and traditional banks in the preceding section.

<sup>2</sup> Total social financing (TSF) is a broad measure of credit from the financial sector to the real economy computed by the People's Bank of China. Shadow banking social financing is defined as TSF minus bank loans, equity-like items, and bond issuance.

<sup>3</sup> Entrusted loans are loans between firms with banks or finance companies as payment agent. Trust loans are loans by trust companies that in turn structure these loans into trust schemes or WMPs and sell them to investors.

<sup>4</sup> Off-balance-sheet bank WMPs package various underlying assets, such as bonds, loans, or discounted bills that are sold to investors. WMPs by securities firms package fixed-income securities, equity, or loans.

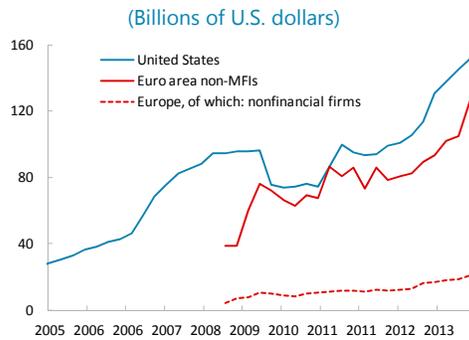
**Box 2.2. New Shadow Banking Developments (concluded)**

sweeping cash balances into money market mutual funds that in turn may (partly) invest in short-term commercial paper issued by local government financing vehicles. The growth of the latter form of shadow banking has been exponential and is subject to run risk because the money can be instantly redeemed, which would require the MMF to sell assets.

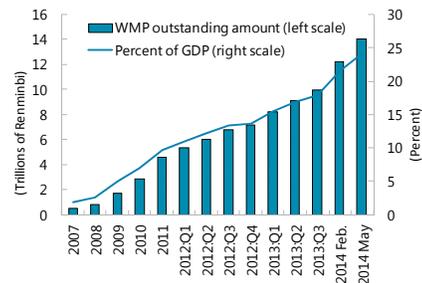
- *Real estate investment trusts (REITs) in Mexico.* With MEX\$16 billion in assets, the industry is small relative to the financial sector (less than 2 percent of banking assets). However, its importance is increasing rapidly. In 2013, REITs accounted for more than a third of the funds raised by Mexican companies in the domestic equity market. Risks seem contained at this point: bank loan financing is low, and the authorities recently established limits on leverage and interest coverage ratios.
- *Lending by nonbanks in southeast Asia.* In Malaysia, this activity accounted for roughly one-quarter of the increase in household debt since 2008, and in Thailand for nearly 60 percent of the increase since 2007.<sup>5</sup> Because it has focused on lower- to middle-income households, it may be more risky than bank lending, although the authorities have taken mitigating action. Another trend in this region is the financing of large (cross-border) infrastructure projects through finance companies, funded by long-term institutional investors.

**Figure 2.2.1. New Shadow Banking Developments and Risks**

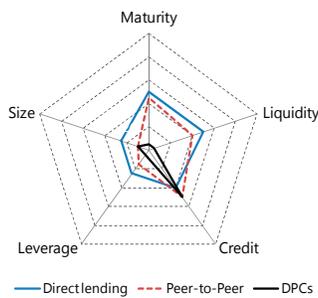
**1. Mutual Fund Loans in the United States and Euro Area<sup>1</sup>**



**2. China: Wealth Management Products**



**3. Risk Scoring in Advanced Economies**



**4. Risk Scoring in Emerging Market Economies**



Sources: CEIC Data; China Banking Regulatory Commission; Haver Analytics; local media; and IMF staff calculations.

<sup>1</sup> In Europe, mutual funds are typically limited to participations.

Note: DPC = derivative product company; MFI = monetary and financial institution; REIT = real estate investment trust; SE = southeast; WMP = wealth management product. Panels 3 and 4 depict qualitative risk scoring of new shadow banking activities from low (toward the center) to high (on the edges of the figures), based on discussions with market participants, policymakers, and IMF staff and research reports.

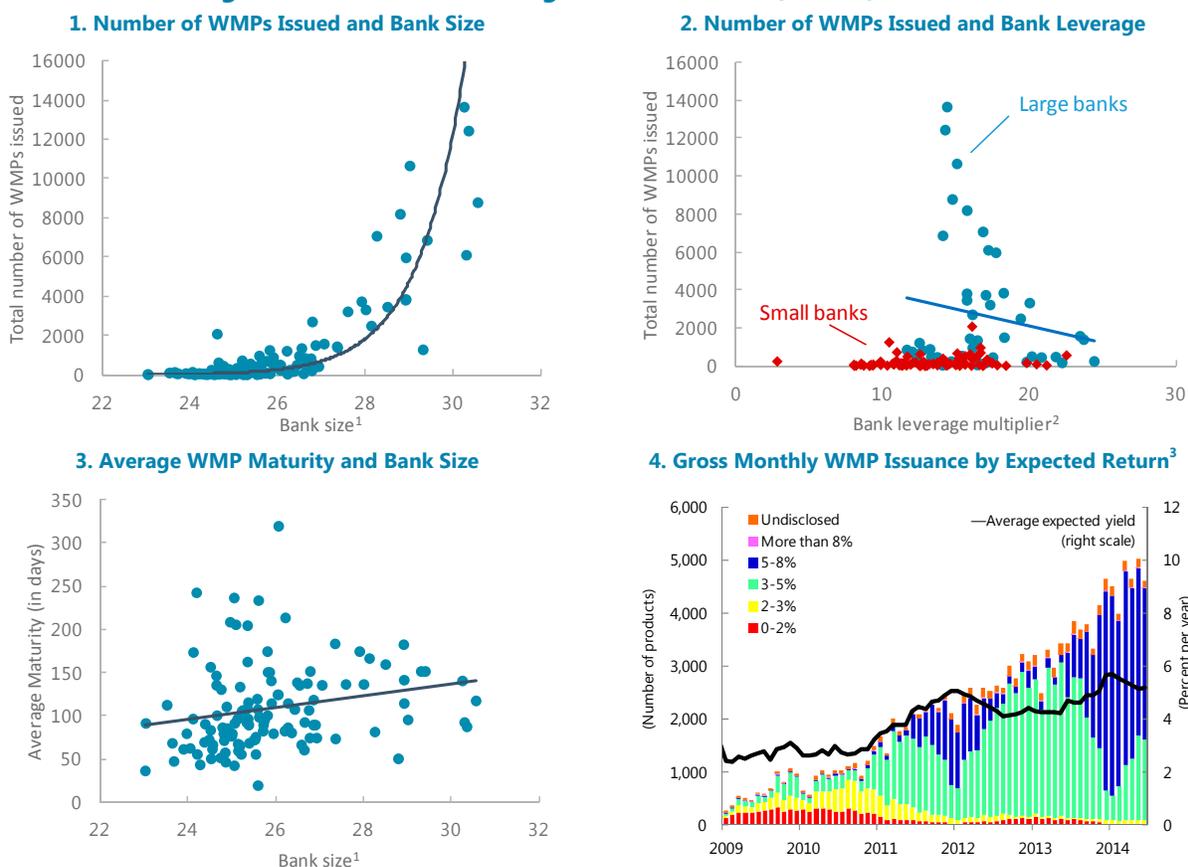
<sup>5</sup> Household debt as a proportion of GDP rose in Malaysia from 60 percent in 2008 to 87 percent in 2013 and in Thailand from 55 percent in 2007 to 82 percent in 2013.

### Box 2.3. China: Bank Characteristics and Wealth Management Product Issuance

**The growth of wealth management products (WMPs) is related to the size of Chinese banks, implying that they may generate potentially higher financial stability risks for large banks.** The majority of new WMPs are offered by banks, and larger banks tend to issue proportionally more. Although data on volume are scarce, sector reports indicate that WMPs account for as much as one-third of total assets at some of the smaller banks and for about 8 percent at some of the largest banks. Because WMP yields are much higher than bank deposit rates or repo rates, and a significant number of them have guaranteed returns, WMPs may entail a shift away from bank deposits and affect bank funding patterns and costs.

**However, several mitigating factors are in place.** For larger banks, higher issuance of WMPs is associated with lower leverage, suggesting that these banks have larger capital buffers to absorb deposit drains. For smaller banks, there is no apparent relationship between WMP issuance and leverage. Furthermore, larger banks tend to have WMPs with a longer tenor, which reduces liquidity and rollover risk. Moreover, on the asset side, many of the underlying loans are granted to public sector companies, which enjoy some form of implicit state guarantee.

**Figure 2.3.1. Wealth Management Products (WMPs) in China**



Sources: RESSET; Wind Info; and IMF staff calculations.

<sup>1</sup> Log of total assets for 2013.

<sup>2</sup> Assets/equity for 2013.

<sup>3</sup> Sample covers all products issued by banks covered by Wind Info.

The authors of this box are Viral Acharya, Zhishu Yang, and Shaun Roache.

## B. Systemic Risk and Distress Dependence

**29. This section estimates the contribution to systemic risk by subsectors of the financial system, including the shadow banking sector.** It also estimates the vulnerability to distress of the banking sectors in the euro area, the United Kingdom, and the United States.<sup>24</sup> The financial system is treated as a portfolio consisting of several different subsectors (Segoviano and Goodhart 2009). Asset prices and size information from each subsector are used to estimate a joint probability distribution of portfolio (systemic) losses. This joint distribution allows computation of a measure of “marginal contribution to systemic risk” (MCSR) by each subsector, where systemic risk is measured as the losses to the system that occur with a probability of 1 percent or less.<sup>25</sup> A related exercise examines “vulnerability to distress,” defined as the risk that distress spills over to banks from other sectors and entities, either because of direct (balance sheet) exposures or indirect (common factor) linkages. Although the analysis attempts to span a substantial proportion of shadow banking activities, it does not cover all of them, and therefore likely underestimates the sector’s total contribution to risk. In particular, for cross-country comparability purposes, non-sovereign bond funds (discussed in Chapter 1) are excluded here. Moreover, the aggregate nature of the analysis means that not all types of risks can be fully captured; for example, certain funds may offer easier redemption options than others and therefore be more exposed to run risk.

**30. Nonbank financial intermediaries contribute substantially more to systemic risk in the United States than in the euro area or the United Kingdom (Figure 2.11).** According to this analysis, in the United States, the largest MCSR does not come from the banking system but from pension funds and insurance companies and from shadow banks (captured by the sum of mutual funds—money, equity, and bond funds—and hedge funds).<sup>26</sup> In the euro area and the United Kingdom, the banking sector contributes relatively more to systemic risk because of its size and direct and indirect interlinkages; the next most important systemic risks are related to pension funds and insurance companies—most likely because the United Kingdom and the euro area have more bank-based financial systems.<sup>27</sup> In the United States at the end of 2013, the shadow banking sector accounted for about 30 percent of systemic risk, about as much as the banking sector. However, for the euro area and the United Kingdom, the shadow banking sector MCSR amounts to only 13

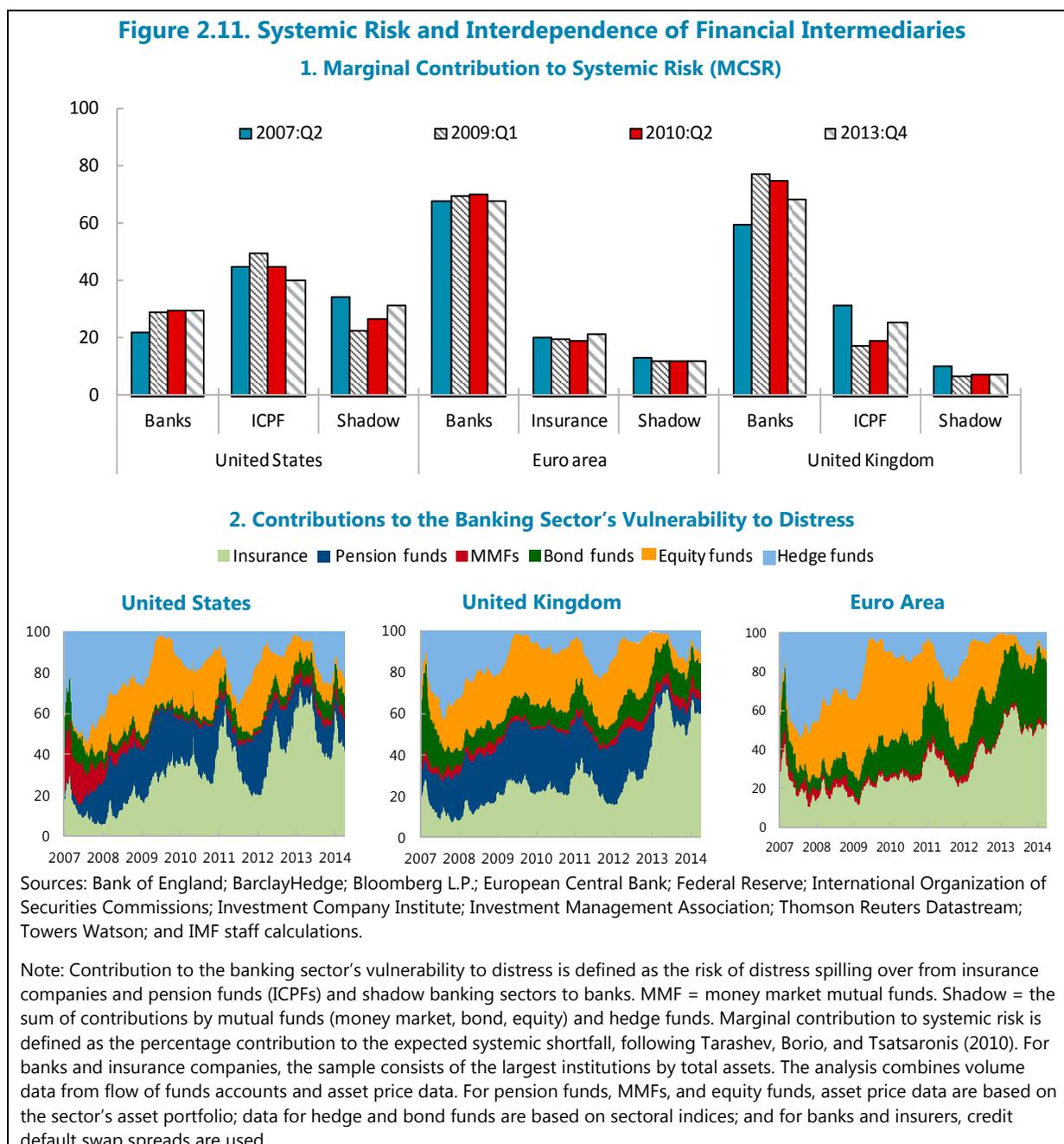
<sup>24</sup> See Segoviano and others (forthcoming) for more details on methodology and results.

<sup>25</sup> The MCSR is not a directional measure—that is, it does not imply causality (for example, it can be driven by a third factor). The MCSR from a particular sector represents the percentage of total systemic risk attributed to that sector. The sum of the MCSR of all sectors equals 100 percent. MCSR is based on the (Shapley-value-based) risk attribution methodology proposed by Tarashev, Borio and Tsatsaronis (2010). For the purpose of this analysis, the system’s “expected shortfall” (ES) is chosen as the measure of systemic risk in the financial system. The systemic ES takes into account the size of each sector (bank and nonbank) in the system and sector interconnectedness. The ES represents the (average) extreme loss to the system that occurs with a probability of 1 percent (or less).

<sup>26</sup> This is commensurate with these sectors’ relative sizes and, especially as regards pension funds, the fact that this sector has large holdings of relatively less liquid fixed-income instruments, such as corporate bonds (similar in size to holdings of U.S. banks).

<sup>27</sup> The contribution to systemic risk also includes “shadowy activity” by banks.

percent and 7 percent, respectively. The contribution of different sectors to systemic risk is fairly stable over time.



**31. The contribution of the shadow banking sector to banks’ vulnerability to distress is more elevated around crises.** During stress periods in the United States, the contribution of the asset management sector (especially MMFs in 2007 and hedge funds in 2007–08) appears to increase, likely because of redemption pressures that lead to fire sales of their assets. In the euro area, hedge funds as well as insurers seem to have contributed substantially to the vulnerability to

distress in the banking sector in 2007–08, but the role of hedge funds was subsequently superseded by that of the equity and bond fund sectors (the latter is in line with the balance sheet risk measures in the previous section). In the United Kingdom, the overall contribution to the banking sector’s vulnerability to distress between 2007 and 2012 appears equally divided between insurance companies, pension funds, and equity funds; subsequently, insurance companies became the largest contributor.

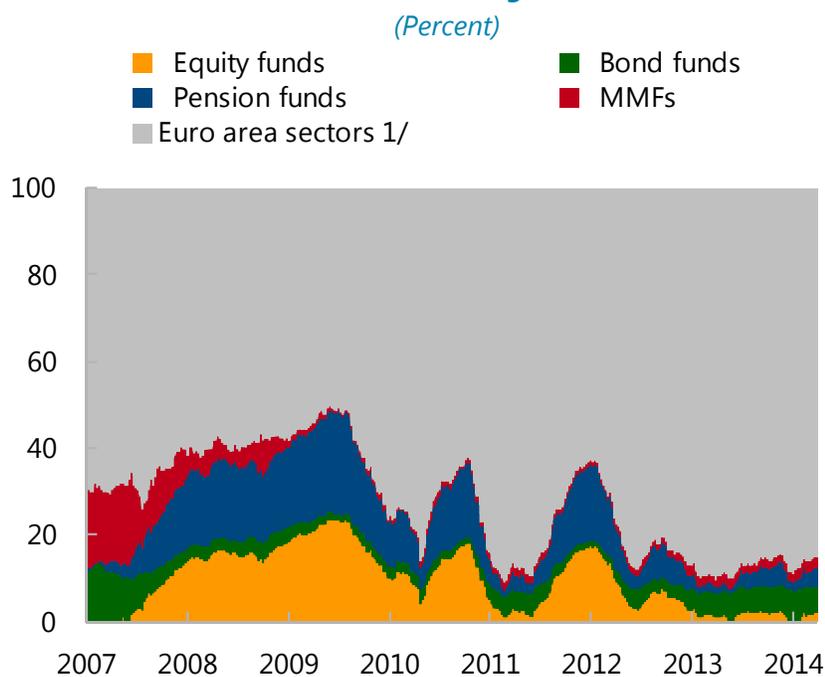
**32. The growing contribution of the insurance sector to the banking system’s vulnerability to distress may reflect growing similarities in exposure, partly because insurance companies have been engaging more in lending to companies.** As discussed earlier (Box 2.2), this lending has often been channeled through the shadow banking system.<sup>28,29</sup> Moreover, insurance companies have become the dominant purchaser of collateralized loan obligations as banks’ interest in such securities has declined. Similarly, in the United States, life insurance companies are the largest investor in the corporate bond market (see Chapter 1). The insurance sector’s overall contribution to systemic risk has, however, remained broadly stable since 2007.

**33. An assessment of cross-border spillover reveals significant but declining linkages between U.S. shadow banks and the European banking system.** The euro area banking sector’s vulnerability to distress from shocks to U.S. financial intermediaries and shadow banks was elevated in the period leading up to the global financial crisis as a result of MMF funding of euro area banks (Figure 2.12) but has recently been falling. Since the start of 2012, the most important contribution from the U.S. shadow banking sector to euro area banking distress vulnerability has come from U.S. bond funds seeking exposure to European sovereign risk in the context of enhanced confidence following the announcement of the Outright Monetary Transactions program by the European Central Bank. Still, the relative contribution of these U.S. funds compared with European funds remains much below their pre-2009 levels.

<sup>28</sup> A greater exposure to common risks would be reflected in a higher contribution to banking system distress vulnerability, without implying a causal direction. More broadly, the finding is also in line with those of Acharya and Richardson (2014), who argue that the insurance industry is no longer traditional: it now offers products with nondiversifiable risk, is more prone to a run, insures against economy-wide events, and has expanded its role in financial markets.

<sup>29</sup> The International Association of Insurance Supervisors has developed a framework of policy measures for global systemically important insurers to increase their loss absorbing capacity, mainly because of engagement in nontraditional insurance and noninsurance activities.

**Figure 2.12. U.S. Intermediaries' Contribution to Distress Vulnerability of the Euro Area Banking Sector**



Source: IMF staff calculations.

Note: See Figure 2.11.

1/ Remaining contributions to the euro area banking sector's vulnerability to distress come from euro area financial sectors (see Panel 2 of Figure 2.11 for the breakdown).

## WHAT SHOULD BE THE ROLE OF REGULATION AND OVERSIGHT?

**34. The challenge for policymakers is to maximize the benefits of shadow banking for the economy while minimizing its systemic risks.** As outlined earlier, shadow banking entails potential externalities and market failures that are unlikely to be solved privately. Policymakers must strike the right balance between containing systemic vulnerabilities related to these risks (see the previous section) and preserving the benefits of shadow banks, including the provision of financing to the real economy. Overall, the degree to which shadow banking requires regulation and oversight depends largely on the degree to which it contributes to systemic risk.<sup>30</sup>

**35. The monitoring of shadow banking should be part of the macroprudential policy framework that aims to address systemic stability risks more broadly.** Differences in legal and regulatory structures imply that a type of firm considered to be a bank in one country may be

<sup>30</sup> Investor protection is another motive for regulation and oversight.

regarded as a shadow bank in another.<sup>31</sup> Moreover, as discussed earlier, risk characteristics of shadow banking activities can differ substantially depending on the context in which they are conducted. Therefore, a one-size-fits-all approach to shadow banking regulation is not likely to work.<sup>32</sup> Nonetheless, this chapter has shown that the drivers of shadow banking growth have been fundamentally similar across countries and types of activities (albeit to different degrees). This suggests the need for an encompassing policy framework to minimize the scope for regulatory circumvention induced by the so-called boundary problem.<sup>33</sup> In this vein, macroprudential policy may be best suited to address shadow banking risks, building on recent progress in this area (IIF 2011; IMF 2013). Notably, dedicated macroprudential oversight agencies have been established in many countries, and macroprudential policy frameworks—aimed at identification and response to nascent threats to financial stability—have improved substantially since the global financial crisis.

**36. A decomposition of shadow banking entities and activities by function and level of risk may serve as a guide to identify systemic stability risks** (see section on balance sheet risk measures and the FSB high-level policy framework, FSB 2013a). Credit intermediation activities that involve significant maturity or liquidity transformation, imperfect credit risk transfer, or excessive leverage should be subject to additional regulation and oversight. Moreover, given the role of liquidity conditions and the search for yield in driving shadow banking growth discussed earlier in the chapter, macroprudential policymakers should be alert to interactions with other policies affecting financial stability, including monetary, fiscal, and structural policies (IMF 2013).

**37. Policymakers have essentially four tool kits at their disposal to address financial stability risks related to shadow banking.** First, they may impose regulations on shadow banks or address risks indirectly by targeting banks' exposures to shadow banks. Second, they may address the underlying causes of the growth of shadow banking. Third, they may, under certain conditions, extend the public safety net to (systemically) important shadow banking markets or entities. Fourth, they may change certain features of bankruptcy laws. Depending on the risks to be addressed, these various tool kits may need to be used simultaneously:

- *Regulation:* Policymakers can regulate shadow banks either directly, through tailored regulatory measures, or indirectly, by extending the regulatory boundary, limiting the ability of banks to

<sup>31</sup> A narrow definition of a bank includes taking deposits and making loans (for example, as applied in the European Union's Capital Requirements Regulation). However, licensing requirements to perform certain activities and therefore the perimeters of banking supervision differ across countries. Countries using a broader definition of a bank require that firms hold a banking license to engage, for example, in factoring, securities underwriting, private equity financing, and extending financial guarantees.

<sup>32</sup> Financial sector entities operate under different legal forms and regulatory regimes, complicating a harmonized treatment.

<sup>33</sup> The boundary problem implies that tightening of prudential requirements for entities within the regulatory perimeter comes with incentives to shift activities outside it or to areas where regulation and supervision are weakest (Goodhart 2008; Goodhart and Lastra 2010). Croatia provides a case in point. As a result of a credit growth cap imposed on banks in 2003, bank credit growth slowed, but the annual growth of the loan and financial lease portfolio of domestic leasing companies exceeded 100 percent in 2003 and 40 percent in the next two years (Galac 2010). In 2007, the credit growth cap was expanded to cover funding of leasing companies.

support shadow banking activities, or by managing the implicit government guarantees of banks (Claessens and Ratnovski 2014). For example, shadow banking growth related to regulatory arbitrage (discussed earlier) could be curbed by applying prudential bank-like regulatory tools such as capital requirements to shadow banks. Specific risks can be mitigated through tools such as redemption limits for collective investment vehicles or restrictions on leverage and maturity or liquidity transformation. Enhancing reporting requirements may raise overall transparency and allow for better risk monitoring. The possibility of cross-border spillovers requires authorities to coordinate closely with their foreign counterparts. The lack of a safety net means that, for a given contribution to systemic risk, more conservative regulatory measures are needed for shadow banks than for banks. The FSB's regulatory work on shadow banking regulation, summarized in Annex 2.4, aims to achieve these goals.

- *Addressing the underlying causes:* Supply-side and demand-side measures are a more indirect but potentially powerful way of addressing shadow banking stability risks. Applying such measures would require intensive coordination with authorities in charge of monetary, fiscal, and structural policies. Demand-side measures tackle the factors stimulating the growth of shadow banking, as discussed earlier. For example, the demand for shadow banking assets that arises from safety considerations (for example, by institutional cash pools) could be redirected by ensuring a sufficient supply of publicly generated safe assets (Pozsar 2011).<sup>34,35</sup> However, among other complications, this may entail moral hazard risks, as the private sector may come to expect such demand accommodation by the government (Singh 2013). Measures on the supply side include imposing restrictions on new instruments. A discussion of the conduct of monetary policy is beyond the scope of this chapter, but evidence presented earlier on the role of the search for yield suggests that, at a minimum, macroeconomic conditions need to be taken into account by policymakers when assessing the development of shadow banking.
- *Access to central bank facilities:* In principle, it is conceivable to extend the lender-of-last-resort function to certain kinds of systemically important shadow banks to protect the financial system against liquidity shocks (Bayoumi and others, 2014).<sup>36</sup> However, extending access to central bank funding entails substantial moral hazard risks. Therefore, explicit public backstops should be considered only if appropriate regulatory oversight mechanisms are in place, including for collateral and governance.<sup>37</sup>

<sup>34</sup> Claims on the private sector are inherently risky, so public debt may be a better basis for the production of safe assets and may provide better protection against negative aggregate shocks, which tend to degrade private label safe assets (Bernanke and others 2011; Gourinchas and Jeanne 2012).

<sup>35</sup> A sufficient supply of public safe assets can be achieved in two ways. First, the sovereign could expand its supply of safe assets. Second, improving fiscal policies could increase the share of existing assets that qualify as safe.

<sup>36</sup> Emergency lending assistance should be at the discretion of the central bank, involve heightened regulatory intervention, and should have a clear justification in terms of the central bank's authority. Moreover, it should be appropriately priced and not be provided on more favorable terms than available to banks.

<sup>37</sup> Expanding the list of nonbank counterparties to which central banks can provide liquidity could have unanticipated consequences for the structure and operation of the financial system (Bayoumi and others 2014). Liquidity provided

(continued)

- *Changes to bankruptcy regimes and privileges:* Ordinary insolvency law may not provide for the specific recovery and resolution tools needed to manage systemic failures of shadow banking entities or activities. Setting up tailored recovery and resolution frameworks would increase the authorities' ability to mitigate systemic risk in crisis situations.<sup>38</sup> Bankruptcy privileges such as safe harbor status allow shadow banks to provide their lenders with safe, money-like assets (similar to insured deposits of regulated banks, Perotti 2011).<sup>39</sup> Prudential policies to contain the risk associated with safe harbor status mostly aim at restricting eligibility. Safe harbor exemptions may also be restricted to certain market segments or transactions, such as claims publicly registered with a central repository, or backed by liquid collateral (Perotti 2011; Duffie and Skeel 2012; Perotti 2013). Alternatively, to maintain the eligibility of less liquid collateral and to facilitate an orderly resolution, an authority could be established to dispose of collateral (Acharya and Öncü 2012). Pursuing changes to bankruptcy privileges requires a careful impact assessment for shadow banks and could have potentially far-reaching consequences for other sectors as well.

**38. Policymakers will have to better integrate the entity and activity dimensions of shadow banking regulation.** Monitoring and risk identification should focus primarily on economic functions and activities, but regulation and supervision have so far mostly focused on entities. This has been recognized by the FSB (see Annex 2.4).<sup>40</sup> Doing so may help overcome the boundary problem and reduce the scope for regulatory arbitrage (Figure 2.13, Greene and Broomfield 2014).<sup>41</sup> Regulators need to consider the characteristics of the entities pursuing the activities to be regulated. For example, highly leveraged entities engaged in a certain activity may need stricter rules than entities that are less leveraged. In the same vein, certain risky activities may be tolerable if carried out by highly capitalized entities. Moreover, entity- and activity-based reforms influence each other. For example, reforming securities financing transactions might make it unnecessary to impose leverage limits on entities that mainly use repos to obtain leverage. As noted, complex and detailed rules governing entities or activities increase opportunities for regulatory circumvention (Tucker

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to structurally weak and insufficiently robust markets may shift risks to the central banks (Grung-Moe 2014). It may also prove politically difficult to establish a public safety net if shadow banking garners little public support on account of limited (tangible) economic benefits, against potentially large contingent liabilities for the government. Moreover, large heterogeneity within the shadow banking sector and difficulty identifying appropriate cost sharing mechanisms may deter the shadow banking industry from entering into safety net arrangements.

<sup>38</sup> See FSB (2013d) for details on potential key attributes of effective resolution regimes for shadow banks.

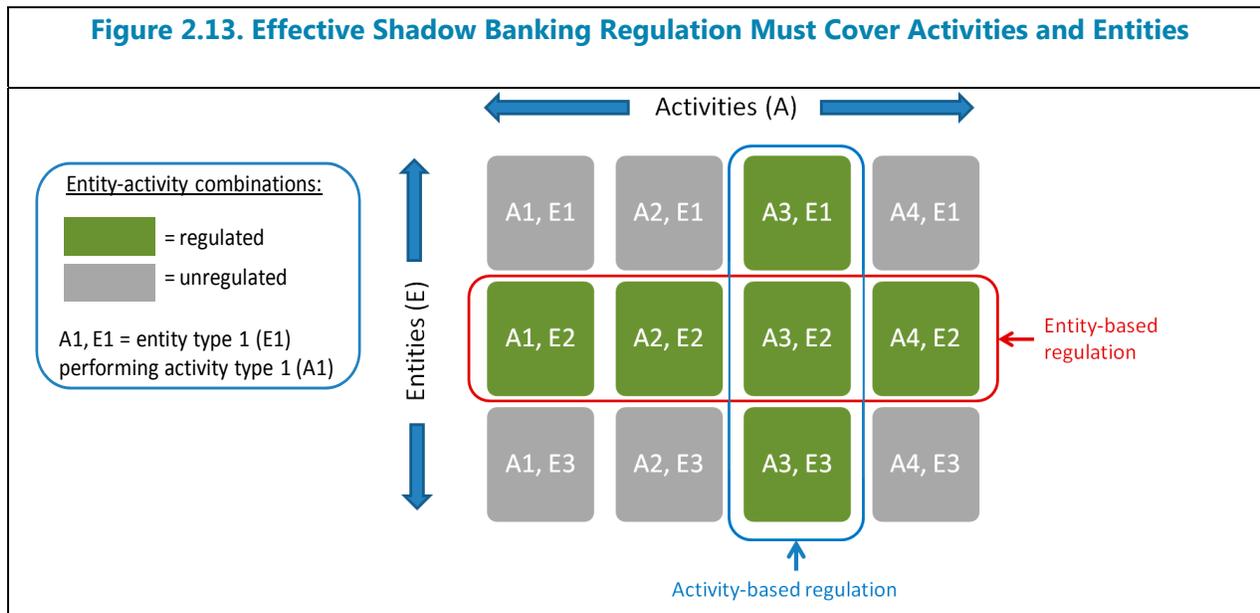
<sup>39</sup> General bankruptcy law prohibits a lender from taking action to collect the amount owed by the borrower once a firm files for bankruptcy. Claims enjoying safe harbor privileges are granted an exemption to this rule and afford lenders a position senior to those of other investors (Duffie and Skeel 2012; Perotti 2011).

<sup>40</sup> For example, the FSB has covered repo and securitization activities, and its work on "other" shadow banking entities is largely activity-/functions based.

<sup>41</sup> To account for network effects and to prevent the migration of activities within one sector, the entity dimension should focus on sectors and not on single entities. Similarly, to capture all transactions that fulfill a function, the activity dimension should focus on clusters of activities (for example, lending that is dependent on short-term funding) instead of on a single narrowly defined activity (such as lending funded by commercial paper).

2014). Indeed, given the dynamic nature of shadow banking, the current architecture of financial regulation may soon need to be revisited (Schwarcz 2014).

**Figure 2.13. Effective Shadow Banking Regulation Must Cover Activities and Entities**



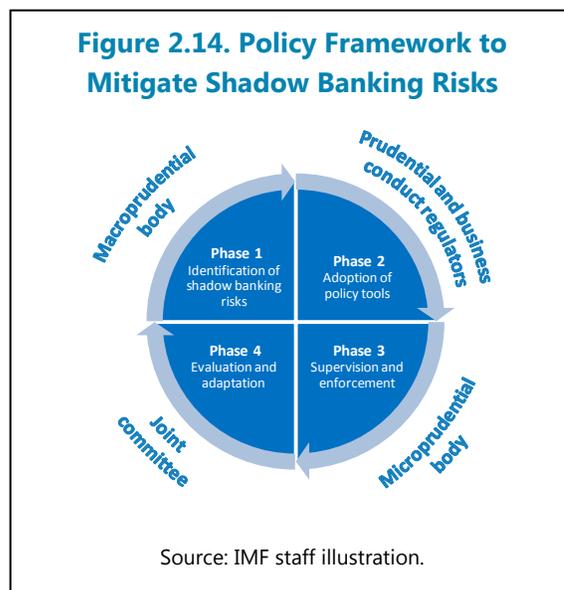
Source: IMF staff illustration.

Note: The figure shows four activity types (A1–A4) and three entity types (E1–E3). Entity-based regulation that covers only entity type E2 would miss the migration of, say, activity type A3 from E2 to E1; but that migration would be picked up by activity-based regulation covering A3. Similarly, activity-based regulation that covers activity type A3 would miss situations in which covered entities (E1–E3) migrate to activities, say A2, that are not covered but have similar economic outcomes.

**39. Addressing shadow banking risks involves close cooperation with microprudential and business conduct regulators.**

One possible approach to implement a regulatory response to shadow banking proceeds in four phases (Figure 2.14): (1) identification of systemic risks based on broad financial sector surveillance by the macroprudential authority; (2) consideration and possible adoption of policy measures comprising prudential, business conduct, and nonregulatory measures;<sup>42</sup> (3) supervision and enforcement, relying on the expertise of the microprudential authorities; and (4) an evaluation phase, in which micro- and macroprudential as well as conduct authorities assess the effectiveness of previous policy measures and relay the findings to their international counterparts. Policymakers should regularly conduct this

**Figure 2.14. Policy Framework to Mitigate Shadow Banking Risks**



Source: IMF staff illustration.

<sup>42</sup> Nonregulatory measures include targeted communication to the public, improved transparency and disclosure, improved risk governance, and/or new industry-wide standards (IIF 2011).

dynamic exercise (perhaps once a year) to update their view on the risks posed by different activity-entity combinations and act on the conclusions drawn, including the adoption of new measures and the removal of outdated ones. The methodology proposed earlier in this chapter may be useful in this respect.

**40. Granular data are a prerequisite for effective regulation and supervision.** The assessment of risks in this chapter was limited by the availability of detailed data on assets and liabilities as well as structural features (such as redemption policies or benchmark orientation) at the firm and sector level. Policymakers should aim to close these data gaps, in particular information that would allow for a more accurate assessment of maturity-, liquidity-, and credit risks, as well as leverage in the financial system; monitoring of common exposures and interconnectedness; and broad financial system stress-tests.<sup>43</sup> As a first step, sectoral and flow of funds accounts need to be revamped, in the context of the G-20 Data Gaps Initiative and the FSB's annual shadow banking monitoring exercise.

**41. Finally, strong international policy cooperation is needed to prevent cross-border regulatory arbitrage and address risks to global financial stability.** Risks are more likely to increase when regulatory initiatives are implemented by only a few countries, or when they are poorly coordinated. Regulatory changes in one country, for example, might lead to spillovers and increased risks in others. Important steps that have already been taken toward international policy coordination include the FSB process for data sharing; peer reviews conducted under the auspices of the International Organization of Securities Commissions on the progress of national regulatory reforms for MMFs; and the establishment of an international oversight group under the nonbank, noninsurer G-SIFI framework (FSB 2013b). However, although most FSB-led reforms of shadow banking regulation are near completion at the international level, implementation at the national level has advanced substantially in only a few areas (see Annex 2.4).

## CONCLUSIONS AND POLICY RECOMMENDATIONS

**42. For advanced economies, broad measures of shadow banking point to recent growth, while narrower measures indicate stagnation.** This discrepancy is driven by two opposing forces: a decline in the role of certain activities, such as securitization, and a concurrent expansion of investment funds (included only in the broad measures).

**43. In emerging market economies, shadow banking continues to grow strongly.** To some extent, this is a natural byproduct of the deepening of financial markets, with a concomitant rise in other financial institutions. However, the strong growth in the variety and size of wealth management products in China is also a major force in the observed growth.

<sup>43</sup> See also IMF (forthcoming).

**44. The main factors behind the growth of different types of shadow banking are similar over time and across countries: stringent banking regulation, ample liquidity, and complementarities with the rest of the financial system.** Tighter regulation of banks (such as changes in capital requirements) often induces growth in shadow banking activities. Moreover, low real interest rates and a compression of term spreads tend to be associated with more rapid growth of shadow banks, especially in the context of tighter bank capital rules. In addition, complementarities with the rest of the financial system often play a role. The growth of pension funds and insurance companies is associated with higher growth of shadow banks, possibly reflecting demand for shadow banking services.

**45. Overall, shadow banking is set to grow further in the current environment of tighter bank regulations and low interest rates.** Many indications point to the migration of some activities—such as lending to firms—from traditional banking to the nonbank sector. That is, some of the fastest-growing shadow banking activities substitute for, rather than complement, traditional banking. An example is direct lending by or through a broad range of investment funds. In the long run, demographics and population aging may continue to lead to an increase in assets under management by institutional investors and hence contribute to the sustained growth of shadow banking.

**46. Whether these cyclical and structural developments imply an overall increase or decline in systemic risk is difficult to assess at this juncture—but there are some indications of increased market and liquidity risk in advanced economies.** Overall, the outcome will, inter alia, depend on the degree to which funds engaging in bank-like activities further deepen their liquidity mismatches and become more exposed to run risks, the extent to which these activities involve leverage, and the extent to which concentration increases further (see also Chapter 1). Another factor will be whether transparency in the system improves, allowing investors to assess risks properly (and reduce herd behavior), and regulatory authorities to take appropriate action when needed. In this context, there appears to be a shift in shadow banking toward activities that are less well understood or monitored, which poses challenges for supervisors and regulators. In any case, the appropriate policy response is not to lower prudential standards for banks, but to ensure adequate standards for shadow banks.

**47. So far, in the United States, the (imperfectly) measurable contribution of shadow banking to systemic risk has been significant, but it remains modest in the United Kingdom and in the euro area.** In the United States, the risk contribution of shadow bank activities seems to have been rising while remaining slightly below precrisis levels, while in the euro area and the United Kingdom, this remained more or less constant. Data problems, however, prevent a reliable and comprehensive assessment. The evidence also suggests noteworthy cross-border effects of shadow banking. In emerging market economies, the biggest domestic financial stability risks stem from the growth of shadow banking in China.

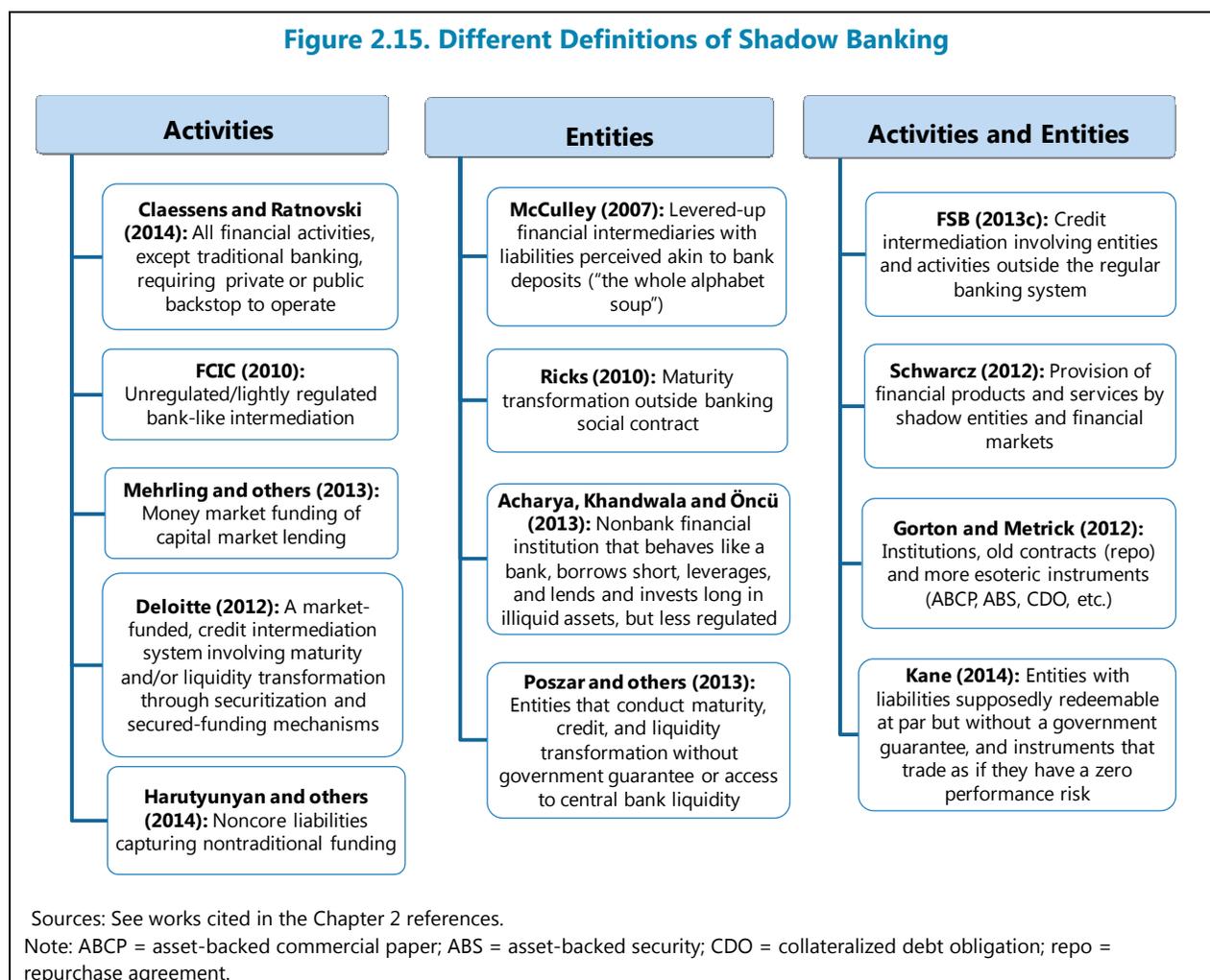
**48. Better integration of the entity and activity dimensions is needed in shadow banking regulation.** The current regulatory reform agenda, led by the FSB, has yielded important progress. However, many of the agreed principles have not yet been implemented nationally, potentially

leading to a migration of risks across countries (for example, to non-FSB jurisdictions) or sectors. To counter such effects, financial sector regulation needs to take a more encompassing view of the financial system. This chapter advocates a macroprudential approach. Moreover, the entity and activity dimensions of shadow banking should be integrated in supervision and regulation. This chapter lays out a concrete framework for collaboration and task sharing among microprudential, macroprudential, and business conduct regulators. International coordination and information sharing between supervisors and regulators must also be enhanced to safeguard global financial stability.

**49. Finally, data gaps remain challenging and need to be addressed.** For example, only five jurisdictions provide statistics on all three shadow banking measures used here. Ideally, balance sheet data on individual entities or sectors would allow for detailed monitoring. A first step forward would be for all country authorities to construct sectoral and flow of funds accounts building on their system of national accounts with sufficient details to assess maturity and liquidity risks as well as interconnectedness. Expanding the reporting of monetary data would also aid in obtaining a macro view of shadow banking. All this would further the understanding and monitoring of different aspects of shadow banking.

## Annex 2.1. Shadow Banking Definitions

50. This annex provides a schematic summary of the different definitions and perspectives on shadow banking (Figure 2.15) and discusses in detail the new definition based on the concept of noncore liabilities.



### Noncore liabilities approach to measuring shadow banking

51. **Noncore liabilities provide a measure of the shadow banking system (SBS).** Noncore liabilities (funding sources) cover all bank and nonbank financial institutions (Harutyunyan and others, forthcoming).<sup>44</sup> Core liabilities represent the traditional financial intermediation function of the banking system. These liabilities are defined as the funding that intermediaries traditionally draw

<sup>44</sup> This approach expands the concept of “noncore” liabilities developed in the recent literature by Shin and Shin (2011).

on, namely regular deposits of “ultimate creditors.”<sup>45</sup> Other depository corporations are the most common issuers of these types of core liabilities.<sup>46</sup>

**52. Noncore liabilities encompass sources of funding for the financial system that fall outside the core liabilities definition.** The financial corporations that are issuers of noncore liabilities in this approach are also other depository corporations, including money market mutual funds (MMFs) and all other financial corporations<sup>47</sup> except (1) insurance companies, (2) pension funds, and (3) non-MMF investment funds. The latter three types are excluded because of the specific nature of the financial intermediation services they provide, which is different from both traditional and shadow banking. The main financial instruments that are considered to be components of noncore liabilities are debt securities, loans, MMF shares, and a small portion of restricted deposits (that is, deposits excluded from broad money). Finally, the holders of noncore liabilities consist of the ultimate creditors, as noted above, plus all nonresident sectors.

**53. One advantage of the noncore liabilities approach is that it captures nontraditional financial intermediation that occurs within traditional banks, thus filling a gap in the estimation of the size and interconnectedness of the SBS.** For example, if a bank establishes a special purpose vehicle to securitize a portion of its balance sheet, those securities would be captured by existing methodologies attempting to measure nontraditional intermediation. However, if the bank were to securitize directly, those securities would not be captured. This approach does not distinguish between the institutions that issue the liabilities. Instead, it focuses on funding sources that diverge from the traditional financial intermediation model of collecting deposits.

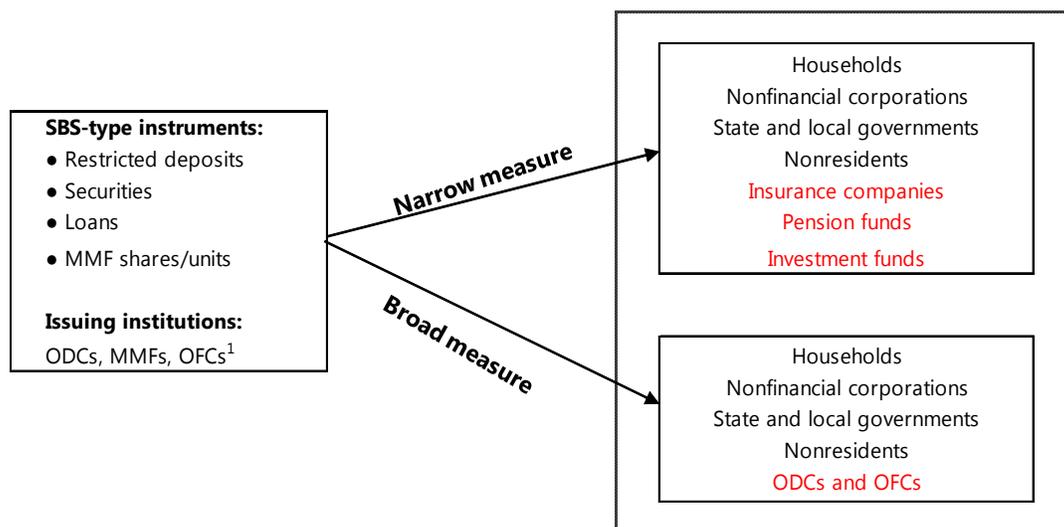
**54. Another important advantage of this approach is that it can be constructed to include intrafinancial sector positions (the broad measure of noncore liabilities) or exclude them (the narrow measure).** Including intra-SBS positions is useful for the assessment of financial stability because the gross size of the SBS reflects its total exposure and its level of interconnectedness. Nonetheless, including them may overstate the importance of the SBS in the overall financial system, in particular the level of exposure to the real economy or vice versa. Thus, the two measures can be seen as complementary in providing the upper and lower estimates of the size and interconnectedness of the SBS in a given jurisdiction. Figure 2.16 provides an overview of the broad and narrow measures.

<sup>45</sup> Shin and Shin (2011) define ultimate creditors to include resident households, nonfinancial corporations, state and local governments, insurance corporations, pension funds, and investment funds.

<sup>46</sup> As defined in the IMF’s *Monetary and Financial Statistics Manual* (MFSM), the other depository corporation subsector consists of all resident financial corporations (except the central bank) that engage in financial intermediation and that issue liabilities included in broad money. Examples include commercial banks, credit unions, and mortgage banks.

<sup>47</sup> The MFSM defines other financial corporations as a diverse group of resident financial corporations that provide financial services, either through intermediation or auxiliary services, and that do not issue liabilities included in broad money.

**Figure 2.16. Components of Broad and Narrow Measures of Noncore Liabilities**



Source: IMF staff illustration.

Note: MMF = money market mutual fund; ODC = other depository corporation; OFC = other financial corporation; SBS = shadow banking system.

<sup>1</sup> OFCs exclude insurance corporations, pension funds, and non-MMF investment funds. The box on the left shows the issuers and types of instruments included in both the narrow and broad measures of noncore liabilities. The distinction between the two measures is derived from the counterparties, shown inside the box on the right. Both measures include ultimate creditors and nonresidents as counterparties. The narrow measure includes only a subset of the OFC sector, while the broad measure includes all OFCs and all ODCs.

## Annex 2.2. Shadow Banking Entities, Activities, and Risks

**55. This annex describes various nonbank financial institutions and activities in the shadow banking system and discusses in broad terms the key dimensions of their risks to financial stability.**

**56. Money market mutual funds (MMFs) are open-end mutual funds that invest in short-term debt securities, including government securities, commercial paper, certificates of deposits, repurchase agreements, short-term bonds, and other money funds.** In some markets, such as in the United States, MMFs are closely connected to other financial institutions because they play a pivotal role in short-term funding markets. The MMF business model and risk profile are similar to those of banks. They undertake credit risks and maturity and liquidity transformation, although regulations seek to limit MMF exposures to losses due to credit, market, and liquidity risks. While returns to MMFs are typically not guaranteed, their shareholders often perceive them as short-term, liquid, deposit-like instruments. As a result, given their lack of deposit insurance or access to liquidity facilities, uncertainty over their asset value could stress MMFs through large-scale redemptions. When redemptions spread to the broader financial system, the functioning of the short-term funding markets can be severely disrupted.

**57. Other investment funds act primarily as fiduciary agents, investing in a range of assets on behalf of clients, who bear the risk of loss.** Asset management companies may maintain proprietary trading positions with limited transparency, but their proprietary balance sheet is typically much smaller than their funds' assets under management. Most mutual funds are not very leveraged and do not directly engage in credit transformation. Most investment funds are open-end funds whose shareholders may redeem their shares freely at the fund's net asset value. A loss of confidence and massive redemptions—namely a run—may not necessarily cause a fund failure because it can respond by selling securities and absorbing valuation losses (through a decline in its net asset value). However, such events could lead to a fire sale of portfolio assets—especially when portfolio assets are illiquid—and adversely affect other market players. The fund's parent asset management company can also be affected, as well as other funds in the same family that share redemption lines of credit and risk management frameworks. Funds may be interconnected with other financial institutions and therefore propagate shocks, whether they originate in the industry or not. Interconnectedness can stem directly from counterparty risk—for those engaged in securities lending, repurchase transactions (repos), and derivatives and from investment in other financial institutions' securities—or indirectly from fire sales of assets held by various financial institutions.

**58. Broker/dealers trade securities on their own account or on behalf of customers.** They are usually more highly leveraged than banks through the use of short-term secured lending arrangements, such as reverse repos. In periods of stress, liquidity runs may undermine their funding model and cause systemwide fire sales.

**59. Real estate investment trusts (REITs) are special purpose companies that own income-producing real estate or mortgages.** They come in two varieties: equity REITs, which own and

manage real estate properties, and mortgage REITs, which rely on short-term funding to finance their mortgages holdings. Mortgage REITs in particular engage in leveraged maturity transformation by relying on short-term repo funding—some of which is channeled indirectly from MMFs via securities dealers—to finance their longer-term, less liquid assets (see the October 2013 GFSR).

**60. Securitization is a process that involves repackaging portfolios of cash-flow-producing, illiquid financial instruments (often loans) into special purpose vehicles funded by issuing securities (liquidity transformation).**<sup>48</sup> Credit transformation is achieved through diversification and the use of various credit enhancements. For example, portfolio cash flows can be divided into tranches that pay out in a specific order, starting with the senior (least risky) tranches and working down through one or more “mezzanine” tranches, and then to the equity (most risky) tranche. If some of the expected cash flow is not forthcoming (for example, because some loans default), after any cash flow buffers are depleted the payments to the equity tranche are reduced. If the equity tranche is depleted, payments to holders of the mezzanine tranche are reduced, and so on, up to the senior tranches. The amount of loss absorption provided by the equity and mezzanine tranches is structured so that it is unlikely that the senior tranches do not receive their promised payments. Credit enhancement is also achieved with credit puts from banks and monoline insurance.

**61. Not all securitization structures involve maturity transformation.** Most asset- and mortgage-backed securities and collateralized debt obligations simply pass cash flow through from the loan to the security holders. However, before to the recent global financial crisis, some *asset-backed commercial paper conduits (ABCPs)* and most *structured investment vehicles (SIVs)* issued short-term paper to fund positions in long-term assets. Hence, they were highly exposed to rollover risk. Investor demand for senior tranches was spurred by inappropriate AAA /Aaa ratings assigned by the major rating agencies (Fender and Kiff 2005). Although securitization transactions are not themselves leveraged, until accounting rules were recently changed in many jurisdictions, banks could use securitization to effectively leverage up their balance sheets (Beccalli, Boitani, and Di Giuliantonio 2014).

**62. Hedge funds are investment pools, typically organized as a private partnership, that face few regulatory restrictions on their portfolio and transactions.** Hence, compared with more regulated institutions, hedge funds use a wider variety of investment techniques in their effort to boost returns and manage risks. Credit-oriented hedge funds undertake long, short, and leveraged positions in fixed-income securities and may also engage in direct lending activities, but typically to a lesser extent. These hedge funds face fire sale risks and possible redemption risks, though the use of redemption gates helps alleviate these risks to some extent.

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<sup>48</sup> Special purpose vehicles are limited-purpose legal entities into which firms transfer assets and/or through which they carry out specific activities or transactions. The vehicles and conduits fund themselves by issuing securities to investors in the capital markets and are structured so that the transferred assets are not at risk if either the firm or the vehicle or conduit becomes insolvent, so the issued securities are usually viewed as less risky than those of the sponsor.

**63. Private equity funds manage large asset portfolios and may provide direct lending to smaller enterprises and firms that cannot access private capital markets.** Private equity funds do not offer early redemptions and thus are not subject to run risk.

**64. Specialty finance companies provide credit in various segments, such as credit cards, automobile financing, student loans, and equipment leases.** These credit types are often securitized, with demand depending on credit risk and yields offered. They may be subject to rollover risk in the form of early amortization triggers (that is, provisions in, say, credit card receivables-backed securities that require early amortization of principal cash flows if certain events occur).

**65. Repurchase (repo) agreements are contracts in which one party agrees to sell securities to another party and buy them back at a specified later date and repurchase price.**<sup>49</sup> The transaction is effectively a collateralized loan with the difference between the repurchase and sale price representing interest. The borrower typically posts excess collateral (the “haircut”). Dealers use repos to borrow from MMFs and other cash lenders to finance their own securities holdings and to make loans to hedge funds and other clients seeking to leverage their investments. Lenders typically rehypothecate repo collateral, that is, they reuse it in other repo transactions with cash borrowers.<sup>50</sup>

**66. Securities lending involves one party agreeing to lend securities to another party in return for a fee and the posting of collateral in the form of cash or high-quality liquid securities.**<sup>51</sup> Securities lenders are seeking to gain additional revenue from their securities holdings; they may be insurers, pension funds, sovereign wealth funds, and central banks, operating through custodians. Securities borrowers are often short sellers who must borrow the securities to trade (since they need to deliver the securities). They post cash collateral to the securities lender in an amount at least as high as the value of the borrowed securities. Securities lenders then reinvest this cash posted as collateral in money and repo markets.

**67. Repo and securities lending transactions involve both maturity transformation and rollover risk, because the terms of the agreements are typically much shorter than the maturities of the underlying securities.** Rollover risk can be particularly acute during periods of market stress, when collateral values fall while haircuts increase on counterparty risk concerns.

<sup>49</sup> See the October 2010 *Global Financial Stability Report*, particularly Box 2.3, for more details on how repo markets work.

<sup>50</sup> Singh (2013) points out that this collateral reuse effectively “lubricates” the financial system by facilitating financial transactions and contributing to the supply of credit in the economy. In that sense, the collateral can be viewed as high-powered money, in which the haircut is equivalent to a bank reserve ratio and the number of reuses is equivalent to a money multiplier.

<sup>51</sup> Broadly speaking, repo and securities lending transactions are very similar, but repo agreements have fixed end dates and repurchase prices, whereas securities lending transactions typically do not (but are subject to termination on a continuous basis).

## Annex 2.3. Econometric Results

**68. This annex describes the data sources and the methodology used in the empirical analysis and provides key results and findings.**

### Sample coverage and data

**69. Two data frequencies (quarterly and annual) and three data sources were used to measure shadow banking dynamics.**<sup>52</sup> Countries used in the empirical analysis are listed in Table 2.3. Specifics on the data frequencies are as follows:

- *Quarterly data.* The quarterly data set comes mainly from Haver Analytics and national flow of funds data. For most countries, shadow banking activity is measured as financial liabilities of other financial intermediaries and financial auxiliaries adjusted for mutual fund shares (see Table 2.4. for more details). The flow of funds data run from 1990 to 2013.
- *Annual data.* The Financial Stability Board (FSB 2013c) is the source for the annual data. The data are based on national flow of funds and sectoral balance sheet data or national authorities' submission to the FSB when the shadow banking activity is measured as financial assets of other financial intermediaries. The sample consists of 24 countries, of which 14 are emerging market economies and the rest are advanced economies. The data set also has detailed data on financial assets of subsectors of the shadow banking system, including MMFs, broker/dealers, structured investment vehicles, finance companies, hedge funds, other investment funds (equity funds, fixed-income and bond funds, other funds), and "other." The FSB data run from 2002 to 2012.

**70. The main sources of explanatory variables are the IMF's International Financial Statistics and World Economic Outlook databases; the source for regulatory variables is Barth, Caprio, and Levine (2013).** The definition of the variables and sources are provided in Table 2.3 The analysis uses real money market rates and term premia to capture the search-for-yield effect. Various measures of bank regulatory and supervisory policies were used to capture the regulatory arbitrage effect. The regressions control for the macroeconomic environment (real GDP growth) and factors that may affect demand for shadow banking products (growth in total assets of institutional investors and traditional banks).

### Results

**71. The extent to which regulatory arbitrage and search for yield contributed to the growth of shadow banking is formally assessed for a set of advanced and emerging market economies.** To this end a panel regression is run with different measures of shadow banking activity

<sup>52</sup> See Harutyunyan and others (forthcoming) for a more detailed analysis with noncore liabilities.

as dependent variables and possible determinants of shadow banking dynamics found in the literature as explanatory variables. A general specification of a regression model is as follows:

$$\Delta SBS_{jt} = \alpha_1 MONPOL_{jt-1} + \alpha_2 MACRO_{jt-1} + \alpha_3 REG_{jt-1} + \alpha_4 OTHER_{jt-1} + \text{Fixed effects} + \varepsilon_{jt}, (2.1)$$

in which  $\alpha_k$  ( $k = 1, \dots, 4$ ) are coefficients (or coefficient vectors) to be estimated, and  $\varepsilon_{jt}$  is an error term for the shadow banking (sub)sector in country  $j$  at time  $t$ . The dependent variable,  $\Delta SBS_{jt}$ , is the real growth in the size of the shadow banking system.<sup>53</sup> *MONPOL* refers to the general monetary stance measured by real interest rates. In addition to the real interest rate, the term spread is used to capture the search-for-yield effect.<sup>54</sup> *MACRO* refers to general macroeconomic and financial market factors (including real GDP growth and global liquidity conditions). *OTHER* captures the real growth rate of the size of other financial sectors to account for possible links between traditional banks and shadow banks and to control for the demand for shadow banking products from institutional investors such as insurance companies and pension funds. *REG* includes variables related to banking sector regulation and supervision, capturing regulatory circumvention.<sup>55</sup> A separate set of regressions was estimated to examine various interaction effects, such as between the monetary stance and regulatory variables and between regulatory and supervisory variables. Standard errors are Driscoll and Kraay (1998) standard errors robust to heteroscedasticity, autocorrelation with MA(q), and cross-sectional dependence.

**72. The growth rate of shadow banking is affected by search for yield (after 2008) and regulatory circumvention, controlling for macroeconomic, financial, and demand factors.**<sup>56</sup> In the flow of funds data regression, real GDP, the growth rate of banking sector assets, and the growth rate of institutional investors have the expected signs and are significant (benchmark specification, column 1 of Table 2.5). The variables capturing the monetary policy stance, namely the real interest rate and the term spread, also have the expected sign but appear significant only after 2008.<sup>57</sup> The benchmark regression is expanded to include regulatory variables for the banking sector

<sup>53</sup> Year-over-year growth rates using quarterly flow of funds data and annual FSB data are used. Quarterly growth rates on flow of funds data were also tried. The results are almost the same as in the regression with yearly growth rates but the explanatory power of these models is lower since quarterly rates are in general much more volatile than yearly rates.

<sup>54</sup> Monetary conditions indices and shadow interest rates (calculated using a simple Taylor rule) were tried instead of real interest rates. Overall, the results do not change by much.

<sup>55</sup> Due to high cross-correlation, the regulatory and supervisory variables are added one by one to the benchmark regression that includes real GDP, size of the banking sector, size of institutional investors, real interest rates, and term spread. Moreover, because of high correlation with fixed effects, the regressions with regulatory variables do not contain fixed effects.

<sup>56</sup> Other measures of the dependent variable (the size of the shadow banking system relative to total financial system assets or GDP and the ratio of shadow bank lending to total financial sector lending) yield counterintuitive results: the sign of the coefficients changes according to whether fixed effects or trend are included; many regulatory variables have unexpected signs; and many macroeconomic and financial variables are insignificant. Moreover, specifications with interaction terms did not produce consistent results.

<sup>57</sup> Since the flow of funds data set includes mostly advanced economies, no regressions were run on these data to examine advanced versus emerging market economies separately.

(columns 2–5 of Table 2.5). Banks' capital stringency measures have a significant positive impact on shadow banking growth.<sup>58</sup> High transparency in bank financial statements has a significant negative impact.

**73. The results of the regression using FSB annual data generally support the results using the quarterly flow of funds data.** Given their annual frequency, the fact that they are not available before 2002 and their coverage of fewer countries, the FSB data can support only limited inferences. For the aggregate shadow banking measure, results broadly confirm our prior results ("All" column of Table 2.6). Regulatory variables are generally not significant, probably as a result of limited variation in the covered period.<sup>59</sup> The chapter examined separately the growth in certain subsectors of the shadow banking system: money market mutual funds, investment funds, and special purpose vehicles (remaining columns of Table 2.6). The results suggest that banking growth is not important for the growth of MMFs; negative for investment funds (in line with the notion that they substitute for, rather than complement, banks); and positive for securitization (probably because special purpose vehicles have been frequently sponsored or owned by banks). In contrast, the growth of institutional investors is strongly correlated with the growth of both MMFs and investment funds (in line with the institutional cash pool view) but less so with the growth of securitization. The compression of the term spread is significant for all three subsectors, but it is most strongly (negatively) associated with securitization. The impact of bank capital regulations is significant only for MMF growth.

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<sup>58</sup> The overall capital stringency index measures whether capital requirements reflect certain risk elements and deducts certain market value losses from capital before determining minimum capital adequacy. The capital regulatory index is constructed as a combination of the overall capital stringency index and an assessment of whether certain funds may be used to initially capitalize a bank.

<sup>59</sup> For illustrative purposes, this annex shows the results for the regressions including the overall capital stringency index.

**Table 2.3. List of Economies Used in the Empirical Analysis**

<b>FSB measure</b>	<b>Flow of funds measure</b>	<b>Noncore Liabilities</b>
<b>Advanced Economies</b>	<b>Advanced Economies</b>	<b>Advanced Economies</b>
Australia	Australia	Austria
Canada	Austria	Belgium
Euro Area <sup>1</sup>	Belgium	Cyprus
France	Canada	Estonia
Germany	Czech Republic	Euro Area <sup>1</sup>
Hong Kong SAR	Denmark	Finland
Italy	Estonia	France
Japan	Euro Area <sup>1</sup>	Germany
Korea	Finland	Greece
Netherlands	France	Ireland
Singapore	Germany	Italy
Spain	Greece	Japan
Switzerland	Ireland	Korea
United Kingdom	Italy	Luxembourg
United States	Japan	Malta
<b>Emerging Market Economies</b>	Korea	Netherlands
Argentina <sup>2</sup>	Luxembourg	Portugal
Brazil	Malta	Slovak Republic
Chile	Netherlands	Slovenia
China <sup>2</sup>	Norway	Spain
India	Portugal	United Kingdom
Indonesia	Slovak Republic	United States
Mexico	Slovenia	<b>Emerging Market Economies</b>
Russia	Spain	Mexico
Saudi Arabia	Sweden	South Africa
South Africa	United Kingdom	Turkey
Turkey	United States	
	<b>Emerging Market Economies</b>	
	Hungary	
	Lithuania	
	Poland	

Source: IMF staff.

Note: FSB= Financial Stability Board; IFS = IMF, International Financial Statistics database.

<sup>1</sup>Euro area data were not used in the panel estimations.

<sup>2</sup>FSB data for China and Argentina were not available. Data for China were compiled by IMF staff.

**Table 2.4. List of Variables Used in Regression Analysis**

Variables	Description	Data Source
Flow of Funds Shadow Banks	The sum of other financial intermediaries and financial auxiliaries for the flow of funds. For countries that have granular flow of funds data the following definition was used: Australia (other depository corporations, MMFs, securitizers, other financial corporations); Canada (total other privatized financial institutions excluding mutual funds); Japan (bond investment trusts, nonbanks, broker/dealers); Korea (nonbanks-collectively managed funds, finance companies, investment institutions; OFIs, excluding public financial institutions); Norway (MMFs, mortgage companies, finance companies, financial holding companies, and investment companies, excluding state lending institutions); Sweden (other monetary credit market corporations, finance companies, OFIs, excluding housing credit institutions); and the United States (MMFs, GSEs, ABS issuers, GSE pool securities, net securities lending, overnight repos, open market paper).	Haver Analytics
FSB Shadow Banks	FSB definition of OFI that is a sum of MMFs, finance companies, structured finance vehicles, hedge funds, other investment funds, money market corporations, broker/dealers, financial auxiliaries, and other nonbank financial corporations	FSB
Real GDP	Series for Poland and Hungary are seasonally adjusted in Eviews using Hodrick-Prescott filter ( $\lambda = 1600$ ).	WEO
Policy Rate	Monetary policy rate.	Bloomberg L.P.
Money Market Rates	IFS is the main data source except for Austria, Belgium, and Greece (one-month euribor from 1999 used); Estonia (EONIA from 2011); France, Netherlands, Portugal, and Luxembourg (EONIA from 1999); Germany (EONIA from 2012); Hungary (overnight bubor); Malta (EONIA from 2008); Norway (one-week interbank rate from 2009:Q3); Slovak Republic (EONIA from 2009).	IFS
Long-Term Rates	Long-term interest rates.	IFS
Short-Term Rates	Three-month interest rates on Treasury bills, except for Austria and Estonia, where money market rates used.	Thomson Reuters Datastream
CPI	CPI index.	IFS
Inflation Rate	Yoy growth rates of CPI index.	IMF staff estimates
Institutional Investors	Financial liabilities of insurance companies and pension funds from flow of funds data. Assets of insurance companies and pension funds from FSB data.	Haver Analytics; FSB
Global Liquidity Indicators	Global liquidity indicators, quantity data (volume of credit).	IMF (2014a)
Systemic Banking Crisis Dummy	A banking crisis is defined as systemic if two conditions are met: (1) significant signs of distress in the banking system (as indicated by significant bank runs, losses in the banking system, and bank liquidations); and (2) significant banking policy interventions in response to significant losses in the banking system.	see Laeven and Valencia (2013)
Bank Regulatory and Supervisory Variables	Scaled indices of overall capital stringency, capital regulatory index, official supervisory power, and financial statement transparency.	See Barth, Caprio, and Levine (2013)

Source: IMF staff illustration.

Note: ABS = asset-backed securities; BUBOR = Budapest interbank offered rate; CPI = consumer price index; EONIA = effective overnight index average; EURIBOR = euro interbank offered rate; FSB = Financial Stability Board; GSE = government-sponsored enterprises; IFS = IMF, International Financial Statics database; MMF = money market mutual fund; WEO = World Economic Outlook database; yoy = year-on-year.

**Table 2.5. Panel Regression of Shadow Banking Growth: Flow of Funds Sample, 1990–2013**

	Expected Sign	(1)	(2)	(3)	(4)	(5)	(6)
Crisis Dummy	-	-4.09** (1.73)	0.38 (0.77)	0.15 (0.78)	1.26 (1.19)	1.13 (1.10)	0.58 (1.20)
Real GDP Growth (lag 0)	+	0.41* (0.24)	0.53** (0.26)	0.51** (0.25)	0.60*** (0.21)	0.61** (0.27)	0.55*** (0.20)
Banking Sector Size (lag 0)	+	0.36*** (0.10)	0.34*** (0.11)	0.35*** (0.11)	0.34*** (0.12)	0.39*** (0.14)	0.35** (0.14)
Institutional Investors Size (lag 0)	+	0.52*** (0.08)	0.43*** (0.08)	0.42*** (0.09)	0.42*** (0.08)	0.40*** (0.08)	0.41*** (0.09)
Real Short-Term Rate (level, lag 4)	-	-0.04 (0.36)	0.51 (0.70)	0.62 (0.65)	0.43 (0.68)	0.42 (0.79)	0.39 (0.77)
Term Spread (lag 4)	-	0.93 (0.71)	1.26 (0.92)	1.33 (0.85)	0.60 (0.66)	0.62 (0.90)	0.93 (0.85)
Real Short-Term Rate (level, lag 4) and Post-2008 Dummy	-	-0.81** (0.39)	-1.41*** (0.45)	-1.51*** (0.43)	-1.61*** (0.52)	-1.52*** (0.55)	-1.38** (0.52)
Term Spread (lag 4) and Post-2008 Dummy	-	-1.76** (0.77)	-2.48*** (0.75)	-2.45*** (0.73)	-2.08*** (0.62)	-1.84** (0.91)	-2.07** (0.81)
Overall Capital Stringency	+		0.84** (0.40)				
Capital Regulatory Index	+			1.02** (0.47)			
Supervisory Power Index	-				-0.49 (0.47)		
Financial Statement Transparency	+/-					-2.69** (1.08)	
Global Liquidity Quantities (level, lag 4)	+						0.34 (0.76)
Number of Observations		1,501	1,233	1,233	1,234	1,245	1,221
Fixed Effects/Pooled OLS		Fixed	Pooled	Pooled	Pooled	Pooled	Pooled
R Squared		0.29	0.25	0.26	0.25	0.26	0.25
Number of Countries		29	29	29	29	29	29

Source: IMF staff calculations.

Note: \*\*\*, \*\*, \* indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Standard errors use Driscoll and Kraay (1998) adjustments for heteroscedasticity, autocorrelation with MA(q), and cross-sectional dependency.

The estimation period is 1990–2013. Equations are estimated by pooled ordinary least squares (OLS) or fixed effects (within regression). The sample countries are as follows: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Ireland, Japan, Korea, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom, and United States.

**Table 2.6. Panel Regression of Shadow Banking Growth: FSB Sample, 2002–12**

	Expected Sign	All	MMFs	INVs	SPVs
Crisis Dummy	-	-3.28*** (0.98)	-5.30* (2.35)	-3.95 (2.92)	-14.13** (5.57)
Real GDP Growth	+	0.13 (0.21)	0.57 (0.64)	0.14 (0.20)	1.13** (0.37)
Banking Sector Size	+/-	0.43*** (0.04)	0.00 (0.08)	-0.40*** (0.04)	0.48*** (0.06)
Institutional Investors Size	+	0.53*** (0.05)	0.70*** (0.07)	1.27*** (0.05)	0.45*** (0.06)
Term Spread (lag 1)	-	-1.36** (0.46)	-2.69** (0.89)	-2.28** (0.77)	-5.01** (1.87)
Overall Capital Stringency	+	0.22 (0.23)	2.03** (0.69)	-0.60 (0.61)	0.86 (1.26)
Number of Observations		181	153	155	117
R Squared		0.68	0.27	0.64	0.58
Number of Countries		23	21	21	17

Source: IMF staff calculations.

Note: INV = investment fund; MMF = money market mutual fund; SPV = special purpose vehicle. \*\*\*, \*\*, \* indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively. Standard errors use Driscoll and Kraay (1998) adjustment for heteroscedasticity, autocorrelation with MA(q), and cross-sectional dependency.

The estimation period is 2002–12. Equations are estimated by fixed effects (within regression).

The countries in the sample are as follows: Australia, Brazil, Canada, China, Chile, France, Germany, Hong Kong SAR, India, Indonesia, Italy, Japan, Korea, Mexico, Netherlands, Russia, Saudi Arabia, South Africa, Singapore, Spain, Switzerland, Turkey, United Kingdom, and United States.

## Annex 2.4. Regulatory Developments

**74. This annex provides a global overview of shadow banking regulation reform and its implementation in key jurisdictions.**

**75. Developments at the international level have progressed and will be presented to the Group of Twenty emerging market economies in November 2014.** The Financial Stability Board (FSB), in cooperation with other international regulatory bodies, carried out work in five areas:

- *Mitigating banks' interactions with shadow banks.* To appropriately capture banks' interactions with the shadow banking sector, the Basel Committee on Banking Supervision (BCBS) is improving its frameworks for (1) prudential consolidation, (2) measuring and controlling banks' large exposures, and (3) capital requirements on banks' equity investments in funds.
- *Reducing the susceptibility of money market mutual funds (MMFs) to runs.* The FSB endorsed recommendations of the International Organization of Securities Commissions (IOSCO), including the conversion of constant net asset value (NAV) MMFs into floating NAV MMFs where workable. IOSCO recommends that constant NAV MMFs be protected against investor runs through redemption gates, redemption fees, or "side pockets."<sup>60</sup> IOSCO is conducting peer review of the progress of national regulation.
- *Oversight and regulation of other shadow banking entities.* The FSB issued a policy framework consisting of an assessment of economic functions or activities of shadow banking and an information-sharing process between authorities, complemented by peer review. Recommended policy tools included primarily prudential measures, such as capital requirements, leverage limits, liquidity buffers, and restrictions on maturity and liquidity transformation.
- *Securitization.* The FSB endorsed IOSCO recommendations to better align the incentives of securitization markets, including issuer risk retention and improved transparency and disclosure. IOSCO is conducting peer review in this area as well. The BCBS, IOSCO, and the International Association of Insurance Supervisors are jointly reviewing developments in securitization markets.
- *Dampening procyclicality in repurchase agreement (repo) and securities lending.* The FSB policy recommendations seek to enhance transparency, regulation, and improvements to the structure of repo and securities lending markets and address risks associated with rehypothecation (reuse of funds in other repo transactions), collateral valuation, and "haircuts" (reduction in the principal paid to creditors).

**76. In addition, the FSB is developing methodologies to identify systemically important nonbank, noninsurer financial institutions.** Its first consultation paper on the topic, released in

<sup>60</sup> Side pockets are special accounts that allow fund managers to separate parts of an investment portfolio from other assets until market conditions allow for proper valuation and liquidation.

January 2014, proposed separate methodologies for finance companies, market intermediaries, and investment funds. The scope of this work is wider than shadow banking, but it will provide additional regulatory guidance on shadow banking entities. Concrete policy measures will be developed once the methodologies are finalized.

**77. In contrast to the progress on the international level, the national implementation of policies on several issues is still at an early stage.** Only a few national regulators have acted in response to the international policy developments, but some reform proposals were brought forward in specific markets.

### United States

- *MMFs.* In July 2014, the Securities and Exchange Commission issued final rules for the reform of MMFs, under which prime institutional MMFs will be required to transact at a floating NAV and daily share prices float with the market-based value of their portfolio securities; retail and government MMFs will continue to use constant NAV pricing.<sup>61</sup> However, in times of stress, all MMFs may impose liquidity fees and redemption gates.
- *Securitization.* U.S. regulators proposed credit risk retention requirements in securitizations and a prohibition against hedging the retained credit risk portion; the actions were taken after the Financial Accounting Standards Board modified its consolidation rules and the federal banking and thrift regulatory agencies required banks to include assets of asset-backed commercial paper programs in the calculation of their risk-weighted assets.<sup>62</sup>
- *Other shadow banking entities.* The process established by Section 113 of the Dodd-Frank Act for designation of systemically important nonbanks allows for extending the perimeter of prudential regulation and supervision by the Federal Reserve.<sup>63</sup>

### Europe

The European Commission's reform agenda has aimed at transactions between regulated banks and the shadow banking sector and the improvement of market integrity (EC 2013).

- *MMFs:* Proposed new rules for money market mutual funds include a capital buffer of 3 percent of a fund's assets for constant NAV funds (with a maximum residual maturity of 397 days) or the

<sup>61</sup> Government bond MMFs hold cash or invest in government debt. Prime MMFs invest primarily in corporate debt securities. Retail MMFs are limited to investments by natural persons, and institutional prime MMFs are geared toward institutional investors. The latter hold a riskier pool of assets than other funds, such as certificates of deposit, commercial paper, and repurchase agreements.

<sup>62</sup> Exemptions are granted for mortgage-backed securities backed by residential mortgages that meet certain underwriting standards ("qualified residential mortgages"), as well as by commercial loans, commercial mortgages, and automobile loans.

<sup>63</sup> By July 2014, three companies had been designated systemically important: American International Group, General Electric Capital Corporation, and Prudential Financial.

conversion to variable NAV structures (EC 2013). Other elements contain new requirements on diversification, liquidity, concentration, and the eligibility of assets.

- *Securitization.* Reform measures include better alignment of interest and information between the parties involved in securitization transactions, such as risk retention of at least 5 percent of the securitized assets by the originator or sponsor institution. In addition, higher capital requirements will be applied to bank holdings of securitization products. Furthermore, changes to accounting standards on consolidation have been introduced and disclosure requirements for unconsolidated structured entities strengthened.
- *Repo and securities financing.* New measures in the area of securities law are meant to limit the risks associated with rehypothecation. Proposed measures also aim to improve investors' understanding of the investment fund risks stemming from their use in transactions that finance securities.
- *Other shadow banking entities.* As of July 2013, the Alternative Investment Fund Managers Directive imposes new rules governing hedge funds, private equity funds, and real estate funds and introduces requirements regarding capital, risk and liquidity management, designation of a single depository for asset holdings, transparency, and supervisors' ability to restrict leverage.
- *Monitoring.* Work is under way to improve the collection and exchange of data as part of the September 2013 European Commission road map. Central repositories have been set up to collect data on derivatives within the framework of the European Market Infrastructure Regulation and have been proposed for repurchase transactions. Beginning in 2014, banks must report exposures related to shadow banking to their supervisors, and the European Banking Authority is set to draft guidelines on respective limits by the end of 2014. In addition, the definition of "credit institution" is being reviewed with a view to possible extension of the prudential regulatory perimeter.

## Japan

- *Other shadow banking entities.* Consolidated regulation and supervision of broker/dealers was introduced in April 2011. It requires large broker/dealers whose total assets are more than ¥1 trillion and their ultimate parent companies to be designated as special financial instruments business operators or as designated ultimate parent companies. Currently, the Nomura and Daiwa groups have been so designated and are subject to bank-like prudential requirements, including intensive supervision and Basel III capital requirements.

Table 2.7. Snapshot of New International Regulatory Initiatives

Key Reforms	Elements	Global Timeline	National Timeline
<b>Banking Sector Reforms:</b>			
<b>Banks' Interactions with Shadow Banking Entities</b>			
BCBS: Policy Proposal Based on Work of BCBS' Accounting Task Force (FSB 2013e)	Improve international consistency of the scope of consolidation for prudential regulatory purposes and ensure that banks' activities and their interaction with shadow banks are appropriately captured.	Completion in 2014	
BCBS (2013a)	Introduce risk-sensitive capital requirements for banks' equity investments in all types of funds (e.g., hedge funds, managed funds, investment funds).	Completed	Effective from January 2017
BCBS (2014)	Limit banks' large exposures to single counterparties (including to shadow banking entities).	Completed	Effective from January 2019
<b>Shadow Banking Entity Reforms:</b>			
<b>Reducing Susceptibility of MMFs to Runs</b>			
IOSCO (2012a)	Introduce common standards of regulation and management of MMFs across jurisdictions.	Completed	
<b>Other Shadow Banking Entities</b>			
FSB (2013a)	Assess and mitigate systemic risks posed by other shadow banking entities and activities (credit intermediation activities by nonbank financial entities, involving maturity/liquidity transformation, leverage and/or credit risk transfer), introduce a framework of policy tool kits and information-sharing among authorities.	Completed. Information-sharing process to be completed in 2014	
FSB (2014)	Prepare methodologies to identify systemically important nonbank and noninsurer financial institutions.	Pending. Consultation ended in April, 2014	
<b>Shadow Banking Market Reforms:</b>			
<b>Securitization</b>			
IOSCO (2012b)	Policy recommendations are related to transparency, standardization, and risk retention requirements.	Completed	
BCBS (2013b)	Revisions to the securitization framework aim at making capital requirements more prudent and risk-sensitive. Other objectives are to reduce the mechanistic reliance on external credit ratings and cliff effects.	Pending. Consultation ended in March 2014	
<b>Securities Lending and Repos</b>			
FSB (2013b)	Dampen financial stability risks and procyclical incentives associated with securities financing transactions such as repos and securities lending that may exacerbate funding strains in times of market stress.	Policy recommendations completed. Minimum haircut standards to be finalized in 2014. Implementation January 2017	Implementation January 2017

Source: IMF staff compilation.

Note: BCBS = Basel Committee on Banking Supervision; FSB = Financial Stability Board; IOSCO = International Organization of Securities Commissions; MMF = money market mutual fund; repo = repurchase agreement.

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## CHAPTER 3: RISK TAKING BY BANKS: THE ROLE OF GOVERNANCE AND EXECUTIVE PAY<sup>64</sup>

### SUMMARY

**There is broad consensus that excessive risk taking in banks contributed to the global financial crisis.** Equally important were lapses in the regulatory framework that failed to prevent this. Reforms are underway to further strengthen the regulatory framework, realign incentives, and foster prudent behavior by bankers. These reforms aim to enhance capital and liquidity buffers and influence the incentives that induce bankers to take excessive risk. Regarding the latter, measures are being introduced to enhance risk governance and to ensure that pay practices fully reflect the risks that bankers take.

**To be effective and avoid unintended consequences, such reforms must be based on a thorough understanding of what drives risk taking in banks.** This chapter aims to contribute to that understanding through an empirical investigation that relates various measures of bank performance and risks to bank characteristics of governance, risk management, pay practices, and ownership structures.

**The results show that banks with board members that are independent of bank management tend to take less risk.** The level of executive compensation in banks is not consistently related to their risk taking. More pay that is related to longer-term job performance is associated with less risk. Moreover, banks that have large institutional ownership tend to take less risk. As expected, periods of severe financial stress alter some of these effects because incentives change when a bank gets closer to default.

**With these results in hand, the chapter recommends policy measures, some of which are part of the current policy debate but have so far not been empirically validated.** They include making compensation of bank executives more appropriately risk sensitive (including to the risk exposure of bank creditors), deferring some compensation, and providing for clawbacks. Bank boards should be independent of management and should establish risk committees. Supervisors should ensure that board oversight of risk taking in banks is effective. Consideration should be given to including debt holders in addition to shareholders on bank boards. Finally, transparency is critical to accountability and the effectiveness of market discipline.

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## INTRODUCTION

**78. The run-up to the global financial crisis was marked by excessive risk taking in the financial sector, and once the crisis hit, the accumulated risks led to systemic problems and the failure of many individual financial institutions.** The causes of such risk taking were many and complex, but there is general agreement in the financial industry, the public sector, and academia that incentive structures at some financial institutions played an important role. Moreover, some have called into question the integrity of banks and their executives, leading to reputational damage to the industry.

**79. To tackle the issue of excessive risk taking, the post-crisis financial reform agenda has focused in part on improving the regulation of corporate governance in banks and regulating bank executives' pay.** Thus, in addition to addressing the problem of banks being “too important to fail” and improving the financial capacity of banks to absorb losses, measures have been proposed to enhance board oversight of bank risk and to ensure that executive pay imparts the appropriate incentives to curb excessive risk taking.

**80. The reform measures should be based on a thorough understanding of the underlying factors that led to excessive risk taking in banks, and this chapter aims to add to that understanding.** By considering how incentives (such as compensation and ownership) and controls (such as board structure and the risk management framework) shape bank risk taking (in theory and in practice), the analysis in this chapter can inform the design of regulation in these areas.

**81. Specifically, the chapter investigates the following questions:**

- To what extent does the design of corporate governance and compensation incentives in banks contribute to bank risk taking and to financial stability risks?
- How does the interaction of the interests of managers, shareholders and creditors affect a bank's risk appetite, and how does it relate to public policy objectives, including the protection of depositors and taxpayers?
- How can regulation contribute to prudent risk taking in banks and thus foster financial stability?

**82. To answer these questions, the chapter conducts a novel empirical investigation that links measures of corporate governance and managerial incentives (including compensation structures) to risk metrics of banks, including their contribution to systemic risk.** It finds that some of these measures are consistently associated with risk taking in banks across countries. For example, more board members who are independent of bank management, a high share of equity awards in bank chief executive office (CEO) compensation, and the presence of institutional investors are related to less risk taking. Although much of the public discussion has focused on the *level* of compensation, this analysis does not find a consistent relationship between the total amount of executive compensation (adjusted for firm size) and risk taking.

**83. With these and other results in hand, the chapter makes the following policy recommendations.** Reform measures should ensure that executive compensation of bankers is sufficiently risk sensitive through mandatory deferrals of compensation and a link to default risk and should require bank boards to be independent of management and to establish board risk committees to improve board oversight and internal risk controls. In addition, policymakers should investigate the merits and pitfalls of having debt holders represented on bank boards.

## RISK TAKING IN BANKS: THE THEORY

**84. This section: (1) explains the traditional tension in objectives between managers and shareholders and argues that it is more severe for banks; (2) notes that especially for banks, maximizing shareholder value is not in the best interest of creditors; and (3) highlights the major conflicting interests vis-à-vis society that arise from the presence of externalities related to systemic risk.**

### A. Banks Are Different

**85. It is worth remembering that modern compensation systems grew partly out of concern about *insufficient* risk taking by managers.** The traditional corporate governance literature points to the well-known “agency” problems between the owners of a firm and the day-to-day managers (Jensen and Meckling 1976). That is, managers may not always act in the best interests of shareholders because of competing interests.<sup>65</sup> Managers’ attitudes toward risk may also not be optimal from the shareholder’s point of view: without additional incentives, managers may be too risk averse when the firm is doing well because they do not want to risk losing their personal financial wealth or the human capital they have invested in the firm. Pay incentives and corporate governance structures are intended to ensure that managers and workers act in the best interests of the owners of the firm, that is, to maximize shareholder wealth by taking on appropriately risky projects.<sup>66</sup> Managers are monitored not only by the board of directors, but also by large shareholders, debt holders, market analysts, and credit rating agencies.<sup>67</sup> But monitoring is costly

<sup>65</sup> They may not put enough effort into supervising employees, seeking new clients, or selecting low-cost suppliers. Managers can also aim to make themselves indispensable in ways that do not necessarily add value to shareholders. Tirole (2006) provides a comprehensive survey of these matters.

<sup>66</sup> The view that the goal of corporate governance is to align managers’ interests with the maximization of shareholder wealth is more common in English-speaking countries; corporate governance systems elsewhere (such as in continental Europe or Asia) often take into account the interests of other stakeholders as well (see Allen and Gale 2001; Clarke 2007; and Macey and O’Hara 2003). However, the shareholder focus is becoming more widespread because of increased cross-listings and international convergence of corporate governance codes.

<sup>67</sup> In most countries boards of directors have a one-tier structure that brings together management and nonexecutive directors in a single body responsible for protecting shareholders’ interests. This system is common in Australia, Canada, France, India, Italy, the United Kingdom, and the United States. In Germany (as well as in Austria, the Netherlands, and Poland, and to a lesser extent in Denmark, Finland, Norway, and Switzerland; see Aluchna 2013), boards have a two-tier structure in which various stakeholders are represented in a supervisory board that is separate from the management board, which is composed only of executives. The management board is responsible for the day-to-day management of the company, while the supervisory board is responsible for appointing and monitoring

(continued)

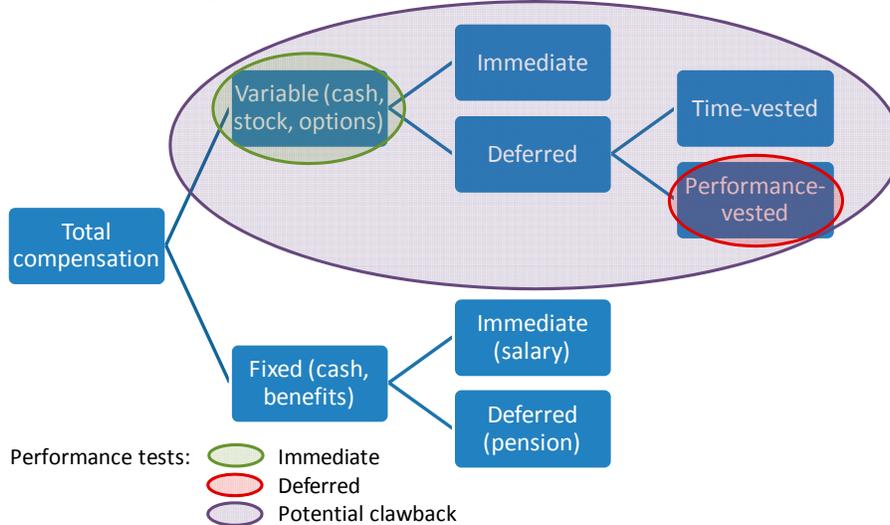
and may not be effective. Firms therefore aim to align managers’ incentives with those of shareholders through schemes such as performance-based compensation packages (cash bonuses, stocks, or stock options), which generally make the manager more sensitive to changes in shareholder value (Box 3.1).

### Box 3.1. Types of Executive Compensation

**Total compensation of executives can consist of a number of components (Figure 3.1.1):**

- *Fixed compensation*, the level of which does not depend on performance. Fixed compensation may be awarded immediately (for example, a salary) or may be deferred (for example, a pension).
- *Variable compensation* (bonus), the level of which depends on a variety of performance measures, which may include profits or stock performance. The bonus can be awarded immediately or be promised for some future time. The future vesting of the deferred bonus can depend merely on the passing of time (in three years, for example), or can be made dependent on performance in the future (future profits or stock price, for example).
- Variable compensation can be subject to *clawbacks*. A clawback occurs when previously awarded variable compensation (that was awarded immediately or after some time or performance test was met) is recouped in response to an adverse development (for example, a failed investment or a deterioration in the solvency position).

**Figure 3.1.1. Types of Executive Compensation**



Source: IMF staff.

**The performance tests that determine the amount of the variable compensation can be based on a variety of measures and should appropriately account for longer-term risk.** Traditionally, compensation structures for bank executives have been based on operating profitability and stock price performance metrics such as return on equity and book value per share. These metrics are short term and do not account for operational, credit and liquidity risks. More appropriate performance measures accounting for longer-term risk could include the sensitivity of a bank’s stock to the wider stock market (beta), the credit default spread of a bank’s debt, or risk-adjusted economic capital (measured by market capitalization plus total debt minus risk-weighted assets).

Box prepared by S. Erik Oppers, with contribution from Poonam Kulkarni.

the executives. In this chapter and for the purpose of measuring board independence, the “board” refers to the supervisory board for firms with a two-tier structure.

**86. Agency problems are especially important in banks, mainly because of the greater importance and difficulty of risk management.** Risk management and the alignment of risk incentives between bank owners and managers are highly relevant for banks because risk taking is at the core of their business model. In addition, the relatively high complexity of banks' day-to-day business means that senior bank management must delegate much of the decision making about risk to less-senior workers.<sup>68</sup> That complexity also means that monitoring and control of the actions of risk-taking staff is difficult to implement and often less effective. Managers therefore base the pay of these employees on measured performance, which acts as a partial substitute for direct monitoring and control of their behavior.<sup>69</sup>

**87. True performance is difficult to measure, however, and pay incentives may go too far and encourage bank staff to engage in too much risk taking from the shareholders' point of view.** For example, by taking on loans that appear to be profitable in the short term but come with hidden, long-term risks, bankers can increase their immediate performance-based pay and move on before the risks materialize. An additional complication is that bank staff often must choose the amount of risk to undertake without knowing how it might affect the overall risk of the institution.

## B. The Interests of a Bank's Creditors

**88. Even if banks manage to align the incentives of their staff with the interests of shareholders, not all stakeholders will be satisfied because maximizing shareholder value is not necessarily in the best interests of the bank's bondholders.** Shareholders have limited liability, which means that they have a limited downside to their investment, but receive all the gains from an increase in the company's value. This position implies that they can sometimes transfer wealth from creditors to themselves by choosing risky projects that do not create value for the firm (see example in Table 3.1).<sup>70</sup> This so-called risk shifting increases as firms get closer to default because managers, often on behalf of shareholders, tend to "gamble for resurrection"—that is, hope to recover solvency by taking large risks that are in their own interests but not those of the bondholders. They are willing to take more risk when firms get closer to default (when their equity stake is nearly depleted) because shareholders and managers have less to lose from failure (and more to gain from success) as their stake in the firm loses value. To the extent that compensation structures are designed to align incentives between managers and shareholders, they increase the risk-taking appetite of managers when the bank is close to default—against the interests of bondholders, who would prefer less risk.

<sup>68</sup> The relatively high complexity and business uncertainty in the banking sector have two additional implications for executive and employee compensation (Prendergast 2002). Because risk is high, overall compensation has to be high. Because delegation needs to be high, compensation must be indexed to some measure of performance or output to constrain employee discretion, and hence variable compensation needs to be a significant fraction of total compensation. Other factors may influence compensation (such as taxation), but those are not bank specific.

<sup>69</sup> See Prendergast (1999, 2000, and 2002) on the trade-off between risk and incentives.

<sup>70</sup> There is evidence that the risk of creditor expropriation by shareholders may be significant: firms with stronger antitakeover protection provisions enjoy a lower cost of debt financing (Klock, Mansi, and Maxwell 2005).

**Table 3.1. Equity Payoffs with Various Distances to Default**  
(Dollars)

	Initial Value	Final Value if Project Fails (Probability = 50 percent)	Final Value if Project Succeeds (Probability = 50 percent)	Expected Final Value (if Project is Undertaken)
<b>Scenario 1</b>				
Value of equity	100	0	150	75
Value of debt	200	200	200	200
Total assets	300	200	350	275
<b>Scenario 2</b>				
Value of equity	50	0	100	50
Value of debt	200	150	200	175
Total assets	250	150	300	225
<b>Scenario 3</b>				
Value of equity	0	0	50	25
Value of debt	200	100	200	150
Total assets	200	100	250	175

Source: IMF staff.

Note: The table shows scenarios for a bank with \$200 of debt and various levels of equity. In Scenario 1, the bank's total assets are initially worth \$300, so the initial value of the equity is \$100 ( $\$300 - \$200 = \$100$ ); in Scenario 2, the bank's assets are initially worth \$250 and the equity, \$50; in Scenario 3, the bank's assets are initially worth \$200 and the equity is worthless.

The bank is considering an investment project that costs \$100 and has a 50 percent chance of failing and a 50 percent chance of succeeding. The yield is independent of all other projects (so the project's risk is not diversifiable). If the project fails, it yields nothing; if it succeeds, it yields \$150. The project therefore has a *negative* expected return of \$25, so it should not be undertaken by the bank.

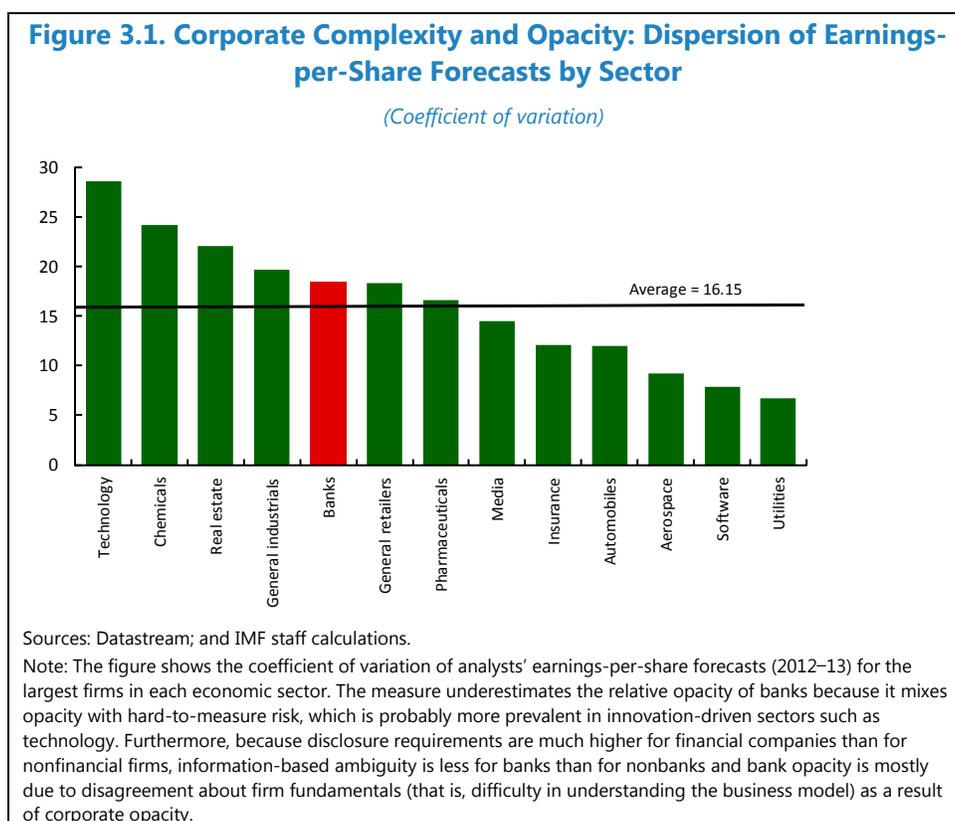
The last column of the table shows the expected value of the equity, debt, and total assets under each scenario if the project is undertaken. In Scenario 1, the expected final value of the equity is less than the initial value; in Scenario 2, it is identical; and in Scenario 3, it is larger. Hence, if the board and the management represent only the interests of the shareholders, they will undertake the project in Scenario 3 even though it reduces the total value of the bank and therefore reduces the welfare of society as a whole. They like the project because in that scenario the equity holders capture all the gains if the project succeeds but the debt holders suffer the losses if the project fails.

In all scenarios, the alignment of incentives between managers and shareholders is taken as given, as well as the compensation practices used to achieve it.

**89. Shareholder conflicts with debt holders are potentially more severe for banks than for other firms as a result of a failure of market discipline.** Banks' many small depositors have little incentive to monitor the banks' actions because they are protected from default by deposit insurance. In addition, banks have much more leverage than other firms (heightening the shareholder–debt holder conflict) because the cost of debt is lowered by deposit insurance and explicit and implicit government guarantees (including from banks being considered too important to fail) and because of the premium banks earn when issuing liquid financial claims (that is, deposits and commercial paper).<sup>71</sup> Finally, creditors find it more difficult to discipline (and monitor) banks

<sup>71</sup> The implicit subsidies coming from bailout guarantees can be appropriated to a larger extent by banks if they choose risky activities. In addition, mispriced debt and leverage reinforce each other. See Chapter 3 of the April 2014 *Global Financial Stability Report* for an assessment of too-important-to-fail subsidies.

through bond covenants and by requiring collateral because banks are very complex and opaque (Figure 3.1).



### C. Externalities and the Interests of Society

**90. The main conflicting interests, however, are between shareholders, managers, and debt holders on one side, and society at large on the other side.** They arise because of the presence of externalities related to systemic risk, and have long been a concern for regulators. For instance, shareholders, debt holders, and managers will fail to take into account the bank's contribution to systemic risk and hence its effect on other institutions and taxpayers. Banks' preferred levels of risk—and the compensation practices used to achieve them—may therefore be inconsistent with financial stability. In addition, banks are subject to runs because of high leverage and maturity mismatches in their balance sheets. These issues have been addressed in various ways by regulation—for example, through capital requirements that are contingent on the riskiness of bank assets.

**91. The global financial crisis showed that existing regulation to address this issue had been insufficient, and a regulatory reform agenda is paying attention to the issue of incentives for banks in a broad sense.** Measures to address the too-important-to-fail problem, the development of standards on debt instruments that can be “bailed-in” (that is, those that can be made part of the loss-absorbing liabilities of a bank), discussions of principles for compensation

practices, and principles for corporate governance, are examples. In addition, measures were proposed (and in some cases adopted) with the goal of enhancing the effectiveness of price-based tools (such as capital requirements) and steering banks' business cultures away from excessive risk taking (see Viñals and others 2013). Such measures include living wills and structural measures that force the bail-in of nonsecured liabilities, ring-fence riskier business segments, or ban banks from engaging in certain types of risky activities.

**92. A number of international reform initiatives for corporate governance in banks are underway.** The Organisation for Economic Cooperation and Development, the Financial Stability Board (FSB), and the Basel Committee on Banking Supervision are revising the standards for corporate governance based on lessons from the crisis in areas such as risk governance, board structures, compensation, internal audit, and the role of supervisors. Individual countries have also taken various initiatives (Table 3.2).

**93. The most prominent incentives-based recommendations aimed directly at individual behaviors are in the FSB's 2009 Principles for Sound Compensation Practices (Box 3.2).** The FSB guidance is intended to ensure (1) proper governance of compensation, (2) effective alignment of compensation with prudent risk taking, and (3) effective supervisory oversight and engagement by stakeholders. In its latest August 2013 review, the FSB reported that all but two of its member jurisdictions had completed the incorporation of the principles in their national regulations or supervisory guidance. The current focus is on the actual implementation of these rules and on effective supervision. Most supervisory authorities report that they now have a good sense of pay practices in their markets and exercise a good degree of oversight on the evolution of pay structures at supervised institutions.

**94. It is important that regulatory reform initiatives aimed at reducing excessive risk taking in banks be based on a thorough understanding of its drivers.** Determining the *optimal* level of risk taking by banks is beyond the scope of this chapter. However, given the evidence that risk taking before the crisis had been excessive, the empirical exercise in the next section investigates a number of factors that are associated with risk taking in banks. Thus, although the results of the analysis do not distinguish between healthy and potentially hazardous risks, they may help policymakers design or refine regulatory reforms that will curb excessive risk taking in banks, while minimizing unintended side effects.<sup>72</sup>

<sup>72</sup> These measures of risk are tilted toward "bad risks" in that they cover negative tail risk, distance-to-default, and systemic risk. However, the analysis also uses more neutral measures of risk based on total or systematic risk, which can represent either healthy or hazardous risks.

**Table 3.2. Reform Initiatives in Various Jurisdictions**

Jurisdiction	Legislation or initiative	Governance dimension	Measures
United States	Dodd-Frank Act (2010)	Compensation	<p>"Say on Pay": listed companies required to hold non-binding vote on compensation of named executives at least once every three years; said companies must also hold a vote at least once every six years on the frequency of "vote on pay."</p> <p>"Say on Golden Parachutes": listed companies must hold a non-binding vote on "golden parachute" compensation when having to vote on a takeover bid.</p> <p>"Increased Disclosures and Transparency": Companies must disclose (1) the relationship between executive pay and the company's financial performance (including share value and dividend payout); (2) the median pay in the firm (excluding CEO) and the CEO's total pay, and the ratio of the two; (3) any hedging against decreases in values of securities awarded to any employee or director.</p> <p>"Integrity and accuracy of executive compensation": (1) new standard for compensation committee independence; (2) clawback provisions allowing the recovery of any excess payment based on misreported financial data.</p>
		Board of Directors	Risk Management: (1) banks and some other financial companies with assets of more than \$10 billion must have a separate board risk committee that includes at least one expert with experience in managing risks of large companies; (2) requirement may be extended to bank holding companies with assets of less than \$10 billion by the Federal Reserve.
	Securities and Exchange Commission proxy rules	Board of Directors	Banks must disclose in the annual report the extent of the board's role in risk oversight.
		Compensation	Companies must discuss: (1) the extent to which risks arising from compensation policies are likely to have a material adverse impact on the company; (2) how compensation policies and practices relate to risk management and risk-taking incentives.
European Union	CRD IV and CRR	Board of Directors	<p>Require separation between CEO and chairman for banks with a one-tier board structure, unless authorized by competent authorities.</p> <p>Large banks must set up a nomination committee, making explicit its responsibilities (including self-evaluation).</p> <p>Require the board to reflect "a broad range of experiences" and to possess sufficient collective knowledge to understand risks.</p> <p>Limit the number of directorships (subject to supervisor approval).</p> <p>Increase individual board members' responsibilities: must have knowledge, integrity, and independence to assess and challenge management.</p> <p>Promote diversity within boards.</p>
		Compensation	<p>Caps ratio of variable-to-fixed compensation at 1:1, which could be increased to 2:1 if approved by a super-majority of voters (65 percent if quorum exists and 75 percent otherwise).</p> <p>Up to 25 percent of variable pay may be exempt from the ratio requirement if paid in long-term deferred instruments (at least five years' vesting period).</p> <p>Bonus-malus and clawback clauses must apply to 100 percent of variable compensation (that is, all compensation that is not required by law).</p> <p>At least 40 percent of each executive's bonus must be deferred, and up to 60 percent for senior executives.</p> <p>Rules apply to MRTs (senior management, risk takers, control functions, and anyone receive equal remuneration).</p> <p>Restrictions apply to worldwide employees of EEA firms, as well as to those of EEA-based subsidiaries of non-EEA firms, and to non-EEA-based employees with material responsibilities over EEA operations.</p> <p>Bans hedging strategies or insurance contracts that would undermine the risk-alignment effects of the remuneration package.</p> <p>Requires complete and detailed disclosure of remuneration practices for large and complex firms: information on the link between pay and performance, shares award criteria, and aggregate figures of remuneration. Some qualitative disclosure required for smaller firms.</p>

**Table 3.2. Reform Initiatives in Various Jurisdictions (concluded)**

Jurisdiction	Legislation or initiative	Governance dimension	Measures
Canada	Ontario Securities Commission (OSC) Toronto Stock Exchange	Board structure	Gender diversity: disclosure of practices and policies required—comply or explain. In consultation stage. Director term limits—comply or explain. Majority votes needed to confirm directors.
Bank for International Settlements	BCBS Principles for Enhancing Corporate Governance		Sets principles for sound corporate governance in six major areas: <ol style="list-style-type: none"> <li>1. Board practices</li> <li>2. Senior Management</li> <li>3. Risk management and internal controls</li> <li>4. Compensation</li> <li>5. Complex and opaque corporate structures</li> <li>6. Disclosure and transparency</li> </ol>
Financial Stability Board (FSB)	FSB Principles and Standards for Sound Compensation Practices	Compensation	Principles for effective governance of compensation: <ol style="list-style-type: none"> <li>1. Board must oversee compensation policies design.</li> <li>2. Board must monitor and review compensation system.</li> <li>3. Financial and risk control functions must be independent, have appropriate authority, and compensation independent of business functions.</li> </ol> Principles for effective alignment of compensation with prudent risk taking: <ol style="list-style-type: none"> <li>4. Compensation must be adjusted for all forms of risk.</li> <li>5. Compensation must be symmetric with risk outcomes.</li> <li>6. Compensation schedules must be sensitive to time horizon of risks.</li> <li>7. Mix of cash, equity, and other forms of pay must be consistent with risk alignment.</li> </ol> Principles for effective supervisory oversight and engagement by stakeholders: <ol style="list-style-type: none"> <li>8. Supervisory review of compensation practices must be rigorous and sustained; supervisors must include compensation practices in risk assessment of firms.</li> <li>9. There should be comprehensive and timely disclosure of compensation practices, as well as of risk-management control practices.</li> </ol> Principles for Sound Compensation Practices - Implementation Standards: Bonus-malus and clawback clauses must apply to cash bonuses. At least 40 percent of each executive's bonus must be deferred. The requirement increases to up to 60 percent for senior executives. At least 50 percent of variable compensation should be awarded in shares or share-linked instruments. Minimum deferral period is three years, and at least half of bonuses are to be paid in restricted shares rather than cash.

Source: IMF staff.

Note: CRD IV = Capital Requirements Directive (European Union Directive 2013/36/EU); CRR = Capital Requirements Regulation (European Union Regulation (EU) No. 575/2013); EEA = European Economic Area; and MRT = material risk taker.

### Box 3.2. Trends in the Regulation of Bankers' Pay

**Several countries put caps on compensation for firms that received direct capital support in the global financial crisis, so as to prevent public funds from being used for paying bonuses.** Most of these countries (including Germany, the United Kingdom, and the United States) limited payouts to top executives, whereas others (such as Switzerland) aimed at limiting the bank-wide bonus pool. With crisis-related government support now withdrawn from most of these banks, the compensation caps have expired.

**Separately, international standards setters have established compensation guidelines specifically for financial institutions.** Under the mandate of the Group of 20, the Financial Stability Forum (which later became the Financial Stability Board [FSB]) issued "Principles and Standards for Sound Compensation Practices" (P&S) that aim to align pay not only with performance, but also with risk. FSB members have agreed to implement these guidelines at least for "significant financial institutions," which in many countries means systemically important banks. The guidelines cover the following aspects:

- *Broad scope:* The rules should apply to senior management as well as to all other employees who have a "material" influence on the risk a financial firm is taking.
- *Ex ante risk adjustment:* Indicators that determine compensation amounts have to recognize all types of risk, including the risk-adjusted cost of capital and funding, the correlation between total revenue and net income, and operational and compliance risks. Substantial parts of compensation packages should therefore be variable, although the FSB does not recommend a concrete split between fixed and variable compensation.
- *Ex post risk adjustment:* Risks may take a long time to be realized and outcomes can significantly differ from projections. Compensation that has already been awarded should therefore be adjusted according to risk outcomes. Between 40 and 60 percent of variable compensation should be deferred by awarding shares that remain blocked for a certain time, and variable pay should also be subject to clawbacks. The guidelines discourage options and other compensation instruments that lack a significant downside.
- *Enhanced disclosure:* The guidelines strengthen disclosure requirements to enhance market oversight and facilitate supervision. Going beyond general "say on pay" disclosure, financial firms are required to provide comprehensive information about pay at all hierarchy levels, in particular for material risk takers.

The FSB principles have since been supplemented by requirements of the Basel Committee on Banking Supervision.

**Although FSB member countries have broadly implemented the P&S, they used significant discretion in setting concrete national rules.** In particular, there is substantial variation in how prescriptive countries are in implementing the P&S. Some jurisdictions, such as European Union (EU) member states, have been more prescriptive by placing absolute caps on variable compensation, with exemptions being subject to shareholder approval. Differences in the rules across countries may have hampered internationally active banks in the setting of consistent firm-wide compensation strategies.

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Box prepared by Oliver Wuensch.

## BANK GOVERNANCE AND PAY: EMPIRICAL EVIDENCE REGARDING THE EFFECTS ON RISK TAKING

### A. The Data

**95. To examine the factors that affect risk taking in banks, the analysis uses a large data set of relevant firm governance statistics for major banks in various advanced and emerging market economies.**<sup>73</sup> The data cover more than 800 banks from 72 countries and include commercial banks, cooperative banks, savings banks, mortgage companies, and investment banks, among others. About 50 percent of the banks are from the United States, more than 20 percent are domiciled in Europe, and the remainder are located in Africa, the Asia and Pacific region, and the rest of the Americas (see Annex 3.1 for a detailed description of data sources).<sup>74</sup> The firm governance characteristics were divided into four groups of variables: board structure, risk management, compensation practices, and ownership (Table 3.3).

**96. The data show the following main trends:**

- *Bank executive compensation* (Figure 3.2): After dropping markedly at the outset of the global financial crisis, total CEO pay has now largely recovered. The share of fixed salary has risen markedly in Europe, possibly due to more direct regulation of executive pay. The importance of long-term incentives is on the rise because the vesting periods for variable pay have been extended. This is in line with the implementation of the FSB Principles and Standards, which require compensation to be sensitive to the time horizon of risks. Finally, bank shareholders are more engaged on matters of executive compensation as evidenced by the marked increase in votes on such practices (“say-on-pay”).
- *Board structure* (Figure 3.3): The share of independent directors on boards has increased in Europe and the United States but has declined in Asia (see Table 3.3 for a definition of independent directors). On average, most independent board members have some degree of experience in finance and this share has shown a modest increase.

<sup>73</sup> The data on compensation and other incentives are limited to CEOs. However, if CEO incentives are aligned with shareholders’ interests, in principle the CEO will, in turn, accordingly condition the behavior of employees who are delegated to take financial risks. Furthermore, if excessive risk taking exists because of poor performance measurement, the problem should be common to senior and midlevel executives. Although agency problems between CEOs and those employees exist, they can be considered of second-order importance. Therefore, the findings based on CEO data provide a lower bound for the overall problem.

<sup>74</sup> Institutional coverage varies across the analyses because not all banks provide complete data. In particular, because many of the U.S. banks are smaller and often have incomplete data, they were excluded from the analysis in a number of cases, providing more institutional balance across geographical areas. Still, all regressions have some degree of oversampling of banks from regions where regulatory reforms have been more extensive (the United States and Europe in particular). To some extent, this issue is controlled for by using bank or country fixed effects.

**Table 3.3. Governance Characteristics Used as Explanatory Variables in the Empirical Analysis**

Risk drivers	Variables	Description
Board characteristics	Board independence	Share of independent board members (as reported by each bank) <sup>1</sup>
	CEO is a chairman	Dummy, if CEO is also a chairman of the board
	Financial experience	Average of independent board members' financial experiences as a share of their total professional experiences <sup>2</sup>
Risk management	Risk committee	Dummy for there being a board risk committee
	CRO board member	Dummy for CRO being a member of the board
	CEO background	Dummy for the CEO having retail banking or risk experience but no investment banking experience
Compensation practices	Share of salary	Share of salary in total calculated CEO compensation
	Equity-linked compensation	Share of equity-linked compensation in total calculated CEO compensation
	Compensation horizon	The maximum time horizon to reach full senior executives' compensation
	Level of compensation	Total calculated CEO compensation adjusted for bank size
Ownership	Institutional investors	Share of firm that is owned by institutional investors
	Inside investors	Share of firm that is owned by inside investors
	Large shareholder	Dummy, if a blockholder owning 10 percent of the firm exists

Source: IMF staff.

Note: CEO = chief executive officer; and CRO = chief risk officer.

<sup>1</sup> Independent board members are defined as directors who are not employees of the bank (currently or in the past few years) and do not have a direct relationship with the bank. The exact definition varies by jurisdiction. For example, large shareholders may or may not be considered independent. In banks with a two-tier board structure, only the supervisory board is considered.

<sup>2</sup> Formally it is the average (over all independent directors) of the share of each director's financial sector experience to his or her total experience.

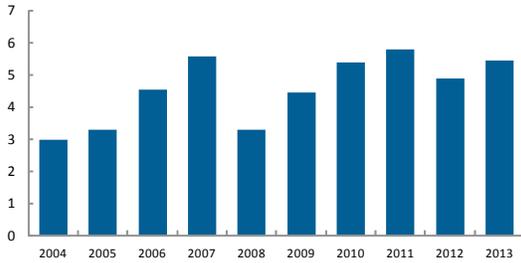
- *Risk management:* The role of risk-related functions has gained importance since the crisis. More boards have established board risk committees, and the chief risk officer (CRO) is more often a member of the board.<sup>75</sup> This enhanced role for risk-related functions is partly also in response to regulations (for example, the Dodd-Frank Act in the United States, and the Capital Requirements Directive [European Union Directive 2013/36/EU, or CRD IV] in Europe) that require companies of a certain size to have board risk committees and CROs with direct access to board members. The Basel Core Principles for Effective Banking Supervision also include a new principle stating that supervisors should require larger and more complex banks to have a dedicated risk management unit overseen by a CRO.

<sup>75</sup> The measure "CRO is a board member" is a proxy for the centrality of this officer but is not meant to capture a best practice. For two-tier boards, the measure indicates whether the CRO is a member of the executive board (he or she can of course not be a member of the supervisory board).

**Figure 3.2. Trends in Compensation Practices in Banks**

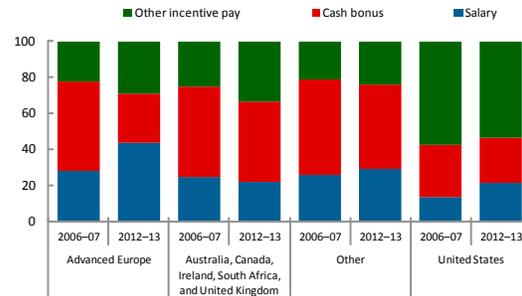
*Total bankers' pay has recovered...*

**1. Average Annual Total Calculated CEO Compensation (Millions of U.S. dollars)**



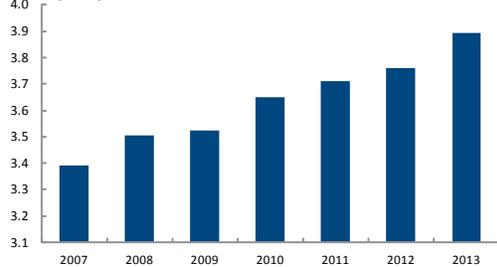
*...and fixed pay has increased mostly in Europe...*

**2. Total Compensation (Percent)**



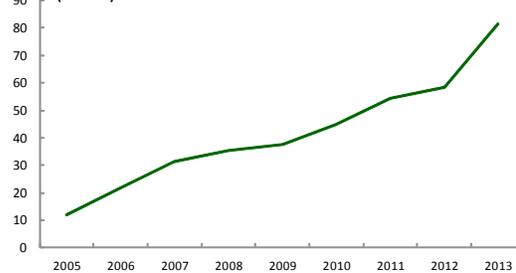
*... but the vesting periods are becoming longer...*

**3. Time to Reach Full Senior Executives' Compensation (Years)**



*... and Say-on-Pay is becoming more widespread.*

**4. Firms with Shareholder Votes on Executive Compensation (Percent)**

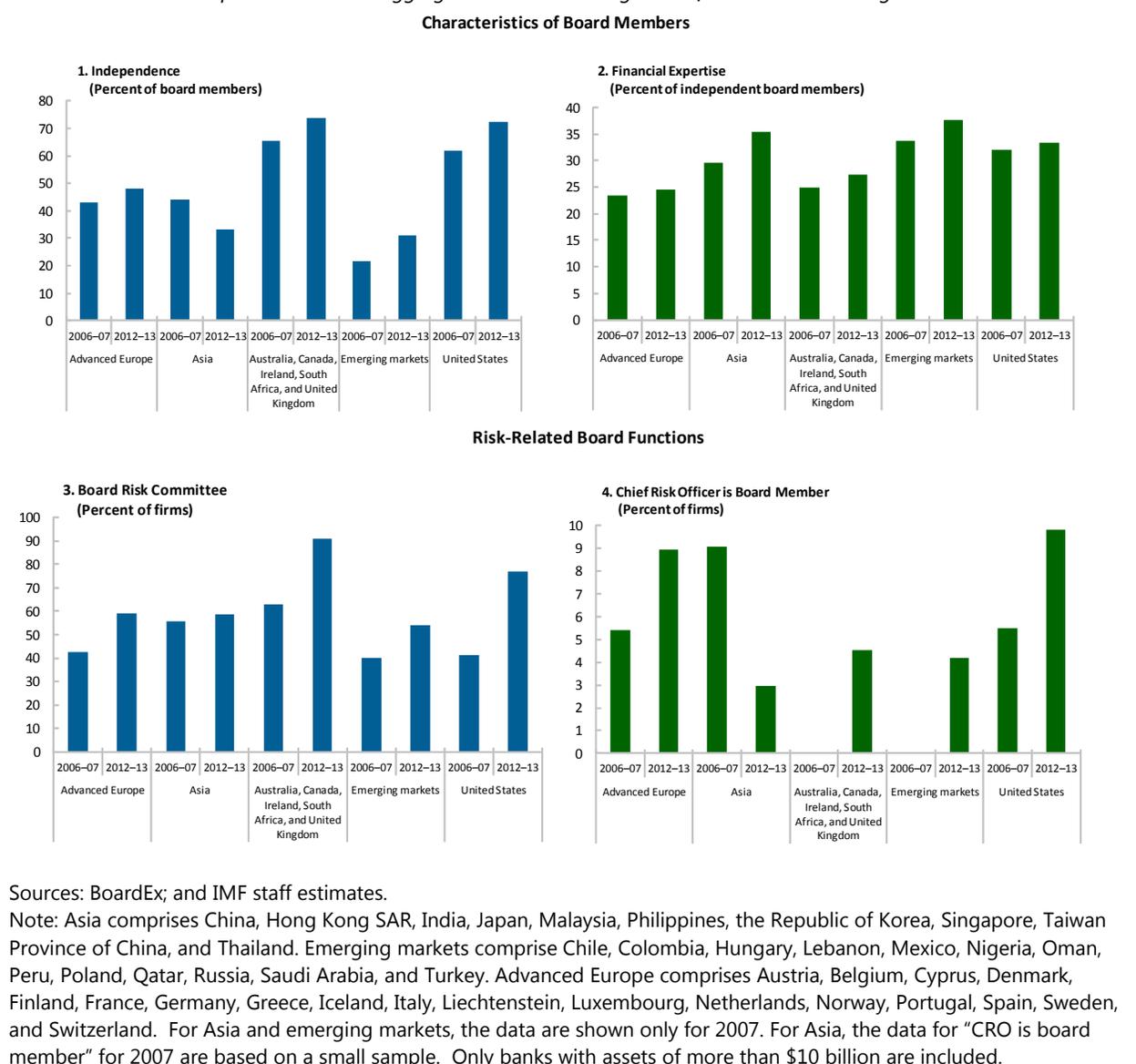


Sources: BoardEx, Datastream; S&P Capital IQ; and IMF staff estimates.

Note: Advanced Europe comprises Austria, Belgium, Cyprus, Denmark, France, Germany, Greece, Iceland, Italy, Liechtenstein, Netherlands, Norway, Portugal, Spain, Sweden, and Switzerland; Other comprises China, Hong Kong SAR, India, Israel, Japan, Malaysia, Pakistan, Singapore, and South Africa. Only banks with assets of more than \$10 billion are included. Panel 2 shows the share of the sum (across all banks in each region) of total compensation that was paid in salary, cash bonus, and other incentive pay.

**Figure 3.3. Summary Statistics of Boards and Risk Management in Banks**

*Board independence is still lagging but the risk-management function is becoming more central.*



**97. In addition to pay and governance, corporate culture has a significant effect on risk taking in banks.** It is impossible to design an incentive structure that leads a bank manager to make the "right" decision every time (Stulz 2014). In cases in which incentive rules are insufficient, corporate culture will guide decisions and complement a bank's ability to manage risk. Corporate culture thus provides a set of unwritten, but widely accepted, rules that determine acceptable behavior—which in some corporate cultures may include disregarding written rules. A key characteristic of culture is that it is adopted over time.

**98. Although measuring a bank’s culture is seemingly impossible, some indicators of a sound risk culture can be identified (FSB 2014).** First, boards and management must set the expectation for integrity in behavior and make clear that noncompliance will not be tolerated (*tone from the top*). Second, a bank’s staff must expect to be held accountable for their actions and their impact on risk taking (*accountability*). Third, a bank should have an environment that fosters communication and discussion of the decision-making process (*effective communication and challenge*). Fourth, financial and nonfinancial incentives must support and be consistent with the firm’s core values (*incentives*). The empirical analysis in this chapter is only partially able to capture these elements.

## B. The Existing Literature

**99. The existing literature has partially investigated the links between governance, pay, and risk taking in various specific countries and cases (Table 3.4).** Most studies look at a limited number of risk and governance dimensions and usually focus on the United States (despite a growing number of studies looking at specific variables using cross-country data). Although most issues remain unsettled, some of the main findings include the following:

- Larger and more diverse boards have sometimes been found to be associated with more risk.
- The share of independent board members does not affect risk taking, and the results on board financial experience are mixed.
- Stronger risk-management functions and cultures tend to be associated with less risk.
- Performance-linked compensation in the form of options tends to be associated with more risk. The evidence on other forms of compensation is mixed.
- Most studies find a positive relationship between institutional or insider ownership and risk taking during the height of the financial crisis, but obtain ambiguous findings for other periods.
- The few studies that examine the impact of concentrated ownership in banks typically find a positive relationship with risk taking.

**100. The next section provides a comprehensive analysis of the contribution of many of these and other previously unexplored governance characteristics to risk taking.** By covering a large number of banks from many different countries, and by using several measures of risk, the analysis tries to overcome the fragmentary nature of most published research and to contribute to a much-needed stock taking.

Table 3.4. Summary of the Empirical Literature

Governance dimension	Authors (year)	Independent variable	Risk measure	Sign	Country coverage	Period	
Board structure	Adams (2012)	Board independence, board size, and number of outside directorships	Bank bailouts	+	United States	2008–09	
	Adams and Raganathan (2013)	Gender diversity in the board	Idiosyncratic risk, tail risk, Z-scores, percent of MBS or derivatives in total assets	+	United States	2006–09	
	Battaglia, Curcio, and Gallo (2014)	Board size, Number of board meetings	Tail and systemic risks	+	European Union	2006–10	
	Beltratti and Stulz (2012)	Shareholder-friendly board governance	Stock performance during the crisis	-	International	2007–08	
	Berger, Kick, and Schaeck (forthcoming)	Executive director age, Executive director education, Female representation on executive board	Risk-weighted assets over total assets and loan portfolio concentration	- - +	Germany	1994–2010	
	Erkens, Hung, and Matos (2012)	Board independence	Pre-crisis aggregate risk and expected default frequency	None	International	2008	
	Fernandes and Fich (2013)	Financial experience of outside directors	Bank failure and bailouts	-	United States	2006–07	
	Ferreira, and others (2013)	Management insulation from shareholders	Bank bailouts	-	United States	2008–09	
	Hau and Thum (2009)	Financial experience of directors	Write-downs and losses	-	Germany	2007–08	
	Minton, Taillard, and Williamson (forthcoming)	Financial experience of outside directors	Aggregate risk and debt ratio	+	United States	2004–06	
	Pathan (2009)	Shareholder-friendly governance	Aggregate, idiosyncratic and systematic risks	+	United States	1997–04	
	Wang and Hsu (2013)	Board size, Board independence, Age heterogeneity, Tenure heterogeneity	Operational risk	- - + None	United States	1996–2010	
	Risk management and risk culture	Aebi, Sabato, and Schmid (2012)	CRO reports to board instead of to CEO	Stock performance during the crisis	+	United States and Canada	2007–08
		Ellul and Yerramilli (2013)	Risk-management index	Tail risk	-	United States	2007–08
Fahlenbrach, Prilmeier, and Stulz (2012)		Stock return in 1998	Bank failure	-	United States	2007–09	
Keys, and others (2009)		CRO compensation	Delinquency of mortgage loans	-	United States	2001–06	
Lingel and Sheedy (2012)		Risk governance index	Aggregate and tail risks	-	International	2004–10	
Compensation	Acrey, McCumber, and Nguyen (2011)	Compensation elements (salary, bonus, shares, and options)	Risk rating variables and expected default frequency	Mostly none	United States	2008	
	Bai and Elyasiani (2013)	Sensitivity to asset return volatility	Default risk and volatility of ROA	+	United States	1992–2008	
	Balachandran, Kogut, and Harnal (2011)	More equity-based pay and less non-equity pay	Default risk	+	United States	1995–2008	

Table 3.4. Summary of the Empirical Literature (concluded)

Governance dimension	Authors (year)	Independent variable	Risk measure	Sign	Country coverage	Period
	Chen, Steiner, and Whyte (2006)	More option-based pay	Aggregate risk and beta	+	United States	1992–2000
	Cheng, Hong, and Scheinkman (2014)	Residual compensation (adjusted for firm size and specialization)	Various risks (aggregate and tail risks as well as various betas)	+	United States	1992–2008
	Chesney, Stromberg, and Wagner (2012)	Sensitivity to asset return volatility	Write-downs	+	United States	2007–08
	DeYoung, Peng, and Yan (2013)	Sensitivity to asset return volatility, Sensitivity to asset return	Idiosyncratic risk as well as beta	+	United States	1994–2006
	Fahlenbrach and Stulz (2011)	Cash bonus relative to salary, Sensitivity to asset return	Buy-and-hold equity returns, ROE, and ROE during crisis	None -	United States	2007–08
	Hagendorff and Vallasca (2011)	Sensitivity to asset return volatility, Sensitivity to asset return	Merger-related default risk	+	United States	1993–2007
	Jokivuolle and Keppo (2014)	Sensitivity to asset return volatility, Cash bonus per net income	Buy-and-hold equity returns	Negative None	United States	2008
	Keys, and others (2009)	CEO compensation	Delinquency of mortgage loans	None	United States	2001–06
	Tung and Wang (2011)	Inside debt holding	Idiosyncratic risk and reduction in bond price	-	United States	2007–08
	Vallasca and Hagendorff (2013)	CEO cash bonus	Default risk	Negative to none	United States and Europe	2000–08
	Barry, Lepetit, and Tarazi (2011)	Individual or families ownership, Bank ownership, Manager ownership	Default risk and volatility of operating returns	- None or +	Advanced Europe	1999–2005
	Beltratti and Stulz (2012)	Ownership by a large shareholder	Stock performance during the crisis	None or +	International	2007–08
	Berger, Imbierowicz, and Rauch (2014)	Ownership by lower management, Ownership by chief officers and outside directors	Probability of default	+	United States	2007–10
Ownership	Dolde and Knopf (2006)	Insider ownership, Institutional ownership	Aggregate risk and volatility of operating returns	U-shape, -	United States	1990–2003
	Erkens, Hung, and Matos (2012)	Institutional ownership	Pre-crisis aggregate risk and expected default frequency	+	International	2008
	Forssbaeck (2011)	Insider ownership	Nonperforming loans to equity and default risk	U-shape	International	1994–2005
	Gropp and Kohler (2010)	Ownership concentration	Deviation from the long-term average ROE	+	International	2008
	Laeven and Levine (2009)	Ownership concentration	Default risk, aggregate risk, and volatility of operating returns	+	International	1996–2001

Source: IMF staff.

Note: CEO = chief executive officer; CRO = chief risk officer; MBS = mortgage-backed securities; ROA = return on assets; ROE = return on equity

## C. The Analysis

**101. The analysis relates a variety of risk variables to a variety of corporate governance measures without necessarily implying causation.** Risk is measured across eight dimensions, capturing both balance sheet and market measures of risk (Table 3.5). These measures can be grouped into four categories: (1) the distance to default captured by the market-implied and balance sheet Z-scores; (2) the market assessment of risk captured by equity beta, equity return volatility and asset return volatility; (3) tail risk captured by the Ellul and Yerramilli (2013) tail risk measure, and the marginal expected shortfall developed by Brownlees and Engle (2011); and (4) the systemic risk measure developed by Acharya, Engle, and Richardson (2012) which captures the expected capital shortfall conditional on a systemic financial crisis.<sup>76</sup> The firm governance characteristics are also grouped into four categories: (1) board characteristics, (2) compensation, (3) risk management and culture, and (4) ownership structure (see Table 3.3).

**102. These variables have complicated interactions and causality may run both ways.** For example, banks that wish to take more risk may feel it is necessary to put in place more risk-management measures. This may make it seem as if more risk control measures lead to higher risk, although the causality actually runs the other way. It is difficult to control fully for endogeneity and although the analyses try to do this to some extent, most of the results should be read as reflecting correlations and not necessarily causation.<sup>77</sup>

**103. Three different approaches are used to link corporate governance characteristics of banks to their risk profiles and performance.**

- A “*difference-in-means*” approach that ranks banks based on their governance indicators in 2007: This approach asks whether there is a significant difference between the average risk profile and performance (as measured by the associated variables in Table 3.5) for the period 2009–13 of banks in the top and the bottom quartiles of each governance indicator in 2007.<sup>78</sup> Focusing on a

<sup>76</sup> With the exception of the balance sheet Z-score, the measures of risk used as dependent variables in the analyses are based on market data and thus only cover publicly listed firms. Given that the degree of market discipline and information disclosure for listed banks is likely to be higher than for nonlisted banks, the results should be interpreted as applying first and foremost to listed banks. However, there is no evidence that sample selection in this dimension affected the results was found (see Annex 3.2).

<sup>77</sup> The endogeneity may arise because of reverse causation (as mentioned in the text) or because of omitted explanatory variables. The exercise ameliorates the problem by controlling for time-invariant firm characteristics (via fixed effects and first differences), using instrumental variables, or by including many control variables in the regressions.

<sup>78</sup> The *difference-in-means* approach compares risk outcomes in a postcrisis period (2009–13) to bank characteristics before the crisis. Although the postcrisis period excludes the most critical period of the crisis, it still includes a period of distress. Using a stronger definition of the postcrisis period (2010–13 or 2011–13) significantly weakens the results, as the 2007 rankings become less and less relevant, especially in light of the postcrisis regulatory reforms. To select a sample of relatively homogeneous banks, the sample is restricted to banks with balance sheet size of at least \$10 billion in 2012. Because the domicile and other bank characteristics can affect bank performance independently of governance characteristics, those effects are removed from the analysis by first regressing the various indicators

(continued)

longer performance period for measuring risk (instead of, say, only one year) reduces measurement error. The approach presupposes, however, that bank-level governance variables change slowly over time.

**Table 3.5. Measures of Risk Used in the Empirical Analysis**

Measures of risk	Description	Risk dimension
Market implied Z-score <sup>1</sup>	Captures banks market-implied distance to default, taking into account profitability, capital levels, and volatility of returns.	Sign switched so that higher values mean higher risk
Balance sheet Z-score <sup>1</sup>	Same as above, but calculated using only balance sheet data (suitable for unlisted banks).	Sign switched so that higher values mean higher risk
Equity beta	Captures systematic risk, that is, risk arising from exposure to general market movements as opposed to idiosyncratic factors.	Higher values mean higher risk
Equity return volatility	Volatility of return on equity.	Higher values mean higher risk
Asset return volatility <sup>2</sup>	Volatility of return on assets, calculated using equity prices and the structure of the balance sheet.	Higher values mean higher risk
Tail risk <sup>3</sup>	Average of the bank's worst five daily returns during the given year.	Higher values mean higher risk
Marginal expected shortfall <sup>4</sup>	The bank's percentage of expected financial sector capital shortfall in a crisis.	Higher values mean higher risk
Systemic risk <sup>4</sup>	Measures firm's share of total financial sector capital shortfall.	Higher values mean larger contribution to systemic risk

Source: IMF staff.

<sup>1</sup> Z-scores are defined as the return on assets plus capital to asset ratio, divided by the standard deviation of return on assets. The balance sheet Z-score uses balance sheet data to calculate this ratio. The market Z-score uses the equity implied volatility and return on assets.

<sup>2</sup> Standard deviation of annual change in market value of assets. The market value of assets is derived from equity prices by treating the value of equity as an implicit call option on the assets with strike equal to the outstanding liabilities. See Merton (1974) for details.

<sup>3</sup> A bank's tail risk is defined for each year as the negative of the average return on the bank's stock during that stock's 5-percent-worst return days that year. See Ellul and Yerramilli (2013) for details.

<sup>4</sup> Marginal expected shortfall captures the daily drop in equity value that would be expected if the aggregate market falls more than 2 percent. It incorporates the volatility of the firm and its correlation with the market, as well as its performance in extremes. Systemic risk is the expected capital shortfall of this firm if there is another crisis. See Brownlees and Engle (2011) for details.

- A *panel regression approach* that uses data for all banks with sufficient coverage for all available time periods (2005–13): Lagged bank-level characteristics are used in an attempt to ameliorate potential endogeneity problems. In the case of risk controls, if the endogeneity problem is particularly severe, an instrument variables approach is used. A set of bank-level and country-level control variables is included to account for effects that can be explained by these other factors.<sup>79</sup> The analysis also explored how bank-level governance measures interact with indicators of the regulatory environment at the country level.

on a set of bank- and country-level variables (usually referred to in econometric analyses as “controls”). Country dummies are also included to capture country level differences not captured by the country controls.

<sup>79</sup> The bank-level control variables are return on book assets, log book assets, the deposit to asset ratio, the Tier 1 capital ratio, and revenue growth. The country-level control variables are log GDP per capita (at purchasing power parity), current account balance as a fraction of GDP, the average of the six World Governance Index variables, and a dummy that equals 1 if the country has deposit insurance (for each year). The panel regressions use firm and time fixed effects and the cross-section regressions use country fixed effects. The analysis controls for different bank

(continued)

- A *first-difference approach* that relates the difference between average risk taking in 2005–07 and 2011–13 to the change over the same periods in each governance dimension: This analysis includes country dummies. The approach mitigates endogeneity problems, which are less severe in comparisons of differences than when levels are used.

**104. The analysis also examines the relationship between the governance indicators and risk taking in times of stress, using financial outcomes at the height of the global financial crisis in 2008.** The expectation is that this relationship is different in times of extreme stress (during so-called tail events). In particular, given the complicated interactions between bank stress (measured by the distance to default) and compensation and ownership, the results along these two dimensions are expected to diverge in a banking crisis. This analysis uses dependent risk variables for all banks for 2008 and lagged explanatory variables for 2007 to investigate how bank risk, as it materialized in the crisis (a measure of exposure to extreme events) was related to banks' corporate governance characteristics in the previous year.

**105. The analyses show a number of important correlations between governance, executive pay, and risk taking in banks.** Many of these correlations are also economically significant when compared with the effect of Tier 1 capital ratios and size (see "Economic Significance and the Regulatory Environment" in Annex 3.2). As expected, different results are obtained for the crisis regression in a number of cases. All the dependent variables were normalized so that higher values signify more risk (see Table 3.6 and Figures 3.4 and 3.5).<sup>80</sup> Specific results follow.

#### Board characteristics

- *Board independence* is associated with lower risk.<sup>81</sup> A board that is more independent of management may be better placed to supervise and control risk taking.<sup>82</sup> This is especially important when executive compensation (designed to counteract the managers' natural risk-aversion) gives managers incentives to take too much risk.

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business models using bank-level fixed effects. The results are robust to the inclusion of controls to capture the effect of overall risk appetite over the global interest rate cycle. See Annex 3.2.

<sup>80</sup> The figures and the last rows in the table show Stouffer's Z-statistic, a measure that summarizes the joint statistical significance of a number of *t* tests having the same null hypothesis (and not to be confused with a Z-score measuring risk). In this case, it gives a statistical indication of the joint significance of the effect of each explanatory variable on risk as measured by the different risk variables. The significance levels were adjusted using the Benjamini–Hochberg procedure to account for correlation among dependent variables.

<sup>81</sup> Since the definition of what is an independent director may vary from country to country, the panel regression was repeated allowing the slope coefficients to vary by region, following Macey and O'Hara's (2003) definition of regional corporate governance models: Anglo-American, Franco-German or Advanced European, and Other. Board independence remains significantly associated to lower risk in the first two regions. These results are stronger for regions where board independence is more homogeneous and data are more available.

<sup>82</sup> A more independent board may also improve the measurement of performance and, in this way, curb risk taking. The two effects are probably observationally equivalent.

Table 3.6. Summary Results of the Empirical Analysis

	Board characteristics			Risk management and culture			Compensation			Ownership structure		
	Board independence	CEO is chairman	Independents' financial experience	Risk committee exists	CRO on board	CEO has retail banking or risk background	Share of salary	Equity-linked compensation	Compensation horizon	Share of institutional investors	Share of inside investors	10 percent block holder exists
<b>Difference-in-mean approach</b>												
Market-implied z-score	-0.56	1.66	1.65	-0.05	0.06	3.13	3.53	-2.12	0.45	-0.51	3.74	-0.56
Balance sheet z-score	-1.28	1.10	1.48	2.00	-0.16	0.34	3.94	-0.05	1.26	-2.57	-2.48	-4.49
Beta (local index)	-1.06	1.92	2.43	5.45	1.29	1.14	0.22	2.52	-0.05	-0.62	-3.49	-5.57
Equity return volatility	-0.47	0.81	1.16	1.80	1.26	0.56	1.65	0.22	0.30	0.34	-1.24	-4.54
Market-implied asset volatility	-0.67	0.25	-1.48	-1.36	1.73	-0.83	1.89	0.44	-1.49	-3.20	-2.08	0.63
Tail risk	-0.12	0.85	1.49	1.62	1.27	0.30	1.76	0.03	0.33	0.58	-1.64	-4.53
Mean expected shortfall	-0.29	0.52	2.91	2.65	1.45	1.49	0.26	-1.24	1.56	0.37	-0.82	-4.88
Systemic risk	-3.92	1.10	1.77	-0.96	0.08	-0.87	-0.73	-0.30	1.22	-3.00	2.27	-3.66
<b>Stouffer's Z-statistic</b>	<b>-2.96</b>	<b>2.91</b>	<b>4.03</b>	<b>3.94</b>	<b>2.47</b>	<b>1.86</b>	<b>4.43</b>	<b>-0.18</b>	<b>1.26</b>	<b>-3.04</b>	<b>-2.03</b>	<b>-9.76</b>
<b>Panel regression analysis</b>												
Market-implied Z-score	0.58	2.37	1.72	-0.17	1.42	2.85	4.28	0.32	-1.80	-1.92	0.63	0.45
Balance sheet Z-score	-3.91	1.08	0.97	-1.36	-3.17	-5.97	4.67	0.24	-2.33	0.53	-0.92	-0.43
Beta (local index)	0.91	-1.42	-0.89	0.73	0.77	1.62	3.22	-2.86	-2.25	1.18	-0.37	0.56
Equity return volatility	-3.77	4.66	2.08	-2.51	1.12	-2.35	4.17	-9.41	-1.31	-3.82	0.71	-1.59
Market-implied asset volatility	-1.92	3.11	5.28	1.95	2.08	2.94	1.07	0.63	-0.41	-0.22	-0.78	0.80
Tail risk	-5.04	3.22	1.11	-2.79	1.06	-2.59	4.94	-5.32	-1.32	-3.52	-1.40	-1.99
Mean expected shortfall	0.38	-0.17	-0.30	-3.01	-0.30	-1.39	0.22	-0.16	-1.00	-0.36	1.30	-0.61
Systemic risk	-1.60	-2.83	-0.27	2.34	-0.18	-2.74	1.27	-2.33	1.36	-0.01	0.00	-0.62
<b>Stouffer's Z-statistic</b>	<b>-5.08</b>	<b>3.54</b>	<b>3.43</b>	<b>-1.70</b>	<b>0.99</b>	<b>-2.70</b>	<b>8.43</b>	<b>-6.67</b>	<b>-3.20</b>	<b>-2.88</b>	<b>-0.29</b>	<b>-1.21</b>
<b>First-difference approach</b>												
Market implied z-score	-0.83	-2.39	-1.48	2.02	1.51	-0.46	4.62	0.70	-0.11	-1.20	0.45	0.91
Balance sheet z-score	-2.67	8.02	3.22	-2.57	3.57	-5.97	5.49	-1.36	-4.80	1.75	-1.78	2.65
Beta (local index)	1.08	1.24	0.75	1.24	-0.90	3.02	2.77	0.26	-0.86	-1.33	-2.93	-0.02
Equity return volatility	-1.62	-0.25	4.85	-2.64	0.00	-4.94	7.70	-6.72	-0.57	-2.47	-1.63	0.13
Market-implied asset volatility	-0.76	-0.44	3.02	1.11	1.02	-0.14	0.06	-0.36	0.32	0.95	0.20	1.15
Tail risk	-1.93	0.62	4.88	-1.88	0.37	-5.11	8.28	-5.07	-0.52	-2.20	-1.53	0.63
Mean expected shortfall	1.00	-0.65	-0.27	0.04	0.28	0.33	2.44	-1.53	-2.82	-1.84	1.70	-0.95
Systemic risk	-0.74	-3.30	0.66	-1.70	-1.58	-1.67	1.31	0.35	2.90	-1.22	0.78	-0.12
<b>Stouffer's Z-statistic</b>	<b>-2.29</b>	<b>1.01</b>	<b>5.53</b>	<b>-1.55</b>	<b>1.51</b>	<b>-5.28</b>	<b>11.55</b>	<b>-4.85</b>	<b>-2.29</b>	<b>-2.67</b>	<b>-1.68</b>	<b>1.55</b>
<b>2008 regression analysis</b>												
Market-implied z-score	-1.03	-0.19	-0.92	1.33	-0.63	-1.32	0.71	-2.65	1.13	-0.10	0.06	0.71
Balance sheet z-score	-1.98	2.32	3.55	3.65	7.04	-2.59	3.64	2.68	8.03	0.96	2.41	0.66
Beta (local index)	-0.89	3.60	-0.11	-0.56	-0.57	-0.98	-3.46	0.85	-0.45	1.44	1.80	-0.82
Equity return volatility	-1.91	1.92	-6.20	-0.82	-0.94	-2.36	3.31	2.09	-1.40	2.66	4.65	0.25
Market-implied asset volatility	-1.81	-2.03	-0.62	1.09	-0.40	-2.95	-0.99	4.20	2.00	0.94	2.00	-0.40
Tail risk	-1.45	-0.21	-4.24	-0.89	-0.95	-2.11	2.85	2.19	-2.33	2.51	5.08	0.49
Mean expected shortfall	-1.12	-1.25	-0.22	-0.46	-0.24	0.08	-1.01	0.11	-1.57	-0.12	-0.99	-1.04
Systemic risk	-0.17	-0.28	0.74	0.38	0.74	-0.73	-1.44	-3.39	-3.51	-0.13	0.56	-1.85
<b>Stouffer's Z-statistic</b>	<b>-3.66</b>	<b>1.37</b>	<b>-2.84</b>	<b>1.31</b>	<b>1.43</b>	<b>-4.58</b>	<b>1.28</b>	<b>2.15</b>	<b>0.68</b>	<b>2.89</b>	<b>5.51</b>	<b>-0.70</b>

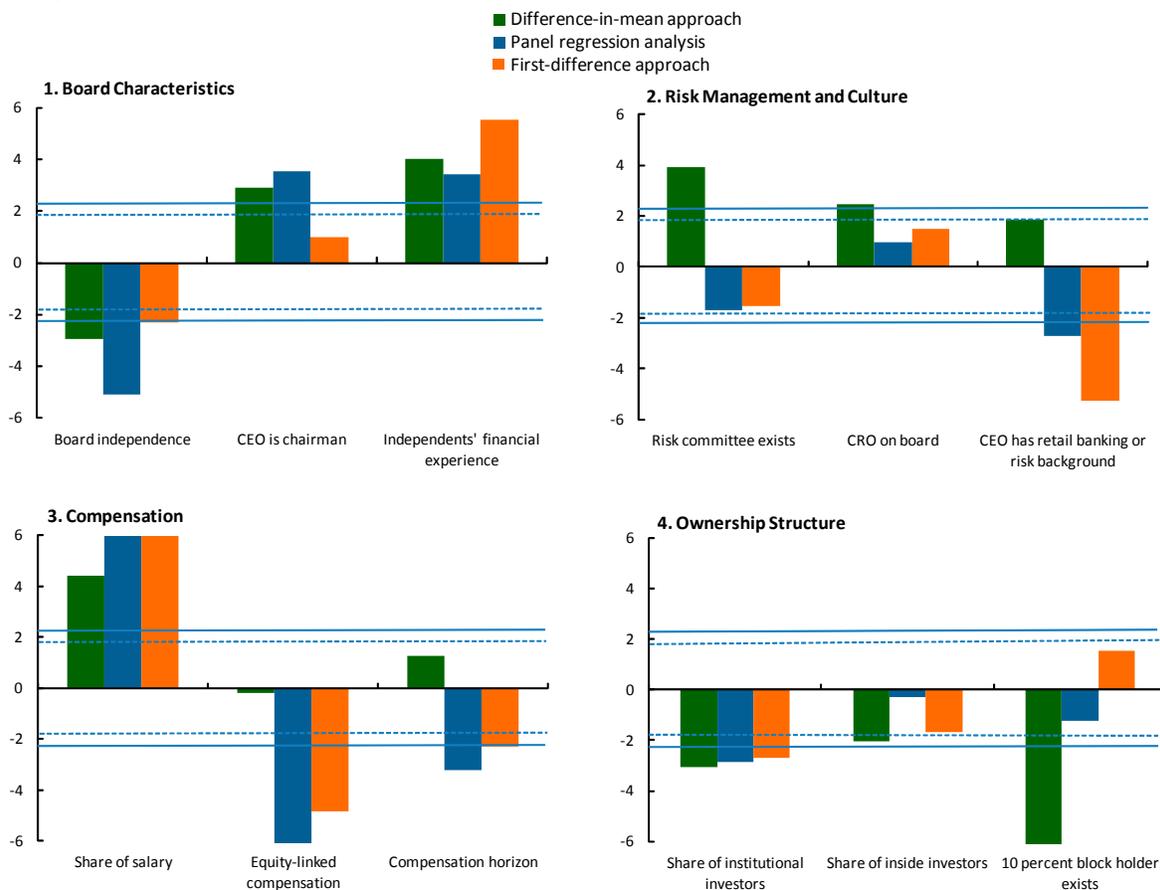
Source: IMF staff estimates.

Note: The table shows *t*-statistics (in plain text) and Stouffer's Z-statistics (in bold)—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left-hand side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. CEO = chief executive officer; CRO = chief risk officer.

**Figure 3.4. Bank Governance and Risk Taking**

(Z-statistics)

Various approaches to investigating the relationship between governance, pay practices, and risk taking in banks give generally consistent results.



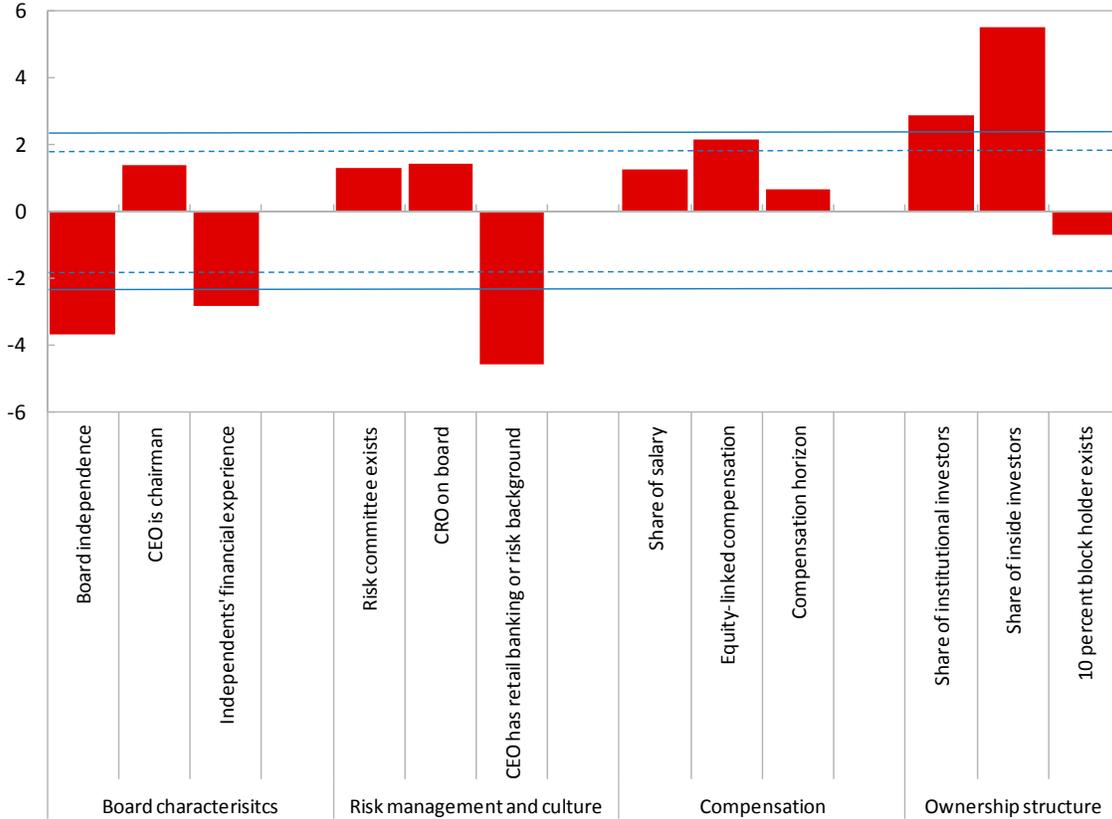
Sources: ASSET4-ESF; Bankscope; BoardEx; Datastream; S&P Capital IQ; and IMF staff estimates.

Note: The figures show Stouffer's Z-statistics—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left-hand side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively. CEO = chief executive officer; and CRO = chief risk officer.

**Figure 3.5. Bank Governance and Risk Taking in the Crisis**

(Z-statistics)

*Vigilant and experienced boards mitigated measured risk, but institutional and insider ownership show evidence of "gambling resurrection."*



Sources: ASSET4-EGS; Bankscope; BoardEx; S&P Capital IQ; and IMF staff estimates.

Note: The figure shows Stouffer's Z-statistics using a cross-section regression of 2008 outcomes on 2007 characteristics. Stouffer's Z-statistic is a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left-hand side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent of significance, respectively. CEO=chief executive officer; CRO=chief risk officer.

- The *CEO who chairs the board* variable also appears to be associated with higher risk taking in banks, reinforcing the important role of board independence in curbing risk taking.<sup>83</sup>
- *Board financial experience* is associated with increased risk in banks. This suggests that board members with financial experience are generally more comfortable with the bank taking more risk. However, the regression using 2008 data shows the opposite effect, suggesting that more financial experience on the board may guard banks against tail risks, or enable boards to better manage the consequences if these risks materialize.<sup>84</sup>

### **Risk management and culture**

- The evidence on the effect of *risk controls* is mixed. It suggests that although risk controls may help manage risks in general, they may not shelter the bank from tail risks. The panel regressions suggest that the existence of a *board risk committee* is associated with lower risk in banks (after addressing the possible endogeneity of the risk-management function using instruments), but the relationship is weak.<sup>85</sup> Only when simultaneously controlling for all governance variables does the analysis find having a risk committee to be significantly related to less risk (see Summary section). Moreover, there is no such evidence in the 2008 cross-section regressions.
- The *professional background of the CEO* (an imperfect proxy for different risk cultures) is related to the bank's risk taking. When the CEO comes from retail banking or has previous experience in the risk function of a financial institution, banks tend to take on less risk, with the opposite being generally true for bankers with a background in investment banking.<sup>86</sup> These results are interpreted as indirect evidence that risk culture is an important determinant of bank risk taking.<sup>87</sup>

<sup>83</sup> Under CRD IV, the separation of the CEO and chairman roles is now required for banks in Europe with one-tier board structure.

<sup>84</sup> This interpretation of the results is reinforced by the finding that financial experience is negatively (though not very strongly) associated with the measures of tail and systemic risks, at least in the regression approach, and is also in line with several studies of bank performance during the global financial crisis (see Table 3.4). The impact of other dimensions of board structure, such as board size and directors' workload, were also tested, but the results turned out either ambiguous or not significant. See Annex 3.2.

<sup>85</sup> Banks with higher risk may choose to have risk controls in place while less risky banks do not; see Annex 3.1 for details of how the regressions control for this potential endogeneity issue. Annex 3.2 provides extensive robustness checks of the findings, including for potential sample selection issues, which are rarely accounted for in the literature.

<sup>86</sup> The measure also gives a rough indication of who gets promoted within the institution. This new finding is in line with another study using a different approach to assess the impact of culture on risk taking in the financial sector (Fahlenbrach, Prilmeier, and Stulz, 2012; see Table 3.4), which suggests that there are time-invariant firm characteristics that shape its willingness to take on risk.

<sup>87</sup> The "Culture and Business Model" section of Annex 3.2 shows that country and specialization characteristics (including investor protection and legal regimes) explain about half of the remaining firm-level heterogeneity in risk taking. The unexplained variation can be attributed to unobservable time-invariant characteristics—including firm culture—and omitted controls.

- As expected, the importance of board oversight and risk management is greater in countries with stronger legal frameworks and government effectiveness (see the “Economic Significance and the Regulatory Environment” section of Annex 3.2 for more details).<sup>88</sup> However, the association between board and risk governance indicators and risk taking is not consistently stronger in countries with strong supervisors.

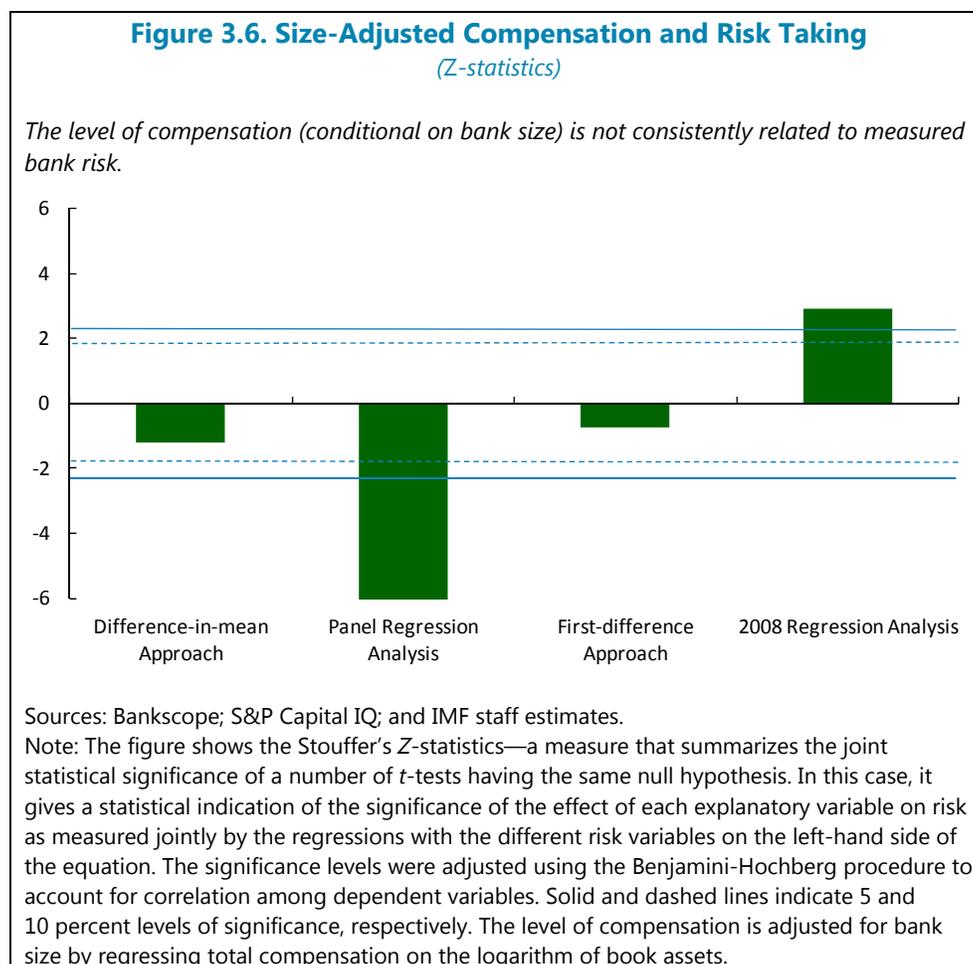
### **Compensation**

- A *higher share salary (fixed pay)* is associated with higher risk, but only for small banks (with less than \$10 billion in assets). This may reflect different compensation practices, reverse causality, or other omitted factors. For instance, smaller banks have a low charter value, which tends to lead them to take on more risk. Taking on more risk, in turn, means that its managers will require higher fixed pay. For larger banks, however, higher risk is usually associated with higher complexity, which demands delegation of responsibilities to managers, but also a higher share of variable compensation (see discussion in footnote 68). In line with the existing empirical literature, the relationship between *cash bonuses* and risk is ambiguous. There is generally no relationship using cash bonus as a percentage of total compensation, but an alternative measure (bonus as a share of salary) shows a positive association with risk during the crisis. See Annex 3.2 for a lengthier discussion.
- *Equity-linked and long-term incentive pay* are associated with less risk in general, except for the year of the crisis, when equity awards are positively related to risk.<sup>89</sup> The same holds for restricted stock awards.<sup>90</sup> Restricted equity awards can lead to increased risk taking if the bank is close to default (“gambling for resurrection”), but the opposite is true if the default probability is low because of the manager’s inability to diversify personal risk (related to his or her job tenure and personal wealth invested in the firm). Results reported in Annex 3.2 confirm this intuition: the impact of equity awards on risk taking during the global financial crisis was much higher and significant for banks closer to default, which suggests that extending the horizon of compensation reduces the incentive for managers to favor short-term risks.
- The *level of compensation (fixed plus variable)* is not consistently related to risk taking. The level of compensation (adjusted for bank size) was related to higher risk taking in the global financial crisis (as found by Cheng, Hong, and Scheinkman 2014), but the other approaches show that it is either negatively or not significantly related to bank risk (Figure 3.6). The findings reinforce the notion put forward by the Squam Lake Report (French and others 2010) that *how you pay matters more than how much you pay*.

<sup>88</sup> As measured by the World Governance Indicators for Rule of Law and Government Effectiveness (World Bank, 2013). See Annex 3.2.

<sup>89</sup> A high level of equity-linked pay is interpreted by some authors to indicate better alignment of the managers’ incentives with the shareholders’ interests. However, as discussed earlier, because of difficulties in performance measurement, a higher share of equity pay may lead to excessive risk taking even from the shareholders’ perspective.

<sup>90</sup> Restricted stocks typically can only be sold after a minimum holding period.



### Ownership structure

- In general, institutional ownership is associated with less risk taking and insider ownership is not correlated with risk. However, the presence of *institutional investors* and of large *insider ownership* correlates with more measured risk in 2008. This result is in line with the idea that banks in which corporate insiders (managers) or institutional investors hold a higher fraction of the ownership of the company should show less risk taking if the bank is financially strong, because they have a lot to lose. When the firm is close to defaulting on its debt (like many did in 2008), managers have less to lose by taking more risk (see Table 3.1). In fact, the latter result can be seen as indicative of a significant “gambling for resurrection” problem, captured by the 2008 crisis regression.<sup>91</sup> These results are broadly consistent with previous empirical findings, which

<sup>91</sup> This hypothesis is further confirmed by results of the panel regressions when insider ownership is interacted with a measure of distance to default (the expected default frequency). These results in the “Gambling for Resurrection” Section of Annex 3.2 show that when a bank is close to default, larger insider ownership is correlated with more risk, with the opposite being true for safer banks. This result is driven by the fact that insiders tend to have more concentrated wealth (and therefore find it harder to fully diversify risk) than shareholders who typically disperse their holdings.

point to a different relationship between institutional or insider ownership and risk taking or performance during the crisis (see the “Ownership” section of Table 3.4).<sup>92</sup>

### Summary

**106. In sum, the empirical analysis suggests that board independence, risk committees, equity pay, and institutional investors (the four dimensions of governance that have received most attention in the literature) are each related to less risk taking in banks.**

**107. Their importance can be confirmed in an overall regression that includes all four variables.** The previous analysis has separately related each governance variable to risk taking. A more general regression would relate risk taking to all four variables simultaneously (at the expense of considerably smaller sample sizes). Figure 3.7 shows the results of panel regressions of each risk measure on all four measures of governance that were found to most robustly relate to risk taking: board independence, the existence of a risk committee, the share of equity-linked compensation in total compensation, and the share of ownership by institutional investors.<sup>93</sup> The results are largely consistent with the previous results—except that having a risk management committee in the board is now found to be significantly associated with lower risk.

## POLICY DISCUSSION

**108. These empirical results have implications for the policy debate.** Some of the recommendations suggested by the analysis are already included in ongoing policy initiatives (although until now they had not been systematically corroborated empirically), but some are more novel.

### On compensation

- Reforms of compensation practices should improve the link between compensation and the various sources of risk as well as extend the horizon over which compensation is awarded to better capture such risks.
- Compensation packages should be adequately sensitive to the risk exposure from the perspective of the bank as a whole, including debt holders. This recommendation is justified by the presence of significant incentives for risk shifting when banks are close to default (gambling for resurrection; see Annex 3.2 Section C for econometric results) and of negative externalities in bank risk taking. A better mix of incentives could be achieved by making long-term illiquid bank

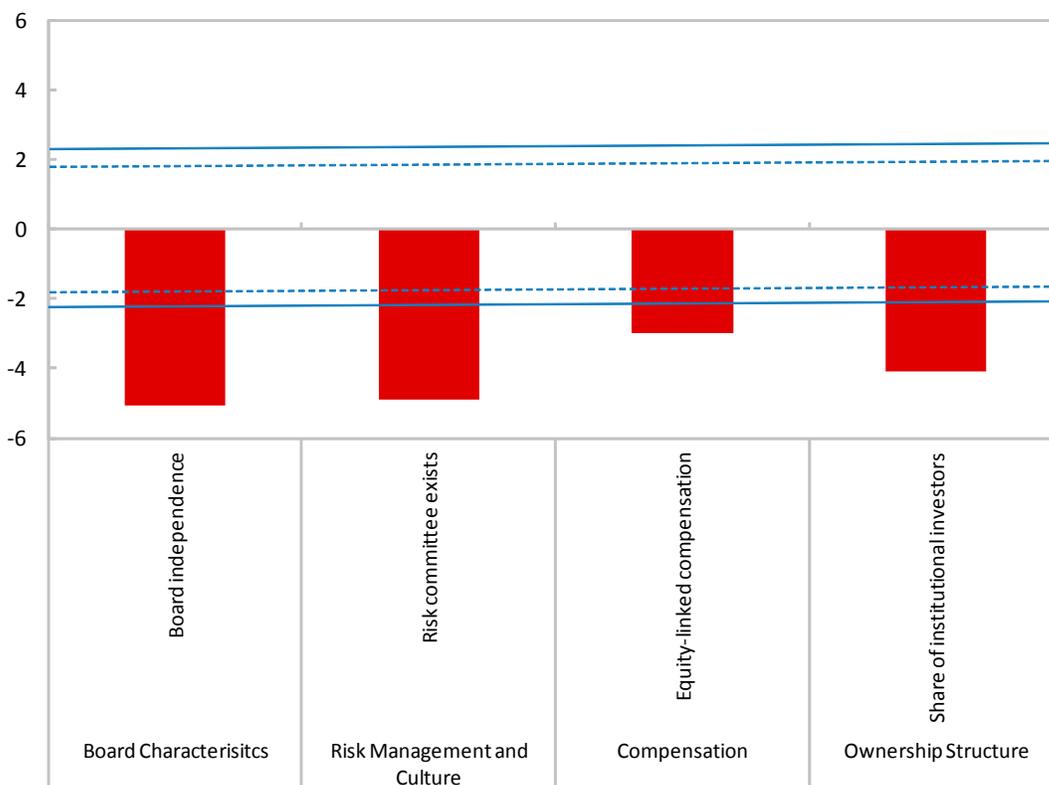
<sup>92</sup> The result on ownership concentration, however, is not consistent with Laeven and Levine’s (2009) finding. This may be due to the use of a different measure of concentration or to the fact that the authors measure risk in 2001 only.

<sup>93</sup> The panel regressions with all four governance variables use significantly smaller samples and therefore were not the preferred specification. The regressions do not use instrumental variables (for the existence of a risk committee) but this does not significantly change the results.

debt a part of compensation (possibly with long vesting periods), or through inverse indexation of compensation to bank CDS spreads, if those markets are sufficiently liquid to reflect the riskiness of the bank. These suggestions are an important element that has largely been absent from reform initiatives so far.<sup>94</sup>

**Figure 3.7. Summary of Main Findings: Impact on Risk Taking**  
(Z-statistics)

*Findings are even stronger when all governance dimensions are considered simultaneously.*



Sources: BoardEx; S&P Capital IQ; and IMF staff estimates.

Note: The figure shows the Stouffer’s Z-statistics—a measure that summarizes the joint statistical significance of a number of *t*-tests having the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left-hand side of the equation. The significance levels were adjusted using the Benjamini-Hochberg procedure to account for correlation among dependent variables. Solid and dashed lines indicate 5 and 10 percent levels of significance, respectively.

- The analysis in the previous section suggests that more pay tied to longer-term equity performance is related to less risk taking, provided that banks are not distressed. Equity awards,

<sup>94</sup> This recommendation is also supported by the theoretical analysis in Bolton, Mehran, and Shapiro (2011). Srivastav, Armitage, and Hagendorff (2014) provide additional empirical support that paying CEOs with bank debt reduces risk shifting.

especially with sufficiently long vesting periods, should therefore be encouraged. The imposition of overall caps, however, should not be expected to reduce risk taking given that no evidence was found that more fixed pay correlates with less risk in large banks. The analysis in Box 3.3 shows that, in theory, a cap on variable pay may actually increase the incentive for managers to take on risk at the expense of shareholders and debt holders.<sup>95</sup> Therefore, measures aimed at reducing the share of variable compensation should be subject to additional study.

### Box 3.3. Adjusting Compensation for Bank Managers: Advantages and Pitfalls

**Suppose that a manager in a bank has an investment project that has a chance for a good outcome (G) and a chance for a bad outcome (B).** The expected profit from the project for the bank is  $P_E$ , which depends on the relative likelihood of the good and the bad outcomes. The manager's expected pay depends on the bank's profit if profits exceed a certain base level, and his expected payoff from the project is  $M_E$ . If the project is not undertaken, the bank and manager get a certain payoff of  $P_0$  and  $M_0$ , respectively.

**Panel 1 in Figure 3.3.1 shows that a convex pay schedule may make the manager prefer to undertake the risky project even though doing so does not benefit the bank.** The manager's expected payoff if the project is undertaken ( $M_E$ ) is higher than the pay he or she gets without the project ( $M_0$ ). Therefore, the manager will prefer to undertake the project, even though  $P_E$  is less than  $P_0$ . The loss—the difference between  $P_E$  and  $P_0$ —is borne by the banks' owners (and its creditors if it leads to default) and the manager's undertaking of the project is an example of risk shifting.

**Panel 2 shows how the pay schedule for the manager can be adjusted by regulation to eliminate the incentive for risk shifting by imposing a bonus cap.** A cap on variable compensation (making the manager's pay not depend on the bank's profits above a certain profit threshold) can make the pay schedule less convex and reduce the project's expected payoff for the manager. In Panel 2, the bonus cap reduces  $M_E$  to a value that is less than  $M_0$ , thereby ensuring the risky project is not undertaken. Similarly, a clawback—which penalizes the manager if the project yields a bad outcome—can also eliminate the incentive for risk shifting.

**Panel 3 shows how this solution can be undermined if developments in the labor market for managers lead to an increase in managers' pay.** If restrictions on variable pay—such as a cap on the ratio of variable to fixed compensation—make bank managers move to jurisdictions where pay has not been capped or to other industries to avoid the regulation, banks may respond to the ensuing shortage of qualified managers by increasing their base pay. This action may undo the effect of the cap if it raises the manager's expected payoff from the risky project above his pay when the project is not undertaken. The same reasoning applies to the case of a clawback clause.

**Panel 4 shows that if the probability of a bad outcome is sufficiently large, imposing a cap could actually induce risk shifting by the manager even if this incentive did not exist before implementation of the policy action.** If the probability of a bad outcome is high enough,  $M_E$  on the original convex compensation schedule from Panel 1 may be less than  $M_0$  on that schedule and the manager may not have an incentive to undertake the project. But the imposition of the pay cap and the ensuing labor market developments can raise the manager's base pay (and with it the variable pay cap itself) such that  $M_E$  is larger than  $M_0$  on the compensation schedule from

<sup>95</sup> In addition, bonus caps can lead to distorted incentives. For example, a banker reaching a bonus cap has an incentive to “manage earnings” and to spread earnings across periods to maximize bonuses. This behavior is potentially costly to banks and may affect their financial performance and risk taking across periods. On the alignment of compensation with risk-adjusted performance see IIF (2013) and on risk shifting see Murphy (2013) and Box 3.3.

**Box 3.3. Adjusting Compensation for Bank Managers: Advantages and Pitfalls (concluded)**

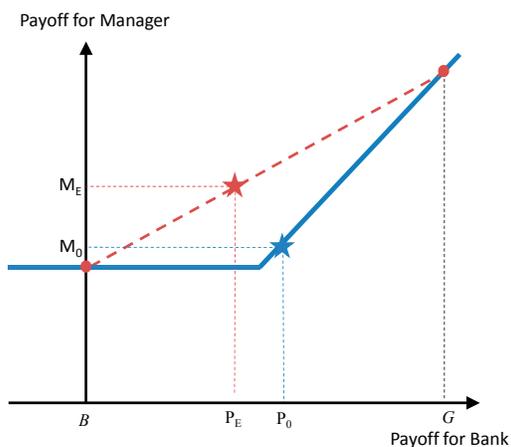
Panel 3. This unintended consequence stems from the fact that the increase in fixed pay caused by labor market developments in response to the cap decreases the manager’s penalty associated with bad performance (this point is also made by Murphy 2013).

**Figure 3.3.1. Risk Taking and Executive Compensation**

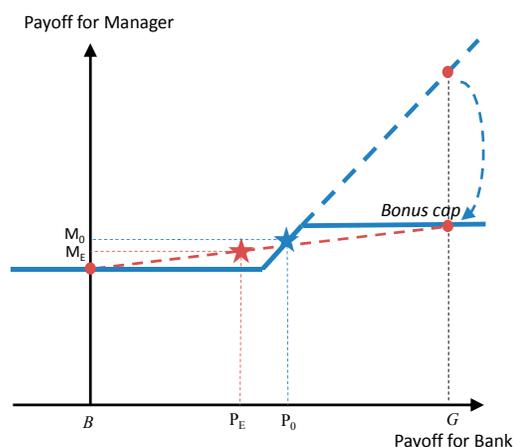
- ★ Outcome if the project is not undertaken
- ★ Expected outcome if the project is undertaken

- Manager’s compensation schedule
- - - Helps determine expected payoffs

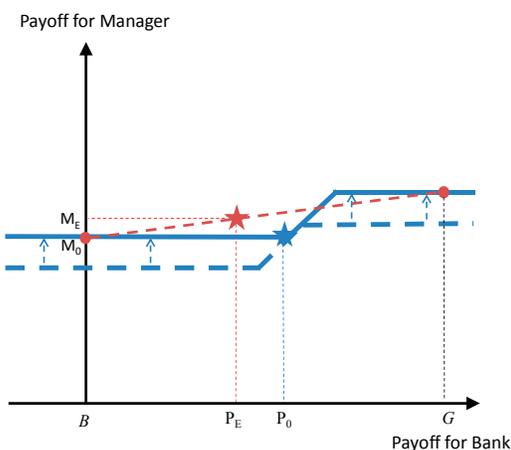
1. Risk shifting occurs if the compensation schedule is convex.



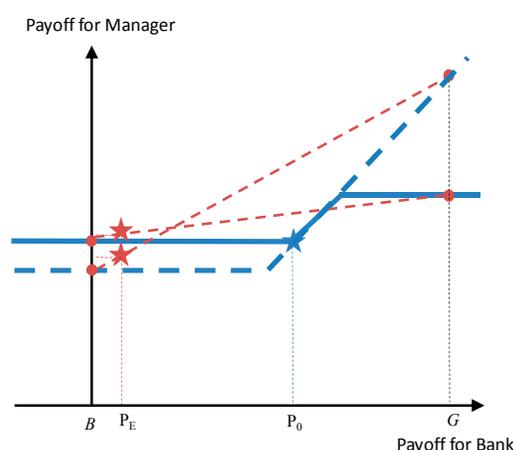
2. Risk shifting can be counteracted by making the compensation schedule less convex.



3. The labor market for bank managers may offset the policy measures...



4. ...and may even increase risk shifting.



Source: IMF staff.

Note: M<sub>E</sub>, M<sub>0</sub>: Manager’s expected pay if the project is/is not undertaken; P<sub>E</sub>, P<sub>0</sub>: Bank’s expected profit if the project is/is not undertaken.

Box prepared by Kentaro Asai.

- Deferred compensation should be mandatory with the creation of bonus accounts (to support bonus-malus clauses), restricted stock and bond awards, and clawbacks. These mechanisms are especially useful when longer-term performance is difficult to measure because they allow for variable compensation to be adjusted later based on actual risk outcomes. Although more research is needed to determine the appropriate length of the deferral period, it should be long enough to take into account the fact that banking risks often take many years to materialize.<sup>96</sup>

### ***On board oversight and risk management***

- Authorities should give consideration to making board directors represent the interests not only of shareholders but also of creditors. In principle, board representation for creditors could improve monitoring and reduce the incentive for risk shifting.<sup>97</sup> Although the analysis suggests that this recommendation has potential merit, it is not currently part of reform proposals and its practical aspects and consequences should be thoroughly analyzed before being implemented.<sup>98</sup>
- Relying on simple metrics of financial sector experience or education to evaluate the suitability of board members may not be sufficient. It may be equally important to assess board members on their ability to effectively challenge management. Further regulatory guidance for fit-and-proper processes for board members also has a useful role to play.
- A sufficient number of bank board members should be independent, and boards should be required to establish an independent risk committee. In addition, independent directors must have the necessary expertise and ability to monitor management. This recommendation is in line with guidelines put forward by the European Banking Authority (EBA 2011), and is already being implemented in the European Economic Area. In the United States, a separate risk committee is required for certain financial companies under the Dodd-Frank Act (see Table 3.2). However, the Federal Reserve has discretion regarding the number of independent board members it requires.
- Risk culture matters. The indirect evidence on the importance of the CEO's professional background suggests that the "tone from the top" is important in shaping risk taking (see also Group of Thirty 2013). Hence, supervisors should evaluate bank risk culture and governance regularly. A good example of this is the qualitative assessment of bank conduct and culture

<sup>96</sup> The FSB P&S stipulate that the deferral period "should not be less than three years, provided that the period is correctly aligned with the nature of the business, its risks and the activities of the employee in question" (FSB 2009, page 3). See also IMF (2009) for tax implications of executive compensation reforms.

<sup>97</sup> Expanding board representation to creditors will probably lead to increased monitoring because of the reduced expectations of government bailouts of unsecured creditors under the new bank resolution frameworks. Board representation could be most useful for creditors that are most vulnerable to bank risk, for example those holding contingent convertible bonds that convert to equity in case of financial distress.

<sup>98</sup> Extending control rights beyond shareholders, namely to bondholders, has been suggested by Macey and O'Hara (2003); Becht, Bolton, and Roell (2011); and Ellis, Haldane, and Moshirian (2014). A more ample policy discussion on this topic has also been requested in the United Kingdom (Parliamentary Commission on Banking Standards 2013).

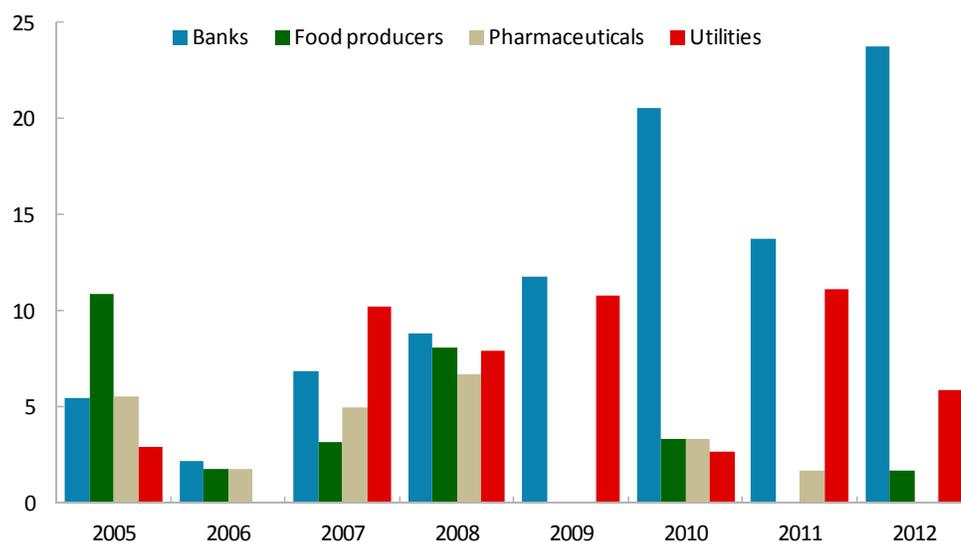
undertaken by the Central Bank of the Netherlands as a complement to the more traditional prudential supervision (see Box 3.4 and Nuijts and de Haan [2013]).

### Box 3.4. Integrity in Financial Institutions

**In recent years, the financial industry has been rocked by corporate scandals in which alleged misconduct and unethical behavior by top- and middle-tier employees has been common.** According to the Edelman Trust Barometer, since 2006, in several economies around the world, banks have gone from being one of the public's most trusted sectors to the least trusted (Edelman 2007, 2014). At the same time, the number of customer complaints against banks has greatly increased, especially when compared with other sectors (Figure 3.4.1).

**Figure 3.4.1. Customer Complaints**  
(Percentage of companies with customer complaints)

*Banks are increasingly under the spotlight because of consumer complaints or dissatisfaction.*



Sources: ASSET4-ESG; and IMF staff calculations.

**A number of factors may play a role in why the financial industry in general and the banking sector in particular have been so afflicted by accusations of unethical behavior.** Financial services and banking activities are often complex and opaque and the value of financial products is often difficult to assess by customers, leading to opportunities for deceit. Moreover, the fast pace of financial transactions makes it difficult for internal and external auditors to monitor misconduct thoroughly. At the same time, the financial industry is subject to stricter rules of disclosure and tighter regulation and supervision, which may increase the number of reported cases of misconduct compared with other industries. Finally, the sensitive nature of some activities—such as price fixing—creates powerful incentives for misbehavior.

**Incentives and controls can go some way toward addressing these issues, but the role of corporate culture is key.** Improved transparency and disclosure, addressing perverse incentives, and internal and external controls are important, but none of these measures can always prevent such behavior. In instances in which incentives are poorly designed or rules insufficient, corporate culture—the set of unwritten rules and shared beliefs that govern how to act in the absence of rules—will be a powerful tool for improving risk

### Box 3.4. Integrity in Financial Institutions (concluded)

management, discouraging misconduct, and even improving performance and creating value (Sørensen, 2002).<sup>1</sup> Corporate culture plays an important role in banks because to a much larger extent than in other sectors, bank employees often face decisions for which rules are ambiguous or allow discretion, which may lead to an expectation that bad behavior will go unpunished and good behavior unrewarded.

**Emphasizing the right tone at the top is an important step toward improving the business culture in banks, but attention should also be given to improving the “tone in the middle.”** The tone at the top may not necessarily trickle down to middle management (Zinkin, 2013). Indeed, strengthening integrity in financial institutions requires a culture in which ethical behavior is consistently rewarded throughout the ranks.

**Supervisors are paying attention to risks arising from corporate culture and conduct.** The Financial Stability Board has issued recommendations on how to assess the soundness and efficacy of the risk culture in a financial institution (FSB 2014). Similarly, at the country level, authorities are supplementing more traditional prudential supervision with supervision of conduct and culture (see Nuijts and de Haan [2013] for the example of the Netherlands). Supervision in this area focuses on leadership styles and the example that leaders set, and on accountability, shared values, openness for discussion, and the effects of “groupthink.”

**Integrity and ethical behavior must also be a requirement for financial supervisors.** In particular, closing the revolving door between financial institutions and supervisory agencies will help minimize regulatory capture.

**To support these supervisory efforts, a thorough analysis of the link between the different flavors of corporate culture and sound risk taking is needed, as is a taxonomy of socially unacceptable behaviors in finance.** Such research would fill a gap in the literature; few studies have explored the role of culture in risk taking and fewer still have done so for the financial industry (see Table 3.4). Accordingly, the IMF is conducting work on the enhancement of integrity in the financial sector.

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Box prepared by Luis Brandao Marques and Ceyla Pazarbasioglu.

<sup>1</sup> Although corporate culture complements and may reinforce corporate governance, culture is different from governance and does not seem to be much affected by it. For instance, Guiso, Sapienza, and Zingales (forthcoming) do not find a significant relationship between measures of executive compensation or firm ownership and managerial integrity and ethics.

**109. The measures proposed here are potentially economically significant.** For instance, the analysis shows that increasing the ratio of independents on the board by 10 percentage points is typically associated with a decline in risk taking as large as that induced by a 2.3 percentage point increase in the Tier 1 capital ratio. Similarly, the reduction in risk achieved by the creation of a risk committee of the board would be equivalent to that achieved by increasing the Tier 1 capital ratio

by 0.9 percentage points (see the “Economic Significance and the Regulatory Environment” section of Annex 3.2).<sup>99</sup>

**110. When implementing new measures for banks, policymakers need to consider the possibility that activities may shift from banks to the shadow banking sector.** New measures could increase the incentive for regulated institutions to shift activities outside the regulatory perimeter. Executives may also choose to leave bank employment and take jobs in less-regulated financial institutions if doing so would allow them to escape executive pay regulation. These incentives could fuel the growth of the shadow banking sector. Although shadow banking has benefits, including expanding access to credit and supporting market liquidity, maturity transformation, and risk sharing (see Chapter 2), by taking on bank-like risks, the shadow banking sector may contribute to overall systemic risk in the financial system. Policymakers should therefore take a broad view of the potential effects on the entire financial system of new regulatory measures on executive pay and governance in banks.

**111. Furthermore, the policy measures should be considered to be complementary to capital and liquidity regulations designed to foster safe and sound financial structures.** Specifically, liquidity and capital buffers help induce managers to adopt more prudent behaviors by reducing the risk of bank failure and hence reducing the incentive that limited liability provides for bankers to gamble for resurrection.

**112. Transparency is important in promoting accountability.** Regulation can play a forceful role by requiring timely and accurate disclosure not only of the financial situation of banks but also of risk-management and corporate governance matters. The Comprehensive Capital Analysis and Review implemented in the United States, where the Federal Reserve discloses its qualitative assessment of a bank’s corporate governance and risk-management framework, is an example of how to enhance transparency in practice (Board of Governors of the Federal Reserve System 2014). In addition, transparency of the work and decision making of regulators and supervisors can add to “supervisory discipline,” which is strongly linked to effective supervisory outcomes (Viñals and others 2010).

**113. Finally, supervisory effectiveness has a strong bearing on incentives and risk outcomes.** This is why the Basel Committee on Banking Supervision has steadily enhanced the framework for risk supervision in banks, starting with the 1988 Basel I Accord, and especially Basel II in 2005 (Box 3.5). In addition, attention is being paid to “softer” issues that rules alone cannot address, such as enhancing supervisor-board relations to improve supervisor and board effectiveness, and to the risk culture in financial institutions.

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<sup>99</sup> The uncertainty associated with the estimates and the understanding that the measures should be considered to be a package of reforms of bank governance and compensation preclude a formal ranking of the measures.

### Box 3.5. Regulation and Risk Taking Incentives: Basel I to III

**Although capital adequacy requirements have a long history in some countries—the United States had capital adequacy rules starting in the 1900s, for example—Basel I (1988) introduced uniform, risk-sensitive minimum capital standards at the international level.** Under Basel I, credit risk was divided into five buckets, ranging from zero percent to 100 percent depending on the riskiness of the underlying asset. Although Basel I was hailed for incorporating risk into the calculation of capital requirements and was regarded as a big step forward, it was also criticized for not taking into account hedging, diversification, and differences in risk-management techniques. It also did not take into account other types of risk, particularly market risk.

**Advances in technology and risk-management techniques allowed banks to develop their own internal capital allocation models in the 1990s, which enabled them to align the amount of risk they undertook on a loan with the overall goals of the bank (internal risk tolerance).** For example, Basel I placed all commercial loans into the 8 percent capital category. In contrast, internal model calculations led to capital allocations on commercial loans that varied from 1 to 30 percent, depending on the loan's estimated risk. It was hence argued that although Basel I was a step in the right direction, it was not sufficiently risk sensitive and could result in arbitrage: if capital regulation was binding, a lack of risk sensitivity would encourage banks to shift toward the riskiest activity within each category (see Koehn and Santomero 1980; Kim and Santomero 1988; Keeley and Furlong 1989, 1990; Rochet 1991).

**The Market Risk Amendment (1996) and Basel II (2005) were introduced to address these shortcomings, allowing internal models for market and credit risk respectively.** These measures allowed banks to use internal models to more finely differentiate risks of individual loans. Risk could now be differentiated not only between each category of loans but also within loan categories. The regulations were designed to induce banks to invest more in risk-management and modeling technology by providing capital relief—the standardized approaches were calibrated to be more conservative than risk-sensitive internal models.

**Before these changes were introduced, banks' internal risk models (and other risk-management functions) were designed to measure risk accurately.** However, after the Market Risk Amendment and Basel II, subject to regulatory approval, models became a key input in determining capital requirements, generating a competing objective of using models to *minimize measured risk* to minimize capital requirements. These incentives may have contributed to the global financial crisis during which banks, particularly large banks, were found to hold insufficient capital. Since the crisis, Basel III has raised the capital requirements for banks, and work is ongoing to better capture risk.

Box prepared by Pragyana Deb.

## CONCLUSION

**114.** The agency problems typical of corporations—shareholders versus managers—are magnified in banks through the additional competing interests of shareholders and managers with those of bondholders, depositors, and society at large. Although taking risks is part of a bank's mission (for example by funding uncertain but productive investment), banks may take more risks than is socially desirable with regard to systemic financial stability, as evidenced by the recent global financial crisis. Excessive risk taking may occur even when managers' incentives are aligned with

those of shareholders, particularly when performance is improperly measured (as was often the case in banks). Risks are heightened when leverage is high and when a bank is close to defaulting, with managers “gambling for resurrection” through high-risk bets because their losses are limited and the potential gains are substantial.

**115. The empirical analysis in this chapter has provided a link between several aspects of corporate ownership, governance practices, and risk taking in banks.** The strongest link is between board independence and lower risk taking. Although the *level* of compensation is not consistently associated with the degree of risk taking, its composition is: a larger share of equity pay and long-term pay for CEOs are related to lower risk in banks, especially when the banks are not in distress. Ownership matters: the presence of institutional ownership is associated with less risk taking, provided the bank’s default risk is low.

**116. The analysis provides the first systematic empirical support for many of the ongoing reform efforts, and two areas warrant particular emphasis in the policy process.** The analysis lends support to the ongoing push for more bank board members that are independent of management, for long vesting periods, and for clawback clauses. It also validates the concept that a company’s culture has a large influence on a bank’s risk taking. The two recommendations that have not figured prominently in the reform effort but should be considered are (1) that creditors’ interests could be represented on boards of directors in addition to those of shareholders; and (2) that the sensitivity of executive compensation to default risk should be enhanced through long-term debt awards or inverse indexation to bank default risk

## Annex 3.1. Data and Methods

### A. Data Set

**117. To analyze the factors that affect risk taking in financial firms, we examine a large data set of risk-taking measures and governance statistics for banks in various advanced and emerging markets.**

- *Dependent variables:* We measure risk across eight dimensions, capturing both balance sheet and market measures of risk. We include measures of distance-to-default, volatility, tail risk, and systemic risk (see Table 3.5 for details). The balance sheet measures were derived from the data on bank financials available at Bankscope and the market measures of risk were calculated using market data from Datastream and Moody's CreditEdge. The data for systemic risk were obtained from the New York University Stern School of Business Volatility Institute.
- *Explanatory variables:* We consider a large set of potentially relevant explanatory variables, which can be classified across four main dimensions of corporate governance—board characteristics, risk management, compensation and ownership (see Table 3.3). The data on board characteristics and risk management were calculated using BoardEx data and S&P Capital IQ was the main source for the compensation and ownership data. The data on horizon of compensation was obtained from ASSET4-ESG, available via Datastream.
- *Country-level control variables:* We include a set of country-level control variables: log GDP per capita (adjusted for purchasing power parity); current account balance as a fraction of GDP (from the IMF World Economic Outlook database); the average of the six World Governance Index variables (from World Bank's World Governance Indicators); and a deposit insurance dummy (from Demirgüç-Kunt, Kane, and Laeven 2007).
- *Bank-level control variables:* We also include a set of bank-level control variables from Bankscope: return on book assets, log book assets, the deposit-to-asset ratio, the Tier 1 capital ratio, and revenue growth.

The resulting dataset includes more than 800 banks (although data are incomplete for a number of banks). The banks come from 72 countries, with slightly more than half from the United States, more than 20 percent from Europe, and the rest from Asia, the Americas, and Africa. Table 3.7 shows the breakdown of banks by country for the panel regressions of tail risk on each of the four dimensions of governance.

### B. Methods

**118. We use four main methods to explore the determinants of bank risk taking during the past decade: (1) a nonparametric difference-in-mean approach; (2) panel regressions; (3) a first-difference approach; and (4) cross-section regressions.**

#### Difference-in-mean approach

**119. For each governance measure, we rank banks based on their value in 2007 and group them in quartiles.** We then compare the average difference in the performance of banks belonging to the top and bottom quartiles for the period 2009–13. To select a sample of relatively

homogeneous banks, we restrict our sample to banks with total assets of at least \$10 billion in 2012. Furthermore, we strip out the effect of bank- and country-level differences that can influence bank incentive structures by regressing the various indicators on the bank- and country-level controls. We also include country dummies to capture country-level differences not captured by the country controls.

### Panel regressions

**120. We regress the explanatory variables (lagged to account for possible endogeneity) one by one, along with the lagged bank control variables, the lagged country control variables, year dummies, and bank fixed effects.** Standard errors are clustered by country. We use dependent variables from 2005 to 2013 (because the explanatory variables are lagged, they are from 2004 to 2012). For this and the remaining approaches we use the full sample of banks because we explicitly control for bank size.

**121. Although we use lagged explanatory variables to control for endogeneity, for some of the more structural explanatory variables that are related to the banks' business models, doing so may be insufficient.** To illustrate, if a bank has a high risk appetite, it may naturally take more risk while intentionally increasing the involvement of its board in risk management by creating a board risk committee and having its CRO sit on the board. In that case, we would observe a positive association between bank risk taking and the variables "Risk committee exists" and "CRO on Board" but we cannot conclude that these two governance variables are responsible for higher risk taking. To mitigate this concern, we use an instrumental variable approach for the two risk-management measures: we instrument the "Risk committee exists" and "CRO on board" measures by net loans over deposits and short-term funding and a country-specific time trend. The rationale is that the net loans over deposits and short term funding can be considered a proxy for a bank's business model (and thus may cause variation in the two risk-management measures) but is not directly related to risk taking. The instruments pass the standard under-identification, weak-identification, and over-identification tests and are statistically valid. We also run a robustness check by using the change in impaired loans over gross loans as an instrument and get similar results.

### First-difference approach

**122. We use a first-difference approach to relate the change in risk taking between 2005–07 and 2011–13 to the change between the same periods in each governance measure.** Using first-differences bypasses some of the endogeneity problems associated with the regressions in levels. We include country dummies to incorporate country-level differences.

### Cross-section regressions

**123. We regress dependent variables from 2008 on independent variables from 2007 to capture the effects of the crisis.** We include bank control variables from 2007 and country fixed effects in the regressions. Standard errors are clustered by country. As in the panel regressions, we use an instrumental variable approach to account for endogeneity in the regressions involving the risk-management measures.

**Summary statistics: Stouffer's Z-statistic**

**124. We calculate the individual impact of each governance measure for each dimension of risk using t-statistics. We use the Stouffer's Z-statistic to summarize our result,**

$$Z = \frac{\sum_{i=1}^k Z_i}{\sqrt{k}} \sim N(0,1), \text{ where } Z_i \equiv \varphi^{-1}(p_i) \text{ is the } t\text{-statistic for test } i.$$

Stouffer's Z-statistic assumes that each regression is independent. Because the (k=8) regressions we run for each governance measure in our analyses (one regression for each risk variable) are not independent, we use the Benjamini-Hochberg procedure and adjust the critical values using the approximate false discovery rate  $\alpha (k+1)/2k$ .

**Table 3.7. Number of Banks by Country in Samples for Different Regressions**

	Board characteristics	Risk management	Compensation	Ownership structure
Australia	10	10	7	10
Austria	4	4	1	6
Belgium	2	2	2	2
Brazil	0	0	0	3
China	4	4	2	8
Denmark	4	4	6	11
Egypt	1	1	0	1
Finland	1	1	1	3
France	3	3	2	4
Germany	4	4	4	7
Greece	1	1	0	2
Hong Kong SAR	1	1	2	2
India	8	8	1	8
Indonesia	0	0	0	5
Ireland	1	1	1	1
Israel	5	5	5	5
Italy	12	12	8	13
Japan	17	17	3	86
Luxembourg	1	1	0	1
Mexico	1	1	0	2
Netherlands	3	3	0	3
New Zealand	0	0	0	0
Norway	4	4	7	15
Philippines	5	5	0	7
Poland	1	1	0	2
Portugal	3	3	2	3
Russia	1	1	0	4
Saudi Arabia	2	2	0	7
Singapore	3	3	2	3
South Africa	3	3	4	5
Spain	5	5	4	5
Sweden	4	4	3	4
Switzerland	6	6	6	8
Taiwan Province of China	0	0	0	0
Thailand	3	3	0	8
Turkey	4	4	0	5
United Kingdom	8	8	8	8
United States	373	373	273	498
Other				
<i>Of which:</i>				
Middle East	6	6	3	28
Eastern Europe	1	1	0	2
South America	2	2	0	5
South Asia	3	3	1	13
Total	533	533	369	834

Source: IMF staff.

Note: The table shows the sample used for the regressions of the tail risk measure on variables from each of the four dimensions of governance.

## Annex 3.2. Additional Results

### A. Robustness

**125. To test the robustness of the positive association between the share of fixed compensation and bank risk, we performed a series of additional analyses.** First, to investigate whether the results were affected by bank size, we restricted the sample to banks with total assets of more than \$10 billion and found that the correlation vanished both in the panel regression (Table 3.8) and in the crisis cross-section regression. We repeated the exercise with different size thresholds and reached the same conclusion each time. Then, using the entire sample, we included an interaction of fixed pay with bank size; the interaction term came in significantly negative, which reinforces the previous finding. Second, we performed a differences-in-differences panel regression in which we interacted fixed pay with a regulatory dummy for CRD IV. The assumption is that those regulatory changes affected the ratio of fixed to total compensation and were exogenous. The effect of fixed pay on risk, measured by the coefficient of its interaction with CRD IV, was not significant.

**126. The global macroeconomic environment could play a significant role in explaining bank risk taking.** For instance, access to abundant liquidity combined with volume-based compensation for loan officers can lead to more risk taking and the formation of asset price bubbles (Acharya and Naqvi 2012; Adrian and Shin 2014). To test the robustness of our results when controlling for the macroeconomic environment, we ran the panel regressions with interest rates on the 3-month and 10-year securities of each bank's national government as additional controls. Separately, we also ran the above panel regressions with country average equity returns as an additional control. The results are robust and similar to those shown in Figure 3.7.

**127. We performed an additional robustness check on the results by extending the specification to include several measures of regulatory and supervisory quality as additional controls.** Specifically, we added measures of the powers of the official supervisory entities, permissible bank activities, capital requirements, and private monitoring (Barth, Caprio and Levine 2013). The results are qualitatively similar. Of the new variables only the official supervisory power index turns out to be significant, usually leading to more risk.

**128. We also performed the previous analyses on a sample that was restricted to bank holding companies and commercial banks (that is, we excluded cooperative banks, savings banks, mortgage companies, and investment banks, among others).** The results are unchanged. The results also hold for subsamples of banks from the United States and Europe (Table 3.8). Because splitting the sample greatly reduces the number of available observations and reduces statistical power of the tests, the panel regression was repeated allowing the slope coefficients to vary by region, following Macey and O'Hara's (2003) definition of regional corporate governance models: Anglo-American, Franco-German or Advanced European, and Other. Again, the results are similar but more significant than in the previous case.<sup>100</sup>

<sup>100</sup> We would have liked to perform the same exercise for government-owned banks but the available data were insufficient to perform a meaningful analysis.

**129. We also checked for the existence of selection bias in our samples.** Specifically, BoardEx and S&P Capital IQ may only sample some types of bank. For instance, their coverage may be better for large banks or for American or British banks. To check whether our results are robust to this potentially serious problem, we performed the panel data analyses using the Heckit method (Heckman 1976). The procedure involves running a first-stage pooled probit regression to estimate the probability that BoardEx or S&P Capital IQ covers a bank based on its size, specialization, country, and whether it is listed on a major stock exchange. We then ran the panel regressions with the inverse Mills ratio (estimated separately in the first stage for each regression) as an additional control. In several instances we could not reject the hypothesis that our samples were nonrandom, but the estimated relationships of our governance variables with measured risk were qualitatively similar.

**130. Finally, we used the dynamic panel generalized method of moments estimator developed by Arellano and Bond (1991) to control for lagged values of the dependent variables in the panel regressions.** The results for board independence, the existence of a risk committee, compensation horizon, and large shareholders were robust, but the results for the CEO is chairman, share of salary, financial experience, equity-linked compensation and institutional investor variables were not robust. This should not be surprising because including a lagged value of the dependent variable in the panel regression is a stringent control that strongly mitigates the effect of the lagged governance variable whenever the governance variable has a contemporaneous effect on the dependent variable.

## **B. Economic Significance and the Regulatory Environment**

**131. We compare the economic impact of each variable in our subset of governance variables (board independence, the existence of a risk committee, the share of equity-linked compensation in total compensation, and the share of ownership by institutional investors) on our eight measures of bank risk to the impact of increasing (1) the Tier 1 capital ratio; and (2) the size of the bank.** To illustrate the effect, we select the results for tail risk when comparing to the capital ratio and systemic risk contribution when comparing to bank size (Figure 3.8). The capital ratio is closely linked to microprudential policy.

**132. Some of the governance variables have impacts comparable to that of changing the Tier 1 capital ratio or the size of the bank.** For instance, an increase in board independence of 10 percentage points has roughly the same impact on tail risk as increasing the Tier 1 capital ratio by 2.3 percentage points. Similarly, creating a board risk committee or decreasing the share of salary by 10 percentage points would be equivalent to increasing the Tier 1 capital ratio by 0.9 and 1.8 percentage points, respectively.

**133. Our analysis shows that the importance of board oversight and risk management is greater in countries with stronger legal frameworks and government effectiveness.** We included in the panel regressions interaction terms of board independence, CEO as chairman, the existence of a risk committee, and the presence of the CRO on the board of directors with measures of government effectiveness and the strength of the rule of law (taken from World Bank [2013]). The results generally indicate that oversight by the board and the risk function are better in countries with a stronger institutional environment. The importance of board oversight and of the risk

function is also more important when banks face few activity restrictions (measure from Barth and others [2013]). However, the association between board and risk governance indicators and risk taking is not consistently stronger in countries with strong supervisors (measured by the index of official supervisory power also from Barth and others [2013]).

### C. Gambling for Resurrection

**134. A CEO who owns a lot of equity in the bank he or she heads may have an incentive to “gamble for resurrection” when the bank is in financial distress.** As Table 3.1 shows, when the bank’s equity has almost been wiped out (that is, when the bank has a high probability of default), the equity holders have an incentive to take high risks, because they will capture any possible upside whereas the possible downsides will be mostly borne by debt holders. This effect may drive the somewhat different results in Figure 3.5 (relative to Figure 3.4), which focus on the crisis period when banks’ distances to default were smaller than usual.

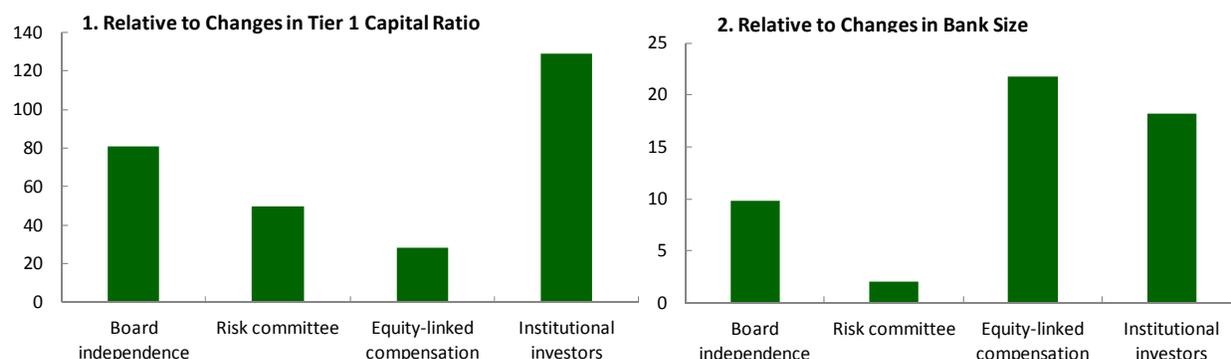
**135. To formally test this supposition, we repeat the 2008 cross-section regressions for each dependent variable using equity-linked compensation in 2007 as the explanatory variable (as well as the customary control variables), with the addition of an interaction term between 2007 equity-linked compensation and a measure of the bank’s distance to default in 2007.** The distance to default is measured by the expected default frequency (EDF).<sup>101</sup> We then repeat the exercise with the share of inside investors instead of equity-linked compensation. If CEOs who own more equity do gamble for resurrection when their banks have a higher probability of default, the coefficients on the interaction terms should be positive.

**136. The results suggest that there is indeed a practice of gambling for resurrection.** As Table 3.9 shows, for both equity-linked compensation and the share of inside owners, the interaction terms with the probability of default are positive and significant at the 5 percent level in most of the eight regressions. The results also hold if we repeat the exercise with the share of restricted stock instead of equity-linked compensation.

<sup>101</sup> Our baseline specification uses the EDF measured at the five-year horizon available from Moody’s (EDF5). We repeated the analysis with the EDF measured at the one-year horizon (EDF1) and, given that the distributions of EDF1 and EDF5 were highly skewed, with their logs. The results are robust to these alternative specifications.

**Figure 3.8. Economic Significance of Bank Governance Variables**  
(Percent)

Bank governance variables have an impact on risk comparable to that of the Tier 1 capital ratio and bank size.



Source: IMF staff estimates.

Note: The bars show the impact on risk of a standard deviation change in the governance measure relative to the impact of a standard deviation change in the Tier 1 capital ratio and bank size, respectively. Risk is measured by tail risk for the comparison with the Tier 1 capital ratio and systemic risk for the comparison with bank size.

#### D. Culture and Business Model

**137. One limitation of the empirical analysis in the body of this chapter (and common to most of the empirical literature) is that some governance measures and dependent variables may be affected by the bank's business model or culture.** To assess how much of the time-invariant bank-level heterogeneity is captured by variation across countries and business segments, we conducted the following exercise.

**138. For each dependent variable, we first run a panel regression of the dependent variable on a subset of governance measures (board independence, risk committee exists, share of salary, and share of institutional investors) and controls together in the regressions.** Second, we regress the resulting fixed effects on country and specialization dummies. Third, we compute the weighted average of the *R*-squared measures of these second regressions, with the weights equal to the regression sample sizes. We obtain a (weighted) average *R*-squared of 52 percent, indicating that about half of the bank-level heterogeneity can be captured by the country and specialization dummies. The other half is attributable to other time-invariant bank characteristics that vary within countries and with bank specialization (such as culture and the business model), for which we cannot control in the cross-section regressions and difference-in-means analyses.

**139. We are also interested in the share of the bank-level heterogeneity that can be captured by variables that aim to measure the legal and regulatory environment in different countries.** To address this question, we repeat the above analysis with the second step replaced by a regression of the fixed effects on (1) the dummy variables measuring legal origin from Spamann (2010); (2) the four variables measuring country-level bank regulation from the World Bank surveys

on bank regulation (namely, Overall Restrictions on Banking Activities, Official Supervisory Power, Private Monitoring Index, and Overall Capital Stringency); (3) the deposit insurance dummy from Demirgüç-Kunt, Kane, and Laeven (2007); and (4) the legal rights measure from the World Bank Doing Business project. We obtain a weighted average *R*-squared of 24 percent, indicating that slightly less than half (24/52, or 0.46) of the country-level variation in bank fixed effects identified in the first analysis is attributable to the measured variation in the legal and regulatory environment.

#### E. Other Governance Variables

**140. We extended the analysis of the association of CEO compensation with bank risk by including, in both panel and cross-section regressions, a dummy variable for options awards and the fraction of cash bonuses in total compensation.** Stock option grants are positively and robustly associated with risk but few banks outside the United States use this type of compensation. Cash bonuses, in contrast, were not associated with risk in our sample. This result prevails even if we restrict the sample to larger banks.

**141. In addition to the board governance variables described in the baseline analysis, we also examined whether director workload (measured by the average number of outside directorships), the fraction of directors who are female, and the nationality mix of the directors were associated with bank risk taking.** The results were either not robust or not significant for any of these variables.

**142. We then looked at the relationship between risk taking and (1) the number of directors; (2) a dummy indicating small boards (with five or fewer directors); and (3) a dummy indicating large boards (with 16 or more directors).** We found that the number of directors is significantly associated with less risk taking and that the small board dummy is significantly associated with more risk taking. The results are not significant and robust for the large board dummy. This suggests that the negative effect of the number of directors on risk taking is driven by the effect of small boards, which is consistent with the hypothesis that small boards do not have sufficient resources to monitor management. We find no support for the hypothesis that large boards are inefficient at monitoring because they provide incentives for directors to free ride.

**143. Finally, we looked at restricted stock as a percentage of total CEO compensation.** We found that more pay in restricted stock is significantly associated with less risk taking in the difference-in-means and first-difference regressions but not in the panel regressions. This result is consistent with our results that more equity-linked compensation and longer compensation duration are associated with less risk taking. The association becomes significantly positive in the crisis regression, which is consistent with the hypothesis that managers tend to gamble for resurrection when the risk of default is high.

**Table 3.8. Robustness in Subsamples**

Variable	All sample	Commercial banks and bank holding companies	United States	Non United States	Europe	Large banks (assets of more than \$10 billion)
Board independence	↓	↓	↓	–	–	–
CEO is a chairman	↑	–	–	–	–	↑
Financial experience	↑	↑	↑	↓	–	–
Risk committee	–	–	↑	–	–	↓
CRO board member	–	↑	–	–	↓	–
CEO background	↓	↓	–	–	–	↓
Share of salary	↑	↑	↑	↑	–	–
Equity-linked compensation	↓	–	–	–	–	–
Compensation horizon	↓	↓	–	↓	–	↓
Level of compensation	↓	↓	–	–	↓	↓
Institutional investors	↓	↓	–	–	–	–
Inside investors	–	–	–	–	↓	↓
Large shareholder	–	–	–	–	–	–

Source: IMF staff.

Note: ↑ = significant, higher risk; ↓ = significant, lower risk; and – = not significant.

**Table 3.9. Gambling for Resurrection**

*A higher level of equity-linked compensation (current or cumulative) is associated with increased incentives to gamble for resurrection.*

	Market implied Z-score	Balance sheet Z- score	Beta (local index)	Equity return volatility	Market implied asset volatility	Tail risk	Mean expected shortfall	Systemic risk	Stouffer's Z- statistic
<b>Equity-linked compensation and probability of default</b>									
Equity-linked compensation	-0.23 (0.17)	2.15*** (0.00)	-0.05 (0.74)	-0.57 (0.32)	-0.01** (0.03)	-1.63 (0.15)	-0.52 (0.64)	-2.24** (0.02)	<b>-4.25</b>
Equity-linked compensation x Probability of default	-1.35** (0.02)	-9.22*** (0.00)	0.31* (0.10)	6.01*** (0.00)	0.14*** (0.00)	11.18*** (0.00)	8.04 (0.12)	-0.67 (0.85)	<b>14.54</b>
<b>Share of inside investors and probability of default</b>									
Share of inside investors	-0.01*** (0.01)	-0.05*** (0.00)	-0.002* (0.05)	-0.01** (0.03)	-0.0002*** (0.00)	-0.01 (0.14)	-0.04 (0.10)	0.02 (0.27)	<b>-4.93</b>
Share of inside investors x Probability of default	0.03** (0.05)	0.17*** (0.00)	0.01** (0.01)	0.08*** (0.00)	0.001*** (0.00)	0.17*** (0.00)	0.14*** (0.01)	-0.11** (0.03)	<b>11.11</b>

Source: IMF staff estimates.

Note: The table shows the estimated coefficients and p-values in parenthesis. \*\*\*, \*\* and \* indicate statistical significance at the 1, 5, and 10 percent levels, respectively. The Stouffer's Z-statistic is a measure that summarizes the joint statistical significance of a number of t-tests with the same null hypothesis. In this case, it gives a statistical indication of the significance of the effect of each explanatory variable on risk as measured jointly by the regressions with the different risk variables on the left-hand side of the equation.

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